Coral Reef Protection Policy in the Waters of Sabu Raijua Regency - East Nusa Tenggara

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Abstract. Marine pollution is the entry of living things, energy, organic or inorganic substances and other components of objects into the marine environment by human activities that cause their quality to decline. The waters in Sabu Regency are polluted or the water quality condition is very poor. This research uses an empirical juridical approach with a qualitative approach. This study discusses the condition of coral reefs damaged by fish bombing and coral reef protection policies using the Coremap method in various activities aimed at providing an understanding of the importance of coral reef conservation and its benefits for people's lives.

Keywords: policy, protection, coral reefs.

1 Introduction

The archipelago in the State of Indonesia has a fairly large number with 6 large islands and thousands of small islands. Indonesia has an ocean area that exceeds its land area, the total area of Indonesia reaches 7.81 million km^2 consisting of 2.01 million km^2 of land, 3.25 million km^2 of ocean and 2.55 million^2 Zone Ekonomi Eksklusif (ZEE).[1] Indonesia has an abundant coral reef ecosystem which is one of the important natural resources. The coral reef ecosystem in Indonesia has an area of 7,500 km² of the Indonesian marine waters and is included in the area of the Zone Ekonomi Eksklusif Indonesia (ZEEI) of 7.1 million km²..[2]

Indonesia has an abundant coral reef ecosystem which is one of the important natural resources. The coral reef ecosystem in Indonesia has an area of 7,500 km² of the Indonesian marine waters and is included in the area of the Zone Ekonomi Ekslufif (ZEEI) of 7.1 million km². Coral reefs are ecosystems on the tropical and subtropical seabeds formed mainly by marine biota that produce limestone. Especially the types of calcareous algae and rock coral animals, in symbiosis with biota living on the seabed. Coral reefs have various very important roles in the environmental arrangement of coastal and marine areas, both in terms of biology and ecology as well as their biota. Coral reefs serve as productive food warehouses for fisheries, spawning

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grounds, laying eggs, and foraging for various marine biota with high economic value. Physically, coral reefs function as breakwaters and beach protectors from storm sweeps, and have a high aesthetic value for the development of marine tourism.

Coral reef ecosystems are found in rather shallow water environments such as continental shelves and clusters of islands in tropical waters. To achieve maximum growth, coral reefs need clear waters with warm water temperatures, large wave movements and smooth water circulation and avoid sedimentation processes. Coral reef ecosystems have a good ability to repair damaged parts if the habitat characteristics of various coral reef formations and environmental factors that influence them are well maintained.

At this time the case of pollution of the marine environment is getting serious attention from the international community. Marine pollution is the entry or inclusion of living things, substances, energy, or other components into the marine environment by human activities or natural processes so that the quality decreases to a certain level which results in the environment being damaged. sea is not in accordance with the quality standards and functions. Marine pollution is the entry or entry of living things, energy, organic or inorganic substances and components of other objects into the marine environment or marine ecosystem by human activities which causes the quality to decrease to a level that causes the marine ecosystem to be no longer in accordance with its function and designation.[3]

One example of marine pollution that occurs in Indonesia is fishing using explosives and using trawler in the waters of Sabu Regency. Marine pollution is a change in the marine environment that occurs as a result of the direct or indirect inclusion of energy materials into the marine environment (including river mouths) which results in such a bad effect that it is a loss to biological wealth. Meanwhile, according to KHL-III marine pollution is the destruction of biological resources (marine living resources) due to changes in the marine environment including estuaries which can cause a decrease in biological resources. Marine pollution is dangerous and negative for human health, fishing activities and other activities that take place in the sea.

The decrease in the quality of marine waters by human activities is carried out intentionally or unintentionally by entering a pollutant that contaminates the marine environment including coastal areas and river estuaries resulting in contamination. Marine pollution can have negative consequences for living and vegetable resources in the sea, human health, activities at sea, and the survival of living resources in the sea. Coral reefs are damaged or die due to various reasons which are grouped into 2 factors, namely natural and human. Damage to coral reefs due to nature can usually be restored to its original state with a long period of time. Damage due to human activities can cause coral reefs to die permanently. [4]Almost all the damage or death of coral reefs on Pawang Island is caused by human activities such as the use of fishing nets and tourist activities such as snorkeling or diving, which intentionally or unintentionally touch and step on coral reefs so that the physical form of coral reefs is damaged to death. Bleaching of coral reefs (bleaching) that occurred on the island of Pawang is thought to be caused by a prolonged increase in temperature changes. The event of the release of zooxanthella from the coral, which is marked by the fading of the color of the entire coral to white, at the next level the coral will die.[5]

At a depth of 2-4 meters, corals were found to be bleaching but not completely. Corals that have been partially bleached by nature can recover if the water temperature and weather return to normal in the near future. The main causes of damage and death of coral reefs are the use of fishing gear, increased pollution and global warming.

