

Geodiversity Raja Ampat Islands and Tourism Development

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Abstract. The geodiversity for tourism on Raja Ampat commonly associated with uplifting of limestone, which followed with the karstification process. This various karstification process create of vary morphology karst type, such as eksokarst and endokarst. The eksokarst landscape, function to the environmental and social value which coherent within endokarst are the element to attract tourists to visit. Geodiversity for tourism purpose of Raja Ampat need to protect from environmental damage caused by human activity. Protection efforts are carried to minimize and reduce changes.

Keywords: Geodiversity, Morphology Karst

1. Introduction

Raja Ampat Islands are located in the eastern part of Indonesia on the bird's head of Papua Island. Raja Ampat are 46.108 km² in wide, consisting of 1600 islands and 87% of its territory is ocean. There are four big islands among them, mainly Waigeo, Misool, Salawati and Batanta. The islands are included in district of Raja Ampat, West Papua Province.

The geodiversity for tourism development in Raja Ampat has not been known. Geological investigations related to paleontology was conducted by Fauzi Hasibuan in Misool Island [1]. The geodiversity of this area are needed to identify in order to support the government program which plan it as geopark area. Since the area is quite broad, the geodiversity identification only focused on the coastal areas of the northern part of Raja Ampat, including Waigeo Island and Wayag Island (Figure 1.)

The purpose of geodiversity identification are:

- a. To identify geology features that can be developed as a tourist destination
- b. To identify relation between geology features with the ecosystem and the local culture

2. Geology

Geology condition of Raja Ampat is not separated from the history of the geological formation of the island of Papua. Papua Island lie on the edge of the Indo Australian plate, which was developed as a result of the meeting between the Australian plate moving northward with the Pacific plate moving to the West [2].

Based on the Geological Map Sheet Waigeo, scale 1:250,000 [3], the rock of Raja Ampat and surrounding are composed of, alluvium, conglomerate of various materials, limestone reefs, limestone of Puri Formations and Waigeo Formation, sandstones arkosa of Yeben Formation, Siltstone of Rumai Formation and Tanjung Bomas Formation, volcanic rocks and ultramafic.

3. Geodiversity for Tourism

The geodiversity for tourism on Raja Ampat commonly associated with uplifting of limestone of Waigeo Formation, which followed with the karstification process. This various karstification process on the

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limestone process create vary morphology karst type such as eksokarst and endokarst. This various morphology type are influenced by solution and geological structure (joint and fault).

The scenic eksokarst landscape as the result of karstification process attract many tourism to visit. Instead of scenic panorama, environmental and social value which coherent within karst also interesting for tourism.

