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MORALITY BEFORE KNOWLEDGE

Community-led coastal resilience: Integrating local knowledge and collaborative disaster management

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ABSTRACT

Background: The community of Oesapa Fishing Village, Kupang City, East Nusa Tenggara Province, has an inspiring experience in facing disaster risks. The community demonstrates resilience and adaptability to disasters and climate change, which is widely appreciated. **Methods:** This study uses a qualitative method with direct observation, in-depth interviews, and an active participation approach. Informants include internal community members of Oesapa Fishing Village and external stakeholders such as the Pikul Foundation and several government agencies in Kupang City, including the Oesapa Sub-district Government. **Findings:** The community faces several disaster threats, including high waves, strong winds, drought, and occasional flooding. High waves are mainly caused by the village's coastal location in Kupang Bay with low topography. This study explores community knowledge of disaster risk, external intervention models and their impacts, as well as behavioral patterns and strategies used by the community to strengthen resilience. **Conclusion:** The findings show that: (1) the community holds a socio-ecological understanding of disasters, viewing them as resulting from human-environment interactions such as environmental degradation, mangrove destruction, and pollution, with threats originating from both land and sea; (2) external interventions from institutions such as the PIKUL Foundation, BPDAS Benain Noelmina, BPBD Kupang City, and BMKG Tenau Maritime Station have significantly shifted local knowledge from intuitive-based understanding toward more scientific and technology-based systems; and (3) community resilience is strengthened through collaborative disaster management aimed at reducing loss of life, economic damage, and environmental degradation. **Novelty/Originality of this article:** The study highlights the role of fishing norms as social capital, fishermen livelihoods as economic capital, and mangrove ecosystems as coastal environmental capital in building community resilience.

KEYWORDS: coastal communities; community resilience; disaster risk; Oesapa Kupang.

1. Introduction

A disaster is an event or series of events that threaten and disrupt people's lives and livelihoods (Uddin, 2021) caused by natural and/or non-natural factors as well as human factors, resulting in human casualties, environmental damage, property losses, and psychological impacts (BNPB, 2020). This means that anything is called a disaster if the event threatens and disrupts the lives of human communities (Khusna, 2023). Geological and non-geological factors that result in loss of life, environmental damage, facilities and infrastructure, property losses, and psychological impacts can be called disasters (Chmutina & von Meding, 2025). However, humans are able to mitigate disasters by using culture adapted to the conditions of the area where they live. The manifestation of community

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resilience culture is local wisdom. Local wisdom is the ability to adapt, regulate, and process the influence of nature and other cultures (Suarmika, 2022). Disaster risk reduction is both a concept and a practical approach to reducing disaster risk through systematic efforts to analyze and manage the factors that cause disasters, including reducing the risk of hazards and minimizing the vulnerability of lives and property (Fakhri, 2017). The most important aspect of increasing community resilience in the face of disaster risk is strengthening community capacity.

Because the primary victims of disasters are communities, the study of community resilience is crucial in analyzing community patterns and strategies in responding to disaster threats. The United Nations International Organization for Disaster Risk Reduction (UNISDR) defines disaster resilience as: "The system of capabilities of a disaster-affected community or society to resist, absorb, and accommodate, and recover from the impacts of a disaster in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions." This concept offers a more systematic and cross-sectoral approach to disaster risk reduction, climate change adaptation, and the humanitarian sector (Chmutina & von Meding, 2025). Kupang City, the capital of East Nusa Tenggara Province, is located on the north coast of Timor Island and has a 22.7-kilometer coastline. With its coastal geography and extensive coastline, Kupang City faces disaster threats from both land and sea. It's no surprise that the majority of its population relies economically on the coast and is a fisherman. One area in Kupang City that is striving to build resilience in the face of disasters is the community of Oesapa Fishing Village. The community of Oesapa Fishing Village is one of many communities inhabiting the northern coast of Timor Island.

