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DEVELOPING A CORAL REEF CONSERVATION MODEL BY INVOLVING LOCAL COMMUNITIES ON SOOP ISLAND, SOUTHWEST PAPUA

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Abstract: Over 75% of the world's coral reef species are found in the Coral Triangle region, located in Southwest Papua. Soop Island, a small island in this region, holds significant potential due to its proximity to Sorong City, expansive white sandy beaches, and historical relics such as caves and Japanese bunkers. Nevertheless, the current exploitation of coastal resources is unsustainable. Therefore, a comprehensive and holistic approach through the Social-Ecological System (SES) is essential. Pertamina EP Papua Field, a company operating in the Papua region, has implemented a Coral Reef Conservation Program based on community empowerment. The aim of this study is to identify the potential of coral reefs within the framework of conservation and ecotourism development, involving active community participation on Soop Island. The Coral Reef Conservation Program was initially conducted in 2021 using the Spider Web method. During the 2022-2023 period, in collaboration with the Coral Reef Conservation Community (Terumbu Karang Lestari), the program successfully rehabilitated 1,348 coral reef fragments covering an area of 150 square meters in a relatively short timeframe. Furthermore, these conservation efforts have facilitated sustainable ecotourism development, providing economic opportunities for local residents and supporting the growth of the tourism sector in the region.

Keyword: Coral plantation, small island, community involvement, ecotourism

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INTRODUCTION

The coastal and marine areas of Indonesia, covering approximately two-thirds of its total landmass, possess significant natural potential. However, their economic contribution to the Gross Domestic Product (GDP) remains limited, while smaller nations have optimized their maritime sectors. The economic potential of Indonesia's maritime sector reaches $1.338 trillion US dollars per year, equivalent to five times the 2019 national budget or 1.3 times the

current National GDP. Unsustainable utilization of coastal and marine resources is attributed to sectoral planning that disregards the interrelatedness of coastal and marine ecosystems. Sustainable efforts require an integrated and holistic approach; otherwise, these resources are at risk of degradation and extinction, jeopardizing national sustainable development. This approach is known as the Social-Ecological System (SES) for coastal and marine areas. Contemporary coastal and marine management based on the social-ecological approach essentially integrates ecological understanding and socio-economic values. The goal of social-ecological-based coastal and marine management is to preserve and maintain the integrity and sustainability of ecosystems while simultaneously ensuring a continuous supply of resources for socio-economic purposes (Peng et al., 2023).

Southwest West Papua is one of the provinces located at the easternmost tip of Indonesia. Its biodiversity, traditional culture, and diverse natural resources have brought global attention to Papua. Not only is the captivating land graced with towering trees, but the alluring underwater beauty also entices international travelers to come from afar just to witness the coral reefs and the marine life within them. Southwest West Papua lies within the Coral Triangle region, where more than 75% of the world's coral reef species can be found (Andradi-Brown et al., 2021; Yalindua et al., 2021).

Coral reefs play a highly significant ecological role as coastal ecosystem buffers, protecting shorelines from erosion and ocean storms (Suryono et al., 2021). Furthermore, coral reefs serve as habitats for various marine organisms, such as fish, mollusks, and other creatures, forming a vital marine food chain. Coral reefs also hold the potential as sources of new pharmaceutical compounds due to the valuable chemical compounds produced by the organisms within them, which are of significant interest to the pharmaceutical industry. In addition to their ecological and pharmaceutical benefits, coral reefs support the tourism sector, providing livelihoods for local communities and offering recreational and underwater exploration experiences for humans. Therefore, maintaining the sustainability of coral reefs is of utmost importance, as it has a positive impact on marine ecosystem balance and human well-being (Hoegh-Guldberg et al., 2017; Wagner et al., 2020; Yuanike et al., 2019).

According to data from the Directorate General of Natural Resources and Ecosystem Conservation of the Ministry of Environment and Forestry (2021), the island of Papua has a coral reef ecosystem covering 262,378.19 hectares, and the Teluk Cenderawasih National Park has managed approximately 26,548 hectares of this coral reef ecosystem. These data reveal that only about 10.12% of the total coral reef ecosystem area has been managed. In 2018, the data indicated that out of 36 zones, 8 zones were in poor condition, 14 were in fair condition, and 14 were in good condition. Coral reef degradation has been significantly on the rise (Hoegh-Guldberg et al., 2017). Efforts to rehabilitate the coral reef ecosystem, particularly in Papua, have been on the decline. Natural recovery will require a relatively

long time, necessitating acceleration efforts through engineering technologies such as fragmentation and transplantation (Schmidt-Roach et al., 2020).

Pertamina EP Papua Field, a company operating in the Papua region, has been actively involved in the implementation of a Social Responsibility Program (Tanggung Jawab Sosial or TJSL), also known as Corporate Social Responsibility (CSR). One of the CSR programs that has been implemented is the Empowerment-Based Coral Conservation Program. The choice to make this program community-based is essential, considering that the sustainability of this program is not solely focused on environmental aspects but also takes into account the social dimension, in which the local community plays a crucial role in ensuring the success of the program (Iqbal et al., 2021). The main issues at the location are plastic waste and a lack of community awareness. Raising awareness and changing the mindset of the community is a motivating challenge for the PEP Papua Field Relations team in addressing and resolving these issues. Soop Island holds great potential due to its geographical proximity to Sorong City, extensive white sandy beaches, and historical remnants such as caves and Japanese bunkers. Therefore, the aim of this study is to identify the potential of coral reefs within the framework of conservation efforts and ecotourism development, involving active participation of the local community on Soop Island.

