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Nusantara Nature Conservation Foundation's Efforts to Mitigate the Impact of Global Warming Through Mangrove Forest Conservation in Berau in 2018-2022

Muhammad Zayyan Yaser[1*], Uni Wahyuni Sagena[1], Chairul Aftah[1]

[1] Universitas Mulawarman, Kalimantan Timur, Indonesia

[*] *Corresponding author: Muhammad Zayyan Yaser (unisku@unmul.ac.id)*

Abstract

This research aims to see and describe the efforts of the Indonesian Nature Conservation Foundation in dealing with global warming through mangroves in Berau in 2010-2019, using the concept of Conservation and Global Warming. The data analysis technique used is a qualitative technique. The research results show that the efforts made by the Nusantara Nature Conservation Foundation in dealing with global warming are by planting every 2 years, monitoring mangroves that have developed, providing education to communities around the mangrove ecosystem. This research uses descriptive research using data collection techniques through primary and secondary data in the form of interviews, journals, books, articles and information from official websites. Nusantara Nature Conservation Foundation (*Yayasan Konservasi Alam Nusantara*/YKAN) (Pratiknjo et al., 2023). Efforts to mitigate the impact of global warming are in collaboration with KKP3K-KPDS, implementing programs in the Berau region that have more of an impact on the economic sector than ecology itself. This can be seen from the achievements of each program which has produced new alternative income for the people in the Berau region, while the impact of global warming itself is still being felt, marked by the increasing temperature changes felt.

Keywords

Mangrove, Global Warming, Blue Carbon, Carbon Gas

1. Introduction

Blue Carbon is a marine and coastal ecosystem that is capable of absorbing carbon gas. The Blue Carbon concept was first introduced in October 2009 by 3 UN collaborative bodies, namely FAO, UNEP and UNESCO, which published the Blue Carbon Report (Nontji, 2010). Blue Carbon itself consists of 3 types, namely Seagrass, Mangrove Ecosystem and Brackish Swamp. Mangrove ecosystems are forests that grow in coastal areas and are able to live in environments with high salt levels and are influenced by sea tides, while seagrass beds are shallow marine ecosystems located in salty water areas whose base is sand. Finally, brackish swamps are swamps that grow at river mouths caused by sea tides. Mangroves are an ecosystem that grows in coastal areas, especially coastal areas. Mangroves are also an ecosystem that requires salt water, muddy areas and are always flooded with water. Mangroves have the ability to absorb carbon gas because the roots of the forest are respiratory roots. Mangrove forests then photosynthesize and function to convert carbon dioxide or CO2 into organic carbon for forest vegetation and leaves. Mangroves have the potential to absorb carbon gas, greater than other plants. Approximately 1 hectare (ha) of Mangrove Forest land can absorb as much as 110-kilograms of carbon, 1/3 of which is released through organic deposition in the mud around the Mangrove forest (Rahim, 2017). The benefits of Mangrove forests are also as a breeding ground for marine biota such as fish and shrimp which can then open economic doors for people living around Mangrove forests.

Mangrove forests have a big function in resisting sea waves which can erode land. The total number of mangroves spread throughout the world is around 16,530,000 hectares, and around 23% are in Indonesia with a total biodiversity area of 3,489,140.68 hectares. Around 1,671,140.75 hectares have good mangrove conditions, while 1,817,999.93 hectares are in poor condition (Director, 2017). In 2012, The Nature Conservancy and Wetlands International stated that mangroves with a thickness of 100 meters towards land could reduce waves by around 13% - 66%. East Kalimantan is the second province with the largest distribution of mangroves in Indonesia after Papua. Papua Mangrove conservation still depends on the Bali Mangrove Forest Management Centre. This is because the Papuan government is still having problems monitoring mangrove damage in its territory, so the Papua Forest Service is not given full responsibility for monitoring the mangroves it owns (Omana, 2014).

