Transformation of Binjai City Spatial Planning Information Through Development and Maintenance WebGIS Based Web

[1] Rikardo Hotman Siahaan, [2] Genius M Laia, [3] Analiser Halawa, [4] Nalom D Marpaung, [5] Kolombus Siringoringo,

[6] Mayono Suko Marbinoto

[1] Technique Informatics, Faculty Technology Industry, Institut Sains dan Teknologi TD Pardede, Medan

[2,6] Technique Planning Region City, Faculty Technique Civil and Planning, Institut Sains dan Teknologi TD Pardede, Medan

[3,4] Technique Mining, Faculty Technology Miniral, Institut Sains dan Teknologi TD Pardede, Medan

[5] Technique Electrical Engineering, Faculty Technology Industry, Institut Sains dan Teknologi TD Pardede, Medan

ABSTRACT:

Digital transformation in spatial planning management is an important requirement for local governments in providing information Which accurate, latest, And easy accessible. City Binjai as region urban The ever-evolving spatial information system requires a spatial information system capable of effectively integrating spatial and non-spatial data. This study aims to realize the transformation of spatial information in Binjai City through the development and maintenance of web-based WebGIS. The research methods used include inventory and identification of geospatial data availability, processing and updating spatial data, and designing and implementing a WebGIS system. The data used consist of the Indonesian Topographic Map (RBI) at a scale of 1:10,000–1:25,000, high-resolution satellite imagery of Spot 7, base maps, thematic maps, and spatial planning maps. WebGIS development is carried out using open source technology, namely PostgreSQL/PostGIS as a spatial database, GeoServer as a geospatial data server, and LeafletJS as a web-based mapping interface. The research results show that the developed WebGIS is capable of presenting spatial information about Binjai City interactively and in an integrated manner, including base maps, thematic maps, and spatial planning maps. Furthermore, the system maintenance strategy involves regular data updates and database management. support sustainability and reliability WebGIS. Existence WebGIS This contribute to improvement accessibility, transparency, and effectiveness provision information order room, as well as support spatial data-based decision making.

Keywords: WebGIS, System Information Tata Room, Data Geospatial, Transformation Digital, City Binjai.

INTRODUCTION

Advances in information and communication technology have driven digital transformation in various sectors, including regional spatial planning. Spatial planning information previously presented in the form of conventional maps and static documents has been deemed ineffective in meeting the need for accurate, up-to-date, and easily accessible data for various stakeholders. This situation demands an information system capable of dynamically integrating spatial and non-spatial data based on digital technology. Binjai City, as one of the cities experiencing rapid regional development, requires a spatial information system that can support planning, control, and dissemination of information on spatial utilization. The availability of geospatial data such as the Indonesian Topographic Map (RBI) and high-resolution satellite imagery, map base, map thematic, And map

plan order room is potential important Which Not yet fully utilized optimally in one integrated information platform.

The use of WebGIS (Web-based Geographic Information System) technology is a strategic solution for presenting spatial information interactively and easily accessible via the internet. WebGIS enables visualization data spatial Which more informative, integrative, And responsive to update data. However thus, development WebGIS No only stop on stage manufacturing system, but must be followed by a continuous system maintenance strategy so that the data and information presented remains accurate and relevant.

Based on these conditions, this research focuses on the transformation of spatial information in Binjai City through development And maintenance WebGIS based web. Study This expected can become systematic efforts to integrate available geospatial data and increase the effectiveness of presentation and utilization information order room for government area and public. Study previously WhichThe topics discussed in relation to this title are (1) WebGIS Development for Urban Spatial Planning Information. Siregar et al. (2021) This study examines the development of WebGIS as a web-based medium for presenting urban spatial planning information. The data used include base maps, thematic maps, and spatial planning maps integrated using GeoServer and LeafletJS. The results of the study indicate that WebGIS is able to increase the accessibility and transparency of spatial planning information for the government and the public. This study emphasizes the importance of WebGIS as a means of transforming spatial planning information from system conventional to system digital. (2) Implementation WebGIS Based Open Source For Pratama & Nugroho Regional Planning (2022) This study focuses on the implementation of open source-based WebGIS in supporting regional and city planning. The system was developed using PostgreSQL/PostGIS as a spatial database and GeoServer as a map server. The results of the study indicate that the use of open source technology is effective in supporting system sustainability and facilitating the maintenance and further development of WebGIS **.** (3) Analysis of Geospatial Data Readiness in the Development of Spatial WebGIS Lestari et al. (2023) This study analyzes the readiness of geospatial data in the development of spatial WebGIS, including aspects of data completeness, scale suitability, and attribute consistency. The results of the study indicate that the readiness of geospatial data is a major factor in the success of WebGIS in presenting spatial information accurately and reliably. This study is relevant to research that emphasizes the importance of identifying data availability before developing a WebGIS system. (4) WebGIS as a Media Digital Transformation of Spatial Information Rahman & Putri (2024).

