GEOTOURISM SITES

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A. Introduction

Geotourism is a tourism activity that prioritizes the appearance of geology on the surface of the earth that aims to improve people's understanding of the environment, culture, and nature. According to Wood (2002), Geotourism is a conservation activity and a form of concern for the environment. Here are the kinds of Geotourism activities that can be done according to Farsani, Coelho, and Costa (2013):

1. Geosite sightseeing is a recreational activity to enjoy the uniqueness of nature caused by geological elements.
2. Geosport is an activity that utilizes the topography of an area to exercise.
3. Geostudy is a study activity to study the geological heritage that exists in an area as well as field trips that are useful for geological purposes.
4. Geoconservation and Geoeducation is a conservation activity accompanied by education and preservation.
5. Geofestival is a promotional activity for the sustainability of geological resources.
6. Geotours facility is a facility provided by a tour guide. An example is the Geotourism Map.
7. Health and Wellness Geotourism is a health facility provided by utilizing geological resources in an area.

Geology is one of the important aspects in the development of tourism in an area, it is evidenced by geological phenomena that occurred in the past that can create a self-interest in an area (Septian et al, 2019). Here are some geological phenomena according to Dowling (2011):

1. A geological structure is a non-living natural building that exists beneath and the earth's surface that is aided by working energy. Two energies working beneath and on the earth's surface. The first is the exogenous energy that works on the earth's surface, the second is the endogenous energy that works beneath the earth's surface. There are several natural beauties formed by this geological structure, for example, the Himalayan Mountains.
2. Stratifiography is a science that studies rock layers, types of rocks, properties, structures, and symptoms (Ahman Sya, 2012). Stratifiography can create a very unique and interesting geological phenomenon that certainly has a high tourist attraction. An example is Green Canyon in Pangadaran, West Java.
3. Topography, According to Geological Sciences, Topography is formed due to the presence of Endogenous Energy and Exogenous Energy, as a result of which topography will continue to change over time. The Geological phenomenon that can attract tourists is the topography of the Karst Mountains.
4. Minerals, not only geological structures, topography, and stratigraphy that will be the attraction of tourists, minerals contained in the bowels of the earth are also able to attract many tourists to visit. This mineral content can be very interesting for us to learn, ranging from the name, properties, chemical elements in it, its benefits for life, and even the history and process of the formation of the mineral.

B. Discussion

1. Geotourism Site development criteria

According to Damanik and Weber (2006), there are 4 criteria that must exist in a tour to develop tourist attraction on the tour.

1. Unique, unique is needed in a tour because the uniqueness is what will attract tourists to visit the tour. The uniqueness here is a uniqueness that tourists cannot find in other tourist attractions.
2. Originality / Authenticity, a tourist spot must still maintain the authenticity value of the tourist attraction.
3. Authenticity, Authenticity is almost the same as Originality, it's just that Authenticity prioritizes the value of anticipation or exoticism as an attraction on tourism.
4. Diversity / Diversity, a tourist spot must have a diversity of products and services offered to tourists who visit. Products can be souvenirs (Geoproducts) that are characteristic of these tours.

According to Hermawan (2017), several principles be considered in developing Geotourism, namely:

- Geologically Based (Geology-Based), a tour that will be used as Geotourism must go through geological processes. This means that the tour is formed naturally with geological processes and not man-made results. As explained by Damascus and Weber (2006) one of the things needed to develop the attraction of a tour is Originality and Authenticity.
- Sustainable (Sustainable), Sustainable Tourism is a form of tourism that not only attaches importance to the selling value of a tourist destination but also pays attention to social culture and natural resources that will later be utilized for tourism development so that it can be enjoyed by the next generation.
- Geologically informative, in developing Geotourism, of course, the tour must have information about geology. Because referring to the notion of Geotourism or Geotourism is a tourism activity that prioritizes the appearance of geology on the surface of the earth that aims to improve people's understanding of the environment, culture, and nature. Of course, Geotourism must provide facilities that will provide information about the history of the formation of geological sites on the tour. So, the tourists or the surrounding community will understand how valuable these geological sites are. This understanding is expected to foster awareness of tourists and the surrounding community to maintain the sustainability of these geological sites.
- Locally beneficial (Beneficial Locally), the existence of geological sites that are used as Geotourism is expected to not only provide benefits and satisfaction to tourists who come. But it is also expected that Geotourism can provide benefits to the people in the area around these geological sites. One example of the benefits that can be felt by the surrounding community is economic improvement.

