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SAVING DERAWAN ISLAND FROM ABRATION FOR MARINE TOURISM SUSTAINABLE

MENYELAMATKAN PULAU DERAWAN DARI ABRASI UNTUK KEBERLANJUTAN PARIWISATA BAHARI

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ABSTRACT

As an archipelago state, Indonesia globally famous with mega marine biodiversity. This country contributes the most extensive area among six countries under the Coral Triangle area. The area contains almost 600 species of corals and, 76% of total corals worldwide found in the coral triangle. Moreover, 574 of coral species which 72% of total corals globally located in Indonesia, and Raja Ampat hosting the highest biodiversity followed by Derawan Island in East Kalimantan Province. Despite having extraordinary marine biodiversity, Derawan Island experience several environmental issues. One of them is Abrasion. Data collecting are through observation and in-depth interview. The research shows that Derawan Island experienced massive abrasion on the East side of the island due to housing developments in the South area of the island. As the consequences, the water current which carried the sand from the East and the Westside was stuck in the South area of the island. Therefore, the solutions that can be conducted are: (1) building erosion prevention; (2) coral reef treatment; (3) relocation for people who live on the coastline.

Keywords: Abrasion, Coral Triangle, Derawan Island.

ABSTRAK

Sebagai negara kepulauan, Indonesia terkenal di dunia sebagai negara yang memiliki kekayaan dunia bawah laut. Indonesia menjadi negara terbesar di Segitiga Terumbu Karang dunia (The Coral Triangle) di mana hanya terdapat enam negara di kawasan tersebut. Sebagai wilayah yang memiliki peranan penting dalam hal biota laut, segitiga terumbu karang dunia yang berada di Timur Asia Tenggara ini memiliki hampir 600 spesies karang, dan 76% total spesies karang yang ada di dunia dapat ditemukan di Indonesia, dan Raja Ampat ditetapkan sebagai wilayah dengan keberagaman biota laut tertinggi di kawasan ini diikuti oleh kepulauan Derawan di urutan kedua yang berada di Provinsi Kalimantan Timur. Terlepas dari keindahan alam yang dimiliki oleh kepulauan ini, Pulau Derawan memiliki beberapa persoalan, salah satunya adalah abrasi. Dalam penelitian ini, penulis menggunakan metode in-depth interview dan studi lapangan dalam mengumpulkan data dan temuan-temuan, kemudian jenis penelitian adalah Deskripsi Eksplanatif yang menjelaskan mengenai penyebab abrasi yang terjadi di Pulau Derawan serta solusi yang dapat ditawarkan. Lebih lanjut, alat analisis yang digunakan dalam penelitian ini menggunakan konsep Abrasi, di mana fokus pada penyebab terjadinya Abrasi secara umum dan secara khusus yang terjadi di Pulau Derawan. Terkait dengan metode penelitian, tulisan ini menggunakan konsep Abrasi dan tipe penelitian adalah Deskripsi Eksplanatif yang akan menjelaskan mengenai penyebab abrasi yang ada di Pulau Derawan dan solusi yang disajikan untuk mengatasi persoalan tersebut kepada pemerintah terkait. Kemudian jenis data yang digunakan adalah data primer yang diperoleh dari penelitian lapangan melalui observasi dan in-depth-interview di Pulau Derawan. Hasil dari penelitian ini menunjukkan bahwa abrasi yang terjadi di Pulau Derawan terkonsentrasi di bagian Selatan Timur pulau diakibatkan oleh maraknya pembangunan perumahan di bagian Selatan Pulau, wilayah tersebut sehingga menyebabkan tumpukan pasir yang terbawa oleh arus dari arah Timur dan Barat tertumpuk di Selatan Pulau. Adapun solusi yang bisa diambil adalah: membangun pencegah abrasi, pemeliharaan terumbu karang dan relokasi masyarakat yang bermukim di bibir pantai Pulau Derawan.

Kata kunci: Abrasi, Pulau Derawan, Segitiga Terumbu Karang.