This study discusses the role of WebGIS in the digital transformation of spatial information presentation in urban areas. WebGIS developed For serve map interactive Which can accessible in a way wide by public. The results of the study show that WebGIS contributes to increasing the efficiency of spatial data management, supporting decision-making, and encouraging public participation. (5) WebGIS System Maintenance Strategy for Spatial Information Sustainability Wibowo et al. (2025) This study focuses on the maintenance aspect of WebGIS, particularly in updating spatial data, management database, and system performance. The results of the study show that without a good maintenance strategy, WebGIS has the potential to experience a decline in information quality. This study confirms that maintenance The system is an integral part of WebGIS-based spatial information transformation. Synthesis (Reinforcement in the Introduction) Based on previous research, it can be concluded that WebGIS has been widely used as a medium for presenting spatial information and regional planning. However, most of the research Still focus on aspect development system, temporary study Which   integrate Integrated identification of data readiness, system development, and WebGIS maintenance strategies are still limited. Therefore, this study plays a crucial role in complementing previous studies by emphasizing the transformation of spatial information through the development and maintenance of web-based WebGIS in Binjai City.

METHOD STUDY

Approach and Type Study

This research uses a descriptive-applicative approach with a research and development (R&D) method. The descriptive approach is used to identify and analyze the availability and readiness of geospatial data, including base maps, thematic maps, and spatial planning maps of Binjai City. This approach aims to describe the condition

of existing data as a basis for developing a WebGIS system. Meanwhile, the applicative approach is applied in the design, development, and implementation processes. And implementation WebGIS System Information Tata Room City Binjai based web. This approach emphasizes the application of web-based Geographic Information System (GIS) technology to produce a functional and usable WebGIS application. The research used is system development research, which focuses on the development and maintenance of a web-based geospatial information system. This research includes the stages of needs identification, geospatial data processing, system design, WebGIS implementation, and system maintenance to ensure the sustainability and accuracy of spatial information.

With this approach and type of research, this research not only produces a descriptive analysis regarding data geospatial, but Also produce external in the form of WebGIS System Information Tata Room Binjai City as a form of transformation in the presentation of spatial planning information from a conventional system to a web-based digital system.

Location and Time Study

This research was conducted in Binjai City, North Sumatra Province. Administratively, the research area covers the entire city, comprising several sub-districts and villages. This location was selected based on the availability of relatively comprehensive geospatial data, including base maps, thematic maps, and spatial planning maps, as well as the need for an integrated and easy-to-use spatial planning information system accessible. Furthermore, Binjai City was chosen as the research location due to its dynamic urban development that requires the support of a digital-based spatial information system. WebGIS development in this region is expected to support the transformation of spatial information presentation and become a example implementation technology WebGIS on level city. Study This implemented in period time

± 6 (six) month **,** Which covering a number of stages activities, namely:

- Preparation And studies literature,

- Inventory And identification availability data geospatial,

- Processing And updates data spatial,

- Design And development WebGIS,

- Implementation And testing system, as well as

- Evaluation And maintenance beginning WebGIS.

Time study customized with need development system And availability data, so that all stages of research can be carried out systematically and continuously.

WEBGIS System Discussion and Evaluation

The development of the Binjai City Spatial Information System WebGIS was not only descriptive but also analytically evaluated to assess system performance, usability, and its impact on the decision-making process compared to previous conventional practices. The evaluation was conducted through technical system testing, spatial data validation, and end-user assessments.

a. System Performance and Usability Evaluation

WebGIS performance was evaluated based on data access speed, system stability, and ease of interface navigation. Test results showed that WebGIS was capable of displaying spatial and thematic data in real time with a faster response time than static map presentation methods (hardcopy or offline files). In terms of usability, the integration of basemap, thematic, and plan map layers in a single platform improved information retrieval

efficiency and facilitated cross-sectoral spatial analysis.

b. Contribution to Decision-Making

Compared to previous practices that relied on printed maps and separate documents, WebGIS significantly improves the quality of spatial planning decision-making. This system enables comprehensive spatial visualization, analysis of data relationships, and uniform access to information for all stakeholders. Thus, WebGIS serves as a decision support system in the planning, control, and evaluation of spatial use in Binjai City.

c. Data Accuracy and Validation Procedures

Spatial data accuracy is maintained through the use of the Indonesian Topographic Map (RBI) from BIG as a base map and high-resolution SPOT 7 satellite imagery. The validation process is carried out through:

1. Cross-checking spatial data between RBI data, satellite imagery, and field survey results.

2. Checking attribute consistency to ensure non-spatial data matches actual conditions.

3. Overlay analysis of spatial suitability between base maps, thematic maps, and plan maps.

Validation results indicate that the data used has an adequate level of suitability for spatial planning and management purposes.

d. System Testing

System testing was conducted through functional testing of WebGIS's main features, such as layer display, data search, spatial data addition, and map export to JPG and PDF formats. All functions performed according to system design, demonstrating that WebGIS is suitable for use as a web-based spatial information platform.

e. User Feedback

Assessments from end users, including regional planners and local government officials, indicate that WebGIS improves the accessibility of information and transparency of spatial planning data. Users believe the system facilitates the understanding of spatial planning policies and accelerates the analysis process. Furthermore, WebGIS is also considered to have the potential to increase public participation through open and easy-to-understand access to spatial information.

f. Implications and Further Development

Although the system has performed well, further development is still needed, particularly in enhancing spatial analysis features, real-time data integration, and mechanisms for gathering online public feedback. With these improvements, Binjai City WebGIS is expected to have a greater impact in supporting transparent, participatory, and data-driven city governance.

