

Geotourism Potential Analysis of North Kalimantan

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Abstract—The Province of North Kalimantan which was previously part of East Kalimantan Province is located in two main tertiary sedimentary basins which have a major influence on the process of forming mineral resources in this region. This makes North Kalimantan Province have a geological diversity which is the basic capital for the implementation of sustainable development that can be utilized by local communities through their involvement in geotourism development. In addition, geotourism also contributes to conservation efforts and increased geotourist satisfaction. The purpose of this study is to identify geodiversity that has potential as geotourism attraction and analyze geotourism development opportunities in North Kalimantan Province. The research approach uses qualitative methods with the acquisition of primary data (field surveys) and secondary (desk study), whereas the analysis method uses qualitative descriptive analysis, content analysis, and map analysis. The findings of this study are the identification of geodiversity which has the potential as geotourism attraction in each region in North Kalimantan Province which includes 20 geosites scattered in Malinau Regency (2 geosite), Bulungan Regency (8 geosite), Tana Tidung Regency (3 geosite), Nunukan Regency (4 geosite), and Tarakan City (3 geosite). In addition, opportunities for sustainable geotourism in North Kalimantan are analyzed through geotourism attraction, geotourism activity, interpretation, and existing geotourism development.

Keywords—geotourism; geoheritage; geodiversity; north kalimantan province

I. INTRODUCTION

Geodiversity has an important role both for the natural environment and human activities [1] and is part of the geoheritage [2]. Geoheritage resources are based on intrinsic, tourist [3], cultural, aesthetic, scientific, and educational values [4] from geological and geomorphological features. The entire geoheritage can be used as a resource for tourism activities, especially geotourism that has opportunity to regional development. It is important to understand each region's characteristics in the geotourism development [5].

Kalimantan's tectonic development based on its situation is influenced by the interaction of Sunda plate with Pacific plate in the east, Australian Indian plate in the South, and South China Sea plate. Kalimantan has been interpreted as a product of Mesozoic accretion of oceanic crust material (ofiolite),

marginal basin fill, archipelago arc material, and microcontinental fragments to the core of the Paleozoic continent of the Schwaner mountains in the southwest of the island [6].

North Kalimantan Province, like many other regions in Indonesia, had a long history since the Paleozoic era 570-251 million years ago. In terms of geology, North Kalimantan Province is located in two main tertiary sedimentary basins which have a major influence on the process of forming mineral resources in this region. The two basins are Nunukan Basin (covering the areas of Nunukan and Malinau Regencies) and Tarakan Basin (covering the area of Tarakan City and Bulungan Regency). The Tarakan Basin, especially the Tidung sub-basin, covers part of the geodiversity inventory research area which borders the North by Tinggian Semporna, New Borneo basin to the west, the Tarakan sub-basin in the South to the Southeast, and Celebes Sea to the East [7]. Moreover, the Tarakan Basin is composed of 4 main depocenter from Paleogene to Neogene era, namely sub-basin Tidung (North Tarakan), Berau, Tarakan and Muara (Muaras) - which is part of the Tarakan basin [8]. That makes North Kalimantan Province have a geological diversity which is the basic capital for the implementation of sustainable development.

This potential can be utilized for development activities in various sectors in accordance with the direction of national development program policies that utilize natural resources as optimal as possible for people's welfare. However, we should pay attention to the preservation of functions and environmental balance and should utilize as much as possible as a resource for the development of science as well as supporting the development of geological-based natural tourism, also known as geotourism. Based on this explanation, this study aims to identify geotourism potential in North Kalimantan Province from the geodiversity side and analyze geotourism development opportunities.

II. LITERATURE REVIEW

Geotourism became a new concept in tourism [9] and its emerging geoscience with clear and deep social interrelation [10]. Geotourism utilizes geological heritage as its attraction by being supported by tourism facilities and infrastructure [11]

which aims to fulfill geotourism needs as long as they are in geotourism destinations [12]. Geotourism is a concept that was developed in the 1990s [13], the term "geo" was then debated by several experts who referred to several terms, whether geology, geography, or geoscience. Currently geotourism tourism has various understandings including:

- Bandung Geological Research Center in 1999 defined geotourism as a tour activity that utilizes all aspects of geology, especially non-living features such as landscapes, rocks, fossils, minerals, waters, and processes [14].
- Geotourism as a tourism activity that introduces and develops the geographical characteristics of tourist attractions, including the environment, culture, aesthetics, heritage, and society [15].
- Geotourism is a combination of elements, geography, and tourism geology with the term earth-science tourism which has the definition that a comprehensive scientific discipline aims to find, evaluate, plan, and protect natural landscapes and cultural heritage supported by the value of tourism [16].