METHOD

This research was conducted from January to July 2023 on Soop Island, located in Southwest Papua. It is a descriptive study employing a qualitative approach that involved two key methods: 1) In-depth Interviews: Structured in-depth interviews were conducted based on an interview guide to gather qualitative data. These interviews were held with key stakeholders, local communities, and program managers to obtain insights into the program and the perspectives of the local community. 2) Observation: Environmental observations were carried out to assess the coral reef conservation activities. These observations were intended to reinforce and substantiate the findings from the interviews, providing a comprehensive view of sustainability aspects (Iqbal et al., 2021).

The data analysis process was conducted using the Social-Ecological System (SES) analysis method within the context of integrated coastal area management. This method provides an interdisciplinary approach and a framework that supports sustainable resource management. In this concept, SES is considered a framework that integrates social and ecological aspects, aiming to serve as the knowledge foundation for addressing complex issues in holistic coastal and marine management (Glaeser et al., 2007). SES also develops knowledge-based strategies for understanding ecological and social processes at various levels, from the local to the global scale. The SES analysis approach offers an inclusive, interdisciplinary framework supported by a strong theoretical and methodological foundation (Mangubhai et al., 2012; Peng et al., 2023).

RESULT

PEP Papua Field initiated its Coral Reef Conservation Program for the first time in 2021, utilizing the Spider Web method (**Figure 1**). This approach offers several advantages, including creating a water flow that helps mitigate wave impact, a larger area for coral reef rehabilitation, provision of habitat for small fish, and a framework that supports substrate stability on the seabed. Remarkably, within just two years, the program achieved tremendous success in a relatively short time frame. To broaden the program's scope, we replicated it in a more challenging location within a densely populated urban setting, namely the Sorong Islands District, Sorong City, South West Papua Province.

Figure 1. Coral transplantation using the Spider Web method

The predominant challenges at this location revolved around issues related to plastic waste and a notable deficiency in community awareness. The task of raising public consciousness and effecting a shift in community mindsets emerged as an inspirational challenge for the PEP Papua Field Relations team as they sought to tackle and ameliorate these issues. Soop Island, owing to its close proximity to Sorong City, extensive stretches of pristine white sandy beaches, and a collection of historical relics, including caves and Japanese bunkers, holds significant untapped potential.

In mid-2022, a persuasive approach was employed with the Soop Island community after issue identification, which included the use of explosives in fishing. Surveys were conducted, and PEP Papua Field, in collaboration with stakeholders like the Sorong Islands District, Community Leaders, and relevant government agencies, conducted assessments and crafted annual strategic plans. Through focus group discussions, awareness campaigns, and coral conservation initiatives, a shift in community mindset was successfully achieved within two months. The community began to realize and formed a "Sustainable Coral Reef or Terumbu Karang Lestari" Monitoring Community Group. Subsequently, local regulations were enacted by the Sorong Islands District, banning the use of explosives in fishing activities.

During the 2022-2023 period, in partnership with the "Terumbu Karang Lestari" Community, the community-based coral reef conservation program successfully rehabilitated 1,348 coral fragments covering an area of 150 m2 in a relatively short timeframe (**Figure 2**). Furthermore, PEP Papua Field or corporate plans to provide scuba diving certification to the community groups to ensure safety during coral reef monitoring every two months. Additional plans include the construction of a communal hall serving as an information center, centralizing the activities of community groups.

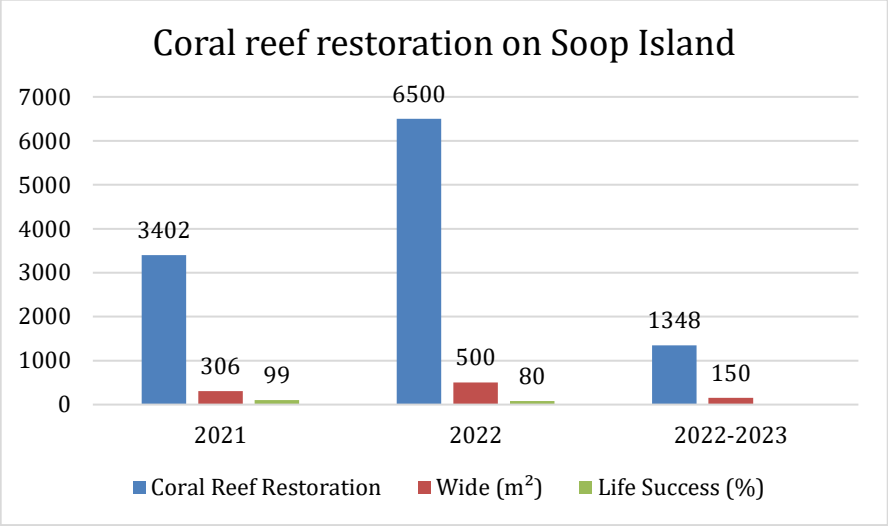

Figure 2. Coral reef restoration on Soop Island

One of the most significant impacts of this program is the increased awareness of the community. Through various socialization activities, campaigns, and the formation of Community Monitoring Groups, the people of Soop Island have started to understand the importance of preserving their coral reefs and marine environment. They have become agents of change within their own community, playing a vital role in maintaining a sustainable coral reef ecosystem and avoiding the destructive practices previously employed.