East Kalimantan is listed in the Memorandum of Understanding (MOU) between the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia and The Nature Conservancy (TNC) in 2013 concerning Program for Increasing the Capacity of Human Natural Resources in the Sustainable Management of Marine and Land Living Natural Resources in Indonesia, stated in article 3 paragraph 1 which contains the benefits of cooperation between the government and TNC to carry out sustainable management of marine and terrestrial biological natural resources in Indonesia (MOU of the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia) (Yumi, 2018). Berau is one of the districts in East Kalimantan which has the densest and most extensive distribution of mangroves among other districts in East Kalimantan. The denser the mangroves, the more effective they are in absorbing CO2 (MOU of the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia). Berau Regency has the densest and most extensive mangrove ecosystem among other districts in East Kalimantan, the area of mangroves in Berau reaches 81,549.57 hectares with a density level of 66,374.21 hectares. For this reason, the East Kalimantan Provincial Government is working to develop Mangroves in Berau together with a Non-Governmental Organization called the Nusantara Nature Conservation Foundation (*Yayasan Konservasi Alam Nusantara*/YKAN) (Pratiknjo et al., 2023).

The Nusantara Nature Conservation Foundation (*Yayasan Konservasi Alam Nusantara*/YKAN) is a local organization that partners with the Government, working in the field of Mangrove conservation and is a national institution affiliated with TNC which aims to preserve Mangrove forests in East Kalimantan. YKAN has been engaged in the field of natural resource conservation for more than 25 years. Initially, YKAN was a foreign organization from the United States and then became a National Organization due to the Regulation of the Minister of Maritime Affairs and Fisheries of the Republic of Indonesia Number 21/Permen-KP/2015 concerning partnerships for managing marine conservation areas as stated in article 4 paragraph 2C which contains Non-Governmental Organizations (Rawung & Rawung, 2018). Foreigners must have a mutual agreement with the local government and must be registered with the Ministry of Foreign Affairs (Reza et al., 2019). So foreign organizations operating in Indonesia must collaborate with local institutions/foundations (MOU of the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia).

Global warming is an event that causes an increase in the average temperature of the earth's atmosphere. The cause of the increase in the earth's average temperature is due to the presence of greenhouse gases such as the burning of coal, petroleum and natural gas. When the earth's atmosphere retains too much heat from these greenhouse gases, the temperature of the earth's atmosphere is hotter than the heat the sun radiates to the earth (Change, 2018). There are several solutions to tackle global warming, namely. Sustainable development with an environmental perspective, humans as the determinants of sustainable development must combine biophysical factors and socio-cultural economic factors. Biophysical factors as supporting biotic and abiotic environments as well as socio-cultural economic factors have a role in determining resources to support development. Maintaining biodiversity, in the current era of development, humans must manage their resources very well, if sustainable resource management is managed wisely then these resources can be shared. There are inexhaustible natural resources such as water, wind and sunlight. There are also natural resources that cannot be renewed such as minerals and oil (Clarke, 2002). Clean Development Mechanism (CDM) is a mechanism to reduce greenhouse gas emissions to help developing countries in sustainable development. This mechanism uses a win-win solution between developed and developing countries to regulate greenhouse gases. The environmental law is an environmental-based law enforcement effort that is designed to ensure compliance by the public, if it is not complied with, there will be administrative sanctions that will be imposed on companies/people who do not comply. Restoring forests or reforestation is one way to overcome global warming. By replanting trees in forests damaged by illegal logging, mining, erosion or other causes of forest damage. Because forests function to reduce greenhouse gases such as carbon dioxide (Akinyele, 2014).

