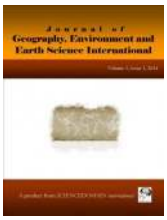

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Web Based Land Information System for Nintavur Divisional Secretariat Division (DSD), Sri Lanka

M. I. M. Kaleel[1*] and I. L. M. Zahir[2]

[1]Department of Geography, South Eastern University, Sri Lanka.
[2]Department of Landuse Planning, Ampara, Sri Lanka.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Nowadays, Web-based Land Information System is important to learn about the use of Geographic Information Systems and software for our profession. Modern technologies like geo-data processing, earth observation data processing and analysis are needed for Sri Lankan young researchers and students. This research work is dedicated to develop a land information system of Nintavur DSD. One task of the work is to establish a land information database which is based on an Open Source Geographic Information System. Work is starting with acquisition of existing geo-data and information, qualification, maintenance, utilization and transferring of data from Nintavur DSD. The establishment of a land information system for Nintavur DSD will contribute to the National Land Information System of Sri Lanka. The study demonstrates that Land Information Systems can be developed using GIS software as e.g. QuantumGIS, and the Open Source database management system Postgre SQL /Post GIS and Arc GIS.
This paper presents a framework for a Web-based GIS for Land Information. It focuses on the underlying concepts, theories and techniques for designing and implementing the conceptual

**Corresponding author: Email: kaleelmim@yahoo.com;*

framework that called WebGIS Land information. It consists of two main elements supporting the deliberative and analytic components of decision-making process. The deliberative part is based on the concept of argumentation maps. The analytic component consists of decision analysis methods. WebGIS Land information uses the server-side architecture approach to Web-based GIS. It employs HTML, CSS and JavaScript on the client-side and a combination of PHP scripting language, Map Server and a Postgres Sql database on the WebGIS Land Information.

Keywords: WebGIS; land information; GIS; monitoring; acquisition; dispute; resolution.

1. INTRODUCTION

The advent of the Internet has seen a number of Geographic Information Systems utilizing its potential to disseminate Geographic Information. Internet features such as platform independence, accessibility to large groups of population worldwide and technical features such as progressive transmission of raster images [2] and development of software packages with GIS functionality has helped its growth in the GIS industry. Initial GI Systems emerged as 'display only' static web pages and have evolved to provide basic spatial operations, often using dynamic pages [5]. While stand-alone GIS have become specialized and highly complex vendor specific software packages, Web based GIS comprises of relatively small pieces of software or components, which perform particular GIS operations, namely Cartographic Visualization [8].

There are a number of Web Based GIS systems on the Internet, which could be generalized into a number of categories. Rinner [8] specifies five different categories in the form of Internet Mapping Applications, based on their functionality, while Plewe [7] describes eight types of Distributed Geographic Information (DGI) Systems. In addition to these, we could category Web Based GIS based on its source. Two types of sources could be identified: Single source GIS (data and operations from single website/server) and multiple heterogeneous Sources (data or operations from multiple sites/servers) [10]. While the latter would be the ideal distributed GIS, either on the Internet or an Intranet, it presents numerous issues related to heterogeneity preventing it from being fully realized on the web yet [7]. Single source GIS will be therefore the subject of discussion in this paper.

World Wide Web permit information without boundaries to whole over the world, now we can freely described our world with map and spatial data. With WebGIS, our information could access with everyone by operating in the internet, access to GIS is not required any permition or limitation by time, space or location [6]. The launch of Google Maps service in 2005 brought countless opportunities for communities around the world to have free access to easy-to-use and browser-based WebGIS functionalities as well as high quality geospatial data [1]. Google Maps and the applications being built using its easy-to-use Application Programming Interface (API) provide a free WebGIS for the general public and non GIS experts where they can interact with and present their customized information in a user friendly and familiar environment. The main objective of this paper is to present the Land Management System based on WebGIS framework [3].

