Research Article

Mapping Mining Potential Using WebGIS

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ABSTRACT

The mining potential of an area has an attraction in terms of research, exploration, investment, and tourism. Unfortunately, information on potential mining areas is still limited and difficult to obtain. A media is needed in the form of a digital map that is able to provide detailed information along with a wide area of the potential mine area. This study describes the mapping of mining potential using the Web Geographic Information System (WebGIS). The coordinates of the mining area's potential points that form polygons in the map will be represented in a web-based digital map. So that information will be more accessible and provide greater opportunities for researchers, investors, and visitors before coming to the mine site.

Keywords: *mapping mining potential, digital map, webgis*

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1. INTRODUCTION

Mining is one of the promising investment potentials (Sobczyk, Kicki, Sobczyk, & Szuwarzyński, 2017). The mining sector has a positive impact including creating jobs, including local own-source revenues (Werner, Bebbington, & Gregory, 2019). The potential of the mining sector can be used as an area of potential mining development such as limestone, manganese, coal, iron ore mining and so on. The mining potential can certainly be used as capital to further develop areas such as the development of the mining processing industry, construction of facilities and infrastructure, and so on (Soleimani, 2018).

To support the development of the mining sector in the regions, it is necessary to have better and more informative information so that it can be used as a guideline for investors who will invest their

capital. One of the systems for presenting information on the potential of the mining sector is through broadcasting in the form of data and information related to the geographical conditions of an area. This data will enter the server layer, the database server (Rusdi, Salam, Abu, Sahib, et al., 2019) and become a dataset in the use of information and communication technology (Rusdi, Salam, Abu, Sunaryo, et al., 2019). Systems on several interconnected devices lead to a web-based information system (Sunaryo, Rusydi, Manab, Luthfi, & Septiana, 2016). This presentation system is better known as WebGIS (Jayakumar, 2019) (Amelia & Ayu, 2016). WebGIS has several advantages in the concept of Computer-Aided Facilities Management (CAFM) (Xia, 2004). WebGIS is a computer-based information system for storing, managing and analyzing and calling geo-referenced data (Taufiq, 2013). The benefit of WebGIS is that it provides insight (Fago et al., 2014) and the convenience of users or decision-makers to determine the wisdom to be taken, particularly with spatial aspects (Ã & Meroni, 2009). With this technology, it will be easier in terms of land tracking and mapping (Sunaryo, Rusydi, Rusdi, Suriani, & Daus, 2019), one of them is mining land.

The purpose of this research is to develop a WebGIS application as a dynamic open information media as well as a promotional media for the mining sector to support the regional economy. Primary database sourced from survey data in the field which is equipped with photos, detailed information and coordinates of potential mining area points using GPS. Data will be analyzed and adjusted with secondary data to produce an appropriate digital map. The results of primary data processing become input data for WebGIS applications. Each point coordinates of the area that forms polygons is a marker for WebGIS in displaying information on mining potential.

2. METHODOLOGY

The research method focuses on developing a WebGIS-based mining potential mapping system. Starting from objectivity and problem identification, analysis and design, system development, system testing, to evaluation. This stage is illustrated in Figure 1.

Figure 1: Research Stages

The stages of the research began with objectivity and problem identification in the limited information on mining potential through online media. Then an analysis and system design are carried out that allows mining potential data to be accessed online. The system was built into a WebGIS application and tested through a web browser. Then the results are evaluated whether it is following needs.

3. RESULT AND DISCUSSION

The data source comes from primary and secondary data collection which is processed in such a way as to produce input values for WebGIS applications (Figure 2). Primary data obtained from observations and taking coordinates the potential for mining using GPS in the field. Secondary data sourced from existing data and basic maps of the region.

