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How the Potential Geotourism Packed to be Geoventure of Buleleng, North Bali

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ABSTRACT

Buleleng Regency, located in North Bali, has geological potential that can be developed into geotourism. There are dozens of waterfalls in Buleleng Regency, several caves that have their own uniqueness, and a beautiful hill stretching on the north side in the West Buleleng part. This paper aims to provide information about the potential of geotourism that can be packaged into a tour package in the form of a geoventure with the attractions visited are Sudaji Cave, Aling-aling Waterfall, Tembok Barak Waterfall, and Bukit Kursi Temple. The approach used is qualitative research with the geological diversity inventory method. Primary data was obtained through survey activities and direct observations in the field. From the research conducted, these four tourist attractions are geologically unique and can present an adventure exploring nature and is accompanied by knowledge of the landscape and culture of Buleleng. This geotourism activity targets those with a special interest in nature and culture, both domestic and foreign. The "geoventure" tour package starts from the East to the West, including the Sudaji Cave in Sudaji Village, then proceeds to Sambangan Village to enjoy and observe the Aling-aling Waterfall and the Barak Wall Waterfall, and then head to Bukit Kursi Temple. The travel time of the geoventure is estimated at more than seven hours so that packages can be made in the form of half-day tours.

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1. INTRODUCTION

Buleleng Regency, located in North Bali, has geological potential that can be developed into geotourism. There are dozens of waterfalls in Buleleng Regency, several caves that have their uniqueness, as well as a beautiful hill that stretches on the north side in the West Buleleng part. This paper aims to provide information about the potential of geotourism that can be packaged into a tour package in the form of a geoventure with attractions visited are Sudaji Cave, Aling-aling Waterfall, Tembok Barak Waterfall, and Bukit Kursi Temple. Geotourism is tourism that visits areas of unique geological diversity with the aim of recreation, admiring natural beauty, appreciation, and learning (Dowling & Newsome, 2006). Meanwhile, based on the Presidential Regulation of the Republic of Indonesia No. 9 of 2019 concerning the Development of Earth Parks (Geoparks), what is meant by Geological Diversity (Geodiversity) is a description of the uniqueness of geological components such as minerals, rocks, fossils, geological structures, and landscapes that are the essential wealth of an area and their existence, wealth, distribution and conditions, which can represent the geological evolution of the area.

The geology of the Sambangan Village, Sudaji Village, and Pemuteran Village was composed of the Buyan-Beratan Group Volcanic Rock Formation and Pulaki Volcanic Rock of lithology in the form of lava, tuff breccia, lapilli, and lava (Hadiwidjojo et al., 1998). Medium-low undulating hills and plains dominate the morphology of this area. The soil conditions are very fertile and overgrown by agricultural commodities such as rice, durian, longan, and cloves. In terms of tourism, this area is dominated by natural tourism in the form of waterfalls, artificial caves, and tracking.

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2. DATA AND METHOD

This study discusses the geotourism-based tourist attraction that can be developed and explores its potential in Buleleng Regency. The approach is qualitative research using the geological diversity inventory method (Geological Agency, 2017). This method includes field data collection and data processing. The data collection methods carried out in the field are geological and geomorphological descriptions at each site location and identify geological diversity, which will be displayed in the form of a geological diversity inventory matrix and a geological diversity characterization matrix.

3. RESULT AND DISCUSSION

Studies on geotourism have been carried out by researchers who have a scientific background in geology and tourism. Ólafsdóttir and Tverijonaite (2018) describes Geotourism as a new concept that is able to develop rapidly, which by most researchers, research activities focus on identifying, describing, and assessing the geoheritage of the area in question and its geotourism potential. In this study, researchers with geological and tourism scientific backgrounds collaborated in researching the potential for geotourism in several locations in Buleleng Regency. In its development, the geological potential in a place has the potential to be developed as a geopark. Farsani et.al (2011) explained that the geo-park as an innovation in the protection of natural and geological heritage has an important role in the development of geotourism, which of course is able to provide benefits to the economic life of the local community.

The research has been done in several locations of potential geotourism attractions in Sudaji Cave, Aling-aling Waterfall, Tembok Barak Waterfall, and Bukit Kursi Temple. Where the geotourism attraction can potentially become a geological heritage site spread over several areas can be seen on the map of the distribution of geological sites (figure 1). The geotourism attraction is distinguished by sites as evidence of historical geological activity (geovidences) and forms due to geological processes (geological features).