Geographic Information Systems, Remote Sensing data and other software are modern technological applications [4]. Nowadays, to apply these modern technologies to our field is increasingly required in developing countries especially, to study their use for a rural cadastre and the agriculture areas in Sri Lanka. Aim of the work is to develop a cadastral database and delineate a parcel structure for a complete coverage of all land resources using GIS and RS data over Nintavur DSD, based on Open Source GIS.

1.1 Web-Based Spatial Data Management

The general process of data handling can be described in the circle data acquisition, preprocessing, data processing and analysis, and land information activity planning, as illustrated in Fig. 1. All the data are parts of NDSD Land Information data infrastructure as our case study.

Firstly, the relevant data were collected, and placed together in a place to make it easier for us. Secondly, all maps and data were processed including map projection and definition of coordinate system. Thirdly, after all data processing and analysis, we store in a server

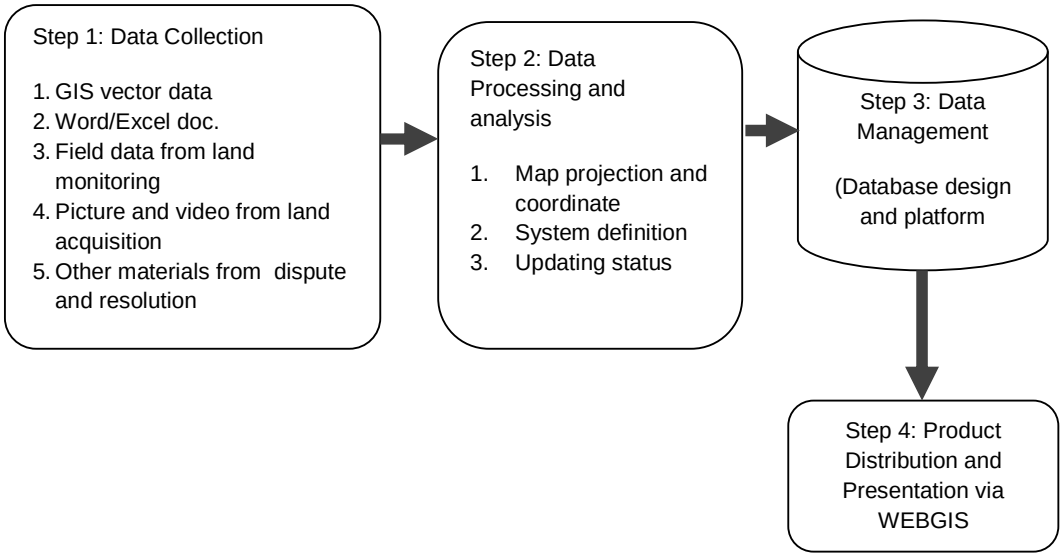

Fig. 1. The cycle of spatial data handling

system with SQL database for next purpose analysis. Finally, according to Land Management Planning, land updating status and distribution data can be acquired from WebGIS Land Information. WebGIS Land Information is to support and give fast solution for Land Monitoring, Land Acquisition and Land Dispute and Resolution [9].

2. CONCEPTUAL FRAMEWORK

2.1 Data Integration

Database component in Web-basedGIS Land Information has been collected from field operation monitoring, land acquisition data, and land dispute and resolution data to manage all problems in land information. All data were stored at server with PostgresSql and connected with MapServer the system. Then, all data were processing in WebGIS Land Information for faster decision in land management problems. Public participation needed for better solutions. Fig. 2. shows the flowchart of WebGIS Land Management.

2.2 System Architecture

Web GIS Land Information is designed to support and make easier land management in Nintavur DSD. The developed Web GIS system consists of client viewer and several server components. The interface of client viewer is designed using HTML, CSS, and JavaScript all of them are employed to facilitate the process of user input/request or to transfer them to the MapServer. The MapServer processes request for maps and related information and perform one or more map service functions such as image, feature, query, and metadata services [8]. In this Web GIS, image services are used for generating image-based map output according to the user request. The MapServer handles incoming requests; tracks map services on the MapServer, and hands off requests to the Spatial Server. The standard HTML viewer template is used in the Client Viewer to provide an interface of the Web-based GIS Land Information with the basic mapping functions including map display, pan, zoom in/out, feature selection, measurement, identification, navigation, and other functions. System architecture of the WebGIS Land Information is displayed in Fig. 3.