Quoted from the National Aeronautics Space Administration (NASA), there are 2 responses to global warming that are occurring, namely mitigation and adaptation. Mitigation of global warming can be done by reducing the sources of emissions themselves, such as the use of fossil fuels for electricity, heating and transportation. Another step taken is to increase the use of gas absorbers (oceans, land and forests). The goal of mitigation is to avoid significant human interference with the earth's climate. Whereas Adaptation to life in climate change is carried out with the aim of reducing the risk of negative impacts of climate change (such as sea level rise, more intense extreme weather events, or food insecurity). Adaptation steps are carried out by exploiting beneficial opportunities related to climate change, for example a longer planting season or increasing crop yields in several regions (Puthalpet, 2022). Until now, the concept of Non-Governmental Organization (NGO) still has many different opinions in its definition. One of them is that according to Lewis, NGOs are non-

governmental organizations that contain voluntary groups, are non-profit and are organized locally, nationally or internationally. Non-governmental organizations are now recognized as key third sector actors in development, human rights, humanitarian action, the environment and other areas of public action (Lewis et al., 2020). NGOs have goals based on shared interests in certain issues and have various functions as services and humanity so that the public has attention to the government in terms of advocacy and policy monitoring.

2. Literature Review

Osland et al. (2018) analyses how the benefits of mangrove forest conservation contribute to controlling climate change as a result of global warming. The essence of the first research describes mangrove damage caused by 3 main factors, namely pollution, conversion that does not pay attention to environmental factors and excessive mining. Meanwhile, natural factors are tsunamis and coastal erosion. It is feared that damage to mangroves will reduce the potential of mangrove forests to control the impact of global warming, so action is needed to prevent further damage to mangroves, one of which is mangrove forest conservation so that the role of mangroves as control of global warming can continue. Mangrove forest conservation as an important aspect in managing tropical coastal systems needs to be managed well based on the integrated coastal resource management concept of Integrated Coastal Zone Management (ICZM). Forest conservation and management must consider all its constituent components comprehensively (Kementrian, 2017). Conservation that only maintains one function will cause forest destruction. Considering the important function and role of mangrove forests, it is urgent that mangrove forests be immediately managed in accordance with their function and land use. The mangrove ecosystem is closely related to climate change as a result of global warming. Mangroves participate in controlling climate change by acting as the world's lungs through absorbing and storing blue carbon (Mitra, 2013).

Abbass et al. (2022) describes how global warming and its impacts and strategies for overcoming it individually, nationally and internationally. The global warming is caused by forest destruction, due to the clearing of forest land for residential areas, agricultural fields and other economic activities. According Bieng et al. (2021), currently every year 10 to 20 million hectares of tropical forest are destroyed. Meanwhile, in Indonesia every year around 600 thousand to 2.5 million hectares of tropical forests are destroyed. This is very worrying, considering that tropical forests are considered the lungs of the earth which are able to circulate and transform carbon dioxide into oxygen. Therefore, there is a need for a strategy to overcome it internationally, nationally and individually. Internationally, several things have been done, such as the implementation of the Kyoto Protocol, the formation of international bodies and institutions, the formation of international forums and the international environmental moral movement (Greenpeace). At the national level, several policies have been implemented based on the Kyoto protocol and for individuals, it is increasing self-awareness in the use of energy saving (Aunio, 2009).

Martins et al. (2019) analyzed how the use of fossil fuels has a major influence on global warming. Johnsson et al. (2019) emphasized how the existence of industries that use fossil fuels will ultimately produce waste and if it is not localized it will become waste that endangers the environment and reduces the quality of the environment. Climate change is also increasingly dangerous, driven by the increase in the production of greenhouse gas emissions produced by human actions, such as CO2 emissions, which are caused by high burning of fossil fuels, commercial operations, transportation and military activities. Several ways that Indonesia could possibly support the Kyoto Protocol, such as limiting carbon emissions by replacing fossil energy sources with more environmentally friendly energy sources, increasing

plants to absorb excess gas, protecting and preserving forests, maintaining balance. between pollution levels and Green Open Space (*Ruang Terbuka Hijau*/RTH) in each region, creating environmentally friendly industrial and transportation machines, providing subsidies for industrial fuel conversion and encouraging research and development of environmentally friendly alternative fuels (Jacobson, 2002).