Figure 1. Geotrail Buleleng Map

Geosite Sudaji Cave

Sudaji Cave, which is located precisely in Bantas Hamlet, Sudaji Village, has been visited by geological researchers and geotourism practitioners. Sudaji Cave which is one of the geological heritages is interesting for tourists, especially researchers to study history and other things related to geology. Franco, et.al (2020) said that biodiversity has elements of extraordinary scientific value which are considered to represent geoheritage, or geological heritage. In its development, when the cave was discovered as a geotourism potential by experts in 2017 and was revisited by several experts in 2022, the cave began to receive special attention, especially from the village and tourism observers in the area.

This geological site is located in the Sudaji Village, Sawan District, Buleleng Regency, Bali an irrigation cave called (aungan) formed on ignimbrite rocks and tuff lapilli resulting from the eruption of the Buyan-Beratan Purba Volcano Caldera around 30,000 years ago. The existence of this geological site is unique because apart from being geological and cultural, these caves functioned as agricultural irrigation canals during the Balinese kingdom era, and these caves still have a close relationship with the existence of subak in Bali, especially in Sudaji Village where the geological diversity can be seen in table 1.

The role of Geotourism (Putra and Wijayanti, 2020) is to provide sustainable tourism information that focuses on geological features of the earth's surface in order to encourage understanding of the environment life and culture, and can provide appreciation and conservation as well as local wisdom that there is a place that has geological potential. Likewise, with the caves in Sudaji Village which have the same role, it is hoped that there will be attention from the local government in the future, so that the caves in the village and other villages can become a tourist attraction, namely becoming geotourism.

Geosite Tembok Barak Waterfall

This geological site located in the Sambangan Village area, Sukasada District, Buleleng Regency, Bali, is a waterfall formed on lapilli tuff, andesite breccia, ignimbrite, and lava resulting from the eruption of the Buyan-Beratan Purba Volcano Caldera around 30,000 years ago which was traversed by horizontal faults that cut rock layers and form rivers and waterfalls. The Barak Wall Waterfall in Sambangan Village according to Manalu et.al (2019) is classified as a low category waterfall tourism potential, due to inadequate access and suboptimal management. Based on the study of Rahman and Citra (2018), the Tembok Barak Waterfall is a type of chute with a height of 5.2 meters, a width of 2 meters so it is relatively narrow, with a tilt cliff of 700 and with a height of 114 meters above sea level.Where the geological diversity can be seen in table 2.

Geosite Aling-Aling Waterfall

This geological site located in the Sambangan Village area, Sukasada District, Buleleng Regency, Bali, is a waterfall formed on lapilli tuff, andesite breccia, ignimbrite, and lava resulting from the eruption of the Buyan-Beratan Purba Volcano Caldera around 30,000 years ago which was traversed by horizontal faults that cut rock layers and form rivers and waterfalls. Rahman and Citra (2018) state that the characteristics of waterfalls scattered in the Sukasada District have various forms. Based on his study, it was explained that the Aling-aling waterfall has a medium height category, namely 22 meters, 3 meters wide, 700 tilt cliff and 272 meters above sea level. Aling-Aling Waterfall and Tembok Barracks Waterfall are still in the same horizontal fault line and river. However, at Aling-Aling Waterfall, a multilevel waterfall is formed due to horizontal faults associated with descending faults. Where the geological diversity can be seen in table 3.

Geosite Kursi Hills

This geological site is located in Pemuteran Village, Gerokgak District, Buleleng Regency, Bali. It is the hills of the remains of a volcanic body, namely Pulaki Ancient Volcano, which was formed in the Pliocene Period or about 15 million years ago. Pura Bukit Kursi (Widiastini et.al: 2022) is mention as a spiritual tourism object, in its development it has been visited by many domestic and foreign tourists, and is preferred as a unique place for take a great picture. This hilly landscape still leaves the forms of its volcanoes, such as craters and volcanic necks. The rock that composes is dominated by andesite breccia and lava. Where the geological diversity can be seen in table 4.

The Characteristic of Geological Diversity

From the results of field surveys and analysis of the existing geological diversity inventory from 4 locations, it is obtained that geological site characterization has a geological diversity rating of high - oustanding to the leading geological diversity assessment at the existing geological site. In addition, several major geological sites have complete meanings ranging from scientific, aesthetic, recreational, and cultural meanings because almost all geological sites surveyed are tourist and cultural objects that have developed.