3. APPLYING THE FRAMEWORK

3.1 User Interface Description

In this paper, Web-based GIS Land Information System has three main modules (Land Monitoring, Land Management, Land Dispute and Resolution). Fig. 4 is a main menu to login the application. Public user can freely access the application but cannot update the information, only the administrator of any section could update the latest information in land information.

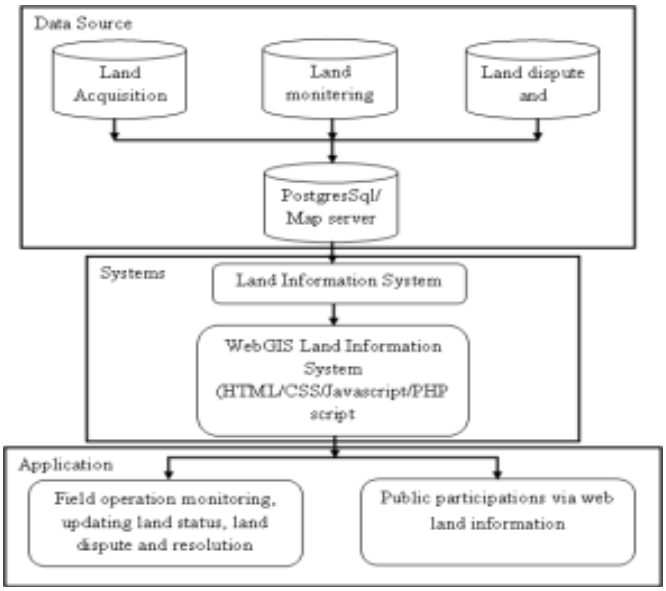

Fig. 2. Data flowchart of web-based GIS land information

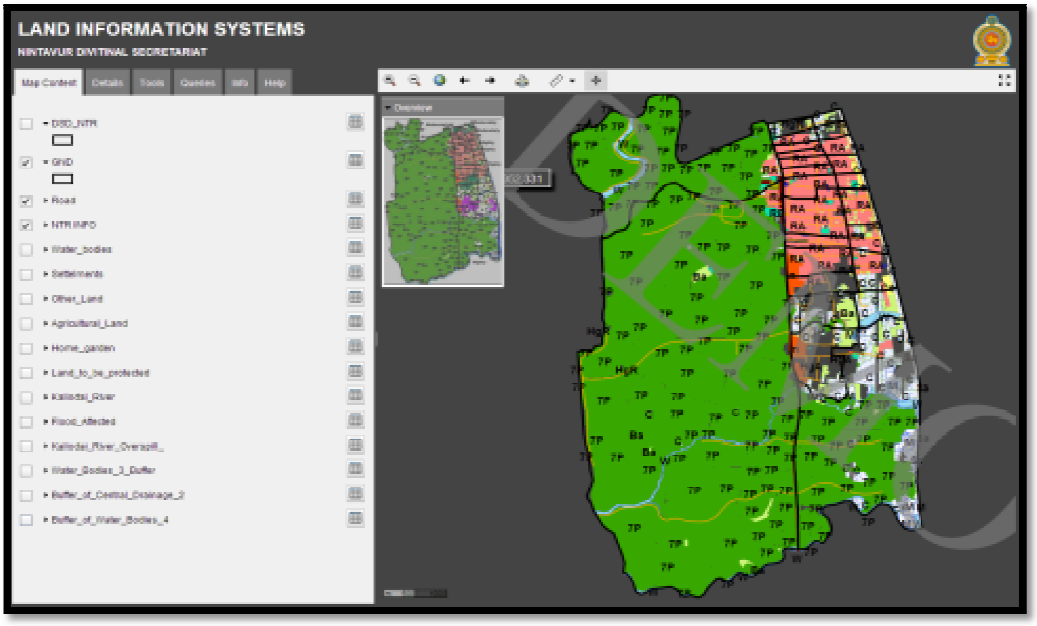

Fig. 3. Web GIS land information in Nintavur DSD

According to Land Information team members, all members can access the application but cannot update the latest information or change the geospatial information. Fig. 4 is a local information interface display for Land Monitoring in Web-based GIS Land Information.

