

Study for Development of Geotourism Potential in Edi Village Timor Leste

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Abstract: Maubisse is one of the administrative posts of the Ainaro in Timor Leste, which is known to have a very high interest of tourist attractions because of its cold weather and beautiful mountain views. However, those attractive natural phenomena have not been fully used yet as educational attractions (as geotourism). The purpose of this study is to conduct an inventory and interpretation of the geotourism potential in Maubisse, especially in Suco Edi. This research was conducted in three phases: literature study, field research and data analysis of the geotourism potential using quantitative and descriptive methods. The data analysis method used was geosite and geomorphosite assessment based on certain parameters according to Kubalíková (2013). The parameters used were scientific and intrinsic values: education, economy, conservation, and added value possessed by a geosite.

1 INTRODUCTION

Geotourism is a scenic spot of natural tourism where the main object is geodiversity through geological tourism attraction to tourists, natural science education and environmental conservation based on geological phenomena. Accordingly, it can attract the attention of tourist to visit the geotourism area and will increase the local community's income economically (Rachmat, H., 2017).

Geotourism was first defined (Hose TA, 1995) in England. There are two viewpoints of geotourism: Purely geological and geomorphologically focused Sustainable Tourism and Geographically Sustainable Tourism, this emphasizes preservation of the geographical sense of a place in general, beyond simple geological and geomorphological features. The aim of geotourism is to make visitors aware of, and to gain some understanding of, the geological features that surround them. Geotourism itself is a tourist activity that is specifically focused on the panorama and geological aspects (Newsome and Dowling 2010). At its simplest geotourism is tourism with some connection to geology or geomorphology. Development of certain areas into a Geotourism region will certainly give a good impact people's lives in various aspects of life such as economic, social,

cultural, and infrastructure. However, in determining an area as a geotourism area, it needs to be analyzed first. The analysis generally carried out is geosite and geomorphosite analysis. Geosite and Geomorphosite are landscapes that have potential as tourism sites and have a value based on the perspective of human assessment (Kubalíková, 2013). This analysis is intended to provide an assessment of the specific parameters such as the value of a scientific approach, educational value, economic value, conservation value and the value-added (beauty, cultural, geological factors) in certain areas (Kubalíková, 2013).

2 RELATED WORKS

Maubisse (Maubesse, Mau-Bessi, Maobisse, Maubise) is a historic town in the hills 70 km south of Dili. It is one of the administrative posts of the Ainaro, Timor Leste which is known to have a very high interest of tourist attractions because of its cold weather and beautiful mountain views. It's about 3 hours traveling from Dili by motorbike and car and from Maubisse town to Edi Village basically takes about 1 hour by Motor and Car. Elevation and coordinates: Elevation (approx.): 1430m Latitude

(Lat): 8°50'17"S Longitude (Lon): 125°35'50"E 50'17"S. The geological map of Timor Leste and the outcrop map of study area are shown in Figure 1 and Figure 2 respectively.

Geotourism is an earth park where its potential is measured based on geodiversity that has unique geological characteristics with the beauty values of natural objects in certain scales and distributions, as well as integrating other forms of natural scenery and cultural existence in regional uniqueness (Rachmat, H., 2017). The geodiversity in the Timor-Leste territory is through regional geological mapping in the Portuguese period (Audley Charles, 1968), regional geology map of Dili sheet (Bachri, S. & Situmorang, R.L.,1994) and also regional geology map of Baucau sheet (Audley Charles, 1986). Therefore, the general potential of geodiversity in Timor-Leste are distributions of complex rocks including the presence of rare fossils in sedimentary rocks, physical geological phenomena (complexity of geological structures) and also variations of geomorphological landscape such as islands, lakes, lagoons, hot springs, spring, waterfalls, beaches, mountains, plateau, plains, rivers and caves.