It can be said that the waters in Sabu are polluted or the condition of the water quality is very poor. The relationship between the quality of sabu sea waters with coral reef ecosystems does not support the survival of coral reef ecosystems on sabu island. This research uses an empirical juridical approach with a qualitative approach.

In law, the term policy is the basis or line of attitude or guidelines for implementation and decision making[6]. Chief J.O. Udoji defines policy as a sanctioned action that leads to a specific goal directed at a particular problem or group of problems that are interrelated and affect the majority of society. From this definition, it means that policy is an action to overcome problems that arise in society. James E. Anderson stated, "*Public policies are those policies developed by governmental bodies and officials,"* meaning that state policies are policies developed by agencies or officials[6].

In the context of the relationship between policy and law, it can be seen the position of law in society. Based on the sociological approach, law is not merely an autonomous institution or as an independent variable, but as an institution that works for and within society. Such an understanding provides an explanation that in addition to being able to give influence, the law is also greatly influenced by other elements in society.

The policy implementation process is mostly left to government agencies at various levels, both provincial and district levels. Each level of implementation still requires the formation of further policies in various forms of legislation to provide further elaboration, so the role of resources is the main element that is very decisive.

Overview of Coral Reefs

Coral reefs are organisms that live on the bottom of the waters and form limestone (CaCO3) which is strong enough to withstand the force of ocean waves. While the dominant organisms that live here are coral animals that have a limestone framework, and algae, many of which also contain lime. In relation to the coral reefs above, it is distinguished between coral or coral animals as individual organisms or components of the community and coral reefs as an ecosystem. [7]

Coral reefs as a seabed ecosystem with the main inhabitants of rock coral have an amazing architecture and are formed by thousands of small animals called polyps. In its simplest form, corals consist of only one polyp that has a tubular body shape with a mouth located at the top and is surrounded by tentacles. But in most species, one individual coral polyp will develop into many individuals called colonies. [6]

Based on the ability to produce lime, corals are divided into two groups, namely hermatypic corals and ahermatypic corals. Hermatic corals are corals that can form coral structures that are known to produce reefs and their distribution is only found in the tropics. Ahermatypic corals do not produce reefs and are a widely distributed group throughout the world. The main difference between hermatypic corals and ahermatypic corals is that there is a mutualism

symbiosis between hermatypic corals and zooxanthellae, which are a type of unisular algae *(Dinoflagellates Unisular)*, such as *Gymnodinium Microadriatum*, which are present in the polyp tissues of coral animals and carry out photosynthesis.

The by-product of this activity is calcium carbonate deposition which has a distinctive structure and building form. This characteristic is finally used to determine the type or species of coral animals. Hermatypic corals have unique properties, namely a combination of animal and plant traits so that the direction of growth is always positive phototheopic. Generally, this type of coral lives in shallow coastal/sea waters where the penetration of sunlight still reaches the bottom of the waters. In addition, to live coral animals need warm water temperatures ranging from 25 – 32 ^{o}C. [8]

According to Veron [9] coral reefs are massive deposits of solid calcium produced by corals with a small addition of *Calcareous Algae* and other organisms that secrete calcium carbonate (CaCo3). In the process of forming coral reefs, rock corals *(Scleractina)* are the most important constituents or *reef-building corals*. Rock coral belongs to the class *Anthozoa*, which is a member of the phylum *Coelenterata* which only has a polyp stage. The *Anthozoa class* consists of two subclasses, namely *Hexacorallia (Zoantharia) and Octocorallia*, both of which are distinguished by origin, morphology and physiology.