3. Methods

This research method uses a descriptive approach. A descriptive approach was chosen to provide a detailed description of the concrete steps taken by the foundation to mitigate climate change. Data collection techniques involve two main sources, namely primary and secondary data. Interviews were conducted to obtain direct information from related parties at the Nusantara Nature Conservation Foundation (*Yayasan Konservasi Alam Nusantara*/YKAN). Meanwhile, secondary data was obtained from scientific journals, books, news articles, and information available on the foundation's official website. In analyzing research data, qualitative techniques were applied. This approach is used by researchers to explain and describe research results based on the facts collected. By prioritizing the interpretation and meaning of the data obtained, qualitative techniques are expected to produce a deeper understanding of the effectiveness of mangrove use in dealing with global warming.

4. Result

4.1. YKAN Collaboration with KKP3K-KPDS

Based on the concept of global warming, two things are done in response to global warming, namely mitigation and adaptation. Humans as creatures living on earth certainly feel the impact of global warming, namely climate change. Therefore, there needs to be a response in responding to it. This response was then realized through one of the non-governmental organizations in Indonesia, namely YKAN. Realizing the impact of global warming, YKAN sees the potential of mangroves which have been proven by experts to be greater carbon absorbers than other forests. One of these potentials is seen by YKAN in Berau Regency. YKAN mitigates the impact of global warming through mangrove conservation in the Berau region (Wiati et al., 2022). YKAN's conservation timeline for Berau mangroves 2018-2022 can be seen in the table below:

Table 1. Timeline of YKAN Conservation Efforts in Berau 2018-2022

No	Year	Conservation Program
1	2018	Derawan Islands Coastal and Small Island Conservation Area and Surrounding Waters (KKP3K-KPDS)
2	2019	Citizens' Inspirational Action for Change (SIGAP)
3	2020	Shrimp Carbon Aquaculture (SECURE)
4	2021	Shrimp Carbon Aquaculture (SECURE)
5	2022	Shrimp Carbon Aquaculture (SECURE)

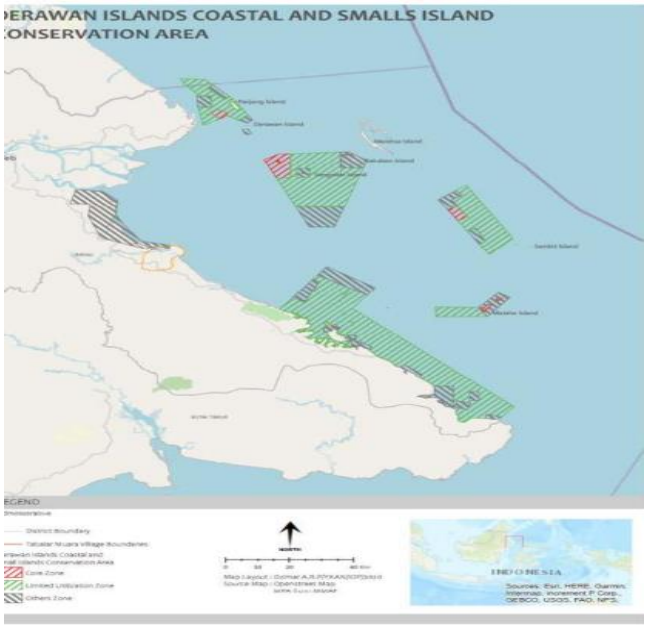
YKAN's collaboration with the Derawan Islands and Coastal Conservation Area and Surrounding Waters (KKP3K-KPDS). YKAN plays an active role as a companion to the government in developing concept designs, preparing the Coastal Area and Small Island Zoning Plan (RZWP3K), as well as achieving each stage of development of water conservation area management in Berau Regency. This conservation concept has undergone two changes in the status of management authority for Marine Protected Areas (*Kawasan Konservasi Perairan*/KKP) from regional government to provincial level in 2016, as well as three changes in name from Berau Marine Conservation Area in 2005, Derawan Islands Coastal Park in

2013 to finally becoming KKP3K- KPDS in 2016. KKP3K-KPDS is regulated in PERMEN-KP NO.21/Permen-KP/2015 concerning Water Area Management Partnerships. This determination itself aims to pay attention to three important aspects, namely ecology, socio-culture and economics. With conservation targets, namely coral reefs, seagrass, mangroves, turtles, whale sharks, cetaceans, rays, mantas, stingless jellyfish and increasing the capacity of community stakeholders (Susilo, 2020).

