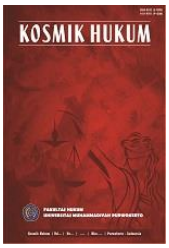

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Mitigation Effort for Sustainable Mangrove Management Towards a Low Emission Indonesia: Study at Arboretum Mangrove Kolak Sekancil

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Abstract
Krida Wana Lestari Farmer Group supports the Indonesian government's policy to reduce carbon emissions as a community obligation to participate in managing the environment, as the purpose of the ratification of the Paris Agreement (Law Number 16 of 2016 on the Ratification of Paris Agreement to the United Nations Framework Convention on Climate Change). The farmer group successfully built an edu-tourism area, the Segara Anakan Lagoon Conservation Mangrove Arboretum (Kolak Sekancil). This farmer group cultivates and utilizes mangrove products for life and has succeeded in increasing mangrove density in the Cilacap Sea Village Area with an area of approximately 6,2126.28 Ha. Mangrove farming by farming communities is a form of community participation regulated in Article 65 Paragraph (4) Law Number 32 of 2009 on Environmental Protection and Management The legal institution of this community is formally supported by the village government with Village Regulation No. 7 of 2022 concerning Mangrove Ecosystem Management in the Segara Anakan Region of Cilacap.

Keywords: Arboretum kolak sekancil, farmer group, village regulation, low emissions

I. Introduction

Mangrove forests are tropical forests that occupy coastal areas and are the most threatened habitat in the world. Mangrove forests are one of the most biodiverse and productive wetlands on earth. Threats to mangrove forests include logging, land conversion for agriculture and mariculture and degradation due to pollution. Mangroves are salt-tolerant evergreen forest ecosystems and ecologically important components of coastal ecosystems.[1] Mangroves contribute potential ecological services,[2] while mangroves are highly sensitive to sea level rise.[3]

[1] N.T. Hai et al., "Towards a More Robust Approach for the Restoration of Mangroves in Vietnam," *Annals of Forest Science* 77, no. 1 (March 11, 2020): 18, https://doi.org/10.1007/s13595-020-0921-0.
[2] Priyanka Kumari, Jitendra Kumar Singh, and Bhawana Pathak, "Potential Contribution of Multifunctional Mangrove Resources and Its Conservation," in *Biotechnological Utilization of Mangrove Resources* (Elsevier, 2020), 1–26, https://doi.org/10.1016/B978-0-12-819532-1.00001-9.
[3] Matthew L. Kirwan and J. Patrick Megonigal, "Tidal Wetland Stability in the Face of Human Impacts and Sea-Level Rise," *Nature* 504, no. 7478 (December 5, 2013): 53–60, https://doi.org/10.1038/nature12856.

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Mangroves, a tree classified as a small evergreen tree, thrive in tidal areas of estuaries, lagoons, and river deltas and dominate subtropical and tropical coastal systems.[4] The productive nature and location of mangroves in nearshore, warm waters make them valuable targets for agriculture, mariculture and creation. These activities alter the physicochemical properties of the habitat affecting animals such as shrimp, crabs and fish that depend on the ecosystem for food and shelter.[5]

The destruction of coastal mangrove habitats through sea level rise through climate change and anthropogenic and natural deforestation, resulted in the loss of one-third of mangrove forests and ecosystem services worldwide over the last 50 years.[6] Mangrove forests as wetlands are recognized as important carbon sinks.[7] Mangrove forests capture four times more carbon than rainforests per unit area,[8] and are an important component of effective carbon sink mitigation efforts with the potential to sequester up to 35% of anthropogenic CO2.[9]

The Paris Agreement under the sustainable development goals calls for countries to undertake adaptation and mitigation actions to reduce the impacts of climate change and increase the resilience of ecosystem services on a global scale.[10] Carbon stored in coastal ecosystems such as mangroves has been integrated in the international policy agenda through the Paris Agreement in the United Nations Working Convention on climate change, consequently countries with mangrove forests need to estimate and track the amount of carbon stored.

These estimates are used to support appropriate and strategic decision-making for climate change mitigation.[11] Myanmar, Malaysia, Cambodia, Indonesia and Guatemala are among the countries with high mangrove loss. Indonesia is the largest producer of mangroves, estimated to account for 26% and 29% of the world's total mangrove stock. Deforestation in Indonesia occurs at rates ranging from 0.26% to 0.66% annually.[12]

Cilacap Mangrove Forest is located in the western part of the city covering an area of approximately 51 Ha in the kampung laut area, almost every year experiencing narrowing and loss of mangrove plant species.[13] Nearly 26 of the 35 mangrove species have been destroyed due to a variety of factors, from the exploitation of their timber products (illegal logging) to the conversion of forests into ponds. The ponds have been abandoned due to mass looting, declining productivity and unavailability of capital. Changes in the condition and function of mangrove forests both directly and indirectly due to the various things mentioned above affect the potential carrying capacity of the surrounding environment.

