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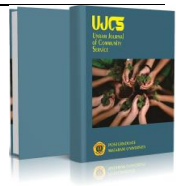

Mangrove Planting on Cemara Beach for Sustainable Development Goals (SDGs)

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Abstract: Sustainable Development Goals (SDGs) in protecting marine and coastal ecosystems and reducing the risk of natural disasters can be achieved through mangrove planting activities at Cemara Beach. Mangroves are useful in maintaining ecosystem balance, protecting the coastline from abrasion and absorbing carbon dioxide which can reduce the impact of climate change. Mangrove planting activities involve local communities in the planting and maintenance process, and contribute to improving community welfare and environmentally-based economic development. Mangrove planting activities use seedlings aged 3 to 6 months. Mangrove planting is in a location with a water depth of 10 to 50 cm. The size of the mangrove seedlings planted is 15 to 30 cm. The type of mangrove planted at Cemara Beach is Rhizophora. Mangrove planting activities support SDGs 13, 14, dan 15 tentang climate action, life below water, and life on land.

Keywords: Mangrove; SDGs; Planting; Climate Change; Cemara Beach

Introduction

In general, mangroves are used to prevent abrasion and reduce high waves on the coast. Mangrove plants have very high economic, ecological and social value. From an economic aspect, mangrove plants can be a source of livelihood for the community and source of food (Syah, 2020). Ecologically, the presence of mangrove plants makes a very beneficial contribution to mitigating climate change by reducing emissions and storing carbon from greenhouse gases (Nisaa, et al. 2017).

The Sustainable Development Goals aim to improve the economy, welfare, social life, environmental quality and inclusive development in society in a sustainable manner (Pranatal, et al. 2023). The Indonesian Government began implementing the Sustainable Development Goals (SDGs) in 2015. In realizing sustainable mangrove ecosystem management, the Indonesian Government issued Presidential Regulation Number 73 of 2012 concerning the National Strategy for Mangrove Ecosystem Management. These regulations are used to manage mangrove ecosystems and improve community welfare by utilizing existing resources (Fitria, et al. 2020).

Based on data from the National Mangrove Map at the Ministry of Environment and Forestry in 2021, it is known that Indonesia has a mangrove planting area of 3.364.080 ha (Rahmawati, 2023). When compared with the total area of forest in Indonesia, it is only approximately 2% (Fajar, et al. 2013). However, mangrove plants in Indonesia are able to store 10% of carbon.

One of the provinces that has mangrove forests is West Nusa Tenggara, precisely on Lombok Island. This island has a level of mangrove forest damage that is divided into three classifications, namely several damaged covering an area of 1.071, 10 ha, moderately damaged covering an area of 590,87 ha and in good condition around 1.426,67 ha (Imran, et al. 2016). The

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district with mangroves growing on the coast is West Lombok Regency. Mangrove plants are spread across Gili Indah, Sekotong and Lembar. Lembar has a beach with the most intact mangrove conditions with a relatively dense population density (>1500 trees/ha), namely Cemara Beach (Nurrijawati, et al. 2024). To increase public awareness and reduce the threat of human intervention on land use changes, socialization and mangrove planting activities are needed at Cemara Beach.

Method

Location of Service

Cemara Beach, which has natural beauty with many mangrove plants around the beach, is located in Lembar Village, Lembar District, West Lombok Regency. Geographically, this beach is located at coordinates 8˚41'48.3" LS dan 116˚07'43.9" BU. This beach is located in the southwest of Lombok Island and about 25 – 30 kilometers from the center of Mataram City. Figure 1 shows the location of mangrove planting at Cemara Beach.

Scope of Activities

Several stages carried out in mangrove planting activities to support the Sustainable Development Goals (SDGs) are as follows:

1. *Location identification and environmental condition assessment*

Field survey activities at Cemara Beach are needed to identify the location and assessment of existing environmental conditions. Activities involving mangrove communities, local communities and governments. The goal is to analyze coastal conditions, water salinity, topography, and biodiversity around the mangrove planting location (Sari, et al. 2022). Then mapping the potential and problems related to mangrove degradation in coastal areas.