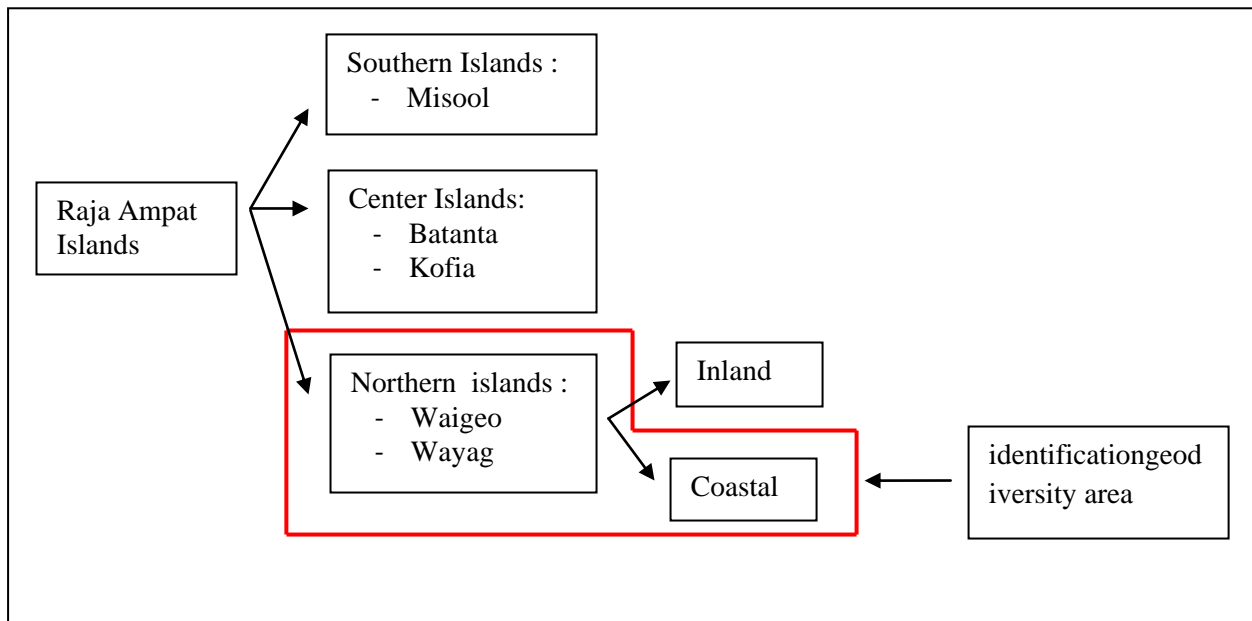


Fig. 1: Focused area for identification geodiversity in Raja Ampat Islands

3.1 Karst and ecosystem

Scattered karstislands(atoll) with the tower shape of the hills is the karst phenomena of Raja Ampat (Figure 2). The hills with a heightvarying between20-60m above sea level (Figure 3), which directly interacts with the coral reef shows a unique interaction between karst with the marine ecosystem. Karst of this region serve a function as a place for the growth of coral reefs and many other marine life.

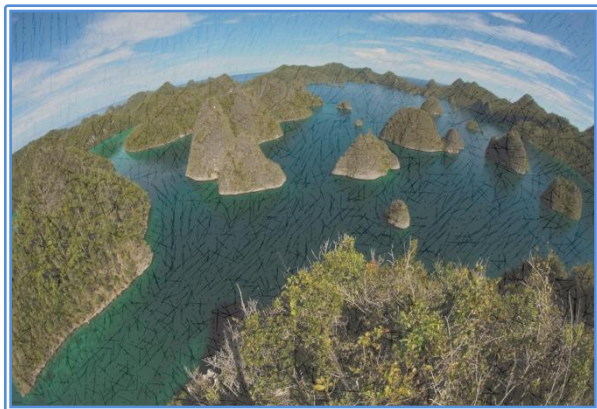


Fig. 2: Eksokarst hill which create atoll



Fig. 3: The tower hill with height varrybetween 20 - 40m.

Commonly physical and biophysical environment of karst both on the surface as well as on the subsurface can only provide limited resourcesfor floraandfauna which live there. In the verry limited physical condition of karst Raja Ampat, the diversity of coral and fish are able to survive on bathymetry depth less than 15 monly within a few feet of the hill.

The marine ecosystem diversity of Raja Ampat is the highest in the world. It was recorded, at least consisting of 553 species of scleractinian corals and also 1.320 coral reef fish. The coral reefs of Raja Ampat is a part of the world Coral Triangle which composed of Indonesia, Malaysia, Philippines, Papua.

New Guinea, Solomon Islands, and Timor-Leste [4]. The marine diversity of Raja Ampat also formed the beautiful marine parkth wich at attracts tourists for diving [5].

3.2 Karst and social

The local communities occupied karst Raja Ampat for along time. Long interaction between local communities with karst create distinctive cultural social structure. Some karst features such ascaves, stalactites, and even cliffs karst have social value for local communities. The socialvalues karst related with spiritual, beliefs and legends are part of the geodiversity which canattract tourists. The socialvalues describe isas follows :