Coral animals as the main builders of reefs are efficient marine organisms because they are able to thrive in a low nutrient (oligotrophic) environment. According to Burke et al (2002) most coral species perform symbiotic relationships with symbiotic algae, namely *zooxanthellae* that live in their tissues. In symbiosis, *zooxanthellae* produce oxygen and organic compounds through photosynthesis which will be utilized by corals, while corals produce inorganic components in the form of nitrate, phosphate and carbon dioxide for the needs of *zooxanthellae life*. [10]

Changes in environmental temperature due to global warming that hit tropical waters in the 1900s have caused coral bleaching followed by mass deaths reaching 90-95%. Suharsono (1999) noted that during the bleaching event, the average water surface temperature in Indonesian waters was 2-3 ^{o}C above normal temperature. [11]

3 Results and Discussion

3.1 The Reality of Coral Reefs in Sabu Raijua Waters

Coral reefs are an important ecosystem for the survival of marine life, but the existence of coral reefs is experiencing a decline and damage in the waters of Sabu Regency. The existence of coral reefs from year to year has experienced a decline, namely there is an alarming damage that causes a decrease in quantity and quality. Damage to coral reef ecosystems is inseparable from human activities both on land and in coastal and marine ecosystems.

Destructive fishing activities such as fish bombing have occurred in the waters of the Sawu Sea, although the local government and law enforcement have been aggressively suppressing them in the last three years. Sabu Raijua Police Chief, AKBP Jacob Seubelan conducts patrols after reports of widespread fish bombings around Raijua Island waters, Sabu Raijua Regency. Sabu Raijua Police Chief hopes that the National Police leadership can provide assistance with boat facilities to support the implementation of tasks for the unrest that occurs in seaweed farmers,

coral reefs and local fishermen on Raijua Island. In addition to sacrificing small fish, this action also damaged coral reefs in locations around Raijua Island. Many fish bombings also occur on the coast of Halla, Kolorae Village, Raijua District, Sabu Raijua Regency.

So far, the highest production of skipjack tuna is 2.162 tons in 2021 and decreased to 1.314 tons in 2022. The second highest rank is baby tuna with production in 2021 reaching 349,3 tons and in 2022 as much as 145,3 tons. Of this number, fish bombing activities are suspected to have contributed to the catch of fishermen's fish, especially pelagic fish. The bombers not only act on the coast but sometimes target the deep sea.

Head of the Marine and Fishery Resources Supervision Station (PSDKP) Kupang Mubarak said that in 2019 his party handled a destructive fishing case and had a final decision from the court (incraht). As for 2020, there are three cases in which two cases are in the trial process and one case is waiting for the submission of the second phase of the file to the Attorney General's Office. Almost all water areas in the province of NTT are prone to fishing using explosives.

This bombing act is a violation of the provisions of Article 84 paragraph 2 (jo) Article 8 paragraph (2), Article 85 in conjunction with Article 9 of Law No.31/2004 concerning Fisheries as amended by Law No.45/2009. The perpetrators of fish bombing can also be charged with Article 9 of Law No. 45/2009 on Fisheries and Article 33 of Law No. 27/2007 on Management of Coastal Areas and Small Islands. In addition, they can be charged with Article 6 of Law No.23/1997 on Environmental Management, Law No.5/1990 on Conservation of Biological Natural Resources and Their Ecosystems, Emergency Law No.12/1951 on Possession of Firearms and Explosives, and Decrees President No.125/1999 on Explosives.

The impact of damage caused by this bombing practice is not only on fish resources but also on the environment and marine habitats. In order to overcome *destructive fishing*, the Regional Government Fisheries Service establishes and fosters Community Monitoring Groups (Pokmaswas). The goal is that people with their own awareness carry out surveillance on their own coasts. The policies that have been taken by the KKP include the stipulation of the Decree of the Minister of Maritime Affairs and Fisheries No.114/KEPMEN-KP/SJ/2019 concerning the National Action Plan for Supervision and Overcoming Destructive Fishing Activities in 2019-2023.

3.2. Reef Monitoring Policy in Sabu Waters

To reduce the rate of damage to coral reefs, the Indonesian government in 1998 launched the Coral Reef Rehabilitation and Management Program (Coremap-Coral Reef Management and Rehabilitation Program). Coremap aims to save Indonesia's coral reefs so that they can be used sustainably for the welfare of the community. In particular, the program aims to protect, rehabilitate, and manage the sustainable use of coral reefs and their ecosystems while improving the welfare of coastal communities.