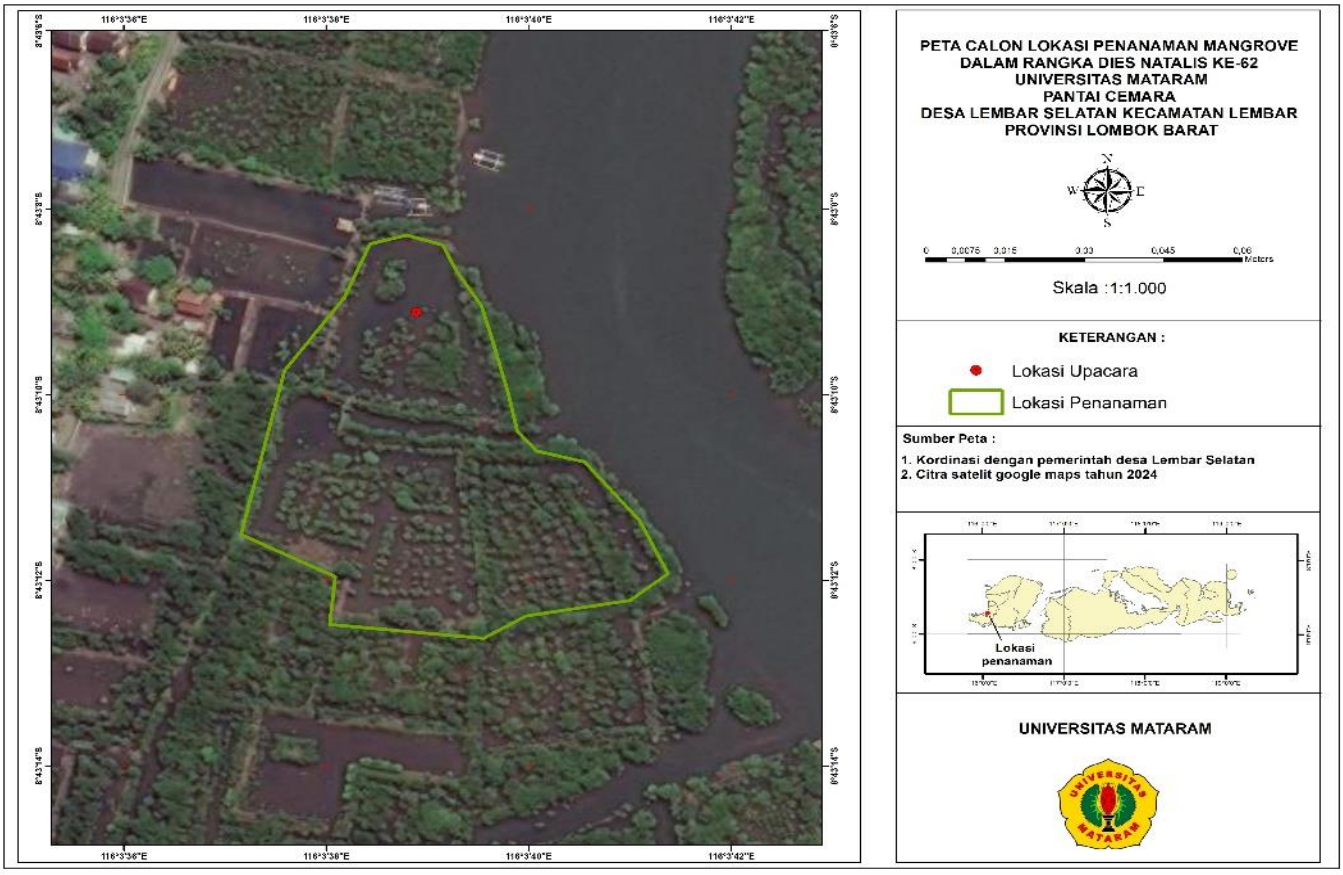

Figure 1. Mangrove planting location at Cemara Beach, West Lombok Regency, West Nusa Tenggara Province