Cilacap Mangrove Forest plays an important role as a supporter of the physical environment ecosystem and biotic environment as well as contributing nutrients that support the

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4 Jitendra Kumar Singh, "Structural Characteristics of Mangrove Forest in Different Coastal Habitats of Gulf of Khambhat Arid Region of Gujarat, West Coast of India," *Heliyon* 6, no. 8 (August 2020): e04685, https://doi.org/10.1016/j.heliyon.2020.e04685.

5 Jessica Jaxion-Harm, "The Relationship Betwen Coral-Reef Fish (Larvae, Juveniles, and Adults) and Mangroves: A Case Study in Honduras" (Ph.D Thesis, University of Oxford, 2010); Jitendra Kumar Singh, Ibid.

6 Lidiane P. Gouvêa et al., "Global Impacts of Projected Climate Changes on the Extent and Aboveground Biomass of Mangrove Forests," Diversity and Distributions 28, no. 11 (November 27, 2022a): 2349–2360, https://doi.org/10.1111/ddi.13631.

7 Takahiko Hiraishi et al., *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*, *IPCC, Switzerland* (Switzerland, 2014).

8 Daniel C. Donato et al., "Mangroves among the Most Carbon-Rich Forests in the Tropics," *Nature Geoscience* 4, no. 5 (May 3, 2011): 293–297, https://doi.org/10.1038/ngeo1123.

9 Jean-Pierre Gattuso et al., "Ocean Solutions to Address Climate Change and Its Effects on Marine Ecosystems," *Frontiers in Marine Science* 5 (October 4, 2018), https://doi.org/10.3389/fmars.2018.00337.

10 Michel Damian and Luigi De Paoli, "Climate Change: Back to Development," *ECONOMICS AND POLICY OF ENERGY AND THE ENVIRONMENT*, no. 3 (July 2018): 5–24, https://doi.org/10.3280/EFE2017-003001.

11 Lidiane P. Gouvêa et al., *Op.Cit*.

12 Stuart E. Hamilton and Daniel Casey, "Creation of a High Spatio-temporal Resolution Global Database of Continuous Mangrove Forest Cover for the 21st Century (CGMFC-21)," *Global Ecology and Biogeography* 25, no. 6 (June 21, 2016): 729–738, https://doi.org/10.1111/geb.12449.

13 E K Purwendah et al., "The Influence of Legal Compliance in Farmer Group on the Growth and Development of Sustainable Mangrove Ecosystem," *Global Journal of Environmental Science and Management* 10, no. 3 (2024): 1371–1390, https://doi.org/10.22034/gjesm.2024.03.26.

surrounding waters and support the life of aquatic biota. The area of the Cilacap Segara Anakan mangrove forest in 1978 reached 17,090 hectares and in 2004 only 9,271, 6 hectares, in 2005 leaving only 6-7 thousand hectares (Water Resources Management Agency of West Java Provincial). The density of Segara Anakan Cilacap mangroves has increased significantly from 2000 to 2015. High-density mangroves are found in the western part of Segara Anakan in Ujung Alang, Panikel, Ujung Gagak, Kutawaru and Tritih villages.

Cilacap Mangrove Forest is located in the western part of the district, with an area of approximately 51 hectares. The Cilacap sea village mangrove area experiences almost annual loss of plant species. About 26 of the 35 species have been lost due to various factors, including illegal logging for timber and conversion of the forest to shrimp ponds. These ponds are abandoned due to massive looting, declining productivity and lack of capital. Meanwhile, changes in the condition and function of mangrove forests can affect the potential carrying capacity of the surrounding environment.

The Krida Wana Lestari Community Farmer Group initially focused on restoring mangrove forests damaged by large-scale logging and shrimp pond development in 1994 and 1998. Investors from various regions, including Sulawesi, Lampung, East Java, West Java, and Pangandaran, acquired mining land by clearing thousands of hectares for shrimp ponds until 1999. However, the practice did not last long, leaving barren land, some of which had been turned into ponds. In 1999, with many people suffering financial losses, farmer groups converted former shrimp ponds and logging areas into economically valuable mangrove areas.