RESULTS AND DISCUSSION

Format and Design WebGIS Binjai City

This website is based on a GIS (Geographic Information System), better known as WebGIS. The GeoServer application, PostgreSQL, and the Leaflet JavaScript library will be used in its creation. The definitions and functions of each tool are as follows:

Introduction Leaflet JavaScript

Leaflet JavaScript , or LaefletJS for short, is an open-source JavaScript library. It was first released by Vladimir Agafonkin in 2011. This library is specifically used for building... application mapping based web, support

part big mobile And desktop platform. Leaflet allows someone without *a GIS (geographic information system)* background to be able to Easily display tiled web maps on public servers. Numerous plugins can be used to add additional features to web maps. Before displaying a web map with Leaflet, you'll need to download the LeafletJS package and save it to your computer.

Understanding GeoServer

GeoServer is a server used for GIS purposes such as sharing, processing and editing. data geospatial. Developed with use Language JAVA, device This become something a very useful tool for various purposes, especially in the field of GIS. GeoServer can connect existing information/data to virtual worlds like Google Earth and NASA World Wide Web, as well as to web-based maps like Google Maps, Bing Maps, and OpenLayers. With this application, we can display data in various formats. GeoServer's primary function is to: server free And open in build data spatial. Same like Apache HTTP Server Which GeoServer offers a free and open source web server for publishing HTML. GeoServer can run on Linux, Windows, and OS X operating systems.

Picture 1. GeoServer

Understanding PostgreSQL

PostgreSQL is A system base data Which can used in a way free according to Agreement BSD license. Device soft This is Wrong One base data Which most Lots used moment This, Besides MySQL and Oracle, PostgreSQL provides many useful features for various database needs. the relationship with System Information Geographical, PostgreSQL is base data Which can store data in the form of geometric objects in the form of points, lines, and areas (polygons) apart from tables attribute (along objects other like case in point view, rule, constraints, index, function / procedure, And(and similar) as a regular database. By using the PostGIS plugin, which is useful as a spatial database engine, or extension that can add support in defining and managing (functional) spatial elements for the PostgreSQL object-relational DBMS. Practically, PostGIS acts as a spatial service provider for this DBMS. Allowing PostgreSQL to be used as a spatial database backend for GIS software. In short, PostGIS also adds SQL types (sets) (queries), operators, and functions (analysis) that then make the PostgreSQL DBMS "Spatially-enabled". PostgreSQL is one of the best databases for GIS purposes.