Table 2. YKAN Collaboration with (KKP3K-KPDS)

No	Year	Conservation Program
1	2018	Derawan Islands Coastal and Small Island Conservation Area and Surrounding Waters (KKP3K-KPDS)
2	2019	Citizens' Inspirational Action for Change (SIGAP)
3	2020	Shrimp Carbon Aquaculture (SECURE)
4	2021	Shrimp Carbon Aquaculture (SECURE)
5	2022	Shrimp Carbon Aquaculture (SECURE)

KKP3K-KPDS management is carried out by dividing area use through a zoning system consisting of core zones and limited use zones. Core zone has an area in good natural condition and is intended for the breeding of fish and other marine biota with the aim of being a source of food reserves for the community. Meanwhile, the limited use zone consists of the tourism and sustainable fisheries subzone, which functions to maintain the sustainability of marine biota and coastal ecosystems for the purposes of tourism and sustainable fisheries activities, in order to support community welfare. Mangrove Protection and Ecotourism Sub Zone functions in ensuring comprehensive protection of the mangrove ecosystem which supports global warming mitigation, community livelihoods and ecotourism activities in the region. Other zones utilized by prioritizing environmentally friendly and sustainable principles for traditional fishing activities, aquaculture and medium-scale fisheries with certain arrangements (Burrough, 2020).



Source: IUCN 2021

Figure 1. Derawan Island Conservation Area

Based on data from the Department of Culture and Tourism, Berau Regency in 2018, it shows an increase in the number of tourists from year to year. Around 286,000 tourists visited Berau, an increase of around 2.7 times in 4 years. Around 94-99% are Indonesian tourists. 50% of tourists visit the KKP3K-KPDS area. The increase in tourists also has an impact on increasing visitors to hotels, inns and homestays. With a total of 220 accommodations, there was an increase of 75% in visitors, apart from that, water transportation also increased (Purwanto et al., 2021). With high tourist activity in the KKP3K-KPDS area and its surroundings, the potential for damage to the ecosystem and rare species such as stingless jellyfish is also high. In addition, residual oil from speedboats, household waste in hotels, inns and homestays that are not properly regulated will cause damage to the ecosystem in the KKP3K-KPDS area. The use of lotion, sun block, and swimming with swimming equipment in the Kakaban saltwater lake are serious threats to stingless jellyfish. Various educational programs for tourists have been carried out by the government and non-governmental organizations to reduce the impact of ecosystem damage and the importance of protecting species (Purwanto et al., 2021).

The opening of ponds and ecotourism in conservation areas and the small island of Derawan Island and its surroundings have had the impact of reducing the existence of the mangrove ecosystem, where various species reside. The decline in the mangrove ecosystem also impacts its ability to withstand waves and tsunamis. Based on the 2016-2036 Berau Regency Layout, the Berau coast is categorized as an area that is vulnerable to tsunamis and abrasion. In addition, the conversion of mangrove forests into ponds will affect the function of the mangrove ecosystem as a carbon sink. In other words, the loss of mangroves will increase the distribution of greenhouse gases in the air (Purwanto et al., 2021). To respond to this, KKP3K monitoring, and research was carried out. Research activities in the KKP3K-KPDS area are generally carried out in ecosystems located in the core zone. In addition, research in mangrove and seaweed ecosystems within the KKP3K-KPDS is in the limited use zone. Apart from monitoring environmental health and external damage, research on mangrove and seaweed ecosystems focuses on the use of blue carbon. Other research in the KKP3K-KPDS area is the use of mangroves as anti-cancer and antioxidant drugs. Research in the KKP3K-KPDS area provides benefits for the community, Marine Protected Area (MPA) team and other stakeholders.