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INTRODUCTION

The coastal area is an important part of the existence of islands in a particular area. However, because it is located between sea and land transition, the area sometimes experiences pressure from various activities and phenomenon which occurred on the land and the sea, such as the development of housing on the coastal area and land clearing. As the consequences, those activities irritated of the local ecosystem, especially on the coastal area and the marine life. Another problematic situation occurred caused by human activities, which affects the configuration of seashore movement. The process of hydro oceanography from the sea is possible to create an unstable situation for sea ecosystem. One of them is the change of ocean currents. Land activity in addition, could affect the transformation of coastline like abrasion. (Kurnia, 2013). By definition, abrasion is a land alleviation (beach) caused by ocean currents activities. In broad view, this phenomenon will cause the land in the coastal area gradually disappear and the sea level increase (Nur, 2004; Kurnia, 2013)

Theoretically, according to detail engineering perspective, there are various causes of abrasion (Kimpraswil, 2006; Kurnia, 2013), as follows:

1. Land Subsidence, caused by the overconsumption of freshwater near by the coastal area;
2. Mangrove Deforestation. Mangrove has a significant role in order to prevent the land subsidence and reduce ocean waves through the strong roots which grow in the coastal area, therefore, if the mangrove distribution is limited, the coastal area is considered vulnerable;

3. Natural Damage, associated with global warming which caused a number of issues, one of them is rising sea level which leads to a higher of ocean waves; and
4. Human. More than any factor that caused the abrasion, humans as the most responsible for natural disasters, such as sand removal, a housing development in the coastal area, the fishpond opening without considering the geographic situation, location, and the environmental condition.

In general, abrasion is happening in everywhere, especially with large populations, and one of them is in Derawan Island. Famous as tropical beach, Derawan island located in Berau district of East Kalimantan Province. The island located in the East side of Kalimantan Island and the Southside of Makassar Strait where connected to Sulawesi and Java territorial waters. (Kondisi Geografis, 2018). In total, the island size is 44.60 ha followed 1,487 total population in 2016. (Badan Pusat Statistik Kabupaten Berau, 2017). In addition, the Island is one of a group of Derawan archipelago, as follows: Maratua Island, Sangalaki and Kakaban (Figure. 1). (Wiryawan *et al.*, 2005).

Derawan Island becomes one of Marine Parks in Indonesia because it is a part of sea ecoregion of Sulawesi-Sulu which across Indonesia, Malaysia and the Philippines. This ecoregion in addition, is a part of the Coral Triangle (Coral Triangle, 2017), and also famous as the Amazon of the seas. The presence of mega marine mega biodiversity and crystal-clear water in the Island are fascinating national and international tourists. As a result, the island is full of tourists and bring a positive atmosphere in the economic and the

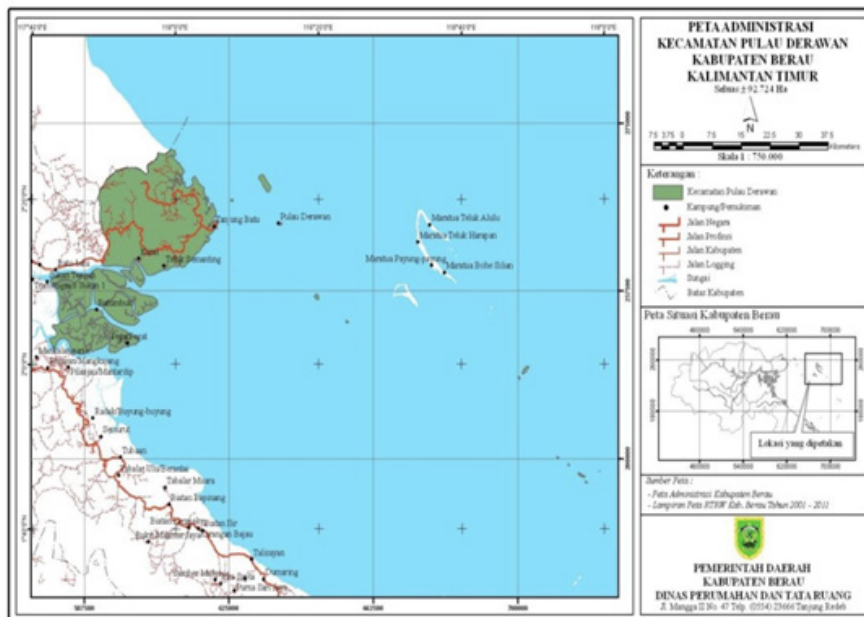


Figure 1. Map of Derawan Archipelago Sub-District (Derawan Island District, Berau Regency, East Kalimantan Province, 2018).

infrastructure aspect. However, as mentioned before, Derawan Island is having abrasion.