Picture 2. PostgreSQL base data for needs GIS

WebGIS Binjai City

The Binjai City WebGIS that has been compiled will be uploaded to the Binjai City WebGIS website (domain), namely: http://webgiskotabinjai.com/
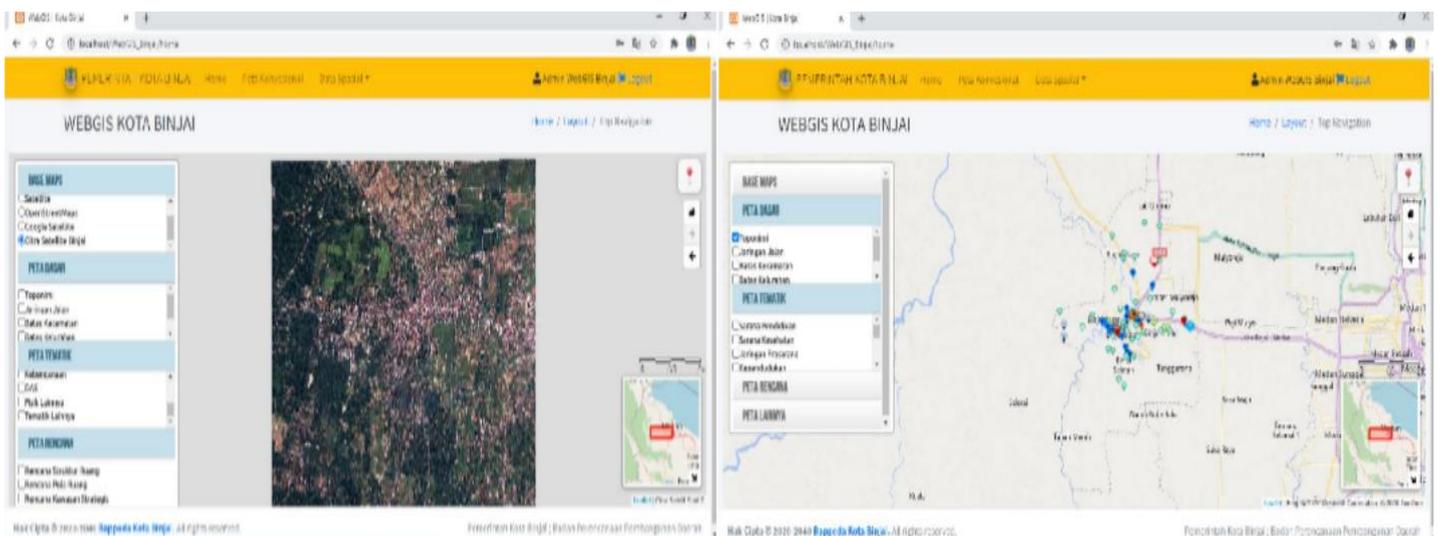
The Binjai City WebGIS will be presented in the following description, while all coding for the Binjai City WebGIS will be presented in the appendix to this final report. The following image shows the results of the Binjai City WebGIS.
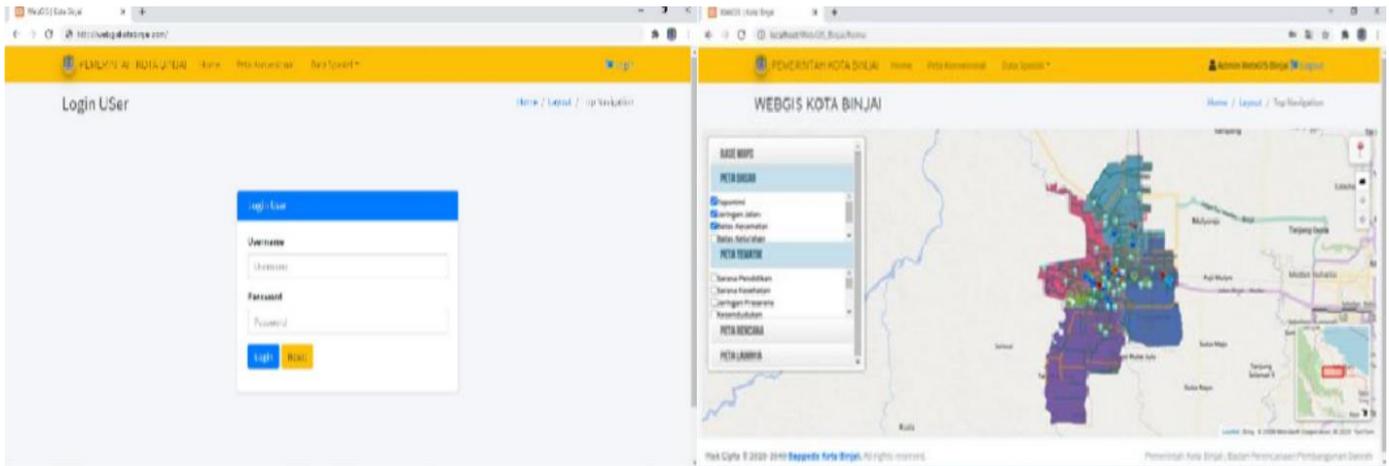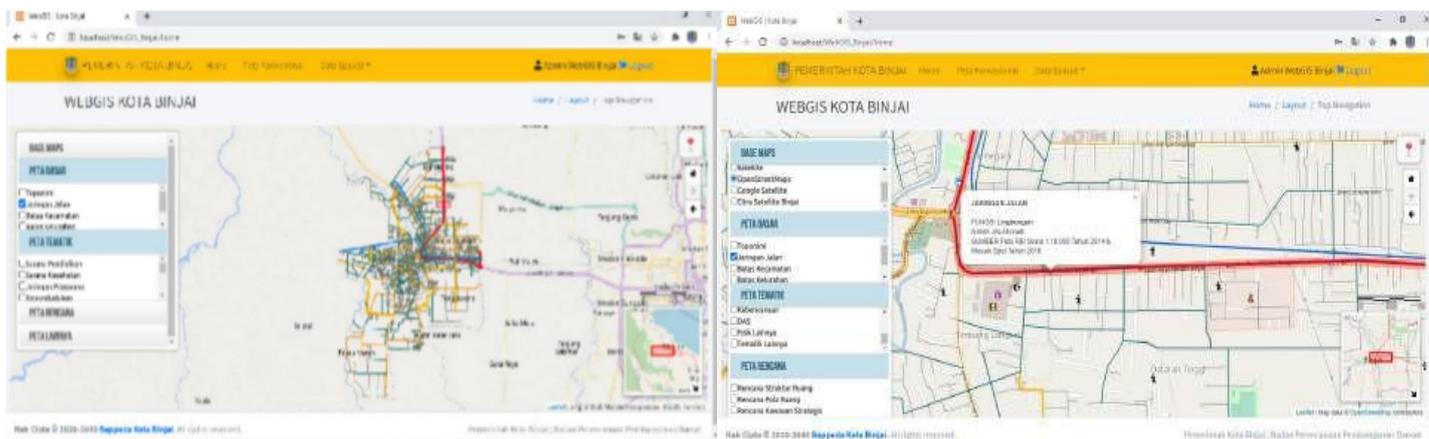

