Geographical Information System Model for Potential Mines Data Management Presentation in Kabupaten Gorontalo

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Abstract. Mining potential in Indonesian is very abundant, ranging from Sabang to Marauke. Kabupaten Gorontalo is one of many places in Indonesia that have different types of minerals and natural resources that can be found in every district. The abundant of mining potential must be balanced with good management and ease of getting information by investors. The current issue is, (1) ways of presenting data/information about potential mines area is still manually (the maps that already capture from satellite image, then printed and attached to information board in the office) it caused the difficulties of getting information; (2) the high cost of maps printing; (3) the difficulties of regency leader (bupati) to obtain information for strategic decision making about mining potential. The goal of this research is to build a model of Geographical Information System that could provide data management of potential mines, so that the investors could easily get information according to their needs. To achieve that goal Research and Development method is used. The result of this research, is a model of Geographical Information System that implemented in an application to presenting data management of mines.

1. Introduction
Indonesia has many regions with abundant mining potential extended from Sabang to Marauke. Gorontalo regency is one the area that has many kinds of mineral resources that can be found in each of its districts, with diverse potential. Most of the natural resource utilization is still conducted conventionally by the local people. The potential of metallic mineral is gold with the amount of reserve approximately 528.29 tons can be found in Boloyohuto district and copper with the amount of reserve approximately 3,978,390 m$^3$ the spread across the Boloyohuto district. The potential of non-metallic mineral includes: Granite (with amount of reserve approximately 470,000,000 m$^3$) can be found in Tibawa district, Limboto, Limboto Barat, Bongomeme, Batudaa, and Batudaa Pantai; Limestone (total reserves about 12,4145 million m$^3$), scattered in the Tibawa District, Limboto, West Limboto, Bongomeme, Batudaa and Batudaa Pantai; Toseki (total reserves of approximately 6,000,000 m$^3$), scattered in Tibawa Subdistrict and Boloyohuto; Feldspar (the amount of reserves approximately 1,000,000 m$^3$), scattered in Batudaa Pantai District; and Andesite (the amount of reserves approximately 1,050,000 m$^3$), scattered in Batudaa District, Boloyohuto and Tibawa [1].

The methods of presenting the information data of mining potential area to the Department of Forestry Mining and Energy in Gorontalo is still done manually which is a map that has been captured from the photos imagery or aerial photographs and then printed and posted on the information board office with very limited captions included, therefore the information cannot be accessed directly by
investors from outside the area, consequently mining potential is not managed properly. Another problem is, the cost of printing the maps are quite expensive hence the regional government should provide extra cost albeit it does not contribute to anything nor giving the desirable result. The last problem is the difficulty of local leaders to obtain information that can be used for strategic decision making about mining potential, so that the management and mining exploration in Gorontalo regency has not been optimal yet.

2. Literature Review

1.1. Definition of Geographic Information Systems
Geographic Information System, or often called the Geospatial Information System is an information system used to compile, store, revise and analyze the data and attributes that are referenced to the location or position of objects on earth [2]. That is, data or information that is referenced to the location or position of objects on the earth is termed as data or spatial information, while attributes describe the characteristics of the spatial data. More specifically, the components of spatial data include position / geographical location, attribute data, spatial relationships and time.

GIS is an organized collection of computer hardware, software, geographic data and personnel which efficiently designed to obtain, store, update, manipulate, analyze and display all forms of information that geographically referenced [3]. GIS is a system (computer-based) that are used to store and manipulate geographic information. GIS is a computer system used to collect, inspect, integrate and analyze information related to the earth's surface [3].

1.2. Data Grouping in Geographic Information System
Data in GIS grouped in two parts, spatial data and non-spatial data. Spatial data is data that contains about the location of an object in the map based on geographic position of the object on the earth by using coordinate system. Spatial data has two basic elements, which are [4]:
1. Locations
   The location is generally refers to the geographic location of an object in the coordinate system of the earth, but other geographies code can also be used. For example, a zip code.
2. Attribute
   Attribute is a characteristic or basic characteristics of an object, for example the location name, gender and others.

Non-spatial data is data that represent aspects of the phenomenon which it models. This data is often referred to as the attribute data. In a map, an attribute usually presented as text or map legend.

3. Result and Discussion

3.1. Mine Potential Data Processing Model
Management of mining potential is operated by application administrators. Administrators perform data input process point map (latitude and longitude), data of mining potential, user data, image / location of mining potential.

Input data point map is used to determine the coordinate points of the mine site. Mining potential data is used to determine detailed information relating to the location / coordinate which likely to deposits any sort of mines. Input user data is used for management of application users (who can use the applications other than the administrator). Lastly, input image location, this feature is used for submitting the photo location / potential mining area. Figure 1 shows a flowchart of data processing potential of the mine by the administrator.
3.1.1 Data flow diagrams level 0
Data flow diagrams level 0 begins by administrator to enter data, where the entered data are stored in four (4) different tables (user for user data, point for location data, category for mining potential data, point picture for location shots). The saved data will then be used by the visitor (public / investor) to obtain detailed information related to the potential mines in Gorontalo Regency simply by entering key words. Figure 3 shows the detailed process that occurs in the data processing system of mining potential.

Figure 2. Context Diagram of Potential Mine Processing System.
3.2 Mining Potential Data Processing Application
At this stage, the application model of Geographic Information System of Gorontalo’s mining potential will be described.

3.2.1 Mining Potential Data Processing Application
To begin the process of data input to the application, the administrator must first log on to the application. The login page for the administrator depicted in Figure 4.

![Figure 3. Data Flow Diagram Level 0](image)

**Figure 3. Data Flow Diagram Level 0**

**Figure 4. Administrator Login page**

3.2.2 Administration page
After the administrator has logged into the system, then the administrator must enter the administration page in order to entering the data that necessary for the site selection process. Figure 5 is used for enter mining potential data.
A. Setting form
This form is used to set the coordinates to default, the language settings and theme settings. Below is the setting form as in Figure 6.

B. User data setting form
This form is used to perform user management. Figure 7 below is the user data setting form.

C. New mine sites data input form
This form is used for adding a new location, by entering point coordinates and then the categories will be displayed. Figure 8 shows the feature on the applications which is used for enter data mining site.

**Figure 8.** New mine sites data input form

D. Mining potential data input form

![Mining potential data input form](image)

**Figure 9.** Mining potential data input form

E. Map Explore form

This form is used by people / users to view the map as a whole. The interface is shown as in figure 10. In order to access this form, public / investor does not need to log in first. Just by entering a keyword in the search box (locate) the locations that contain those keywords will be displayed.
Jelajah Klasifikasi Tambang

Figure 10. Map Explore form

4. Conclusion
Through the use of these GIS application, yield the model of potential mining management in DISHUTTAMBEN Kabupaten Gorontalo has change from manual model to computerization model. It is proving by the presentation of potential mining areas information have been done by digitally and could be access everywhere by the investors, so the investor could have information they need up to date and all the information that required by local government in decision making about exploration of mining could be done by online.

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