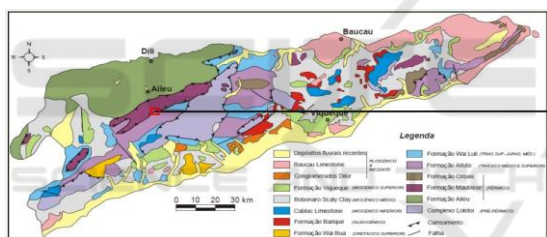


Figure 1: Geological map of Timor Leste (Carvalho and Lisboa, 2003).

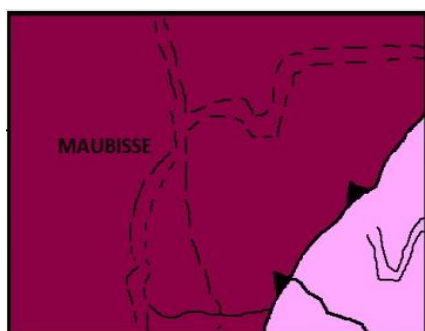


Figure 2: Outcrop map of study area (Carvalho and Lisboa, 2003).

Based on the regional geology, the studied area is part of Maubisse and Aitutu Formation with medium corrugated mountain morphology unit to Structural Mountain. The geological structures found in the

form of a sliding fault and thrust fault. The Formation of Aituto, dating from the Triassic mid. - upp, corresponds to an alternation of thin slates of limestone, clayey and clayey shales, with predominance of the carbonated component, whereas the Wai Luli Formation, Triassics up. to the Middle Jurassic, is characterized by an increase of the clayey component. Its potential is linked to the joint occurrence of more or less marly clays and limestone, from which the cement industry is interested.

The potential of the Maubisse Formation, also dating from the Permian, rests on the lower part of the unit, which is about 400 m thick and where very thick stands of massive limestone predominate. The upper part of this Formation consists essentially of rocks of an eruptive nature, about 500m thick. The limestone are very poorly affected by metamorphism and correspond to bio-carcasses of separatists cement, very rich in fauna, with enhancement for crinoid remains. They typically have red to pinkish tones, and lighter tones, cream and gray may also occur. Their noblest suitability will be for ornamental purposes, and the use of different aggregates, especially for lime and cement, in terms of light tones, can not be ruled out.

Furthermore, geoconservation is the environmental conservation which consists of the singularity of geological phenomenon that needs to be protected through geotourism programs (Crofts, R. & Gordon, J.E., 2015). The geological conservation area of Timor-Leste that has been identified from (Haig, D.W. & McCartain, E., 2010) with the topic of “Triassic Organic-Cemented Siliceous Agglutinated Foraminifera from Timor Leste: Conservative Development in Shallow Marine Environments” amounts to four (4) areas are as follows; Area of Tutuala, Area of Iliomar-Aliambata, Area of Manatuto-Pualaca and Area of Ainaro-Maubisse. According to Sharples, C., 2002, general reasons for doing geoconservation are:

1. Geodiversity has a scientific value which is used for human needs and related ecosystems
2. Characteristics of non-renewable geodiversity
3. Many sensitive geodiversity is easily damaged, especially the risks caused by various human activities
4. Providing knowledge information with the fundamental principles of geoconservation
5. Provide information on geological conservation status in Timor-Leste
6. Propose to Conservationists to give advice for decision maker
7. Provide estimation on geoconservation.

Inventory and preliminary identification of geodiversity data as the first phase in collecting and improving the quality of information and also the beginning of a database to make conservation area of geological diversity. Very important data and a fundamental basis of information for developing a geoconservation area based on four points are as follows (Crofts, R. & Gordon, J.E., 2014):

- a. Scientific Value; Characterization of the geodiversity and geoheritage values based on their geological processes and history
- b. Aesthetic Value; describes the formation of geoheritage phenomena and various attractions of geomorphological landscapes
- c. Cultural Value; the location of the geoheritage site is always associated with the culture of the local community
- d. Recreational Value; shows the relationship between geoheritage sites with various tourism activities, such as recreation, sports and adventure.