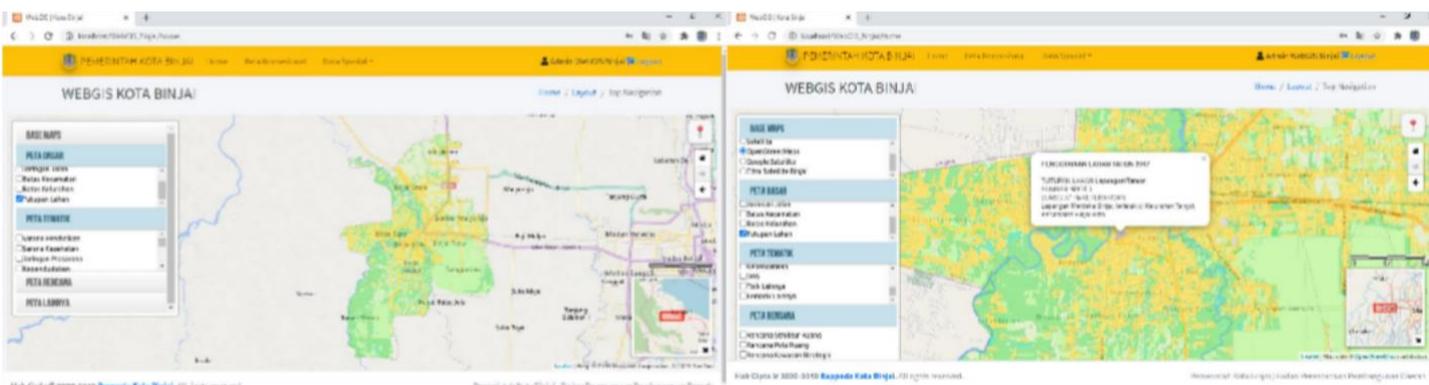Picture 3. Page beginning after Login and Basemap