Geoventure package packaging in Buleleng

In packaging this geotourism package, it can be divided into three routes, namely the Sudaji Geotourism route by offering geological site in the form of traces of the ancient Buyan-Beratan volcanic eruption combined with cultural stories related to subak and the existence of aungan as an agrarian culture of the people of North Bali with a duration of activities ranging from 3-4 hours. The following package is the Sambangan Geotourism route, with its main geological diversity, namely the Barak Wall Waterfall and the Aling-Aling Waterfall Complex. The activities offered are trekking packages along

the trail of rocks resulting from the eruption of the Buyan-Beratan Purba Volcano by combining natural beauty and activities to enjoy waterfall tours. This activity can be enjoyed from short trekking with a duration of 40-100 minutes long trekking with a duration of up to 4 hours. The third path is the Pemuteran Geotourism route, where this route prioritizes geological diversity stories related to the history of the Pulaki Purba Volcano, with the main object being Bukit Kursi, where this activity is in the form of soft trekking with a duration of 40-50 minutes. Along the path, geotourism guides can tell about the rocks found and their relation to volcanoes. In addition, when arriving at the top of Bukit Kursi, tourists can enjoy the beautiful view of Pemuteran Village and, at the same time, see the hilly landscape resulting from the eruption of Pulaki Volcano in the past. In addition, this geotourism route can be combined with nearby attractions such as hot springs and marine tourism activities such as snorkeling and diving. In addition, the "geoventure" tour package can also be combined into one package starting from the East to the West point, which includes the Sudaji Cave in Sudaji Village, then proceed to Sambangan Village to enjoy and observe the Aling-aling Waterfall and the Barak Wall, and so on. Head to Bukit Kursi Temple. The travel time of the geoventure is estimated to be more than seven hours, so the package can be made in the form of a half-day tour.

Geotourism as a geoventure package is possible to be developed in northern Buleleng with extraordinary geological diversity and heritage making this area a leading tourist destination, exceptional interest tourism. In addition, this geotourism package provides added value to Buleleng tourism with new tourism options while increasing the length of time tourists visit Buleleng Regency

4. CONCLUSIONS

From the research conducted, these four tourist attractions are geologically unique. They are able to present an adventure exploring nature and is accompanied by gaining knowledge about the landscape and culture of Buleleng. This geotourism activity targets those with a particular interest in nature and culture, both domestic and foreign. The "geoventure" tour package starts from the East to the West, including the Sudaji Cave in Sudaji Village, then proceeds to Sambangan Village to enjoy and observe the Aling-aling Waterfall and the Tembok Barak, and then heads to Bukit Kursi Temple. The travel time of the geoventure is estimated to be more than seven hours, so the package can be made in the form of a half-day tour.

To commercialize this geotourism package, cooperation between stakeholders such as geotourism guides and tourism object managers is needed to integrate this package.

REFERENCES

[1] Dowling, R. K., & Newsome, D. (2006). Geotourism, Elsevier Butterworth-Heinemann.
[2] Badan Geologi, 2017, Standar Teknis Inventarisasi Keragaman Geologi dan Identifikasi Warisan Geologi.
[3] Hadiwidjojo P., 1971, Peta Geologi Lembar Bali skala 1 : 100.000, Puslitbang Geologi
[4] Permadi R., 2022, Potensi Daya Tarik Geowisata Di Jalur Sesar Palu-Koro, Sulawesi Tengah, Jurnal Media Bina, Vol. 16 ISSN No. 1978-3787
[5] Peraturan Presiden Republik Indonesia No. 9 Tahun 2019 tentang Pengembangan Taman Bumi (Geopark)
[6] Ólafsdóttir, R.; Tverijonaite, E. Geotourism: A Systematic Literature Review. Geosciences 2018, 8, 234. https://doi.org/10.3390/geosciences8070234
[7] Farsani, N.T., Coelho, C. and Costa, C. (2011), Geotourism and geoparks as novel strategies for socio-economic development in rural areas. Int. J. Tourism Res., 13: 68-81. https://doi.org/10.1002/jtr.800
[8] Herrera-Franco, G.; Montalván-Burbano, N.; Carrión-Mero, P.; Apolo-Masache, B.; Jaya-Montalvo, M. Research Trends in Geotourism: A Bibliometric Analysis Using the Scopus Database. Geosciences 2020, 10, 379. https://doi.org/10.3390/geosciences10100379
[9] I Kadek Adiana Putra. Ni Wayan Eka Wijayanti. 2020.
[10] Studi Geologi Pariwisata Pada Jejak Arkeologi Objek Wisata Goa Gajah Sebagai Salah Satu Limpasan Erupsi Gunung Batur Purba. Media Komunikasi FPIPS Volume 19, Number 1, April