2. Geotourism sites in Indonesia

The country of Indonesia is located on the equator and the ring of fire, this causes Indonesia to have abundant geological resource potential. The potential of abundant geological resources makes Indonesia has many areas that have Geotourism potential. a potential site from (Manyoe et al, 2021). A geological perspective and can be used for education/research. Therefore, the Geological Sites or what is commonly referred to as Geosites in Indonesia should be introduced to the whole world. Here are some Geotourism sites in Indonesia:

2.1 Togean Islands Geotourism Sites

Administratively, the Togean Islands are located on the island of Sulawesi, precisely in Tojo Una – Una regency, Central Sulawesi Province. This archipelago is famous for its underwater conditions which are rich in coral reefs with various kinds of marine life. Not only that, but this island also has a National Park which covers an area of 292,000 hectares, which is what makes this park the largest marine national park in Indonesia. Besides the beauty of the park that invites many tourists, the Togean Islands have several sites that have the potential to become Geotourism sites. Here are the Potential Geotourism Sites in the Togean Islands (Botjing and Asrafil, 2019)

- Tanimpu Waterfall

This waterfall in the Togean Islands is located under a limestone cave on Batudaka Island. The existence of the Tanimpu waterfall can be used as a hydroelectric power plant because it has a large water discharge. Around the waterfall also found several geological structures caused by endogenic activity. The beauty of this Tanimpu Waterfall can attract many tourists to visit, especially supported by the existence of geological structures that have educational value. This shows that the Tanimpu Waterfall meets the principles of a Geotourism site.

- Volcanic Landscapes

The Volcanic Landscape in the Togean Islands can be said to be quite a unique landscape and only found in the Togean Islands. The volcanic landscape in the Togean Islands can be seen from the presence of geological structures in the form of joint meniang, the crater/caldera of the Colo volcano, volcanic manifestations in the form of hot springs, and volcanic rock outcrops in the form of rock intrusion and pillow lava. Volcanic Landscapes have good Geotourism potential because they have beauty, educational value for visitors and have great benefits for the community in terms of the economy and tourism development.

2.2 Bantul Regency Geotourism Site

Administratively, Bantul Regency is located in the Special Region of Yogyakarta (DIY). This area has the potential to be used as a Geotourism area because it has abundant natural resources and makes it beautiful in the eyes of tourists. Not only that, in this area several geological potentials can be used as an educational value for visitors. In 2021, Ali and colleagues will conduct a feasibility study on several geological sites in Bantul Regency to be developed as Geotourism. From this research, several sites that deserve to be used and developed as Geotourism are:

- Parangtritis Sand Dunes

Parangtritis Sand Dunes have an area of 6,446 hectares and stretch in 3 sub-districts in Bantul Regency, namely from Sanden District, Kretek District, and Srandakan District. The process of

forming the Parangtritis Sand Dunes begins with the deposition of loose materials. This Sand Dune has a light sand material because it is formed during the dry season and has fairly low humidity. The minerals contained in the sand at Gumuk Pasir Parangtritis are magnetite, quartz, and karst fragments. According to Ali et al (2021) Parangtritis Sand Dunes, deserves to be developed as a Geotourism site because it has intrinsic and scientific value, educational value, economic value, tourism value, and added value of more than 50%, which is 85%.