All users can get tabular data information from this application with identity tool, this application can also give them video data from land payment, land blockades, demonstration, land combustion, land illegal occupancy, illegal land clearing or even flood area. All these information have collected by Land Monitoring team members and input to this application by administrator.

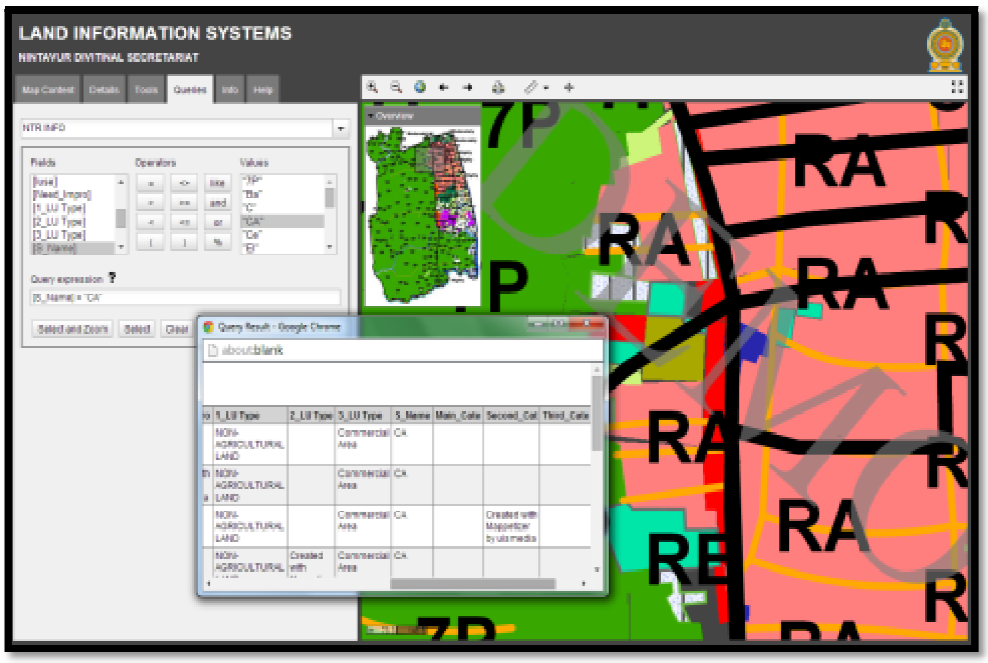

Fig. 4. Information Interface display for land monitoring

3.1.1 Web-based GIS land information system function and application

Web-based GIS Land Information designed to help the land management team members in Nintavur DSD for a faster decision of every land problem which needs fast solutions. All members could open this application anywhere, anytime to know what the latest information in land management is. Especially for an administrator of any module, they can update the land status, input some new information and also print out the latest map of land management.

4. DISCUSSION AND CONCLUSION

The purpose of this paper was to describe the design of Web-based GIS for Land Information System. This application has been useful tools to land management and solve the problem as fast as possible, especially for problem which needs fast decision.

In the future, we need to enhance and exceed this application, focusing in alert system procedure. We want to directly input the coordinate via short message service to the application from land monitoring activity (i.e. for land combustion, land illegal occupancy, illegal land clearing, demonstration, blockades, or even flood and inundation area), the system automatically present land escalation status change to land dispute module or land acquisition. Finally, show the present map to public user. As a continuing program, Web-based GIS Land Information needs feedbacks and suggestions from user, by adding some advance tool to give them more useful and functional application.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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