This policy is implemented in several provinces, covering eight districts in western region of Indonesia and seven districts in eastern region of Indonesia. Coral reef conservation efforts through Coremap are implemented in Sabu through five main components, namely institutional strengthening, community awareness, community-based management, research, and monitoring and supervision, prevention and law enforcement. Meanwhile, the implementation is divided

into three stages, namely the initiation stage for the first three years, the acceleration stage for the second six years, and the institutionalization stage for the last six years.

The coral reef protection policy approach used in implementing the Coremap in Sabu Raijua is community-based management by involving the community from planning, implementation, to program monitoring. Therefore, in its implementation, the community, which is the main user of marine resources, is expected to be actively involved in planning, implementing, and monitoring the management of coral reefs in their area.

Pokmas Conservation or Pokmaswas is a forum for Sabu coastal communities to be involved in monitoring coral reefs in marine waters. This activity is important to reduce illegal activities that damage corals. To support Pokmaswas activities, Coremap facilitates boats and patrol equipment with quite a variety of equipment and capacities inter-villages.

Some villages provide fuel and costs for Pokmaswas patrols, while other villages oversee the waters. Pokmaswas patrol activities also vary between villages, depending on community activities and the availability of boats and the condition of supporting equipment and operational funds in each village. Pokmaswas is quite active in conducting patrols.

Community involvement in Pokmaswas activities in Sabu Raijua Regency where community participation in Pokmaswas activities is still relatively high. Community involvement in monitoring coral reefs is not only identified in their participation in Pokmas Conservation or Pokmaswas activities. Increased public awareness and concern for the importance of saving coral reefs at the Coremap location has encouraged the growth of community self-monitoring. Independent monitoring is an activity that involves the active role of the community to monitor coral reef areas in an effort to maintain and conserve coral reefs.

Independent supervision in this context is not carried out by the Pokmas Conservation formed by Coremap, but the supervision is carried out by the community voluntarily. Community self-monitoring activities at Coremap locations are generally carried out simultaneously with fishing activities or when they are in their residential environment because the location of coral reef areas, especially those designated as marine protected areas (DPL), is located near residential areas.

The impact of the independent supervision has provided economic and social benefits for the community. The economic benefits can be seen from the increase in catches as a result of the increase in coral cover in DPL which is a place for fish to grow and develop around the DPL area. Meanwhile, social benefits involve a sense of togetherness to maintain DPL because they already know the benefits of DPL to their lives. The perceived benefit is that the number of fish they catch also increases.

Policies for the Protection of Coral Reef Ecosystems in the Waters of Sabu Regency through Coremap, include:

1) Community-based management of coral reef ecosystems so that coastal communities can play a more active role in dealing with problems that exist in the marine environment.

2) Establishment of a Community Monitoring Group (Pokmaswas) institution that has a work program and clear legal rules in the context of monitoring marine ecosystems, especially coral reefs.
3) The Regional Government determines the area of Sabu waters to become a regional conservation area which is supported by the issuance of a Regional Regulation (Perda).
4) Management-based management, involving the responsibility of the Government and coastal communities in managing coral reef resources.
5) Improving the community's economy in order to create awareness of the importance of conservation and management of coral reef ecosystems.
6) Training for the community on the sustainable management of coral reef ecosystems through activities organized by the Central Government, such as the coremap program in collaboration with universities.
7) Issuance of regional regulations governing sanctions and penalties for fishing activities that damage coastal ecosystems, especially coral reefs.

4 Conclusion

The impact of damage caused by the practice of fish bombing is not only on fish resources but also on the environment and marine habitats. In order to overcome *destructive fishing*, the Regional Government Fisheries Service establishes and fosters Community Monitoring Groups (Pokmaswas). The role of the coastal community of Sabu Raijua as the main users of marine resources will determine the success of coral reef conservation efforts carried out through Coremap. The role and involvement of the community is influenced by their understanding of the aims and objectives of the Coremap and the benefits derived from the activities to be carried out. In an effort to involve the community, at the beginning of the program, Coremap carried out various activities aimed at providing an understanding of the importance of conserving coral reefs and their benefits for people's lives. This activity is important to encourage community involvement in program management. Thus, in thi s article suggest: Perpetrators of *destructive fishing* are expected not only to be charged with the Fisheries Act, but other laws including possession of explosives so that they are severely punished and have a deterrent effect. And, Public awareness and Sabu tourists are needed to always maintain the beauty of the marine environment. Periodic research is needed to monitor the condition of coral reef ecosystems with a wider range and water quality.

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