METHODOLOGY

The research was done through observation, interview, and collecting data directly in Derawan Island. Furthermore, the research expects to enlighten the author and the reader about the abrasion phenomenon in Derawan Island, the cause and the proper solution in order to prevent the worst problem in the future.

By the purpose, the research paper is categorized as explanative research which that will provide an explanation about the cause of abrasion and formulate the best solution to fix resolve the/problem based on the geographic characteristic and social life of a citizen were Derawan Island. Furthermore, the data sources mainly obtained through in-depth interview following with a number of stages, as follows: a. Plan (Identify candidate interviewers, which is five candidates); b. Develop Instruments (the rules and guide); c. Train Data Collectors (identify and train interviewers) d. Collect Data (Set up interviewers with stakeholders related interviewers), such as Chief of Tourism and Culture Board of Berau, Head of local sub-district of Derawan Island, Civil Servant in Tourism and Culture Board of Berau, as well as a number of Local Citizens) e. Analyze Data (review the data) f. Disseminate Findings (write report and feedback) (Boyce *et al.*, 2006). In addition, the secondary data mostly will be acquired through literature reviews that consist by of journals, e-news, trusted websites and relevant sources.

RESULTS AND DISCUSSION

Derawan Island as Tourist Destination

The Coral Triangle (Figure 2) comprising six countries in the east side of Southeast Asia, these countries are Indonesia, Malaysia, the Philippines, Solomon Island, Papua New Guinea and Timor Leste (CTI, 2009). In terms of marine biodiversity, the area is hosting 76% of 798 coral species (Veron, 2000; ADB, 2014) and 37% of 6.000 coral reef fish species throughout the world (Allen, 2008; ADB, 2014). Moreover, the epicentre of the coral biodiversity located in the Bird's Head Peninsula of Indonesia, Papua (Bentang Laut Kepala Burung (BLKB)) which hosts 574 species (95% of the Coral Triangle, and 72% in global) and within the Bird's Head Peninsula, Raja Ampat is the highest biodiversity in the area (WWF Australia, 2009). Followed by Derawan Island in East Kalimantan. The spread of the coral reefs in Derawan Island approximately at up to 17,41% consist of hardcover and the life spread in average 27,78% (Wiryawan *et al.*, 2005). In terms of sea turtles, Derawan Island is also one of the habitats of a few marine turtles which consider as an endangered species. Such as Green turtle (Jeffrey *et al.*, 2015) and Hawksbill turtles (McLellan *et al.*, 2012).

In terms of the fish population, there are 37% of reef fishes found in the area. Approximately 2,228 of the fish species from 6,000 in total worldwide, and 56% of the fish species in Indo-Pacific (4,050 species). In addition, there are about 8% (235 of endemic species) of reef fishes that can only be found in this area. In total, there are four areas with the highest diversity of marine life, as follows: Sunda Strait, Indonesia, Papua



Figure 2. The Coral Triangle Map (WWF, 2018).

New Guinea, Solomon Island, and the Philippines, especially in the middle part. (Allen, 2007; Coral Triangle Facts, 2008). The coral triangle also a place for several huge fishes, such as Blue whale, Sperm whales, Indo-Pacific Dolphins and Dugongs.

According to recent observations and in-depth interview to some of Berau authorities, as follows chief of tourist and culture department, sub-district of Tanjung Batu, and Derawan Head Village. They are standing one opinion that Derawan Island is experiencing the most damaging problem, which is abrasion. The problem of abrasion can be traced back to 2008. At that time, Derawan Island was one of the sports venues of Pekan Olahraga Nasional (PON) for beach volleyball. In that year, massive development occurred, especially developing housing by the local citizen in the coastal area as a respond of visiting athletes, sports organizers and supporters. (Jaerani. Personal Interview. October 24. 2017).