Primary data is converted into digital maps using the Quantum GIS application and produces Shapefile (SHP) format files. Then this file is stored in a Keyhole Markup Language (KML) format file to display potential mining data accompanied by polygon coordinate values. Data will be analyzed based on database field parameters in WebGIS. If appropriate, the data is inputted into the WebGIS application.
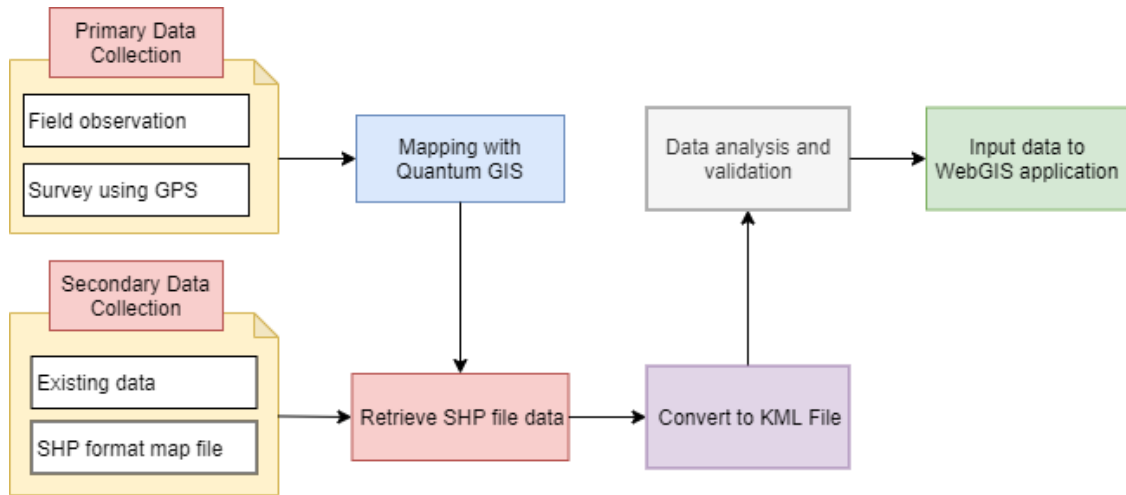
Figure 2: Data Resources for WebGIS Application

Following the basic map data potential of mining potential, a database structure was designed for the WebGIS application (Figure 3). The base map data attribute is used as the main table, the mining_potential table. Then some reference tables were added to facilitate the processing of mining potential data later. Some reference tables are region table, land_status table, wp_status table, and user table.
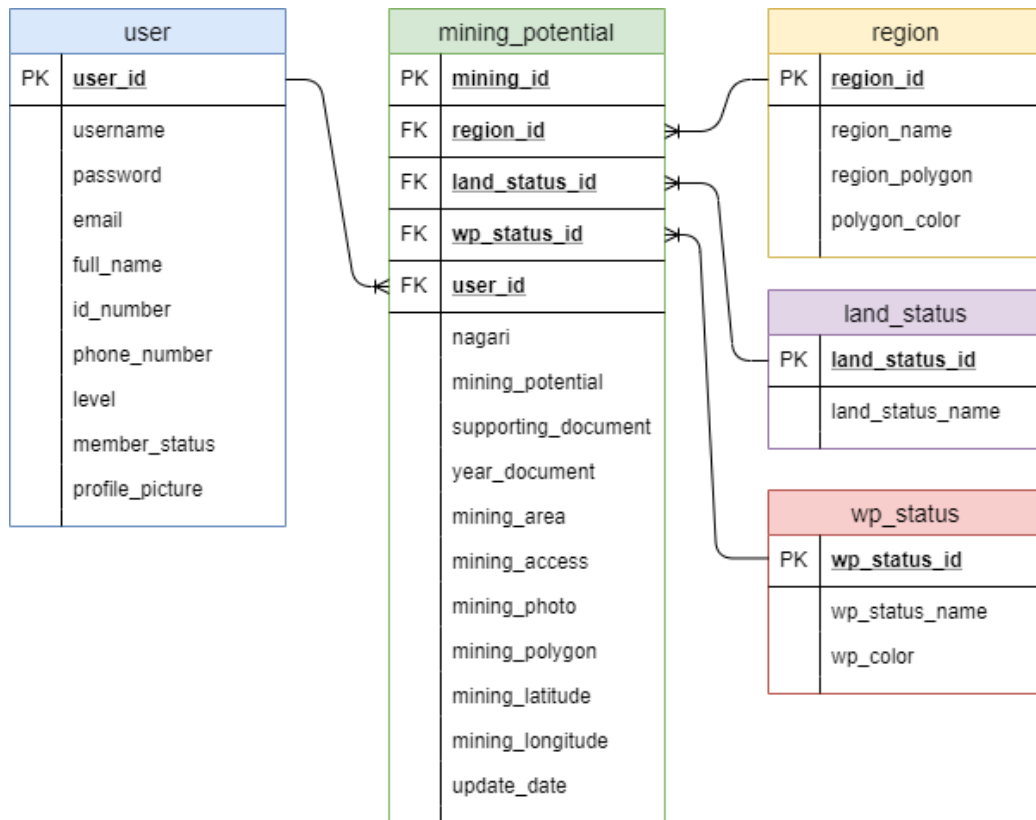