Source: YKAN

Figure 2. KKP3K-KPDS Special Use Zone

The figure 2 shows the mangrove and seaweed ecosystem as one of the KKP3K-KPDS research and monitoring targets. One of the research and monitoring targets of KKP3K-KPDS. The solution framework provided by KKP3K-KPDS is to provide

an opportunity to increase education to all levels of society and awareness to all local communities, promote and implement better practices in Marine Protected Area (MPA). It is hoped that it can contribute to increasing protection of the mangrove ecosystem. In order for MPA to work, it needs to work together with environmental communities, one of which is YKAN. Meanwhile, KKP3K-KPDS runs with regional support from the government and support from YKAN as a partner who is very helpful because of its experience in MPA itself.

4.2. Citizens' Inspirational Action for Change (SIGAP)

Citizens' Inspirational Action for Change or SIGAP is a social approach to assist program implementation processes at the community level to encourage increased capacity and independence of village communities in the practice of sustainable use of natural resources and protection of important ecosystems in their area. One of the SIGAP programs is coastal SIGAP which was prepared to encourage communities to face critical issues that occur on the coast such as ecology, social, economic, agrarian, and geopolitical. Ecological damage, both natural and anthropogenic. Naturally, such as tsunamis, hurricanes, El Niño and earthquakes. Global warming also contributes to changes in the ecology of coastal villages. Meanwhile, direct ecological damage includes fish bombing and other destructive fishing practices, pollution, and coastal erosion due to mangrove clearing. The coastal SIGAP approach by YKAN combines two methods, Appreciative Inquiry (AI) and Participative Rural Appraisal (PRA), where the PRA approach functions as problem solving used in the planning stage. Meanwhile, AI is used to improve the collection of information needed in village planning (Thomas, 2009). Through the SIGAP approach, strengthening community capacity to manage natural resources at the regional level in East Kalimantan Province. One example of a village assisted by SIGAP is Biatan Bapinang Village, which has biodiversity potential and ecotourism development potential that can still be polished. This village has a mangrove forest covering an area of 6.5 hectares which is located in the Other Use Area (APL). For two years starting from 2020, YKAN and the Foundation for the Improvement and Development of Community Resources (YP2SU) implemented the SIGAP approach in Biatan Bapinang Village with the aim of assisting in improving governance, improving the economy of residents, and protecting natural resources of important value (Thomas, 2009).

Source: Merdeka.com

Figure 3. Hot Water Soaking Tour in the Middle of Mangroves

Bapinang uses hot water rivers as a unique mangrove ecotourism. Another achievement of this assistance is the establishment of a High Conservation Value Area (*Kawasan Bernilai Konservasi Tinggi*/ANKT) covering an area of 5,121 hectares in Biatan Bapinang Village. This ANKT is then managed by the village conservation

institution, namely the Mampanas Nuntulung Tourism Awareness Group (pokdarwis). This assistance also helps create 3-dimensional maps and Village Land Use Plan maps. To achieve the conservation aspect, signs have been installed in conservation areas and routine patrols. From an economic perspective, residents now have alternative income by cultivating kelulut bees, and there has been an increase in Pokdarwis institutions in managing the village's tourism potential (Kusuma et al., 2020).