2020, pp. 01-10 DOI: http://dx.doi.org/10.23887/mkfis.v19i1.23190

[11] Fahyumi Rahman. I Putu Ananda Citra. 2018. Karakteristik Air Terjun Sebagai Potensi Wisata Alam Di Kecamatan Sukasada. Jurnal Pendidikan Geografi Undiksha Volume 6, Number 3, pp. 133-145 P-ISSN: 2614-591X E-ISSN: 2614-1094 DOI: 10.23887/jjpg.v6i3.20700

[12] Sara Hotnida Manalu. I Putu Ananda Citra. Putu Indra Christiawa. 2019. Strategi Pengembangan Daya Tarik Wisataair Terjun Di Desa Sambangan. Media Wisata, Volume 18, Nomor 2. D oi:10.36275/mws

[13] Ni Made Ary Widiastini. I Gede Mudana. Ni Luh Putu Agustini Karta. I Ketut Sida Arsa. 2022. Community Leaders and Their Influence on Tourism Development in Bali. International journal of Innovation in Management Economics and Social Science. Vol. 2, No2, 83-99

DATA ATTACHMENT

Table 1. Geodiversity in Geosite Sudaji Cave

Names of Geological Diversity Objects (Geodiversity) & Cultural Sites	Geosite Sudaji Cave	
Location	Sudaji Village, Sawan District, Buleleng Regency, Bali	
Coordinate	Y : 08°08'35.2" X : 115°09'18.9"	
Outstanding Geology Component	A. Lithology (ignimbrite from Old Buyan-Beratan Volcanic) B. Geological Process C. Culture	
Description	A. Geological Site Sudaji Cave was formed in layers of ignimbrite rock resulting from the eruption of the Purba Buyan Beratan Volcano 30,000 years ago. The rocks are composed of lapilli-tuff with a massive structure to inverse graded. The rocks found are brightly colored, ranging from gray-white to weathered brownish color. B. The geological process contained in the geological site of Sudaji Cave is in the form of pyroclastic flows resulting from the eruption of the caldera from the Ancient Buyan-Beratan Volcano 30,000 years ago. C. Sudaji Cave is a cultural heritage that is part of the UNESCO-recognized Subak cultural heritage. Besides it is estimated that Sudaji Cave was once part of the irrigation technology made by ancient people to meet water needs (Aungan). This site proves that Balinese people have been familiar with irrigation technology and rock engineering since ancient times. The width of Goa (Aungan) ranges from 80 -120 cm, with a height of 150 -200 cm.	

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Table 2. Geodiversity in Geosite Tembok Barak Waterfall

Names of Geological Diversity Objects (Geodiversity) & Cultural Sites	Geosite Tembok Barak Waterfall	 
Location	Sambangan Village, Sukasada District, Buleleng Regency, Bali	
Coordinate	Y : 08°08'40.2" X : 115°06'01.3"	
Outstanding Geology Component	A. Geological Process B. Lithology C. Geological Structure	
Description	A. Geological Site, The Tembok Barak Waterfall, was formed starting from the deposition of material from the eruption of the Ancient Buyan-Beratan Volcano, which experienced a horizontal fault due to tectonic processes so that it lifted and cut layers of rock, then slowly passed by the Banyumala river flow to form the current condition. In addition, the naming of this waterfall cannot be separated from its geological conditions, where several layers of the rocks undergo an oxidation process, causing the red color of the rocks so that this waterfall is named the Tembok Barak waterfall (Red Wall). B. The rocks found in the geological site of Tembok Barak Waterfall are ignimbrite (lapili-tuff), andesite breccia, and andesite lava. It is estimated that the rock thickness reaches 15 meters which	

	is the result of the volcanism of the Ancient Buyan-Beratan Volcano. C. The phenomenon of geological structure is the dominant geological diversity found at this location, which is a horizontal fault that cuts the rock layers to form a waterfall. It is estimated that this geological fault has a right horizontal movement. Besides that, several minor faults and fractures were found in the rock.	