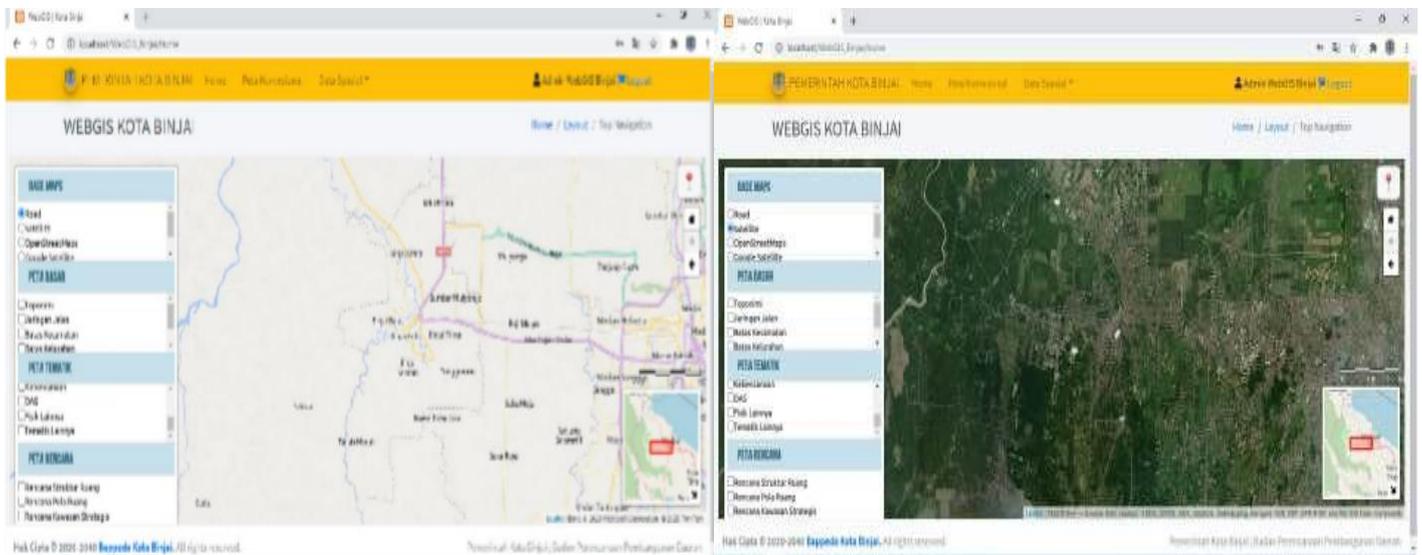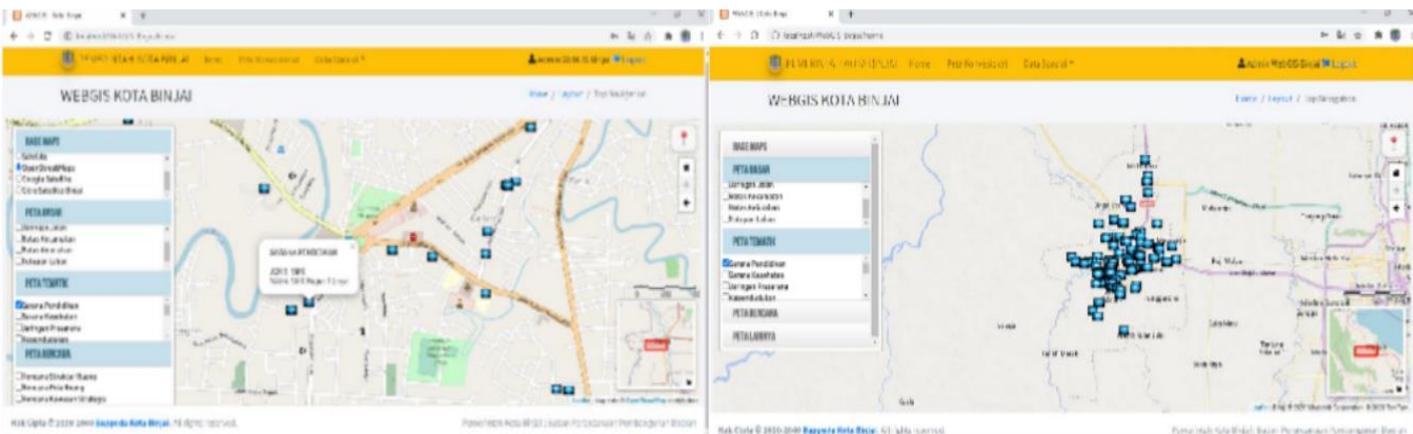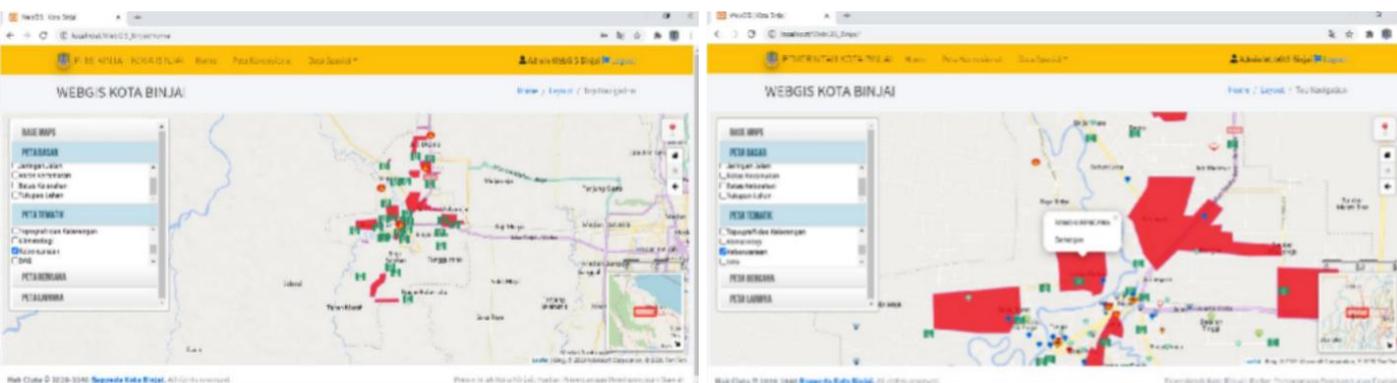