The Regional Government of Cilacap Regency shows that one of the Segara Anakan ecosystem areas that was still in good condition until 2000 was in Ujung Alang Village covering an area of approximately 3,428 ha.[14] The level of mangrove density is inseparable from the role of the community, especially coastal communities. Awareness of the importance of mangroves for life made some residents of Ujung Alang Village realize that they had to form a farmer group called the Krida Wana Lestari Farmer Group, which decided to change their profession from fishermen to mangrove farmers.

This study aims to look at the legal institutional form of mangrove farmers participation, and the sustainability of mangrove ecosystem management as an agricultural commodity. The National Strategy for Mangrove Ecosystem Management (SNPEM) with Presidential Regulation of the Republic of Indonesia Number 73 of 2012 as the legal basis for implementation.

II. Research Problems

1. To what extent can sustainable mangrove management based on community participation contribute to carbon mitigation and greenhouse gas emission reduction?
2. How can community-based mangrove management in Kolak Sekancil Arboretum, Ujung Alang Village, Kampung Laut, Cilacap support the sustainability of the mangrove ecosystem and increase the community's role in environmental conservation?
3. What are the obstacles faced by the Krida Wana Lestari Farmer Group in mitigation efforts and sustainable mangrove management to support low emission Indonesia?

III. Research Methods

This research uses empirical normative legal research methods and is categorized as applied research. The main focus is to examine the practical implementation of positive legal provisions in the context of certain social events, with a special emphasis on achieving predetermined goals. This study begins by examining relevant written positive legal provisions regarding mangrove farming carried out by the Krida Wana Lestari Farmer Group. The data analysis process is carried out in two stages, namely examining normative law, including a

[14] Hariyadi Hariyadi, "Peran Masyarakat Dalam Pengelolaan Ekosistem Mangrove Untuk Mitigasi Bencana: Studi Di Segara Anakan, Kab. Cilacap," *Kajian* 23, no. 1 (2018): 43–62, https://doi.org/10.22212/kajian.v23i1.1873.

Kosmik Hukum Vol. 25 No. 1 (2025): 25-36
E-ISSN: 2655-9242 | P-ISSN: 1411-9781
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deeper study of applicable normative law, such as basic principles with related theories, and empirical application of legal provisions to certain events generated through primary data collection in the form of observations, questionnaires and in-depth interviews to the Krida Wana Lestari farming community. Analysis of cases and legal documents is conducted to explain the actualization of normative legal provisions.

IV. Result and Discussion

1. Sustainable Mangrove Management as a Form of Carbon Mitigation Based on Community Participation

Ministry of Environment and Forestry is responsible for the sustainability of mangrove ecosystems in Indonesia according to the low carbon policy by 2030. Government policy related to mangroves in Indonesia is marked by the National Strategy for Mangrove Ecosystem Management (SNPEM) with Presidential Regulation of the Republic of Indonesia Number 73 of 2012. National Strategy for Mangrove Ecosystem Management is an effort in the form of policies and programs to realize sustainable mangrove ecosystem management and sustainable prosperous communities based on available resources as an integral part of the national development planning system.[15]

Sustainable mangrove management is all efforts to protect, preserve and sustainably utilize through an integrated process to achieve the sustainability of mangrove ecosystem functions for the welfare of society. To implement this National Strategy for Mangrove Ecosystem Management (SNPEM), a Mangrove Ecosystem Management Coordination Team was formed at the national, provincial and district levels.[16]

Ministry of Environment and Forestry, based on Regulation of the President of the Republic of Indonesia about Amendments to Presidential Regulation number 9 of 2016 concerning the Acceleration of the Implementation of the One Map Policy[17] at the 1: 50,000 level in the preparation of mangrove thematic maps[18] produces data on significant changes in existing mangrove areas from the 2013-2019 National Mangrove Map (PMN) of 3,311,245 Ha., to 3,364,080 Ha. The latest National Mangrove Map in 2021 shows an additional 52,835 Ha of existing mangrove area. This increase shows positive efforts to conserve mangrove ecosystems in Indonesia.[19]

Article 57 (1), (2), (3), (4), Law Number 32 of 2009 on Concerning Environmental Protection and Management (UUPPLH) states that the maintenance of the environment is carried out through efforts, conservation of natural resources, reserve of natural resources, and/or preservation of the atmosphere. Natural resource reserves are natural resources that cannot be managed within a certain period of time. Preservation of atmospheric functions includes: efforts to mitigate and adapt to climate change; efforts to protect the ozone layer; and efforts to protect against acid rain.