The housing development has created a positive and negative impact. As the positive side, the island is getting famous throughout the nation and internationally. Many houses become a homestay for tourist, and that condition is affected the economic growth of local citizen. A number of restaurants and public services were built as a response to a growing number of citizen and tourists. However, some of did not realize and recognize that the massive residences in the coastal area have caused an abrasion, especially related to the ocean currents activities.

According to Figure 3, 4 and 5, it is clear that in 2003, the shape of Derawan Island appears like a long shape with white sand on the Eastside and create a shape like a tail. After that, eight years later, the white sand in the Eastside (the tail shape) disappeared and covered by the water. Furthermore, in 2015 where massive residences built in the coastal area in the Southside, the tail in the Eastside was completely wore off, and the sand concentration moved from the



Figure 3. Satellite Image of Derawan Island 2003 (Google Earth, 2017).



Figure 4. Satellite Image of Derawan Island 2011 (Google Earth, 2017).



Figure 5. Satellite Image of Derawan Island 2015 (Google Earth, 2017).

Eastside to near the Westside.

After conducting an observation on the Eastside of the Derawan Island, the recent situation even worse than the satellite image captured by Google. A number of facilities built in the East side, especially in the tail shape damaged and abandoned by the owner. The helipad dedicated to former Indonesian President, Soeharto, even vanished.

To make its clear about the abrasion in Derawan Island, it will illustrate the figures about how the abrasion has occurred in the island (Figure 6).

Figure 7 illustrates the abrasion phenomenon in Derawan Island caused by several factors. First, it associated with the ocean currents. If we take a closer look, the Eastside of the island where the tail located was full of white sand. Because of natural activity in

the ocean, the East wind flows and created the ocean currents moved from the East to the South of the island. The shift in ocean currents certainly brings the sand. As previously mentioned that this is a natural process, and the ocean currents and wind will always occur as a result of earth rotation.

However, the problem is not associated to the ocean currents. But it was related to residences on the Southside of the island. As the ocean currents shifted from the East to the West followed with the sand carried by the currents, the sand was stuck in the South side where the houses are mainly concentrated. A few years ago, when the residences were not existing, the sand which stuck temporarily in the South side will return to the Eastside after the ocean currents shifted from the West. As a result, the shape of the island, especially in the Eastside (the tail) will return to the origin shape. Thus, this condition will not occur due to the recent



Figure 6. The Recent Situation at the Side of Derawan Island.

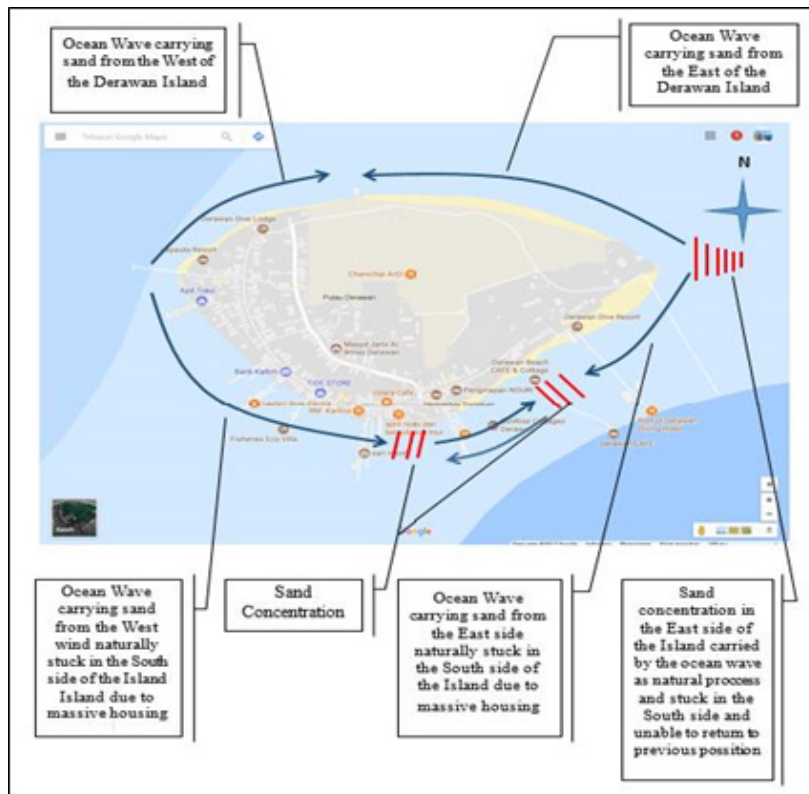


Figure 7. Illustration of Abrasion in Derawan Island.

situation on the island.