2. *Socialization and education to the community*

The purpose of socialization and education to the community is to increase their understanding of the importance of mangroves for the environment and life. Conveying the benefits of mangrove plants for coastal protection, reducing natural disasters, and providing natural resources. Explaining that this mangrove planting activity focuses on understanding the SDGs, namely the relationship with SDGs 13 on climate change, SDGs 14 on life underwater, and SDGs 15 on

life on land (Ling, et al. 2024). Explaining how to plant and care mangrove seedlings.

3. *Planting and maintenance of mangroves*

Mangrove planting activities begin with collecting mangrove seeds from the mangrove nursery community in Cemara Beach. Determining the planting location and ensuring the appropriate planting distance so that the mangrove trees can grow optimally (Field, C.D., 1999). After planting, it is hoped that the community can carry out maintenance by monitoring the development of the mangrove plants.

Sustainable Development Goals (SDGs)

Mangrove planting carried out on the coast is related to the Sustainable Development Goals (SDGs) so that inclusive, sustainable and environmentally friendly development occurs. Environmental benefits that can support the achievement of various SDGs targets are climate change, protection of marine ecosystems, life on land and community welfare (Rohmawati, et al. 2022).

Action on climate change (SDGs 13), aims to reduce the impacts of climate change (Noor, et al. 2021). According to the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (2019), mangrove ecosystems play a role in absorbing five times more carbon per hectare than other tropical forests.

Life below water (SDGs 14), aims to conserve and sustainability use marine resources, coastal areas and other marine ecosystems. Mangroves act as natural filters that filter pollutants and support better coastal water quality (Titisari, et al. 2022). Mangroves can support the lives of more than 75% of fish species in tropical and subtropical areas based on The State of the World's Mangroves (2020) published by FAO.

Life on land (SDGs 15), mangrove planting helps protect coastal ecosystems from soil erosion and natural habitat destruction (Sumarmi, et al. 2022). The goal is to protect, restore and promote sustainable use of terrestrial ecosystems. The Ramsar Convention on Wetlands (2010) states that mangroves play a role in preventing damage to coastal ecosystems and maintaining the ecological balance between land and water.

Figure 2. SDGs 13 (action on climate change), SDGs 14 (life below water) and SDGs 15 (life on land)

Result and Discussion

Water Quality Conditions of the Cemara Beach Ecosystem

The temperature of the mangrove waters in Cemara Beach ranges from 29 C to 35 C. Temperature is an important factor in supporting the growth of mangrove plants. Mangrove plant growth is good when the water temperature is not less than 20 C. Water temperatures that are too high can increase the metabolic value of aquatic biota and biota respiration so that the level of dissolved oxygen will be low.

The acidity level at Cemara Beach ranges from 7.5 to 8.0. A good pH value for waters ranges from 6.0 – 9.0 and the optimal pH ranges from 7.0 – 8.5 (Khaerah, et al. 2019). The results of the analysis show that the pH conditions of the mangrove ecosystem waters at Cemara Beach are in normal conditions. Tidal conditions have a major influence on the lives of organisms in sea waters. The form zoning and community structure of the mangrove ecosystem are determined by the tidal conditions that occur in the area. The tides at Cemara Beach have a double daily tidal type, there are two high tides and two low tides in one day with different heights and periods. Tide data at Cemara Beach on October 12, 2024 can be seen on the Tides application which can be accessed online and the graph is shown in Figure 3.