Understanding geotourism in research refers to the process and form of geology supported by various tourist facilities for geotourism, geotourism refers to two components, namely geo components related to geological, geomorphological and natural resource features and processes involving tourism activities through tourist visits to geological sites with the main goal for recreation, wonder, appreciation, and learning [17]. Geotourism activities can be carried out actively such as visits to the geosite and tracing the geotourism or geotrack paths, as well as passive activities such as seeing sights, guided tours, and visiting geological museums.

Meanwhile, there are main principles in geotourism, namely: 1) geotourism can encourage economic feasibility, increase community and geoconservation (sustainable); 2) geotourism is an attraction for people who want to interact with the earth's environment in developing knowledge, awareness and appreciation (Geologically informative); 3) local communities can be involved in geotourism activities through the provision of knowledge (interpreters), services, locally beneficial facilities and products; and 4) security, comfort, informative, experience, and service must match or exceed the visitor's realistic expectations (geotourist satisfaction) [18].

III. METHODOLOGY

This research approach uses qualitative methods, data gathering uses primary and secondary data collection methods. Primary data is done through field observations in providing an assessment of geotourism attraction; semi-structured interviews with related actors including government institutions in charge of tourism, community institutions related to geotourism, and managers of geotourism attraction; and the spatial positioning based on satellites using Global Positioning System (GPS) technology in determining the coordinates of the location of geotourism attraction. While the secondary data collection

method in the form of spatial information and geotourism is a development study that aims to obtain data and information from various policy documents and literatures.

This study uses qualitative analysis methods, map analysis, and qualitative descriptive analysis. The data and information obtained are then carried out by the process of data input, data management (coordinating transformation, digitizing, and editing). Descriptive methods that are used in this research is analytic description. Analytic description is a description that is done by connecting the data that has been obtained by categories on existing theory so as to produce a new description.

IV. FINDINGS AND DISCUSSION

Some of the geodiversity that has been identified in North Kalimantan and has the potential for geotourism are described below and can be seen in Figure 1.

1. Martin Billa Waterfall (Malinau), has a height of 70 meters and is in the middle of the dense forest of Malinau District and is located in the Selimbu River. Named Martin Billa Waterfall because this waterfall began to be developed into one of the tourist destinations during the reign of Regent Martin Billa.
2. Semolon Waterfall (Malinau), to reach this waterfall it takes around 2 hours by driving from the center of Malinau City. Semolon Waterfall has a panoramic view of 9 (nine) levels of natural stone and each stair forms a pool. The source of this waterfall has two springs, the left feels cold while the right side is a source of hot water.
3. Idaman waterfall (Bulungan) consists of three levels. The first level has a height of 5 meters, the second level has a height of 2 meters, and the third level is the highest which is 15 meters. The swift waterfall that flows from above and surrounded by lush green trees makes the atmosphere very natural. The Idaman Waterfall is in KM 18 towards Bulungan, the axis road of Tanjung Selor - Tanjung Redeb.
4. Long Pin Waterfall (Bulungan), is one of the interesting tourist locations and usually local residents can enjoy the beautiful scenery. In the downstream form a lake surrounded by natural rocks so that it adds to its natural beauty.
5. White Mountain (Bulungan), is a limestone mountain tourist attraction with reliefs such as sculpture of an artist. On this mountain there are also bird caves, based on local residents the cave is a place to calm down the Sultan of Bulungan. At White Mountain, regional art is also presented at the stage house.
6. Giram River (Bulungan), which has a length of 2 km and a width of 50 m is located in the Peso District which is used as a place for rafting tourism activities.
7. Sajau Hot Springs is located in Sajau Village (Bulungan) or 20 minutes by road from the city of Tanjung Selor. Hot water here comes from geothermal energy which is trusted by the local community as a Natural Medicine that can cure various diseases.