What is more important, abrasion in Derawan Island also appears due to the power of the ocean current. According to Roem (2016) who conducted field research in the Derawan Island by studying on waves, tides, and tidal currents. It was revealed that the momentous of wave elevation of Derawan Island is about 0.22 meters along with a significant period of 10.3 seconds. Additionally, based on the Waverose analyses, indicated, that the highest potency of ocean currents in Derawan Island is 4 meters, where come from the Eastern side followed by 1% and the South East side which is 1%. Related to the wind speed, it also recorded that, the highest rates in the interval between 7 to 10 m/s with average rates based on a Beaufort range. Furthermore, relatively large-form waves will occur during the Western season, compare to the Eastern season which is comparably smaller (Roem *et al.*, 2016)

The head of Derawan village added that the abrasion phenomenon in Derawan Island still occurring and based on his observation, the sand nearby the PT BMI Resort has accumulated and create a long shape for 20 meters. Previously, at the end of the resort was crystal clear water, nowadays, the water has disappeared and replaced by the land. This evidence proves that the sand which concentrates in the east side has stuck in the south side where the housing

and cottages were built. (Jaerani, Personal Interview, October 24, 2017).

In 2005 to 2006, the Chief of local authorities initiated an eco-friendly policy for the sake of keeping the existence of Derawan Island, which is limiting restricted area for housing development in the coastal area. Although the policy has introduced to the central government in Berau, yet the authorities did not respond the initiative. In addition, this condition was exacerbated by the Chief of Derawan Village, who disobey the initiative. As the consequence, more and more development has occurred and reflected with the condition of the coastal area (Jaerani, Personal Interview, October 24, 2017).

One of the interviewees also stated that the following effect of abrasion also affects the sea turtles. As stated before, there are two species of sea turtles usually appear in Derawan Island, which is Green and Hawksbill turtles. Those turtles are breeding in the Island. If the problem still occurring (abrasion) and there is no a proper solution, the turtles will hardly reach the coastal area because the structure of the beach has worn off and difficult to climb, and the worst consequence is the turtles will not be able to lay their eggs and breed in the island.

Another problem is associated to the production of waste in the island. This condition caused by the rising

popularity of Derawan Island as the tourist spot. The more tourist visited to the island the more waste will be produced. In order to solve the problem, the local authorities tried to initiate one of the policies with asked the tourist to bring back the waste that they brought from the mainland in Berau. Nevertheless, many visitor not accepted the initiative and just litter the trash in the trash box in the island. In reducing the amount of trash, the local public community burn the trash through the incinerator.

The tourist awareness group (*Kelompok Sadar Wisata/Pokdarwis*) also taking some action to mitigate the waste. The action is involving and maximizing the role and function of the group to socialize to tourist and local citizen to maintain and try to reduce the production of waste by recycling the daily wares.

Proper Solution

Building Erosion Prevention

One of the solutions introduced by the local authorities was building erosion prevention. The project will be implemented by joint working between the local government and Universitas Gadjah Mada (UGM). The authorities in Derawan Village agreed to maximize the fund belongs to the Derawan budget. The project managed by the “Badan Permusyawaratan Kampung (BPK)” (the consultative board) in conjunction with the house of representative (HoR) of Berau District. One of Berau legislators said that the initiative to build erosion prevention will be maximized in the year of 2019. The decision to implement the project in 2019 and not in 2018 is because of consideration of the processing time of the project and the funding itself (Abrasi, 2018). The member Berau’s legislators believes if the project begin in the middle of 2018 it will not finish on time at the end of 2018. Moreover, if the project does not finish until at the end of 2018, the project might be considered

as unfinished project and subjected to corruption act. Therefore, arranging the budget and the implementing the project by the first semester of 2019 is the right decision.