3 METHODOLOGY

The method that used in this study is descriptive explorative. Explorative descriptive research is research that aims to explore extensively about things or causes that influence the occurrence of something. The main purpose of this type of research is to systematically describe the facts and characteristics of objects or subjects that are precisely examined, related to this research, the situation that will be seen is the potential of geotourism in Suco Edi, Maubisse, Ainaro, Timor-Leste.

This study applies two (2) stages approaches i.e. Literature Review and Field Observation. The aim of reviewing existing literatures are to have a prior understanding and accumulation stage of references needed from various sources, especially about geotourism and geology of Timor-Leste while Field Observation or Field Work is the stage of collecting all pertinent geotourism objects in identifying the general potential of geodiversity. There is one (1) considered method applying in this research. It is qualitative method such as "GIS Survey, Descriptive and Interview to the community". Lastly, this database is used and analyzed using the Kubalíková parameter 2013, to obtain the results of the feasibility of the geotourism percentage.

4 RESULTS AND DISCUSSIONS

We have discovered three types of tourism resources that are potential for geotourism: geological tourism, geomorphological tourism and river tourism – all located in nine sites (two geomorphosites and seven geosites).

4.1 Pousada Geomorfosite

Pousada is located in Maubisse village in (1302 - m, 08 50' 27,5''-125 36' 07,6'') perched on a lookout just off the main road near the bend. It's a Guesthouse set in amazing gardens within old stone walls (Portuguese colonial era), Considering the Hill top location offers expansive views and history behind this beautiful old place, the community, traditional and culture in the surrounding area and based on feasibility study, we consider it as a potential geomorphosite for geotourism (89%).

4.2 Erus Manu Waterfall

It is located in Edi Village (1300 m, 08°51'41"0 S-125°35'50" E). Erus Manu waterfall is the body of Edi Erus rivers, water's steep fall from 4 meters height over a rocky ledge of Limestone that fall downward in to pool below with depth of 2 meters. The type of this waterfall is horsetails. Horsetail is a type waterfall in which water flows over a broad ledge, usually an overhanging one, into a pool by keeping contact with the underlying rock during its descent. In fact, the local people use this place for swimming recreation because the water is clear, clean and fresh. The average geosite potential is 64% for Geotourism.

4.3 Haut Doner Waterfall

Haut Doner is the water's steep fall from 1-meter height over of massive boulders of Limestone and surrounded by red limestone outcrop that descending in to pool below where the water is very clean, clear and fresh with depth about 0.85 meter as the body of Edi Erus river. It's type of FAN waterfall that is a steep angled cascade that fans out from a narrow width at the top to a larger base at the bottom. Most fans are also horsetails in that are maintain contact with undering rock during their descent. It's located in Edi Village (1201 m, 08°51'42"5 S - 125°37'40"8"S) The average geosite potential is 64% for Geotourism.

4.4 Ermanfoli Waterfall

Ermanfoli Waterfall is very clear clean and cold and water's steep fall from 15 meters height over a

bedrock of Clastic limestone (Maubisse Formation) that falls downward without making contact with the underlying rock in to pool below with depth of 2 meters. The waterfall has enough space between the water and the rock that you can walk behind it. This type of waterfall is known as plunge waterfall. The Ermanfoli has a cave behind the waterfall that makes it unique in and has historical story in it, where in the conflicts times the Portuguese colonization and of the Indonesian occupation the local people escape and evacuate into the cave. The average geosite potential is 59% for Geotourism. It is located Edi Village (1197 m, 08°51'42"2 S - 125°37'44"0"S).

4.5 Ersulihatmau Waterfall

It's water steeps fall from 1-meter height over of massive boulders of limestone that descending in to pool below where the water is very clean, clear and fresh with depth about 0.73 meter as the body of Edi Erus river. It's type of fan waterfall that is a steep angle cascaded that fans out from a narrow width at the top to a larger base at the bottom Most fans are also horsetails in that they maintain contact with underlying rock during their descent. It is located in Edi Village (1175m, 08°51'42"5 S - 125°37'40"8"S). The average geosite potential is 64% for Geotourism.