DISCUSSION

One of the coastal areas, namely Soop Island, which is located in Soop Village, Sorong Islands District, Sorong City, Southwest Papua, has historical heritage and offers beautiful white sand and coral reefs. Sorong Regency has coral reefs that are increasingly decreasing, due to the many factors that cause damage to coral reefs. In order to improve the quality of the environment on Soop Island, the people of Soop Village intend to plant coral reefs in order to restore the damaged coral reef ecosystem on the island.

Pertamina EP Papua Field planted 1000 coral reefs on Soop Island, Sorong Regency, PEP Papua Field, through a 5-year strategic plan which has been created as the basis for a program commitment not only targeting the successful restoration of coral reef ecosystems, but also looking at the existing potential. Soop Island has a variety of land potential that can be developed. This makes the company expand its target by making Soop Island the first Edu-Ecotourism Center in the Sorong Islands so that it can attract the attention of local and international people to come to Soop Island. Coastal and marine ecosystems which cover around 2/3 of Indonesia's total territorial area contain enormous natural wealth, their economic activities have only been able to contribute +20.06% of the total Gross Domestic Product. Even though other countries have a much smaller area and marine potential than Indonesia (such as Norway, Thailand, the Philippines and Japan), their marine economic activities (fisheries, mining and energy, tourism, transportation and communications, and industry) have provided greater contribution to their GDP, which is around 25-60% per year (Dahuri, 2001). This shows that the contribution of marine-based economic activities is still small compared to the enormous potential and role of coastal and marine resources, and the achievement of marine-based development results is still not optimal.

The results of the study show that the problem of utilizing coastal and marine resources has not been optimal and sustainable due to complex factors that are interconnected with each other. General agreement reveals that one of the main causes is the planning and implementation of coastal and marine resource development which has so far been carried out in a sectoral and disaggregated manner. In fact, the characteristics and nature of coastal and marine ecosystems which are ecologically related to each other, including upper land ecosystems, as well as various natural resources and environmental services as development potential which are generally found in a stretch of coastal ecosystem, require that resource management optimal and sustainable coastal and marine areas can only be realized through an integrated and holistic approach.

If planning and management of coastal and marine resources is not carried out in an integrated manner, it is feared that these resources will be damaged or even become extinct, so that they cannot be utilized to support sustainable national development in realizing an advanced, just and prosperous nation. Viewed from the perspective of sustainable development and the status of the Indonesian nation as a developing country, integrated management of coastal and marine resources is actually at the cross road (Renggong et al., 2022; Suryono et al., 2021).
Ecological systems in coastal areas are closely related to/and influenced by one or more social systems. This approach is known as the Ecological-Social System (SES) of coastal and marine areas. The contemporary approach to coastal and marine management based on social ecology is basically an integration between ecological understanding and socio-economic values. The aim of socio-ecological-based coastal and marine management is to maintain and maintain the sustainability and integrity of the ecosystem, so that at the same time it is able to guarantee the sustainability of the supply of resources for human socio-economic interests (Peng et al., 2023).
The success of the community participation-based coral reef conservation model on Soop Island illustrates the effectiveness of this approach in preserving coral reef ecosystems. The positive results in terms of coral reef rehabilitation, increased public awareness, and growth of the ecotourism sector indicate that this model can be used as a successful example that can be applied in similar locations. Despite its success, this program also faces challenges and obstacles. Some of these include the community's initial lack of understanding regarding the negative impacts of practices such as the use of explosives in fishing. Apart from that, plastic waste management remains a problem that must be addressed in a sustainable manner.

The relevance of the coral reef conservation model involving local communities on Soop Island also has wider implications. This concept can be a guide for other regions that have similar challenges in protecting their coral reefs. Collaboration between the private sector, regional government and local communities opens up opportunities for sustainable conservation models. The implications of this research extend beyond Soop Island. Success in integrating local communities in coral reef conservation can provide guidance and motivation for other regions to adopt similar models (Robinson et al., 2023; Schmidt-Roach et al., 2020). In addition, sustainable ecotourism development can be an example for other regions that want to combine environmental conservation and local economic development.

CONCLUSION

The development of community-based coral reef conservation on Soop Island has significant potential to support the preservation of crucial coral reef ecosystems, provide ecotourism benefits, and enhance the well-being of the local community. Further steps, including scuba

certification and information facility construction, can bolster these efforts and involve more stakeholders in sustainable coral reef conservation.

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