Mangrove carbon mitigation is important because mangroves have the highest carbon density of all tropical forests. These blue carbon ecosystems can store large amounts of carbon for long periods of time and are useful for reducing greenhouse gas emissions and supporting climate change mitigation.[20] In Article 1 Number 7, Regulation of the Minister of Environment and Forestry of the Republic of Indonesia No. 7 of 2023 on Forestry Sector Carbon Trading Procedures, climate change mitigation actions are mentioned as activities that can reduce Green House Gas (GHG) emissions, increase carbon sequestration and/or storage/strengthening of carbon stocks. Meanwhile, what is meant by mitigation actions is explained in Article 3, Paragraph (2) including: GHG emission reduction; and forest carbon storage and/or sequestration. Climate change mitigation actions are carried out through activities, one of which is reducing the rate of degradation of peatland forests and mangroves; mangrove rehabilitation;

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15 *Undang-Undang Nomor 32 Tahun 2009 Tentang UUPPLH*, 2009.

16 Ady Suryawan, *MELESTARIKAN EKOSISTEM MANGROVE: Sebuah Panduan Pengenalan, Pelestarian, Dan Pemanfaatan Dari Ekosistem Mangrove* (Manado: Balai Penelitian dan Pengembangan Lingkungan Hidup dan Kehutanan Manado, 2015).

17 BPHN, "Peraturan Presiden Nomor 23 Tahun 2021," 2021.

18 Portal Informasi Indonesia, "Peta Mangrove Nasional Untuk Langkah Tepat Pengelolaan Mangrove," 2021, https://www.indonesia.go.id/kategori/kabar-g20/3399/peta-mangrove-nasional-untuk-langkah-tepat-pengelolaan-mangrove?lang=1.

19 *Ibid.*

20 Maria F. Adame et al., "Future Carbon Emissions from Global Mangrove Forest Loss," *Global Change Biology* 27, no. 12 (June 17, 2021): 2856–2866, https://doi.org/10.1111/gcb.15571.

Kosmik Hukum Vol. 25 No. 1 (2025): 25-36
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and law enforcement supervision to support the protection and security of forest areas (Article 3, Paragraph (3) d, e, and u).

The density of mangroves in Segara Anakan is shown to have increased considerably as shown in the 2021 National Mangrove Map (Figure 1.), categorized as dense mangroves (purple image).

Figure 1. Map of dense mangrove distribution in Cilacap's Segara Anakan ecosystem

Source: Ministry of Environment and Forestry of the Republic of Indonesia

Data on the density of mangrove forests in Ujung Alang Village in 2015 was influenced by mangrove deforestation by the Patra Krida Wana Lestari Farmer Group Community of Kampung Laut Subdistrict, Cilacap Regency.

This farmer group changed professions from fishermen to mangrove farmers, they revived former ponds and former illegal logging land into mangrove areas of economic value. Mangroves are processed into food ingredients, drinks, batik dyes, mangrove tea and coffee. Considering the importance of mangroves to the lives of the people of Ujung Alang Kampung Laut Cilacap, this farmer group even restores mangroves through replanting activities by cultivating seeds from mangrove fruit.

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2. Kolak Sekancil Arboretum, Ujung Alang Village, Kampung Laut, Cilacap, as a Form of Sustainable Mangrove Management Based on Farming Communities

Arboretum is a place where various trees are planted and bred for research or educational purposes on a small scale,[21] an arboretum is a mini forest or commonly referred to as a botanical garden, because in it there are several types of plants and animals so that there is reciprocity between the two. According to Moestrup and Harum,[22] it is an area consisting of various types of tree plants that grow in-situ and ex-situ and can be used for research and plant conservation purposes.

Arboretum as a garden park has a collection of trees planted in a certain area and follows its natural habitat or area of biodiversity conservation. This forest park area is intended at least to improve or maintain climatic conditions in its environment.[23] Arboretums are expected to be a means of research and development and can be educational.[24]

Arboretum has an important role as a facility made by humans to protect organisms, especially plants.[25] Arboretum is a collection of living trees either built through planting or natural growth in natural forests. Arboretum according to Lekitoo (2016)[26] has a function as a place to collect various types of trees and is an important tool that can be utilized in the exercise of recognizing the diversity of plant morphological traits. The Cilacap Segara Anakan Lagoon Conservation Arboretum (Kolak Sekancil) is a forest park built by the Krida Wana Lestari farming community in Ujung Alang Village. This arboretum has an area of approximately 6 hectares, which is overgrown with mangrove trees of approximately 56 types of mangrove trees owned by farmer groups as a driver of mangrove conservation.

