DEVELOPING WEB-GIS FOR THE PROVINCIAL SPATIAL PLANNING DATABASE

Samsu Arif, Ilham Alimuddin, Nurjannah and Sumbangan Baja
Pusat Penelitian Dan Pengembangan Wilayah, Tata Ruang, Dan Informasi Spasial (WITARIS)
Universitas Hasanuddin, Kampus UNHAS Tamalanrea, Makassar, 90245
Center for Research and Development of Spatial and Regional Planning and Spatial Information
Hasanuddin University, Kampus UNHAS Tamalanrea, Makassar, 90245

Samsu Arif: samsu_arif@yahoo.co.id, Dr.Eng. Ilham Alimuddin: ialimuddin@hotmail.com
Dr. Nurjannah: nurj_din@yahoo.com; Prof. Dr. Sumbangan Baja: baja_s@yahoo.com

ABSTRACT:

It is an undeniable fact that the advancement of information technology has provided an excellent problem solving related to managing spatial information nowadays. Unfortunately the advancement of this technology has not been used to the outmost due to the lack of implementation in the area of Spatial and Regional Planning in Indonesia. Indonesian government has approved the Act No. 26 of 2007 which has mandated all the provinces, districts, and the city should have the Spatial Plan and Detailed Spatial Plan for development in the area can be properly implemented. To realize the implementation of appropriate spatial planning law, local governments still have to face issues that are considerably basic; this is the lack of human resources in the understanding and implementation of spatial planning. On the other hand demands that society is based on the awareness of the function and role of good spatial planning has also increased. Based on these facts an application where the spatial arrangement can be acceptable to all parties needed to be supported by regular, consistent, and sustainable efforts. One of the efforts is developed by this study, namely developing the Provincial Spatial Planning Database System (Sistem Informasi Tata Ruang, SIMTARU) through Regional Spatial Development Implementation in South Sulawesi Province which is activity-based WEB GIS database preparation. This activity is closely associated with aspects of land use district / city in the province of South Sulawesi. The application system is developed to focus on the data collectivity and the enhancement of the system capability. Data collectivity includes entry and data integration compiled by the operators to the users. The main emphasis of this database development study is more on data base management systems and WEB GIS application program. Data were collected and integrated into a system of basic data of a general nature, such as base maps, satellite image data, map forest areas and public infrastructure data and its attributes. The challenge of this study is to publish the database to the web using programming language of PHP-Mapserver and continuously updating the database. Coordination among the sub provincial level (kabupaten) is highly concerned in the data collectivity. In conclusion, some functions of spatial analysis in the system have not been developed to the fullest which is therefore there are a lot of spares for further development.

Keywords: Spatial and Regional Planning, Web-GIS, PHP-Mapserver, SIMTARU.

1. INTRODUCTION

Our earth where we dwell which includes the land, sea, and air, and also that in the subsurface of the earth basically has its limitations. One day these resources will vanish. On the other hand the population growth rate is not in line with the availability of land and the uncontrolled use of land has been causing problems resulting spatial degradation , conversion , and fragmentation threaten the carrying capacity of the land area (FAO , 2012). Utilization and development of land resources are to face conflict of interest in the various sectors of economic problems which ultimately are counter-productive to one another. In relation to this, to realize a manageable area that is safe, comfortable , productive , and sustainable Act No. 26 of 2007 of Government Decree has mandated all the provinces, districts, and the city in Indonesia should have the Spatial Plan and Detailed Spatial Plan for development in the area as a guide for the Spatial Planning Development . This law mandates the need for spatial planning that can harmonize the natural environment and the built environment, which is able to create an integrated use of natural environment and man-made environment, as well as to provide protection to the function assigned space and the prevention of negative impacts on the

environment due to the mismanagement of an assigned space . The spatial planning rules should be applied and realized in every spatial planning process. To support the development of spatial planning system that emphasizes sectoral and territorial approach simultaneously, then the support of spatial data and spatial information systems (SIMTARU) based on Geographic Information Systems (GIS) is needed. The capacity of this spatial data and spatial information systems are expected to visualize the spatial variable region, make a rapid response to discrepancies in the data becomes faster; describe the spatial relationship between the various aspects of the changes that occur spatially; serve as a means of coordination and synchronization of data, and to serve as a control for spatial data formats used in the spatial arrangement (Steel , 2011). The objectives this spatial arrangement can be acceptable to all parties then need to be supported by the efforts of regular, consistent, and sustainable system. One effort that can be done is the preparation of the information system GIS -based spatial WEB .

WebGIS is a software engineering methodology that helps provide for the design, develop, maintain, and involves a web-based spatial applications. Web programming using science, engineering, and systematic approaches and principles for successful management of the development, application maintenance , and high-quality web systems (Murugesan , 2001) .