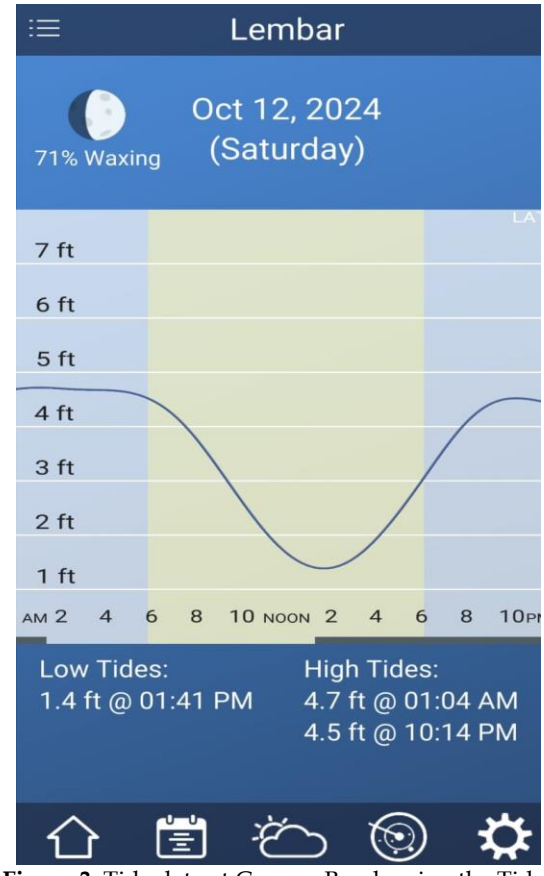

Figure 3. Tide data at Cemara Beach using the Tides application on October 12, 2024

Mangrove Seed Selection

Selection of good quality seedlings is essential to achieve restoration goals. Healthy mangrove seedlings are indicated by green leaves, sturdy stems and undamaged roots. The age of good mangrove seedlings ranges from 3 to 6 months because the seedlings will be stronger and easier to adapt to coastal conditions. The selection of mangrove species is determined based on environmental conditions, salinity, water depth, and soil type. The type of mangrove planted at Cemara Beach is Rhizophora Apiculata. Figure 4 shows the location of mangrove seed selection.

Figure 4. Location of mangrove seedling selection owned by the community at Cemara Beach

Mangrove Planting Methods

The stages of mangrove planting require a good understanding of the right planting techniques so that mangroves can grow well. The stages carried out for planting mangrove seedlings at Cemara Beach are preparing the planting location, selecting mangrove seedlings, and planting seedlings.

Figure 5. Mangrove seedling planting location at Cemara Beach, West Lombok Regency

The location for planting mangroves should be a coastal area with high salinity and not too deep water. The water depth ranges from 10 to 50 cm. Next, ensure the planting area is clean from garbage and does not hinder the roots from growing. Dig a hole with a depth of 20 to 30 cm and adjust it to the size of the mangrove seedlings. The presence of a hole can facilitate planting seedlings. The seedlings to be planted should be 15 to 30 cm in size. In Figure 5 shows one of the mangrove planting locations on the coast of Cemara Beach.

The next stage is planting seedlings, tying seedlings and compacting the soil. Seedlings to be planted should be upright and the roots slightly submerged in the soil or water. Mangrove seedlings with the Rhizophora type are planted by directly sticking them into the soil. Mangrove seedlings that have been planted are then tied with rope or natural materials such as small bamboo that hold the mangrove seedlings so that they remain stable. Furthermore, after planting, compact the soil around the seedlings so that the seedlings can penetrate strongly and the seedlings remain upright. Mangrove planting activities at Cemara Beach involving university leaders, government, lectures and students can be seen in Figure 6

Figure 6. Mangrove planting activities at Cemara Beach, West Lombok Regency

Conclusion

Socialization and mangrove planting activities at Cemara Beach are very much needed to prevent abrasion on the coast and provide a good understanding of the importance of mangrove plants. Conservation activities should involve many parties such as the community, village government, local government, and private sector.

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