This arboretum is a farmer-owned land managed by the farming community for edu-tourism and community activity center. The arboretum is managed by the Kolak Sekancil Farmer Group with the Decree of the Head of Ujung Alang Village Number 40 of 2022 and the Pandu Alam Farmer Group formed through the Decree of the Head of Ujung Alang Village Number 140/4/YEAR about the Pandu Alam Youth Tourism Group Dusun Lempongpucung. This group is tasked with preserving existing mangrove trees and supporting and facilitating tourism activities in the Segara Anakan area of Ujung Alang Village, in particular and the Kampung Laut Sub-district area.

The scheme below illustrates the participation of the Krida Wana Lestari farmer group. This farmer group was formally established based on a Decree of the Village Head. The Krida Wana Lestari Farmer Group is the main farmer group, where this farmer group has sub-groups, namely, the Kolak Sekancil farmer group and the Pandu Alam Youth Group which are tasked with preserving mangrove trees and facilitating mangrove tourism activities. These farmer groups consciously participate in mangrove conservation for the fulfillment of economic life by conducting nurseries for sale and mangrove conservation.

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21 Pusat Bahasa, *Kamus Besar Bahasa Indonesia (KBBI)*, n.d.

22 Bima Surya Limenta, "Strategi Pengembangan Arboretum Berbasis Arsitektur Ekologis Di Hutan Pinus Pracimantoro Wonogiri," *ARSITEKTURA* 19, no. 1 (May 1, 2021): 107, https://doi.org/10.20961/arst.v19i1.45448.

23 *Ibid.*

24 Hongki Napolion, Evi Sribudiani, and Tuti Arlita, "PEMAHAMAN PENGUNJUNG TERHADAP ARTI DAN FUNGSI ARBORETUM UNIVERSITAS RIAU THE UNDERSTANDING OF VISITORS TO THE MEANING AND FUNCTIONS OF ARBORETUM IN UNIVERSITY OF RIAU," *Jom Faperta* 2, no. 2 (2015).

25 Raynard C. Sanito and Henderina J. Keiluhu, "Analisis Strategi Pembangunan Arboretum Di Universitas Cenderawasih Sebagai Upaya Konservasi Tumbuhan," in *Seminar Nasional Pendidikan Sains II UKSW* (Salatiga: Fakultas Biologi, Universitas Kristen Satya Wacana, 2017), 148–154.

26 *Ibid.*

Kosmik Hukum Vol. 25 No. 1 (2025): 25-36
E-ISSN: 2655-9242 | P-ISSN: 1411-9781
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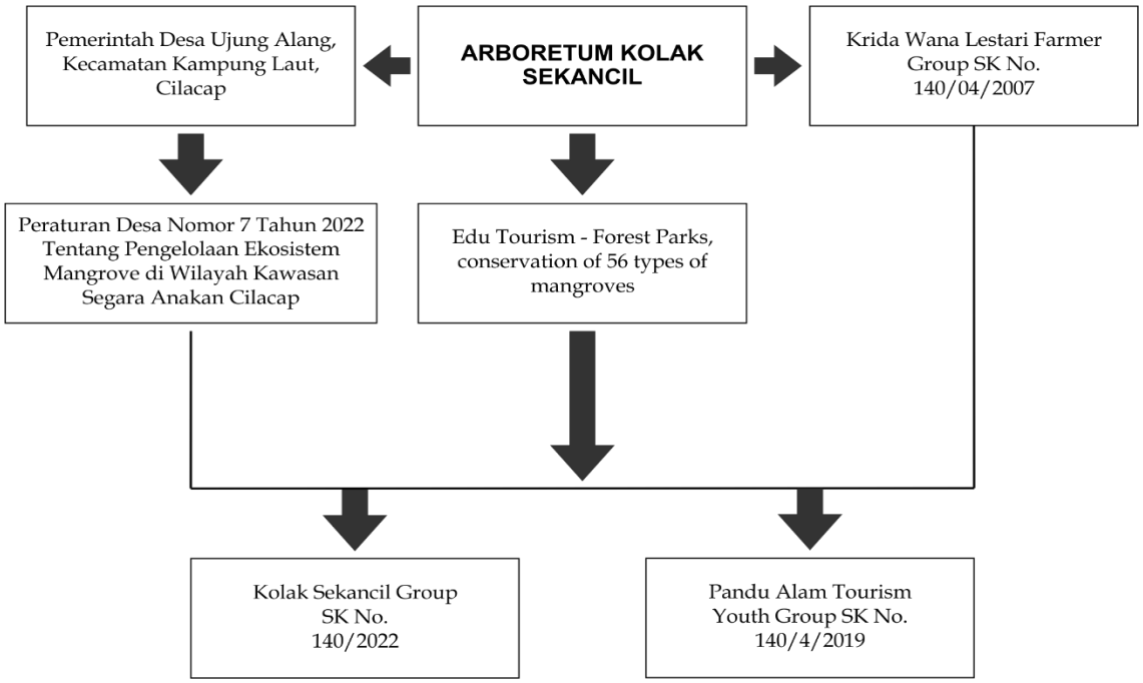
Figure 2. Scheme Management of Kolak Sekancil Arboterium by Farmer Groups