8. Bird Island (Bulungan) was once inhabited by various species of birds, currently there are only a few species but still its natural panorama still can be enjoyed.
9. Tanah Kuning Beach (Bulungan) comes from the name of the village where this beautiful beach is located, the white sand will look beautiful when exposed to sunlight.
10. Nibung Beach (Bulungan) has a 500 m stretch of white sand located in the Nibung area on Bunyu Island, nibung is an elite residential area that was once inhabited. Activities that can be done are swimming, fishing, or just relaxing.
11. Mount Rian (Tana Tidung) is located in Safari Rian Village, Sesayap District, Tana Tidung Regency. Mount Rian is a protected forest area with various species of flora and fauna that live in it.
12. Sesayap River Protected Forest (Tana Tidung). Sailing activities on the Sesayap river using a boat provided by the residents is one of the attractions in the region. This protected forest in Tidung land is a place to protect and shelter various types of protected animals such as monkeys, several species of birds and other protected animals.
13. Mount Rian Waterfall is located at the foot of Mount Rian, Tana Tidung Regency. Named Rian Waterfall because of its location in Rian Village. About 30 kilometers from the district capital or about 1-hour drive, the location is quite far away, making this tour totally unmanaged by the local government.
14. Krayan Highland, presents high folding mountainous areas on Borneo highlands. Describing the micro tectonic evolution of the plates that were originally under the ocean rose above the mean sea level to rise to form the mountains or Krayan highs - which are included in the Kuching High, which stretches on the central mountainous path of the island of Borneo.
15. Ruab Sebling Waterfall, Ruab Sebling Waterfall is located at 115.8820 BT and 3.8630 LU coordinates, formed on the Krayan river which is surrounded by forests. This waterfall has a height of about 25 m, allegedly formed by tectonic activity with evidence of a large number of solids scouring on its constituent rocks.
16. Lamampu Stone Beach, Geographically, Lamampu Batu Beach is located at 117.9110 BT coordinates and 4.0440 LU in Tanjung Karang, Sebatik Island. The beach is composed of sandstones and claystone with N 1280 E / 300 coating direction and there are parallel laminate and cross-sectional sedimentary structures, and recessive coastal deposits of brownish gray color.
17. Binusan Waterfall, Binusan Waterfall is a small waterfall located in Binusan Botanical Garden area. Binusan Waterfall is composed of quartz sandstones inserted by siltstone with the direction of rock lining N 2950 E / 210 which is an only Formation, there are also thin inserts of coal, has a cross-sectional sedimentary structure and parallel lamination, there are also wood fossil release components.

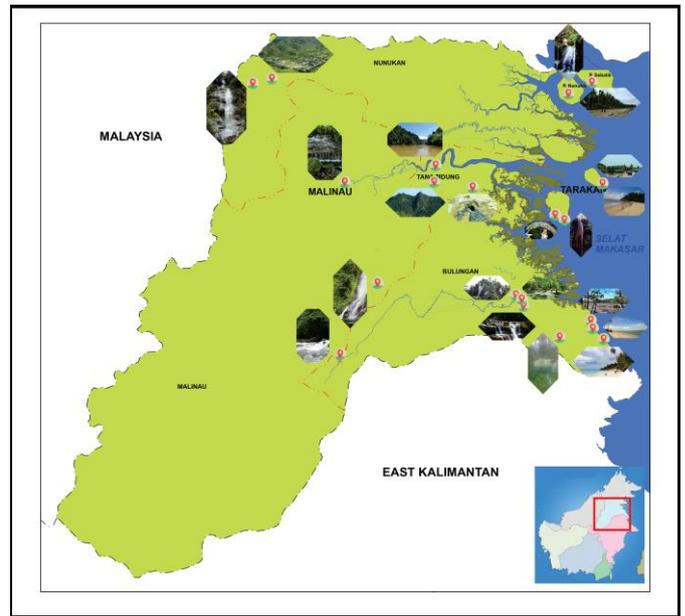


Fig. 1. North Kalimantan's geodiversity distribution has the potential to be geotourism

18. Karungan Waterfall (Tarakan). Current conditions start to change a lot to a better direction such as access roads, relaxing places and landslide retaining walls. To reach this place, it takes approximately 20-25 minutes from the City Center.
19. Mangrove and Bekantan Conservation Areas, has a forest area of approximately 9 hectares, with various collections of mangrove plants that grow and many of mangrove plants that are decades old and some even reach hundreds of years, this area has become a tourism icon of the city of Tarakan.
20. Amal Beach (Tarakan), This beach is located in the city of Tarakan and "Amal" is the name of one of the villages in the District of East Tarakan, North Kalimantan Province. This beach can be reached by using both two-wheeled and four-wheeled vehicles with a distance of approximately 11 km from the city center in approximately 20 minutes. This beach is divided into two beaches, the beach "Old Amal" and the beach "New Amal".