Table3. Geodiversity in geosite Tembok Barak Waterfall

Names of Geological Diversity Objects (Geodiversity) & Cultural Sites	Geosite Aling-Aling Waterfall	
Location	Sambangan Village, Sukasada District, Buleleng Regency, Bali	
Coordinate	Y : 08°10'28.4" X : 115°06'23.3"	
Outstanding Geology Component	A. Geological Process B. Lithology C. Geological Structure	
Description	A. Geological Site Aling-Aling Waterfall is formed from the deposition of material from the eruption of the Ancient Buyan-Beratan Volcano, which experienced a downward fracture due to deflation from the collapse of the volcanic body due to the caldera eruption so that it cut layers of rock like stairs—slowly flowed by the Banyumala river, that produces a multilevel waterfall complex, namely Aling-Aling, Kroya, Twin and Pucuk. B. The rocks found in the geological site of Aling-Aling Waterfall are the result of the eruption of the Buyan-Beratan Volcano in the form of Breccia, sheeting joint Andesite Lava, and Tuff-lapilli. It has a relatively dark to brownish color due to weathering. C. Phenomenon of geological structure is the geological diversity found at this location, which is a descending fault (similar to stairs) that cuts through layers of rock to form a multilevel waterfall to create Aling-Aling, Kroya, Kembar, and Pucuk waterfalls.	

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	Some minor faults and fractures in rocks, especially in lava rocks, produce waterfalls due to fractures flowing from water from springs.	

Table 4. Geodiversity in Geosite Kursi Hill

Names of Geological Diversity Objects (Geodiversity) & Cultural Sites	Geosite Kursi Hill	
Location	Pemuteran Village, Gerogak District, Buleleng Regency, Bali	
Coordinate	Y : 08°09'29.0" X : 114°39'46.1"	
Outstanding Geology Component	A. Geomorphology B. Geological Process C. Lithology	
Description	A. The landscape is the dominant geological diversity in the Bukit Kursi geological site. This landscape was formed from the Pulaki Purba Volcano's eruption, estimated to have formed 15 million years ago, which is part of a crater and a volcanic neck that is no longer active and undergoing processes. Exogenous (weathering and erosion), leaving the landscape as it is today. This landscape is categorized as a hilly landscape with moderate to strong waves at an altitude of 250-400 meters above sea level. B. The geological processes that occur are in the form of ancient volcanic eruptions and exogenous processes (weathering and erosion) to form the hilly landscape as it is today. C. The rocks that make up this area are predominantly volcanic breccia, lava, and pyroclastic layers with varying thicknesses and dominantly dark colors.	 

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Table 5. Results of the Assessment of the Characterization of Geological Diversity

No	Name of Geosite	Clasification of Geological Diversity	Geological Diversity Ranking	Geological Diversity Assessment	The Meaning of Geological Diversity	Geological Diversity Clustering
1	Geosite Sudaji Cave	A. Hill Fault Zone Landscape B. Lapili-tuff and Breccia, Volcanic Rock C. Its Formation is Influenced by Volcanism and Weathering Processes	High	Oustanding	Scientific Aesthetics Recreation Culture	As a Key Record of a Geological Event As a Special Landscape
2	Geosite Tembok Barak Waterfall	A. Hill Fault Zone Landscape B. Lapili-tuff Volcanic Rocks, Andesite Lava and Breccia C. Its Formation is Influenced by Volcanism, Tectonic (faulting) and Weathering Processes D. Active tectonics	High	Oustanding	Scientific Aesthetics Recreation	As a Key Record of a Geological Event As a Special Landscape
3	Geosite Aling-Aling Waterfall	A. Hill Fault Zone Landscape B. Lapili-tuff Volcanic Rocks, Andesite Lava and Breccia C. Its Formation is Influenced by Volcanism, Tectonic (faulting) and Weathering Processes D. Active tectonics	High	Oustanding	Scientific Aesthetics Recreation	As a Key Record of a Geological Event As a Special Landscape

4	Geosite Kursi Hill	A. Volcanic Remnant Hills B. Andesite and Breccia Lava Volcanic Rocks C. Its formation is influenced by tectonic processes, volcanism and weathering processes D. Active tectonics E. Geological Evolution of the Island of Bali (Quarter Age)	Oustanding	Oustanding	Scientific Aesthetics Recreation Culture	As an Earth History Artifact As a Key Record of a Geological Event As a Special Landscape As an Ecology Supporter