Figure 3: Structure of Database

WebGIS users are divided into two. The first is that guests can only access detailed mining information along with digital maps in the form of polygons. The second is the operator that can perform data processing of the database server. The user access process for a WebGIS application is illustrated through the information system flow process in Figure 4.
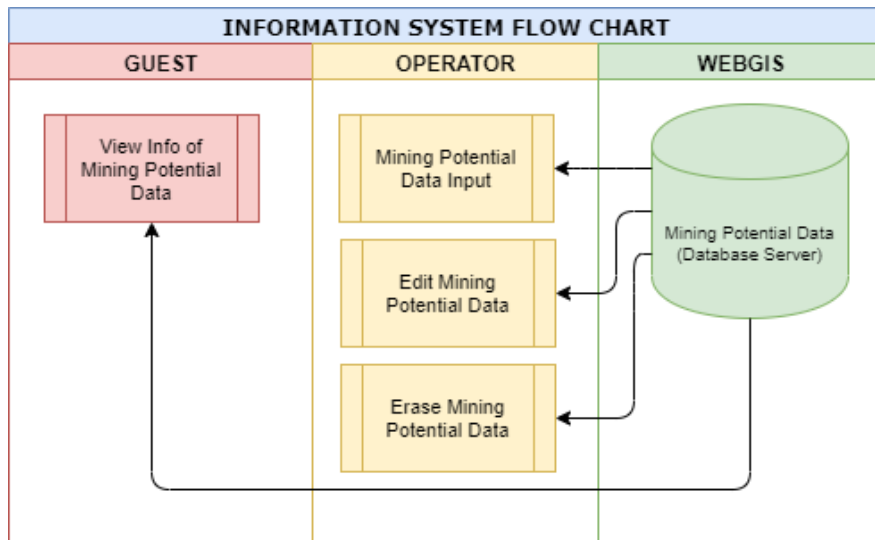
Figure 4: Information System Flow Chart

After passing through the stages of system analysis and design, primary data sourced from observations in the field are converted to KML data and opened through a text editor. Testing the system through the WebGIS application can be done by inputting KML data after passing the input value needs analysis process. Visually, the process of data conversion to data input can be seen in Figure 5.
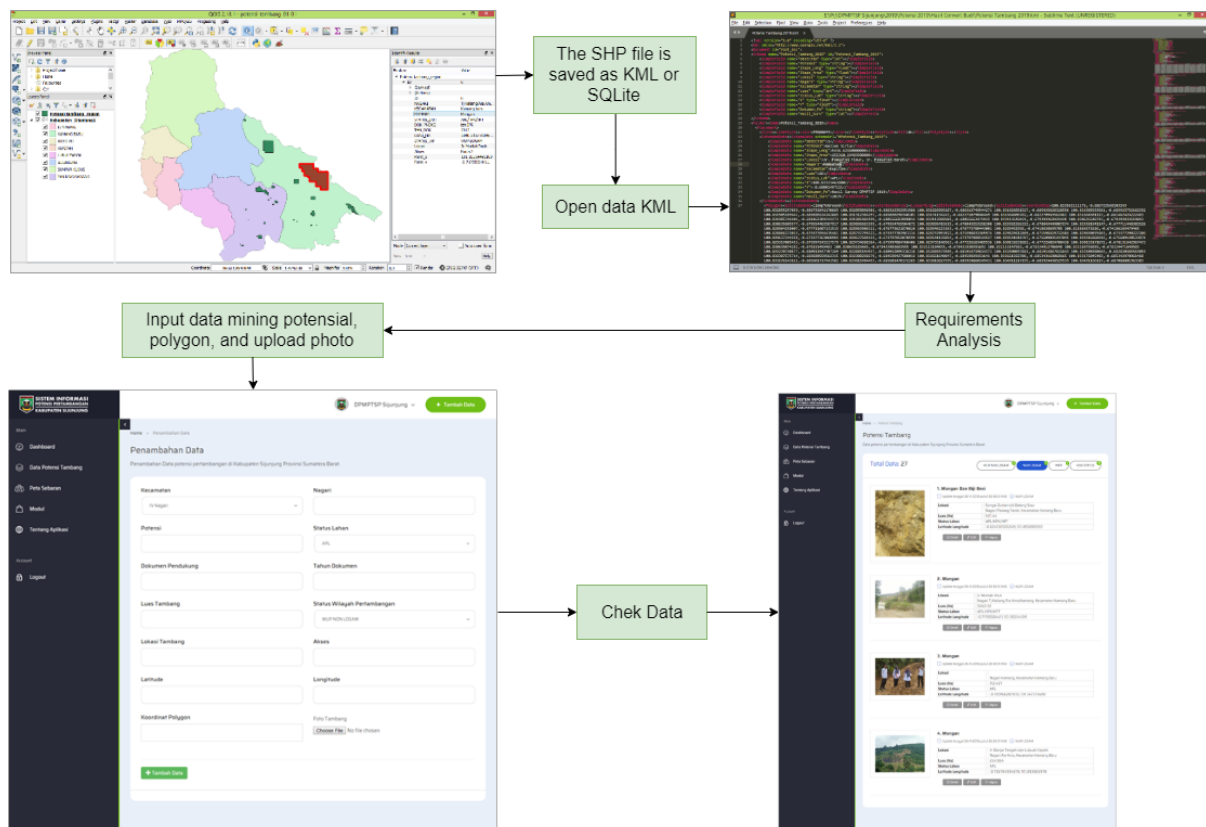