- a. Stalactites in the Mayalibit Gulf is believed have the religious value by the local people. The stalactites with the shape like male genitalia, are believed by the descendants people, who difficult to have children, will have the kid with only holding or touching it.
- b. The relief of the Papua cultural heritage can be found on the karst wall in the Salpele village. The relic with the picture of plam in red color seems like the human blood.
- c. Cavein the Mayalibit Gulfused by ancestors as a sacred place to store the skull [6]. Currently this tradition is not implemented, but the scars of the skull in the cave still can be seen.
- d. The graben of limestone in the GulfMayalibit provide benefit for local fishery resources, because this place serves as pawning place for fish species known as the lemnaormackerel. To reduce the threat of taking of fish, the local people aplyyasi culture. This culture is a reflection of the wisdom of local communities to manage marine resources by which traditional leaders by consensus to set to close the sea against taking certain biota within a certain period

4. Conservation

In the long term, for tourism purposes, the nature and scenic of geodiveristy Raja Ampat need to protect from environmental damage caused by human activity. Threatening of mining and tourism activities are predicted damage karst in this area [7].

Mining activities, particularly lime stone mining forcement industry, can change the shape of the landscape. The impact of landscape change can reduce attractiveness of the island for the tourism. Mining acitivities also increase rate of erosion and sedimentation that can disrupt to the growth of flora and fauna marine in this region.

The increase rate of sedimentation in the marine will result in the closing of the body by marine sediments. Sedimentational so will result in a murky sea water thus blocking sunlight penetration, consequently widened biotadie.

In some places, construction of cottages for tourism, tend to build in around the karst hills. Such trends effect to landscape change and also disrupt marine ecosystems in the future.

Therefore the conservation efforts that have been made by local governments that only focus ingoncoastal regions, must be followed by efforts to conserve the hundreds eksokarsthills, which start from the coast up to the top of the hillkarst by minimizing landscape changes.

5. Conclusion

The geology features for tourism on Raja Ampat commonly associated with limestone of Waigeo Formation. The various karstification process on the limestone create vary morphology karst type such as eksokarst and endokarst. The scenic eksokarst panorama, environmental and social value which coherent within karst are interesting for tourism.

The karst serve a place for the growth of coral reefs and many other marine life. Besides this function, the karst in this region also has long interaction with local communitieswhich create distinctive cultural social structure. Some karst features such as caves, stalactites, and even cliffs karst have social value for local communities. The social values karst related with spiritual, beliefs and legends are part of the geodiversity which can attract tourists.

The nature and scenic of geodiveristy Raja Ampat need to protect from environmental damage caused by human activity. In the future, threatening of mining and tourism activities are predicted damage karst in this area.

6. Recommendation

Geodiversity identification for tourism development only focused on the northern part of Raja Ampat Islands. Geodiversity in other part of Raja Ampat geo diversity may still be found, such as in the centre of the Raja Ampat Islands, (Batanta Island and Kofiau Island) and south of Raja Ampat Islands (Misool Island).

The geodiversity knowledge of Raja Ampat can be used as the initial information for the purpose of geopark development of this area in the future.

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8. References

- [1] Fauzi Hasibuan, *Mesozoic Geology and Paleontology of Misool Archipelago, Eastern Indonesia*, Geology Agency 2012, : 1-10.
- [2] Direktorat Jenderal Penataan Ruang, *Pembahasan Pengembangan Kawasan dan KLHS KSN Raja Ampat*, 2012, pp 1 – 15.
- [3] Lastiadi, Heru.A., *Laporan Penyelidikan Geologi Kawasan Lindung Geologi Kabupaten Raja Ampat*, Badan Geologi, 2012 : 3.4 – 3.22.
- [4] Kementerian Perikanan dan Kelautan, *Cerita Sukses Coremap II Kabupaten Raja Ampat*, 2009, : 1 -10.
- [5] Dinas Kebudayaan dan Pariwisata Kabupaten Raja Ampat, *Profil KKLD Kabupaten Raja Ampat*, 2009, : 1-15.
- [6] Dinas Kebudayaan dan Pariwisata Kabupaten Raja Ampat, *Profil Ragam Wisata, Kabupaten Raja Ampat, Papua Barat*, 2009, : 43 – 52.
- [7] Supriatna S, et al., *Peta Geologi Lembar Waigeo, skala 1:250.000*, Pusat Penelitian dan Pengembangan Geologi, 1995