The use of the web as a dissemination medium for maps can be regarded as a major advancement in cartography and opens many new opportunities, such as real time maps, cheaper dissemination, more frequent and cheaper updates of data and software, personalized map content, distributed data sources and sharing of geographic information. It also implicates many challenges due to technical restrictions (low display resolution and limited bandwidth, in particular with mobile computing devices, many of which are physically small, and use slow wireless Internet connections), copyright and security issues, reliability issues and technical complexity. While the first web maps were primarily static, today's web maps can be fully interactive and integrate multiple media. This means that both web mapping and web cartography also have to deal with interactivity, usability and multimedia issues.

Distributing geospatial information on the internet is an enforcing factor for information providers. Internet allows all levels of society to access geospatial information and provides a media for processing geo-related information with no location restrictions. Web-based GIS is evolved from different web maps and client-server architecture to distributed ones. In turn, Internet reshapes all functions of information systems including gathering, storing, retrieving, analyzing and visualizing the data. The high cost of GIS system, the release of system specific databases, and the enormous software developer efforts on upgrading the system are fading with the introduction of web based GIS, moreover disseminating spatial information on the internet improves the decision making process (Alesheikh et.al, 2013).


2. DATA AND METHODOLOGY

The research was conducted in the province of South Sulawesi , geographically is located at $0^{o}12'-8^{o}0'$ South Latitude and $116^{o}48'-122^{o}36'$ East Longitude, with an area of 45.575 km2 . The administration consists of 21 regencies / and 2 municipalities with 263 subdistricts.

This research uses vector data format. Landcover/landuse data obtained from the analysis of land Landsat image which then converted to vector data. Other supporting data consists of : Basic Maps, and Administrative Map, and Thematic Maps such as Climatology, Topography Map, Geomorphology, Geology , Hydrology, Mineral Resources and Minerals , Natural Hazards, Map of Forest Areas , Soil Map, Transport Network Map , Facilities and Regional Infrastructure, Educational Facilities, Health Facilities, Tourist Sites and other special assigned maps. **Figure 1**.

SIMTARU development method using modified *waterfall models* , the *waterfall method* which is enriched in the scope of the new development to meet the challenges of web applications are developed. Stages of the application development process is shown in **Figure 2**, where the development stage iteratively applied to repeat and improve the various steps to get the results and find the requirements as desired by the user.