Source: Author's Analysis

Farmer groups have an awareness of the important role of mangrove ecosystems for the environment. The participation of farmer groups in managing mangroves as a valuable commodity for the economy and the environment has the full support of the village government. This is a form of community participation in environmental management that is closely related to the right to the environment. The right to a good and healthy environment has been protected in the Constitution Law of the Republic of Indonesia Year 1945[27] Post-amendment, it is formulated in Article 28H Paragraph (1), which states that everyone has the right to live in physical and mental prosperity, to live and obtain a good and healthy environment and to obtain health services.

Community participation or public participation is an important element of good and democratic environmental decision-making. Community participation is a form of channel given to the community, thus encouraging the community to actively demand the fulfillment of the right to a good environment. Currently, recognition of the process of community participation can be seen at every policy level, both internationally, regionally, nationally and locally.

According to Hardjasoemantri community participation in environmental management has a wide range.[28] This participation not only includes the participation of individuals affected by various regulations or administrative decisions, but also includes the participation of groups and organizations in society. Effective participation can exceed the ability of an individual, both from the point of view of financial ability and from the point of view of knowledge ability, so the participation of groups and organizations is very necessary, especially those engaged in the environmental sector.

Farmer groups as a driving force signify community participation in environmental supervision and community awareness of their rights. This is as the opinion of Selo Soemardjan,[29] who sees social change from the perspective of changes in social institutions in a society. Changes

[27] *UUD 1945*, n.d.
[28] Koesnadi Hardjasoemantri, *Aspek Hukum Peran Serta Masyarakat Dalam Pengelolaan Lingkungan Hidup.* (Yogyakarta: Gajah Mada University Press, 1993).
[29] Jelamu A. Marius, "KAJIAN ANALITIK: Perubahan Sosial," *Jurnal Perubahan* 2, no. 2 (2006): 125–132.

in social institutions affect the social system, including values, attitudes and patterns of behavior among groups in society. Changes in social institutions affect the social system, including values, attitudes and patterns of behavior among groups in society. When the structure of society changes, the functions and roles, mindsets and attitudes of the community change.

Community Participation in the Krida Wana Lestari farmer group forms a gemeinschaft community that is characterized by tradition, intimacy, close social brotherhood and a strong emotional bond that the Cilacap sea is important for the sustainability of its life, a marker of community is still characterized by a community (gemeinschaft) and this is a marker of environmental justice characterized by antophoscentrism-ecocentrism.[30]

The Ujung Alang village government and the head of the Krida Wana Lestari Farmers Group community succeeded in integrating the strong bonds of the Ujung Alang community in a traditional social fraternal intimacy to utilize mangrove ecosystem sources as an alternative source of livelihood from the fishermen's livelihood that is usually done by the residents of Kampung Laut. The ability to adapt to the climate and the uniqueness of the region makes this farming community have a local genius,[31] who explains the local values or characteristics of the region that have evolved distinctively. Overall, local genius according to Haryati Soebadio (Putu Tuni Cakabawa)[32] is considered the same as cultural identity which is interpreted as the identity or personality of the nation's culture. Mundardjito (in Putu Tuni Cakabawa)[33] says the term local genius is a match for the personality of the local culture.