- Parangtritis Beach

Parangtritis Beach is located in a coastal area, precisely in Parangtritis Village, Kretek District. This beach is said to be worthy of being developed as a Geotourism site by Ali et al (2021) and managed to get a score of 83% because this beach has unique geology that does not necessarily exist in other places. Parangtritis beach has fine-grained sand with black color which contains the mineral magnetite which comes from the weathering process of Mount Merapi material.

2.3 Bayah Coastal Area Geotourism Site

Administratively, the Bayah Coastal Area is located in Lebak Regency, Banten Province. According to Rizqi et al (2020), several geological sites deserve to be developed into Geotourism areas, namely:

- Taraje Coral

Taraje Coral is located in Cipanas Village, Sawarna Village, Bayah District, Lebak Regency, Banten. In Karang Taraje, an alternation of claystone and sandstone was found, the layers leading to the west-east and having a sedimentary structure that was quite different from the others. Several broad joints are controlled by tectonic processes. The rocks in Karang Taraje are very resistant and have fairly good conditions. According to Rizqi et al (2020) Karang Taraje deserves to be developed as a Geotourism site because it has educational value, economic value, conservation value, additional value, and scientific and intrinsic approach value which is more than 50%, which is 68.5%.

- Langir Cave

Langir Cave is located in Sawarna Village, Bayah District, Lebak Regency, Banten. Goa Langir is composed of limestone originating from the Citarete Formation (TMTL) Limestone Member. In the cave can be found stalactites formed from water droplets. The morphology around Langir Cave is influenced by the geological structure in the form of a right-hand shear fault. There has been an exogenous process in the form of a wave-cut platform and a sea cave. According to Rizqi et al (2020). Taraje Coral deserves to be developed as a Geotourism site because it has educational value, economic value, conservation value, additional value, and scientific and intrinsic approach value which is more than 50%, which is 55%.

2.4 Mount Slamet Geotourism Site

Mount Slamet is located in Central Java Province and is spread over 5 different regencies, namely Banyumas Regency, Tegal Regency, Brebes Regency, Purbalingga Regency, and Pemalang Regency. This mountain is recorded to have erupted several times and is the highest mountain in Central Java Province. The presence of Mount Slamet caused dozens of cinder cones and managed to produce a beautiful panorama of its morphological formations which will certainly be interesting to study by tourists and researchers. This is what makes these cinder cones can be developed into a geological education-based tourist attraction. According to Geosciences (2017) in Djafar and Nurlathifah (2020), there is a classification of qualitative assessment of geological heritage resources.

Table 1. Classification of Geological Heritage Assessment based on Scientific assessment, education, tourism and risk of degradation in Inventory engineering Standards

Geological Diversity and Identification of Geological Heritage

Number of Values	***Scientific* Assessment**
< 200	Low
201 – 300	Keep
301 – 400	Good

Here are some Sinder Cones produced by volcanic eruptions that have the potential to become geological education-based tourist attractions (Djafar and Nurlatifah, 2020).

Whale Shark Tours in Indonesia

- Cinder Cone of Siremeng Hill

The Siremeng Hill Cinder cone is located in the Sarangan Atas area, Purbalingga Regency, precisely this cone is located at the eastern foot of Mount Slamet. The Bukit Siremeng Sinder Cone is considered to be a conservation and education-based Geotourism object because this cone contains scientific records or scientific values, this is what causes this cone to have a high geological heritage value. Not only that, this cinder cone has a beautiful view because it has a fairly specific landscape. This certainly supports the cinder cone of Siremeng Hill to have an important role in growing the economy of the surrounding community through Geotourism. From the assessment of the Bukit Siremeng Cinder

Cone, the total score was 290. Based on this value, the Bukit Siremeng Cinder Cone received a moderate scientific rating.