Figure 5: Visualisasi Input Data

If the input process is successful and entered into the database, then the user can access mining potential information through a browser like a Figure 6. When the polygon area on the Google Map is clicked, a detailed mining potential information appears with a photo of the mine type.
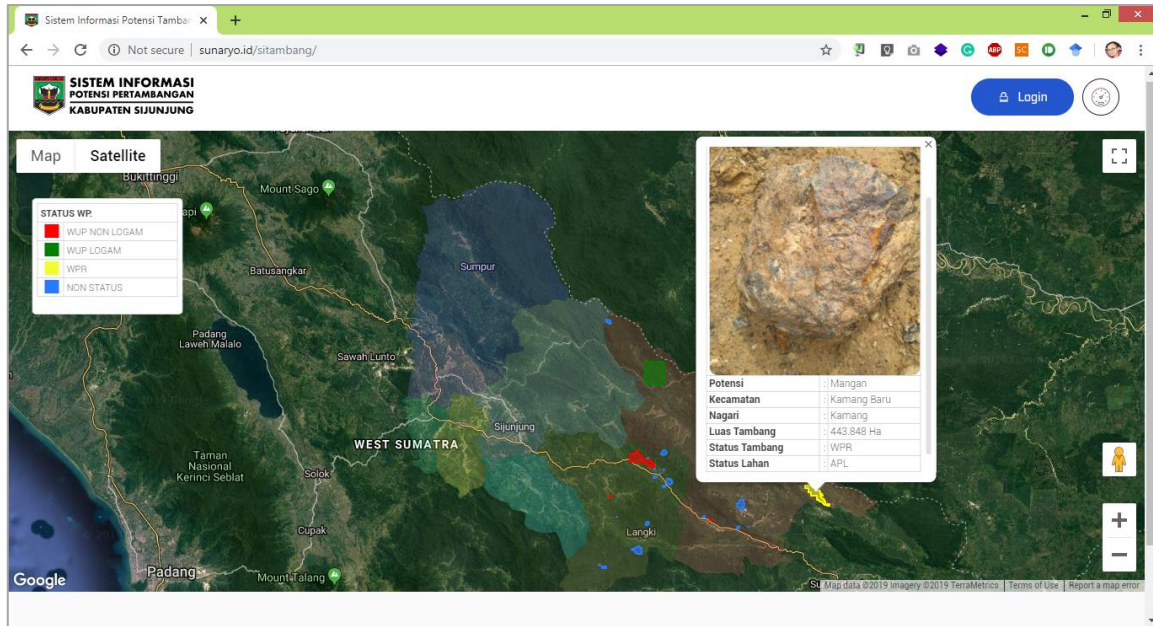
Figure 6: WebGIS of Mining Potential

4. CONCLUSION

Information on mining potential has become more accessible because of WebGIS. So there is a great opportunity to attract researchers, investors, and visitors to come to the area of potential mining. With the opening of information and the interest of people to come, it can have a big impact on regional economic growth.