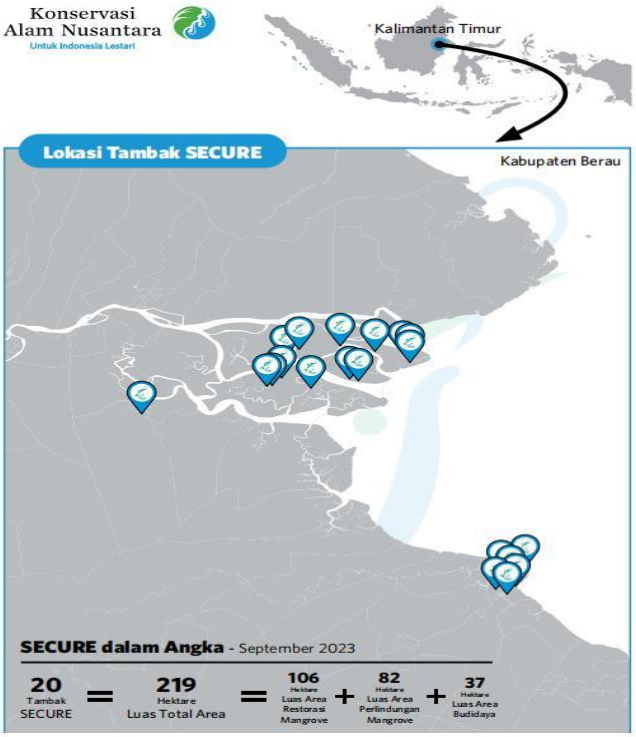
4.3. Shrimp Carbon Aquaculture (SECURE)

Mangroves make a major contribution to carbon mitigation, 3-5 times more than tropical rainforests. Of the many factors, the practice of shrimp farming is a contributor to the reduction of the global mangrove ecosystem Shrimp Carbon Aquaculture or SECURE Factsheet 2020. Most of the existing low-quality shrimp ponds are the result of conversion of mangrove land. This type of tiger prawn from the aquaculture sector is the type with the fastest growth, with a trade value reaching 15% of the total global trade value of international fisheries. Because Indonesia is targeting export volumes of up to 250% in 2024, which is expected to help the local and national economy. This is one of the reasons that encourages many parties to look for ways and strategies to minimize negative impacts rather than prohibiting the practice of shrimp farming. Environmentally based cultivation was then initiated by YKAN and is expected to provide a great opportunity to increase production and product quality, as well as enable wider market penetration, without ignoring the function of mangroves as carbon absorbers. SECURE is an approach to increase coastal resilience by returning 50-80% of pond land to mangroves, and the remaining land can be used for cultivation with better and environmentally friendly cultivation management practices in an effort to increase production (Ahmed et al., 2018). This effort is important so that the mangrove ecosystem remains healthy and can support environmental conservation.

Source: SECURE YKAN Factsheet

Figure 4. Six SECURE Targets

The image above shows how the SECURE program will continue to prioritize the function of restoring mangrove ecosystems and reducing carbon emissions. The target of SECURE YKAN in 2025 is to become a successful 100-hectare pilot pond, restore at least 50 of the 100 hectares of ponds back to mangroves, a maximum of 20 of the 100 hectares of shrimp ponds are managed sustainably, 3 ponds have successfully received IndoGAP certification and meet international standards for practice. sustainable cultivation and the Berau Regency Government adopted the SECURE model for implementation in Berau. The SECURE Berau program by YKAN has been running since 2020, the location of the SECURE pond can be seen in the picture below:



Source: SECURE YKAN Factsheet

Figure 5. SECURE Pond Location

Ponds using the SECURE approach have begun to be implemented in Tabalar Muara Village and Pegat Batumbuk Village, Berau Regency, East Kalimantan. In 2021 the SECURE program will also collaborate with PT. Indonesian Infrastructure Guarantee (Persero)/PT PII. With the assistance location in Pegat Batumbuk Village, Derawan Island District. This collaboration will last up to 3 years. The community will be accompanied and given information and training regarding sustainable aquaculture practices. According to the Main Director of PT. PII M. Wahid Sutopo, collaboration with YKAN is necessary because in the study of natural climate solutions, mangroves contributed 3% to the national emission reduction target (Tosiani & Novita, 2022).

Source: YKAN Secure

Figure 6. SECURE Pond Program in Berau Pegat Batumbuk Village

The implementation of the SECURE Kampung Pegat Batumbuk program is expected to promote and expand the reach of farmer groups to support government efforts in the mangrove restoration program and protect nature which has protected the community, quoted from the statement by YKAN Development and Marketing Director Ratih Loekito (Gunawan & Visser, 2012). The achievement of the SECURE program in 2022 is that 10 hectares of active shrimp ponds have been restored to 2 hectares of shrimp ponds. Meanwhile, the remaining 8 hectares are used as a mangrove restoration area which will support natural food for shrimp and fish, as well as reduce carbon emissions.