Picture 4. Basemap Bingmap And Basemap Esri

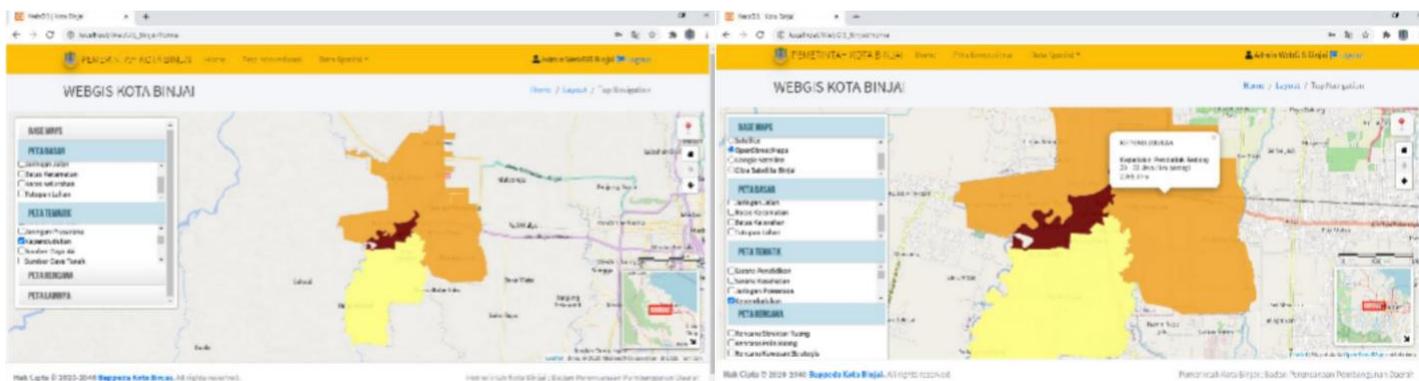Picture 5. Basemap Spot

Picture 6. Basemap Spot 6/7 And Toponymy

Picture 7. Appearance Network Road And information road
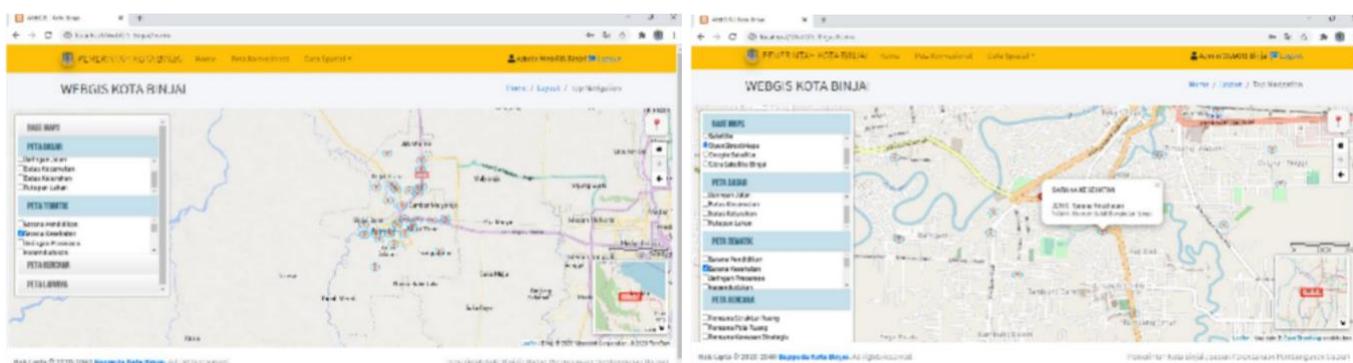