It is located along the coast within the administrative area of Oesapa Village, Kelapa Lima District, Kupang City, East Nusa Tenggara. The distance between the sea and the settlement is limited only by a village road and an abrasion retaining wall. The community of Oesapa Fishing Village in Kupang City, East Nusa Tenggara Province, has an inspiring story of how they face disaster risks. They have demonstrated resilience and adaptability (Khadka, 2024) that are worthy of recognition. Throughout the period between 2011 and the present, the community of Oesapa Fishing Village in Kupang City has experienced various threats and disasters.

According to records from the Central Statistics Agency of East Nusa Tenggara Province (BPS NTT) in 2024 regarding disaster events in the NTT province area from 2018 to 2023. The most dominant ones threatening the East Nusa Tenggara area were whirlwinds, followed by floods and droughts, landslides, coastal abrasion and waves. Whirlwinds are usually accompanied by high waves, considering that most areas of East Nusa Tenggara consist of coastal regions and small islands. Therefore, strong winds and high waves disrupt the economy of fishermen because fishing boats cannot operate, and they also threaten coastal fishermen's settlements, especially the fishermen's village of Oesapa in Kupang.

The categories of disaster events that frequently threaten the Oesapa Fishing Village community include high waves, strong winds, drought, and, to a lesser extent, flooding. High waves and strong winds occur because the fishermen's village is a coastal area located very close to the sea, while floods are caused by the village's location in the lowest-lying area, located at the mouth of the Liliba River. These events are addressed using the community's own local knowledge (Liang, 2020), utilizing their livelihood assets and knowledge potential to build a self-sufficient community resilience system (Kobluk et al., 2021). Disaster lessons are a key strategy for character development (Kitagawa, 2021), as learning through disasters is also internalized in local wisdom values for three character traits: social awareness, environmental awareness, and creativity (Suarmika, 2022).

Social awareness is demonstrated through mutual cooperation and environmental awareness through cleanliness and environmental conservation activities, and creativity is demonstrated through effective post-disaster management (Erni Suharini, 2015). This research is limited to the effort to explore how the community of Oesapa Fisherman's Village, Kupang City, East Nusa Tenggara, in the period before external intervention until 2024, attempted to overcome disaster risks with local resources and limited capabilities,

then the influence of external intervention, and the relationship between the two which became a component of adaptive change in building the resilience of the Oesapa Fisherman's Village Community, Kupang City, East Nusa Tenggara.

2. Methods

This study uses a descriptive research method with a qualitative approach. Data collection techniques in this study used active participant observation and in-depth interviews with internal and external parties (Benedict, 2023; Austin, 2024). Internal parties are the community in the Oesapa Fishermen's Village, Kupang City itself, while external parties consist of the government and other stakeholders whose roles are recognized by the community of the Oesapa Fishermen's Village, Kupang City in efforts to increase disaster resilience (Mueller, 2023). Active participant observation was carried out by directly observing objects in the field and taking pictures in the form of photographs or documentation that can support research activities.

2.1 Research location

The location of this research was conducted in Oesapa Fishermen's Village, Oesapa Subdistrict, Kelapa Lima District, Kupang City, East Nusa Tenggara Province. Oesapa Village covers an area of 4.37 km2 with a population of 26,838. Geographically, it is located at coordinates 10° 8′ 57″ S, 123° 38′ 29″ E (Bansele, 2024). Administratively, the Oesapa Village borders the following areas: North: Located on the coast, bordering Kupang Bay. East: Bordering Lasiana Village. West: Bordering West Oesapa Village, with the Liliba Watershed as the boundary. South: Bordering South Oesapa Village. Administratively, Oesapa Fishermen's Village is an area within Oesapa Village, Kelapa Lima District, Kupang City, East Nusa Tenggara.