Source: YKAN Secure 2022

Figure 7. Shrimp Pond and Mangrove Restoration 2022

Figure 7 is a form of the SECURE program in the Village. Batumbuk last update in 2022. At the end of 2022 the SECURE approach has been implemented in 100 hectares of pond land in three villages in Berau Regency, East Kalimantan Province. Of these three efforts, YKAN in its conservation certainly has several achievements. In 2021, the Mission Lestari campaign will be held for the first time. This campaign carries the theme of milformangrove which is aimed at increasing public awareness about the importance of the mangrove ecosystem. For 2022 itself, overall it shows increasing corporate support for YKAN as an illustration that the level of trust is also increasing to continue to make YKAN a trusted partner in carrying out conservation initiatives. At the end of 2022, collaboration has been established with five partners who support various YKAN program strategies, namely supporting the implementation of nature-based climate solutions, mangrove restoration, implementing SECURE, supporting the SIGAP approach and protecting coastal areas through cultivation, one of which is in Berau Regency, East Kalimantan (Ahmed, 2022).

Based on the 2022 report, the YKAN membership program has been supported by more than 6,000 members joining, while domestic fundraising increased 16% compared to the previous fiscal year. For Berau, the achievements that can be seen are that village spatial planning and important habitats have been carried out in 23 SIGAP villages in Berau Regency and others. Vulnerability analysis and adaptation strategies have also been carried out in 12 villages (five in Berau Regency and seven in the Bird's Head Seascape area, West Papua Province) structured in a participatory manner. These strategies are carried out using a nature-based solution approach to increase the resilience of coastal ecosystems in mitigating the impacts of global

warming and will be integrated into village plans. However, these efforts as a whole have more of an impact on the economy of local communities in the Berau region, rather than their contribution to mitigating the impacts of global warming. This is proven by BMKG observation data over the last 40 years which shows that East Kalimantan is experiencing the highest rate of increase in surface air temperature in Indonesia. With a temperature increase of 0.47 degrees in East Kalimantan as a whole and for Berau itself up to 0.95 degrees Celsius (Rusmayadi, 2023). However, YKAN will continue to carry out its vision, namely protecting land and waters that support life and will continue to carry out its mission, namely creating a sustainable earth for future generations, creating a prosperous Indonesia, where the pace of life and development runs in harmony with natural resources for years to come.

5. Conclusion

Global warming has been an issue since the industrial revolution era of the 1850s and we feel its impact to this day. There has been a very significant increase in temperature due to the contribution of human activities. The highest recorded temperature rise in Indonesia was in East Kalimantan, Berau region. However, apart from that, the Berau region has large potential for mangrove forests, so if conservation is carried out it is hoped that it can contribute to mitigating global warming, considering that mangroves have better carbon absorption capacity than other forests. Apart from these functions, the condition of mangroves which is decreasing every year requires efforts to overcome global warming and degradation of the mangroves themselves. In the analysis explained by the author in previous chapters, YKAN's efforts to mitigate the impact of global warming, namely collaborating with KKP3K-KPDS, implementing the coastal SIGAP program and implementing the SECURE program in the Berau region have had more of an impact in the economic sector than ecology itself. This can be seen from the achievements of each program which has generated new alternative income for the people in the Berau region, while the impact of global warming itself is still being felt, marked by the increasing temperature changes felt (based on BMKG data). However, it cannot be denied that local efforts are not enough to have an impact on climate change that is occurring. Global warming, must be made globally as well, so that the impact can be felt. However, YKAN will continue to make efforts, and it is hoped that it can become an example that can spread to other institutions and organizations throughout the world, considering the importance of mitigating the impact of global warming for a better earth through mangrove conservation.

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