4.6 Ermihis Waterfall

Its water steeps fall from 25 meters height over of limestone (Maubisse Formation) that descending in to pool below where the water is very clean, clear and fresh with depth about 0.1 meter. It is type of FAN waterfall that is a steepagled cascade that fans out from a narrow width at the top to a larger base at the bottom maintain contact with bedrock during their fall downward. It's located in Edi village (1165m, 08 51' 45,9"125 37' 57,4"). The average geosite potential is 64% for Geotourism.

4.7 Erkuira Waterfall

Erkuira block waterfall is a type of "ledge" waterfall. In a block waterfall, water falls from a wide river or stream, and the fall is typically wider than it is tall. The water drops over the vertical cliff with 5 meters height over a rocky ledge of clastic limestone that fall downward into the pool bellow with depth of 2 meters. It is located in Edi Village (1160 m, 08°51'51,2"- 125°38'03,7"). The average geosite potential is 59%.

4.8 Debu Waterfall

Debu waterfall It is located in Edi Village (1160m, 08°51'58,5"-125 38' 08,4"). The average geosite potential is 59% for Geotourism. It is Slide waterfalls can be considered a sub-type of horsetail. The water glides down a relatively low angle slope, maintaining continuous contact with bedrock of layered clastic limestone. However, is that contact is constant because of the shallow slope of the rock in slide waterfalls (Height 11m, depth 2m).

4.9 Edi Simerah Waterfall

This geomorphosite is located in Edi Simerah Village (2002m 08 51' 31,3"-125 37' 43,5"). The geomorphosite of Edi Simerah shows landforms that have acquired a scientific, cultural or historical, aesthetic and/or social/economic. In the hill of Edi Simerah there are complete component for a geomorphosite. Raimerah Waterfall (Fan waterfall), Traditional house of Edi Raimerah, small chapel made of woods and Hill top location offers expansive views of structural mountain landscape with average potential to be develop for geotouristic destination makes up to 69%.

A geotouristic tracking route map has been designed. It is start from Pousada to Edi Village. It normally takes about 1 hour by motorbike and car. The road to Edi village is adventurous and the surrounding view is amazing and in the middle of the trip it's better to take a stop in Ule Lefa strawberry garden. Ule Lefa is well known as a ecotourism site for strawberry farming (1411m, 08 50'30,3' S - 125°37' 14,5").

5 CONCLUSIONS

Edi Village has significant potential to be developed as one of the geotourism destination in Maubisse, Ainaro, Timor-Leste. The geotourism potential of Suco Edi, we have discovered three types of tourism resources: geological tourism, geomorphological tourism and river tourism all located in nine sites (two geomorphosites and seven geosites). The average results of the feasibility study of the geotourism potential in each of these sites are: Pousada Geomorphosite 89%; Erus Manu Waterfall 64%; Haut Doner Waterfall 64%; Ermanfoli Waterfall 59%; Er Sulihat Mau waterfall 64%; Er Mihis Waterfall 64%; Er Kuira Waterfall 59%; Debu Waterfall 59%; and Edi Simerah Geomorphosite 69%. Considering all the aspects above, which were based on the quantification and comparison of the various wonders between nature and geological

processes that turns possible the implementation of geotourism object, it shows that Suco Edi has tourism resources that are suitable to be developed into geotourism sites with an overall average feasibility value of 65.66%. Recognizing that Edi is a rural village, the development of geotourism in the area would even be beneficial for a local and sustainable economic development. Hence, infrastructure development would be required as well as legislative protection in order to use the geotourism resources of the area to improve the living conditions of the local community and to promote this village (and, thus, Timor-Leste) in a wider scale. Community and local leaders of Edi Village need protect those sites and develop as much as possible and propose it to the government for the further study and support geotourism development in the potential area. Further survey research is needed which is more focusing in to the detailed on the geological condition and process of the area. This place is recommended for geologist students for the field study due to the existence of geological essential features such as beautiful and complex structures and unique lithology that is Permian Maubisse formation. Highly recommended to adventurer, traveler and nature lover to explore this hidden beautiful remote Village of Edi Maubisse.

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