Oesapa Fishermen's Village in Kupang City comprises 9 neighborhood units (RT) and 4 neighborhood units (RW), which have formed a community group as a means of structured communication and coordination in response to disaster threats. The group was named the "Angsa Laut Joint Business Group (KUB)" because they are geographically located on the coast and economically dependent on fishing. The location of the fishing village along the Oesapa coastline means that disasters can occur from both land and sea. The disasters that frequently threaten coastal communities include extreme weather, strong winds, earthquakes, high waves, tsunamis, tidal flooding, and if rainfall intensity is high, it can lead to flooding during the rainy season (Jenkins, 2023).

2.2 The disaster that occurred in Oesapa Fishing Village

One of the climate phenomena that have an impact and become a disaster in the East Nusa Tenggara region is El Niño and La Niña (Karuniasa, 2020). These two natural climate phenomena have a major impact on the activities of fishing communities who fish in marine areas and those who live in coastal areas (PIKUL, 2024). The El Niño phenomenon is the warming of sea surface temperatures in the central and eastern Pacific Ocean to warmer than normal temperatures. Meanwhile, La Niña occurs when sea surface temperatures become cooler than normal in the same region. These two phenomena can bring significant climate change, which in turn can affect the condition of marine ecosystems and fishing catches of fishing communities (Li, et al., 2023). Disasters that frequently occur in the Oesapa Fishing Village, Kupang City include tropical cyclones, strong winds and high waves, and droughts, as shown in Fig. 1. When high waves pass through the retaining wall and inundate residents' homes.

Strong winds can occur on land or at sea. When strong winds occur on land, they can cause houses to collapse and trees to fall. If accompanied by heavy rain, they can lead to landslides (Sakar et al., 2024). When strong winds occur at sea, they pose a threat to fishing

communities and coastal areas, combined with high waves, which can cause coastal houses to collapse and damage fishing boats, thus hampering the community's economic base.

Fig 1. Ocean waves threatening the lives of the Oesapa Fishing Village community

2.3 External parties who intervene

Several parties are involved in capacity building to build a resilience system in the Oesapa fishing village community. It is acknowledged that numerous external parties are involved, both individually and institutionally, in interventions for the Oesapa fishing village community in Kupang City. This does not negate the role and involvement of parties not mentioned in this study. However, due to time constraints and to focus this research on disaster management efforts and capacity building for community resilience, only a few were selected, assuming they are relevant to the study. These include non-governmental organizations (NGOs) such as the PIKUL Foundation (Penguatan Lingkar Belajar Komunitas Lokal) and government agencies such as the BMKG (Meteorology, Climatology, and Geophysics Agency) Tenau Kupang Maritime Meteorology Station, the Benain-Noelmina Water Resources Management Agency (BPDASHL), and the Kupang City Regional Disaster Management Agency (BPBD).

The following are the works of external parties who intervened in the Oesapa Fishermen's Village community in Kupang City, namely: The PIKUL Foundation has been active with the Oesapa Fishermen's Village community since 2017 with its first program, the Right to Food (RTF) from 2017 to 2019. The aim of this program is to encourage coastal communities to learn about the basic rights and needs of fishermen as citizens and who are protected according to Law Number 7 of 2016 concerning the Protection and Empowerment of Fishermen, Fish Farmers, and Salt Farmers. This program also encourages the inclusion and recognition of women as fishermen to obtain protection rights because women are also involved in all processes at sea. Starting from before going to sea, some participate in going to sea until the process after going to sea. The second work program of the PIKUL Foundation in 2021 in the voice of action project for climate justice. The aim of this program is how coastal communities and those who make a living as fishermen, especially small and traditional fishermen, can access their rights and needs on the coast. One of these concerns the issue of climate change and ensuring that infrastructure in coastal areas accommodates the community and does not restrict their livelihoods. Every development must consider access and not further complicate fishing boat parking. During extreme weather, communities receive not only weather information but also insurance for work accidents, damage to boats, fishing gear, and protection mechanisms when fishermen go out to sea and encounter high waves that could endanger their lives.