This research can be developed into a better application from the technical side or other sectors. For example in terms of data input, display, and completeness of the information. So that information and communication technology can be optimally utilized in encouraging business growth in the region.

REFERENCE

Ã, V. P., & Meroni, F. (2009). A WebGis tool for seismic hazard scenarios and risk analysis. *Soil Dynamics and Earthquake Engineering*, *29*(9), 1274–1281. https://doi.org/10.1016/j.soildyn.2009.03.001

Amelia, R., & Ayu, S. (2016). Sistem Informasi Geografis Lokasi SMA di Kota Padang. *Jurnal Teknologi Informasi Dan Pendidikan*, *9*(3), 18–25.

Fago, P., Pignatelli, C., Piscitelli, A., Milella, M., Venerito, M., Sansò, P., & Mastronuzzi, G. (2014). WebGIS for Italian tsunami : A useful tool for coastal planners. *Marine Geology*, *355*, 369–376. https://doi.org/10.1016/j.margeo.2014.06.012

Jayakumar, K. (2019). *Chapter 15 - Managing Mangrove Forests Using Open Source-Based WebGIS*. *Coastal Management*. Elsevier Inc. https://doi.org/10.1016/B978-0-12-810473-6.00016-9

Rusdi, J. F., Salam, S., Abu, N. A., Sahib, S., Naseer, M., & Abdullah, A. A. (2019). Drone Tracking Modelling Ontology for Tourist Behavior. In Journal of Physics: Conference Series (Ed.), *International Conference on Electronics Representation and Algorithm (ICERA 2019)* (Vol. 1201, pp. 159–165). Yogyakarta, Indonesia. https://doi.org/10.1088/1742-6596/1201/1/012032

Rusdi, J. F., Salam, S., Abu, N. A., Sunaryo, B., Taufiq, R., Muchlis, L. S., … Vitianingsih, A. V. (2019). Dataset Smartphone Usage of International Tourist Behavior. *Data in Brief*, 104610. https://doi.org/10.1016/j.dib.2019.104610

Sobczyk, E. J., Kicki, J., Sobczyk, W., & Szuwarzyński, M. (2017). Support of mining investment choice decisions with the use of multi-criteria method. *Resources Policy*, *51*(November 2016), 94–99. https://doi.org/10.1016/j.resourpol.2016.11.012

Soleimani, H. (2018). A new sustainable closed-loop supply chain model for mining industry considering fixed-charged transportation: A case study in a travertine quarry. *Resources Policy*, (July), 1–11. https://doi.org/10.1016/j.resourpol.2018.07.006

Sunaryo, B., Rusydi, M. I., Manab, A., Luthfi, A., & Septiana, T. (2016). Sistem Informasi Manajemen Perangkat Elektronik Berbasis Web. *Jurnal Nasional Teknologi Dan Sistem Informasi*, *02*(01), 75–82. https://doi.org/10.25077/TEKNOSI.v2i1.2016.75-82

Sunaryo, B., Rusydi, M. I., Rusdi, J. F., Suriani, R., & Daus, S. (2019). Sistem Pelacakan Lokasi Pelaporan Petugas Lapangan Irigasi Provinsi Sumatera Barat Berbasis GPS Smartphone dan WebGIS. *Jurnal RESTI (Rekayasa Sistem Dan Teknologi Informasi)*, *3*, 271–281. https://doi.org/doi.org/10.29207/resti.v3i2.957

Taufiq, R. (2013). *Sistem Informasi Manajemen : Konsep Dasar, Analisis dan Metode Pengembangan*. Graha Ilmu.

Werner, T. T., Bebbington, A., & Gregory, G. (2019). Assessing impacts of mining: Recent contributions from GIS and remote sensing. *The Extractive Industries and Society*, *6*(3), 993–1012. https://doi.org/10.1016/j.exis.2019.06.011

Xia, J. (2004). Library space management : a GIS proposal, *22*(4), 375–382. https://doi.org/10.1108/07378830410570476