North Kalimantan Province has various types of potential sources of attraction that can be utilized for the development of geotourism. Analysis of these potentials will be discussed in each geotourism component as follows:

1. Geotourism Attraction Analysis

The potential geotourism attraction in North Kalimantan Province consists of various types of geodiversity. Besides being able to be used for mining activities, some of these locations can also be used for tourism activities. The forms of geodiversity include:

- a. Hot springs, seen from the existence of hot springs at several points such as in Semolon (already used for tourism activities), Sebakis (the area is used for coal mining activities), Sajau (not yet managed), and Mengkuasar (not yet managed).
- b. Waterfalls, including Martin Billa Waterfalls, Idaman Waterfalls, waterfalls on Mount Rian, Ruab Sebling Waterfalls, and Binusan Waterfalls.
- c. Karst area, the majority is in Bulungan Regency. Some areas have been designated as geotourism areas by local governments, such as the White Mountain karst (rock and natural uniqueness factors), Stacked karst rocks (rock uniqueness factors), West Tanjung Palas karst (rock uniqueness factor), karst Peso (rock uniqueness factor), the uniqueness of the landscape, and the uniqueness of the geological process), and the Peso Hilir karst (factors of rock uniqueness, the uniqueness of the landscape, and the uniqueness of geological processes).
- d. Beaches, including Nibung Beach and Lamampu Stone Beach.

Among these potentials, the karst area is a form that is considered to have a greater opportunity to be developed, considering that there has been recognition from the local government (as stated in the spatial plan), also basic geological research has been carried out in these areas. In addition to the karst area, hot springs are the next one that has the potential for geotourism development, supported by research on hot springs in these locations.

2. Geotourism Activities Analysis

Current geotourism activities that develop in North Kalimantan Province are:

- a. Geosite sightseeing, where tourist activities offered to tourists are just enjoying the landscape from the uniqueness of such earth forms.
- b. Geostudy, where research is the main focus of this activity.
- c. Geotourism health and wellnes, can be seen from the use of hot water resources offered to tourists for health

When viewed from various forms of activity, geotourism activities that develop in North Kalimantan Province are still considered passive and have not been able to educate tourists about the geodiversity which is actually the focus of geotourism.

3. Interpretation Analysis

Interpretation is an important component in the development of geotourism. However, the interpretation in the geosite of North Kalimantan Province is far from the ideal condition, there are no interpretations that characterize educating geotourists. This should be a

concern of the regional government in developing geotourism.

4. Current Geotourism Potential Development Analysis

Analysis of these principles includes:

- a. Sustainable. In this principle, only the aspect of geoconservation has been fulfilled by the potential of geotourism in North Kalimantan Province. This can be seen from the stipulation of the karst area as a protected area (in the spatial plan). What becomes concern to this aspect is that not all geosites are protected by law, can be seen from the vandalism by tourists in Semolon hot springs. Other things that are concerns to this principle are high economic gains, as well as increasing community capacity that has not been maximally implemented in the geosite.
- b. Geologically informative. Increasing knowledge, awareness and feelings of respect for the environment of tourists and society are focuses on this principle. But in reality, this principle has not been implemented properly, given the absence of an interpretation component of the geotourism potential found in North Kalimantan Province.
- c. Locally beneficial. In this principle, the focus is on the welfare of local communities through their involvement in potential geotourism areas. The form of community involvement in the development of geotourism potential in the Province of North Kalimantan is still in the form of working as an officer in tourist attraction, noting that there are only a few geotourism potentials such as Semolon hot springs and the White Mountain karst area that have implemented it. Involvement in tourism development is not only as an officer, but also can be seen from the involvement of the community in decision making, implementation of development, and the positive impact of tourism development.
- d. Tourist satisfaction. This principle must go through its own study, whether tourists who come to geotourism potential in North Kalimantan Province are 'geo-tourist' who come because of the formation of the geological region or 'general visitor' who came but did not care about it.

In addition to providing an overview for the development of geological conservation areas and geotourism destinations, geotourism potential analysis in North Kalimantan Province, can also contribute to regional economic development, especially in regions experiencing a low economic growth. A regions with particular geotourism potential, all that face problems of slow economic development and unemployment can be overcome by developing geotourism as one of the economic sectors [19]. The importance of coordination among stakeholders in developing geotourism as one of the economic tools is very important, considering the current overlapping interests in North Kalimantan Province, especially in geosite

management. Geotourism development has the potential to bring stakeholders together and ensure regional prosperity, the approach of the whole government is very important in ensuring sustainable development and prosperity of the region [20].

V. CONCLUSIONS

Geodiversity in North Kalimantan Province has the opportunity to be developed into a tourist attraction, based on the results of identification, there are 20 geodiversity, each of which has a uniqueness that can be used for geotourism activities. The current analysis of geotourism development in North Kalimantan shows the needs of local community involvement in geotourism development and protection from geoheritage through aspiring geopark. With the study of the geotourism potential in North Kalimantan Province, hopefully it can provide input for future research on the delineation of the geopark region; policy formulation of North Kalimantan Tourism Development Master Plan and its cities and regencies; and the study of geotourism potential that is more specific in each cities and regencies based on geodiversity, biodiversity, and cultural diversity aspects [17].

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