The participation of the farmer community in managing mangroves as part of the fishing community is inseparable from marine fisheries. This is evidenced by the silvofishery method carried out by farmer groups by combining fisheries and mangrove businesses. Crab and fish breeding is carried out in conjunction with mangrove conservation, followed by the concept of introducing a management system by minimizing inputs and reducing environmental impacts.[34] Silvofishery is a technical approach pattern consisting of a series of integrated activities between fish, shrimp or crab farming activities, with planting, maintenance, management and conservation efforts of mangrove forests.[35]

3. Hindering Factors of Sustainable Mangrove Management for the Krida Wana Lestari Farmer Group

Community engagement is a process that helps people realize the situations and problems they face and encourages them to find solutions that can be used to solve these problems. Community participation is not only considered as part of the process, but also as an important indicator that affects the results in human resource development.[36]

The farming community chooses mangrove farmers as an option for their livelihood rather than their livelihood as fishermen. They choose to farm mangroves not only for their livelihood but also to preserve the condition of the mangrove ecosystem in the Kampung Laut and Segara Anak areas. Community participation is now not just an obligation, but a right for the community to be directly involved in every planning or development activity. As a party that knows the

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30 Andri Gunawan Wibisana, "Antroposen Dan Hukum: Hukum Lingkungan Dalam Masa-Masa Penuh Bahaya" (Seminar Indonesian Center of Environmental Law (ICEL), 2021).

31 P. E. de Josselin de Jong, "Prehistory and Religion in South-East Asia by H. G. QUARITCH WALES," *Bijdragen tot de Taal-, Land- en Volkenkunde* 117, no. 2 (1961): 291–294, https://www.jstor.org/stable/27860298.

32 Putu Tuni Cakrabawa, "Potensi Kearifan Lokal Dalam Pembangunan Berwawasan Lingkungan," in *Hukum Lingkungan (Teori, Legislasi Dan Studi Kasus)*, ed. Laode M. Syarif and Andri G. Wibisana (United States Agency for International Development (USAID), 2015), 690–741.

33 *Ibid*.

34 Antonius P. Rumengan et al., "Penerapan Teknologi Budidaya Ikan (Silvofishery) Di Kawasan Hutan Mangrove Bagi Masyarakat Pesisir Bolaang Mongondow Selatan (Application of Silvofishery Technology in Mangrove Forest Area for Coastal Citizen in Bolaang South Mongondow)," *Jurnal Ilmiah Tatengkorang* 3 (2019): 45–51.

35 Ajeng Nurul Fitriawati, Joko Triwanto, and Amir Syarifuddin, "Development of Silvofishery in Mangrove Forest, Budeng Village - Jembrana, Bali," *Journal of Forest Science Avicennia* 1, no. 2 (February 13, 2019): 13–16.

36 W Isbandi, *Partisipasi Masyarakat* (Jakarta: Balai Pustaka, 2007).

Kosmik Hukum Vol. 25 No. 1 (2025): 25-36
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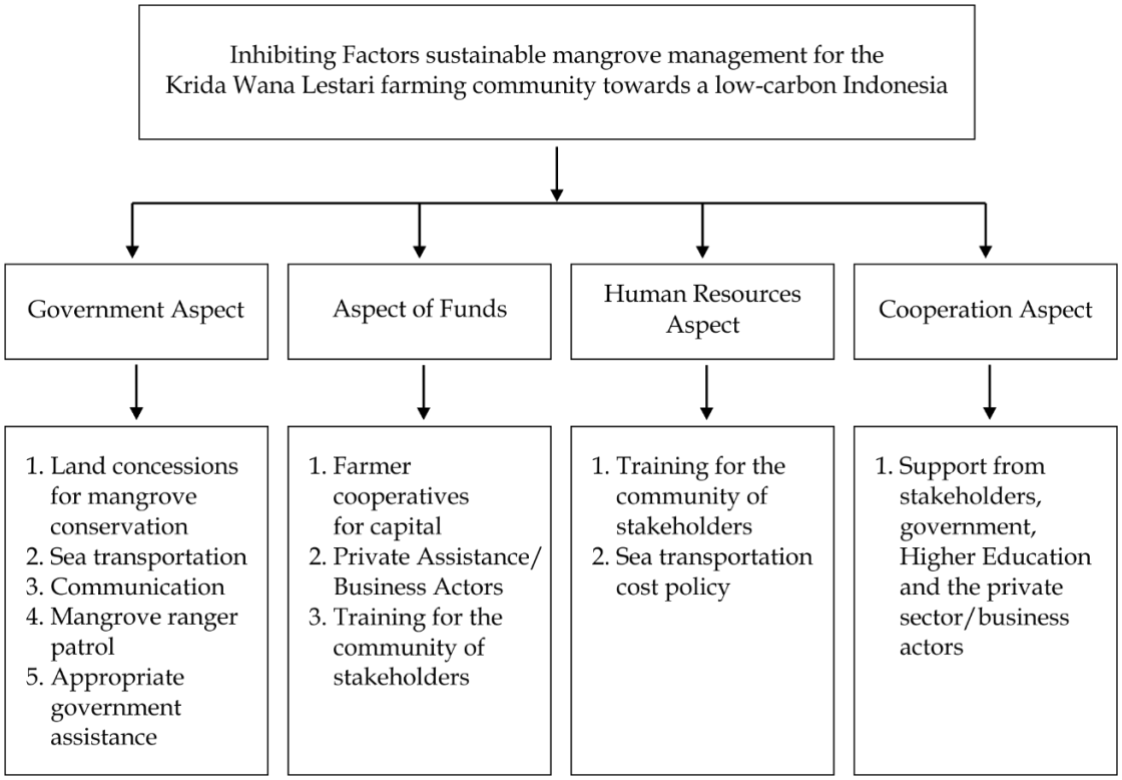
needs and challenges that exist, the community has the freedom to determine the implementation of development activities.[37]