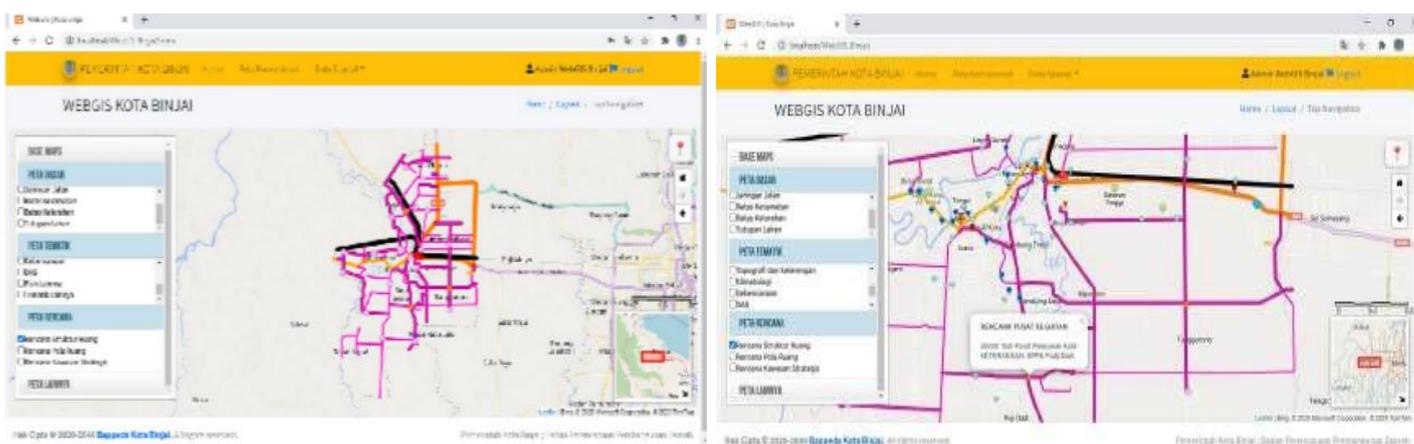Picture 8. Cover Road And Purpose Land

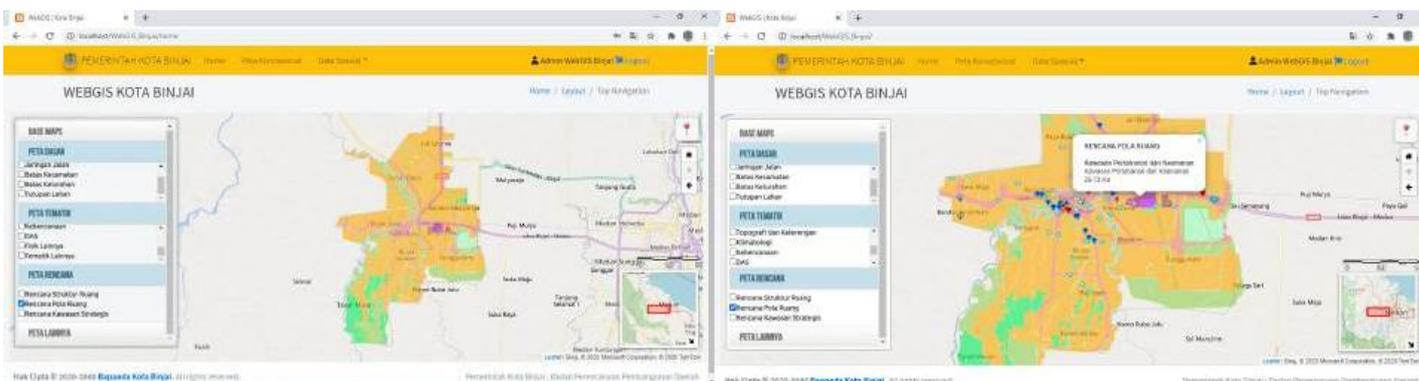Picture 9. Means And information educational facilities

Picture 10. Appearance Means And information means Health
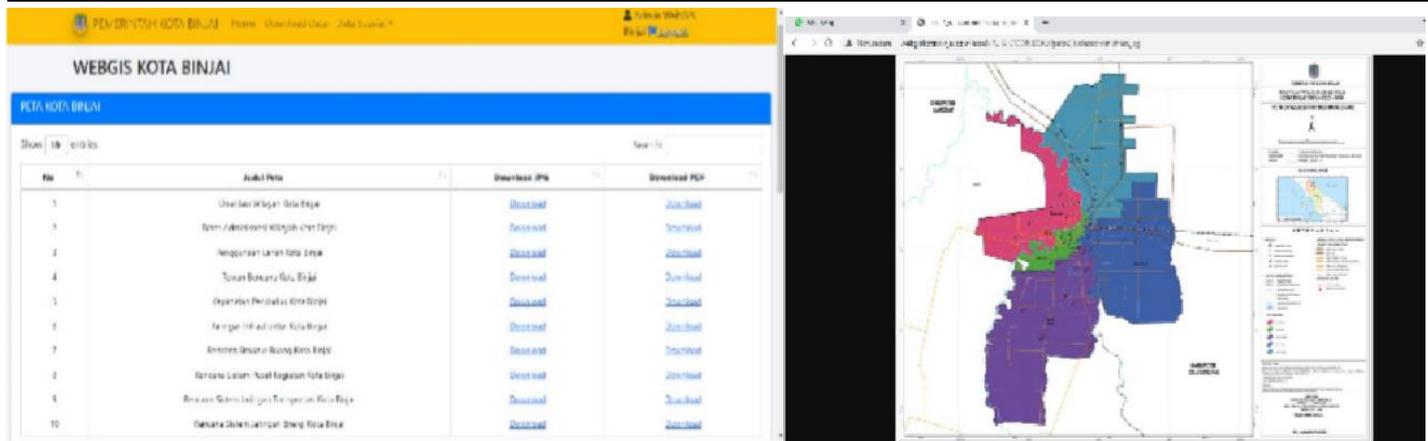

Picture 11. Appearance population And information population

Picture 12. Appearance disaster And information disaster

Picture 13. Plan structure room And information structure room

Picture 15. Plan Area Strategic And information area strategic

Keep Data/Map Conventional in form JPG or PDF

CONCLUSION

Based on the results of research on the transformation of spatial information in Binjai City through the development and maintenance of web-based WebGIS, it can be concluded that the availability of geospatial data including the Indonesian Topographic Map (RBI), high-resolution satellite imagery, base maps, thematic maps, and spatial planning maps has met the needs in developing a WebGIS system. The data can be integrated effectively after going through an updating and standardization process, making it suitable for use as a basis for spatial information. The development of the Binjai City WebGIS using open source technology, namely PostgreSQL/PostGIS, GeoServer, and LeafletJS, has proven to be able to present spatial information interactively and easily accessed through a web browser without the need for special GIS software. This system allows visualization of base maps, thematic maps, and spatial planning maps, and supports more efficient management and dissemination of spatial information. In addition to the system development aspect, WebGIS maintenance is an important factor in maintaining the sustainability and reliability of information. Regular data updates, spatial database management, and system performance evaluation are necessary to ensure that WebGIS remains relevant to the dynamics of development in the Binjai City region. Thus, WebGIS functions not only as a medium for presenting information but also as a tool to support decision-making in spatial planning and regional development. Overall, the implementation of WebGIS in Binjai City has contributed to improving accessibility, transparency, And effectiveness provision information order room for government regions, communities, and other stakeholders. The existence of WebGIS is expected to support planning, control, And development region in a way sustainable as well as become base development of a more comprehensive spatial information system in the future.

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