The resulting WebGIS is a database system that runs on the scope of the Internet. The system uses MySQL database created and supported by the application program using the PHP - MapServer . To be able to communicate with the different components in the web environment then used an Apache web server that is integrated with MapServer (**Figure.3**) .
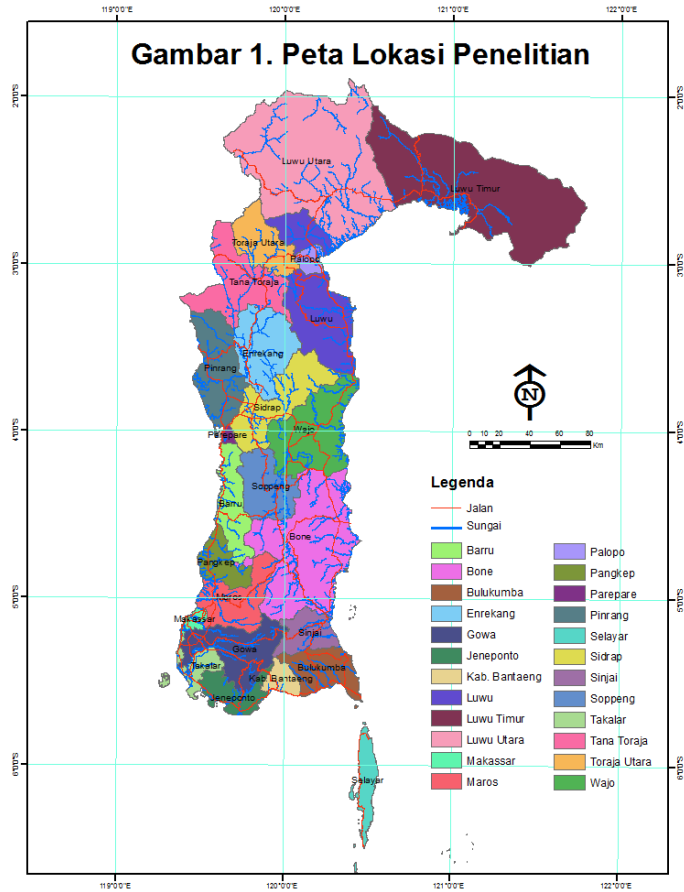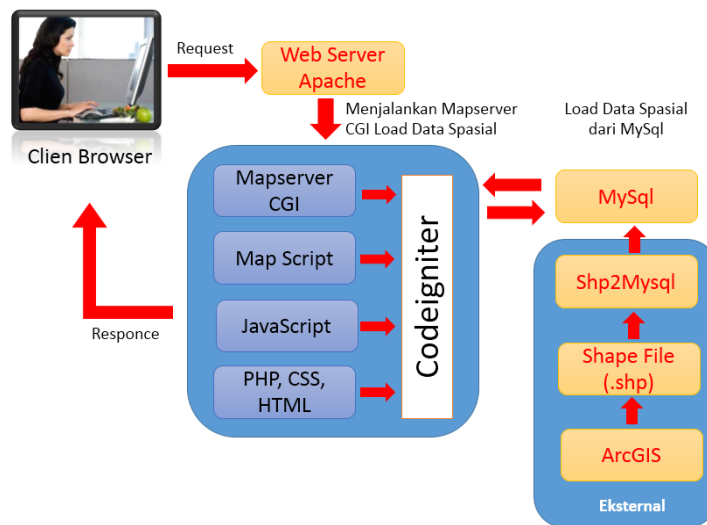
Figure 1. Study Location
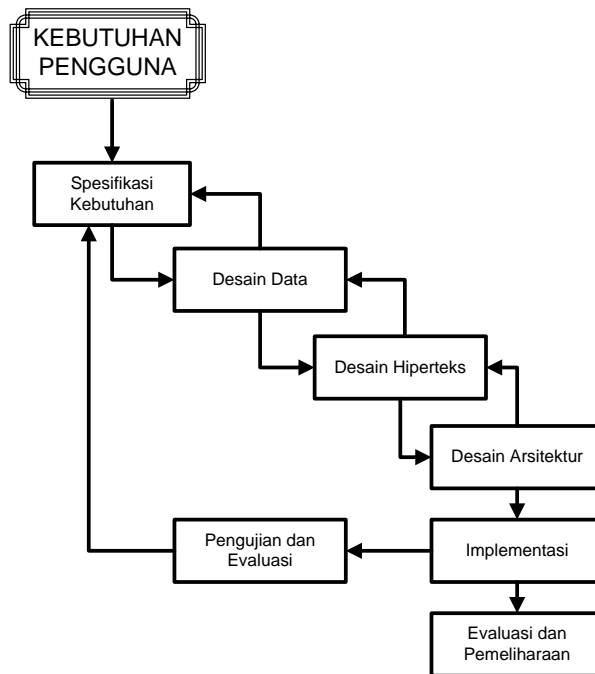
Figure 2. The Waterfall Method
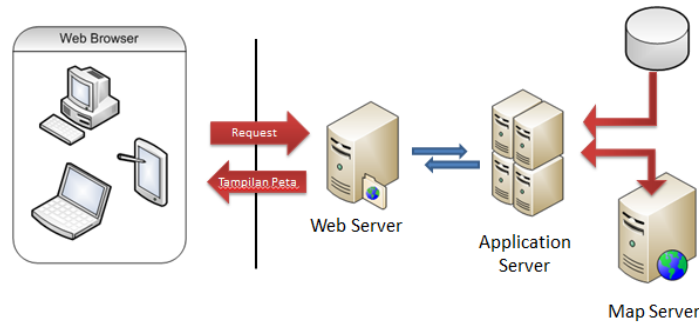
Figure 3. Web GIS Architecture

Figure 4. Data Flow and Final Result of SIMTARU

Spatial information is visualized using Mapserver and displayed dynamically in HTML pages . Request call the design of PHP that interacts with the database . Request and Response Database process sends a data request to PHP , the result of a request in the form of the response data format is sent back via the browser . When the client requests a connection is made to the DBMS , then the chosen spatial information of DBMS in Mapserver convert into shape . Plug -in browser on the client side as the display output Mapserver output into a map . MapServer also provides a script that allows a process when the user clicks the object . Through this Mapserver request sent to the application on the server . Server receives and translates into information and sends it to the HTML to display to the browser . To receive data from the spatial and non-spatial DBMS needed a technique that is able to communicate between the client and the database on the server . Such techniques are already available in PHP and MySQL . The selection of techniques adapted to the web server that is used (**Figure 4**) .