Participation is the mental and emotional involvement of people in a group situation that encourages them to continue contributing ideas to achieve the goals of the group and are equally responsible for them (Keith Davis, 1995). The mental and emotional involvement of the Krida Wana Lestari farmer group arises because of the same interest in preserving mangroves and utilizing mangroves as their source of livelihood. The participation of farmer groups requires support from all stakeholders, both the government, the private sector (business actors), and higher education. The results of the study show that there are factors that inhibit mangrove management for farmer groups in the form of government aspects, fund aspects, human resources aspects and cooperation aspects.

Figure 3. Scheme Inhibiting Factors sustainable mangrove management for the Krida Wana Lestari farmer group.



Source: Author's Analysis

The above scheme illustrates obstacles to the government aspect experienced by farmer groups are the unclear land concessions used in conservation related to land ownership, networks and transportation as well as the lack of communication between boat transportation and villages and the tidal elevation of sea water which varies greatly depending on the climate. In addition, obstacles in the form of regular ranger patrols are not supported by periodic legal structures. The provision of assistance from the government in the form of technology is not appropriate, such as the provision of windmills that burden the community because it requires expensive maintenance.

Obstacles to the funding aspect are related to the government and business actors in helping community capital in the form of farmer cooperatives, or the absence of Village-Owned Enterprise (BUMDES) for mangrove farming activities. Obstacles in the aspect of human

[37] *Ibid.*

resources related to the lack of education in the farming community, as well as high transportation costs are obstacles to the development of handicrafts based on mangrove resources. Obstacles to the aspect of cooperation are related to the assistance of business actors or parties needed by farmer groups to improve the seedling strategy, mangrove planting as a source of community income from the government because the authority of stakeholders in mangrove areas based on territory has a division of authority from the central, provincial and district governments. Business actors or the private sector as stakeholders because of social and environmental responsibility have an obligation to pay attention to the interests of blue economy policies.

V. Conclusion

Institutionally, the Krida Wana Lestari Farmer Community is a combination of farmer groups that has a legal basis because its establishment is based on the Decree of the Head of Ujung Alang Village to carry out mangrove ecosystem management and maintenance activities in Ujung Alang Village and Segara Anakan Cilacap. This community even has an edu tourism area Arboretum Kolak Sekancil which has an area of 6 hectares, as a mangrove park forest containing approximately 56 types of mangroves and stands on land owned by the Krida Wana Lestari farming community. However, the sustainability of this farmer group has inhibiting factors consisting of four aspects, namely the government aspect, the fund aspect, the human resource aspect and the cooperation aspect. Government aspects are in the form of conflicts of authority over conservation land concessions, the absence of Village-Owned Enterprise (BUMDES) for mangrove farming activities, access to transportation, electricity and clean water. The aspect of funds is related to the capital of the farmer community, starting from nurseries to planting and sending seeds such as farmer cooperatives. The aspect of improving human resources is related to training in the use of mangroves to meet the needs of life. The Cooperation aspect is related to the support of all stakeholders, especially business actors as a form of social and environmental responsibility. Community participation is a form of community responsibility to carry out the obligation to manage and maintain the environment as mentioned in Article 70 Paragraph (1) Law Number 32 of 2009 on Concerning Environmental Protection and Management (UUPPLH) which emphasizes that the community has the same rights and opportunities as wide as possible to play an active role in environmental protection and management.

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