- Cinder Cone of Lompong Hill

The Lompong Hill Cinder cone is still located in Purbalingga Regency, precisely in the Kutabawa area. This hill is composed of pyroclastic fall sediment material, has a fairly smooth relief and the cone shape is very symmetrical and clear. From the top of the Cinder Cone, Bukit Lompong, we can see the hills that extend towards the eastern slope of Mount Slamet. The Bukit Lompong Sinder Cone is considered to be a conservation and education-based Geotourism object because this cone contains scientific records or scientific values, this is what causes this cone to have a high geological heritage value. This certainly supports the cinder cone of Batu Sanggar Hills which has an important role in growing the economy of the surrounding community through Geotourism. From the assessment of the Bukit Lompong Cinder Cone, a total score of 264 was obtained. Based on this value, the Bukit Batusanggar Cinder Cone received a moderate scientific rating.

2.5 North Kalimantan Geotourism Sites

Geologically, North Kalimantan has abundant mineral resources because North Kalimantan is located in two basins (Nunukan Basin and Tarakan Basin) the main tertiary sediments which of course have a large effect on mineral resources in North Kalimantan (Permadi et al, 2019). Of course, this will greatly affect the geological diversity in North Kalimantan. Of course, this geological diversity makes North Kalimantan have a lot of potential natural resources that can be used as Geotourism sites. Here are some geotourism sites in North Kalimantan (Permadi et al, 2019)

- Semolon Hot Water

Semolon Hot Springs can be found in Paking Village, Mentarang District, North Kalimantan. To arrive at Semolon Hot Springs, tourists only need to use their vehicles. This hot water comes from hot springs upstream of the river and has a temperature of 51.4°C to 60.2°C and a neutral pH of around 6.91 to 7.07. There are rock contours that are shaped like stairs that are flowed by water, making this hot spring even more beautiful and unique to visit. At Semolon Hot Springs, there are several supporting facilities such as lodging, camping ground, prohibition information boards, suspension bridges, and parking areas.

- Central Tanjung Palas Karst Area

The Tanjung Palas Tengah Karst area is located in 14 villages at once with an area of more than 300,000 ha. The Tanjung Palas Tengah Karst area is unique from the landscape to the rocks. The attraction of this tour is its beautiful panorama, there are caves to scientific values that we can learn. This Karst area has also been facilitated by a gazebo and parking area.

C. Conclusion

Geotourism site sites can also bring benefits to tourism in terms of phenomena that occurred in the past that caused their interest and uniqueness in existing geological sites. Indonesia itself has abundant geological potential and resources, this is what makes Indonesia have many Geotourism sites or Geosites.

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Glossary

Equator:	a line that crosses at zero degrees is imaginary or imaginary that surrounds BMI and divides the earth into two parts.
Endogenic:	The energy that causes changes in the earth's crust which generally occurs due to earthquake, tectonic, or volcanic activity is an activity that originates from within the earth.
Education:	efforts to mature a person through training or teaching
Conservation:	is the preservation of protection against an area

Biography

Juhriana Yusuf

Nana Juhriana Yusuf, born on May 3, 2000 in Tibawa District, Kab. Gorontalo Gorontalo Province. The second of three children were born to Mr. Amin K. Yusuf and Mrs. Syamsia Datau. Nana studied at SD Negeri 1 Dunggala in 2006, SMP Negeri 1 Tibawa in 2012 and SMA Negeri 1 Tibawa in 2015. Now, nana is an active semester student at the Geological Engineering Study Program, State University of Gorontalo. In 2019, Nana as one of the team members successfully passed funding for the Exact Research Student Creativity Program (PKM-PE) by the Ministry of Research, Technology and Higher Education with the title "4D Geology and Radar Image Analysis for the Ilotidea Flood Tourism Science Village". In the PKM Program, Nana together with the team leader and one of her colleagues succeeded in publishing 1 monograph book with ISBN and 2 national research journals. In 2020, Nana together with the group leader and 11 other members managed to pass the Village Development and Empowerment Holistic Program funding and became the 20 best teams.