Coral Reefs Treatment

The other alternatives are nursing the coral reefs. Besides the ultimate outweigh of coral reef as the nursery of the sea, the coral reefs is effective for the sake of withstand the ocean wave (Harris *et al.*, 2018). Although the effect unlike planting the mangrove trees in terms of hold back the wave, yet through proper preservation and keeping the coral reefs from various threats, the ocean wave will not hit the coastal area extremely as usual. According to observation in Derawan Island, it appeared that number of corals were easy to find nearby. Therefore, through proper treatment and planting in the right condition, the possibility to transplant some specific corals nearby the coastal area is the best practice to reduce the strength of the ocean wave before it reaches the beach.

The coral reefs treatment also will become one of the valuable resources of the economic growths for the local community. For instance, the corals treatment could invite tourist to get involved in coral restorations. On this scheme, the tourist requires to pay for involving this action. Another great benefit is the area of coral restoration is also able to become a research area for scientists who focus on the coral treatment. This project is similar in the coral restoration in Florida Keys, the USA (Figure 8) (The Nature Conservancy, 2018).

Not only in the Florida Keys, Indonesia since establishing the Coral Triangle Initiative on Environmental and Social Safeguard Framework (CTI-ESSF), also have a various working project that concerns about the coral conservation. Those projects



Figure 8. Coral Reef Restoration in Florida Keys. (Florida Keys Coral Restoration Project. n.d.).

implemented in various areas throughout Indonesia, for example in Sawu Sea Marine National Park in East Nusa Tenggara and Kapoposang Marine Tourism Park in South Sulawesi, as well as in Marine Nature Reserve of Southeast Aru (SAP Aru Tenggara) in Maluku (Indonesia Institute, 2018). Furthermore, there are various ways in terms of the coral plantation, and one them through build the coral garden such as in Pulau Sepu, part of Malang Regency in East Java Province (Luthfi, 2016).

Relocation

Referring to the depth interview conducted by the author and Derawan head village, it said that one of the proper solutions which possible implemented in Derawan is relocating the household who lives in the coastal area. He also added, a coastal area in Derawan Island should become a restricted area for development accommodation. The legislator member of Berau also added and supported his argument and said "if possible the growth of population in Derawan Island should be reduced" (Harus, 2018). In total, around 1,000 people lived in the island and most of them agreed to be relocated as long as there are certain decision about the intended relocation for people who previously lived in the island. According to some local news stated that most probably the relocation will take place in Tanjung Batu sub-district. Considering a number of palm oil factories have built so that population expected will growth significantly

Moreover, the significantly to relocate the people of Derawan Island who live in the coastal area (Roem, 2020) explain, the existence of housing on the sea (poles and suai) will causes attenuation (weakening) the strength of the current in transporting sediment (sand) sea. Naturally the beach process is abrasion and accretion simultaneously. There is a law of conservation of mass that applies, where if a beach experiences abrasion (the sediment is lost), then there is another part of the beach that receives (accumulates) sediment shipments. The part of the beach that can be sent by sediment is called experiencing accretion. This argumentation is exceptionally relevant with the Figure 7 that explained the sand concentration which previously was in the East side of Derawan Island, however, due to massive and development that does not care about the marine and coastal ecosystems cause has caused sediment buildup in the south of the island, right around residential settlements and resorts.

As a result, the relocation decision will automatically transform the view of coastal area in Derawan Island. Once the residence in the Southside of the island is disappearing, the coastal area will return to the original shape. Especially in the east side of the island, and most probably the tail which has been wearing off will return naturally.

CONCLUSION

Derawan Island has an ultimate function as the nursery of the sea with the coral reefs that surrounds the island. In addition, despite having remarkable marine creatures that making the island become one of the most tourist attraction in Indonesia. Derawan Island experiences certain specific issues that need to be resolved as soon as possible, and one of them is abrasion. The cause of abrasion is caused by massive and unregulated development of housing in the coastal area, especially in the Southside of the island. As the result, the sand in the East side has worn off gradually and caused many problem around the area. In order to solve the problem, a number of solutions are provided, and one of them is to relocate the residence in on the south Southside of the island. By doing this, the shape of the island will return to its original condition.

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