The Meteorology, Climatology, and Geophysics Agency (BMKG), through its "Fishermen's Weather Field School" program, began intervening in the Oesapa fishing village community in 2019. The program aimed to provide weather information to coastal fishing communities and provide direct education. Then, in 2022, due to complaints regarding the coastal weather information system, the Seroja tropical cyclone disaster in April 2021 was considered the largest disaster and worst experience for the people of NTT. This disaster left coastal communities deeply traumatized and anxious, often receiving hoaxes about the weather. The fishing village community took the initiative to request assistance with the BMKG for weather monitoring equipment. A year after the Seroja disaster, the Meteorology, Climatology, and Geophysics Agency (BMKG) provided a weather information service in the form of a weather monitoring device for fishermen equipped with the INA-WIS (Indonesian weather information for shipping) application. The BMKG provided a monitor with the weather monitoring application installed, which could be accessed directly by the residents of the Oesapa fishing village. This weather information display can actually be accessed by everyone throughout Indonesia through the website https://maritim.bmkg.go.id/inawis, which shows wind direction, wave height, and fish distribution in Indonesian waters.

The BPDAS-HL (River Basin and Protected Forest Management Center) Benain Noelmina began installing rainwater harvesting (IPAH) in the Oesapa fishing village in 2022 and 2023. The purpose of this program is to meet the drinking water needs of the residents of the Oesapa fishing village. Considering that the need for drinking water in Kupang City is very high and its use always exploits groundwater, it is necessary to utilize rainwater to unravel the use of groundwater. In addition, this program can help answer community problems in anticipating drought disasters and reducing flooding through rainwater reservoirs installed connected to the roof of the house and rainwater that enters the reservoir can be directly consumed. The Kupang City BPBD has activities and programs for monitoring tidal waves that are carried out annually and seasonally, especially during the rainy season in the administrative work area of Kupang City, one of which is in the coastal area of Oesapa. The purpose of this program is to monitor sea level rise and anticipate high waves in the waters of Kupang Bay. In addition, the BPBD has a SMAB (Disaster-Safe Madrasah School) program. The aim of the SMAB program is to provide students with knowledge of disasters and disaster management methods for elementary school students, which will begin in 2024 in Oesapa.

3. Results and Discussion

3.1 Fishing communities understand disasters

The people of the Oesapa fishing village in Kupang City understand that disasters pose two major threats to those living along the coast: those from the sea and those from the land. They also recognize that living as a coastal community means living in a state of vulnerability. The Oesapa fishing village community possesses a socio-ecological understanding that humans are part of nature itself (Maurischa et al., 2023). There is no dichotomy between the two. Disasters arise from climate change and human actions on the environment, overexploitation, marine pollution, destruction of mangrove ecosystems, and even human ignorance (Hiwasaki et al., 2014). Non-human elements such as mangroves, coral, and fish cease to reproduce due to human ignorance, which contributes to their destruction and exploitative activities to meet human needs.

Meteorological elements such as wind, waves, the moon, stars, and the sun are the fishermen's allies (Sousa et al., 2022). Wind and waves propel boats. The moon serves as a marker for the rise and fall of sea levels. The stars serve as a guide and guide their way home at night. The sun serves as a timepiece, and their shadows help them read the wind direction. The experience of recurring disasters affecting coastal communities can be a learning experience in building community resilience through a highly adaptive process (Choudhury et al., 2021). This adaptive process in coastal fishing villages is coupled with intervention

efforts by external parties. Losses of life, economic disruption, financial losses, and even the means of livelihood, such as boats, are often damaged by weather events that are only observed through the fishermen's interpretations and seasonal calculations. This activity is referred to by the community as "challenging nature".

3.2 Intervention as a form of increasing community capacity

Community development is not a quick fix for addressing the problems faced by the community. Community development requires time and careful planning as a collaborative effort, ensuring the community feels involved, connected, planned, and constantly reflective (Blust et al., 2021). Various efforts have been made to identify how community resilience is formed, including examining factors that promote the growth of community resilience and the level of resilience, based on very different dimensions of location and time (Kessel, 2025). Identifying community resilience can be seen by referring to the dimensions of community resources, community resource development, involvement or influence over resources, and collective action within the community carried out by active and equitable members within the community.