3 . RESULTS AND DISCUSSIONS

The results obtained from this study is an application system called Spatial Information System of South Sulawesi province , run the online network can be accessed anywhere and anytime without having constrained by distance condition . Various features of this system with the primary function of each , namely : Home : The main page displays information related to Spatial Information System of South Sulawesi province . News : features that are prepared to present the news related to the spatial or moments that have to do with spatial problems and potential of the region . Download : features that are prepared to do the downloading of several maps and documents contained on SIMTARU . Login :

a feature used by administrators and operators who were given permission to manage the portal , either to enter or edit data or set of maps that exist in the application system . Gallery : displaying images in the database in turn in the form of animation **Figure 5** . Regional Profile : features that serve to show the profile districts / cities in the province of South Sulawesi , namely : An area , region strategic Issues , Payload spatial planning , land use map , Pictures state of the area , and the program indicator table . Link : features that provide links to the website address , in accordance with the inputted by administrators . Contact : feature that displays the address information associated with the portal manager .
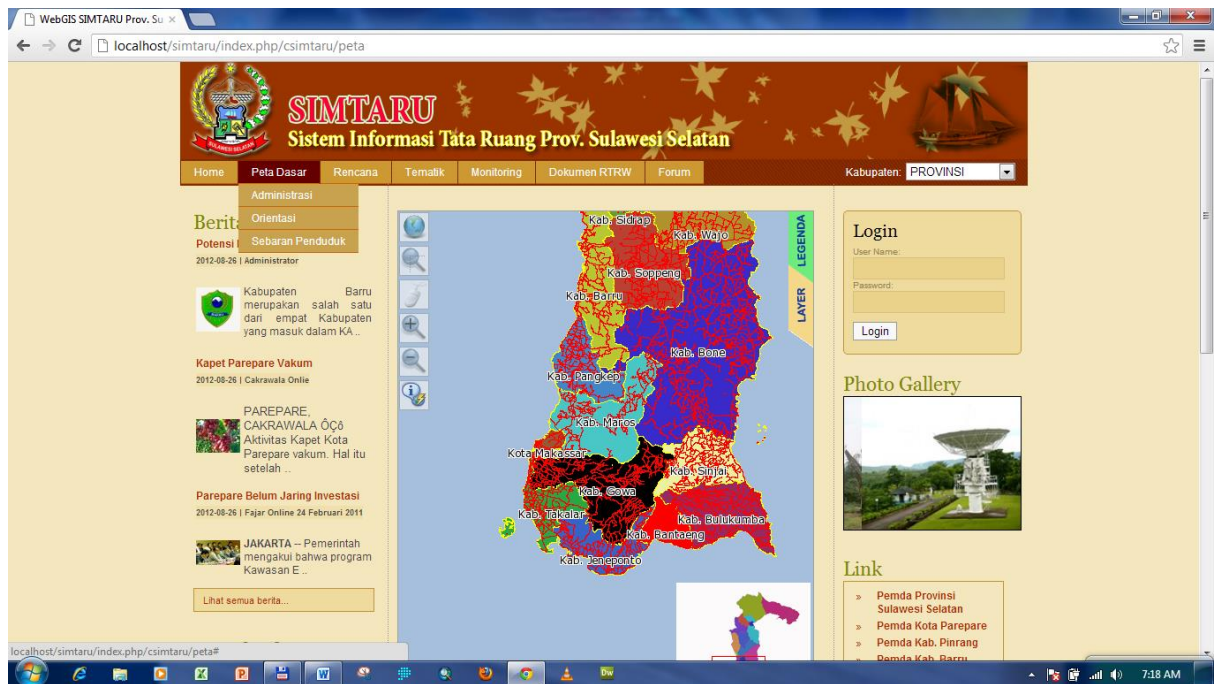
Figure 5. Tampilan Peta Dasar dan tematik sesuai dengan kebutuhan user untuk log in

4 . CONCLUSIONS

Presence SIMTARU provide convenience to obtain information from within the pattern of land use , spatial structure , strategic and general overview information on the South Sulawesi province . Selian , the availability of standardized maps that can be downloaded to a uniform format . SIMTARU can also be a guide in spatial synchronize state / city in order to realize the suitability of the information within a unified spatial plans .

REFERENCES

[1] Alesheikh A.A., , Helali H., and Behroz H.A., 2002, Web GIS: Technologies and Its Applications, Symposium on Geospatial Theory, Processing and Application, Ottawa,
[2] Baja. S, Arif. S, 2011, Penyiapan Basis Data dan Sistem Informasi Penataan Ruang : Pengembangan Sistem Evaluasi Data Spasial GIS RTRW Kabupaten/Kota Provinsi Sulawesi Selatan. DInas Tata Ruang dan Permukiman Provinsi Sulawe Selatan.
[3] FAO, 2012. FAO Statistical Year Book 2012. Rome: Food and Agriculture Organization of The United Nations.
[4] Jin-Yong Choi, Bernard A. Engel and Richard L. Farnsworth, 2005Web-based GIS and spatial decision support system forwatershed management, *Journal of Hydromatics*, 7.3
[5] Prahasta. E, 2006,. Membangun Aplikasi Web-based GIS dengan MapServer. Informatika Bandung.
[6] Simarmata. J., 2009, Rekayasa Web. Andi, Yogyakarta.