Fig. 2. Shows that the necessary intervention model is a community development model, an effort and process to create community progress (Hurd & Stanton, 2022) through community understanding of their environmental conditions through active involvement, mutual engagement, co-design, and continuous reflection by the community itself. This model does not view the community as a client but rather as a social group possessing the potential to fully understand local values. This community development model can empower integrated communities and develop their capacity to solve their problems cooperatively and develop self-help skills. The community recognizes the potential of their environment, which is fraught with disaster risks, and the agencies they partner with clearly have a relationship with the lives of coastal communities. Initially, the community formed a joint business group (KUB) called Angsa Laut. Through this coastal community and fishing organization, they established partnerships with the BMKG (Meteorology, Climatology, and Geophysics Agency), the Regional Disaster Management Agency (BPBD), the Search and Rescue Team, the Indonesian Navy (TNI AL), and the Water Police.

Fig 2. Community development intervention model for capacity building to build community resilience

The community was enthusiastic about being involved in government work programs. They felt that their energy and ideas were being invested in building community resilience

strategies (Suhardita, 2024). They apply the knowledge they have gained through external interventions not only within their own communities but also to development efforts elsewhere. Through community partnerships with the Regional Disaster Management Agency (BPBD), they understand the disaster response process and develop it to minimize threats and risks. The community is also able to understand the IPAH program as an effort to mitigate drought and reduce the risk of flooding. Rainwater is harvested and no longer discharged into the sea, but rather as a process of planting water and injecting dug wells. Rainwater is no longer discharged into the sea or becoming floodwater. It can meet the needs of the community in the coastal area of the Oesapa fishing village.

The Indonesian government strives to build community resilience through the Disaster Resilient Village (Destana) program, which positions communities as active subjects and fosters their ability to shape community structures for the sustainability and continuity of the program. According to the National Disaster Management Agency (BNPB, 2012), the Disaster Resilient Village program is developed based on several principles, including the understanding that disaster management is a shared responsibility, development must be based on disaster risk reduction, and the fulfillment of community rights must be prioritized. In addition, communities are positioned as the primary actors in achieving the success of Disaster Resilient Village development, which is implemented in a participatory manner through the mobilization of local resources. The program also emphasizes inclusiveness and humanity, promotes justice and gender equality, supports vulnerable groups, and upholds transparency and accountability. Furthermore, the program encourages partnerships, adopts a multi-threat approach, supports autonomy and decentralization of government, integrates with sustainable development, and is implemented across sectors.

Table 1. External intervention actions and their impact on the Oesapa Fishing Village community

Institutions	Work programs	Year	Objectives	Impact
PIKUL Foundation	RTF (Right to Food); Voice of Action for Climate Justice	2017-2019; 2021	To encourage coastal communities to learn about the basic rights and needs of fishermen as citizens protected by Law No. 7 of 2016 concerning; to encourage the inclusion and recognition of women as fishermen.	The community began to realize their rights as fishermen, guaranteed by law. The community eventually formed the Angsa Laut Joint Business Group (KUB) with the initial goal of gaining access to government programs.
Tenau Kupang Maritime Meteorology, Climatology, and Geophysics Agency	Fishermen's Weather Field School; Weather Monitoring Equipment Installation	2019; 2022	Coastal communities and those who earn their living as fishermen, especially small-scale and traditional fishermen, can access their rights and needs along the coast. Infrastructure built in coastal areas can accommodate the community and not restrict their livelihoods.	The community, especially women, began to change their employment status to Fisherman on their ID cards (KTPs); the community understood their role and involvement in mitigating the impacts of climate change, thereby reducing plastic waste dumped into the ocean.
Benain Noelmina Regional Disaster	Rainwater Harvesting Installation (IPAH)	2022; 2023	The Meteorology, Climatology, and Geophysics Agency (BMKG) no longer	The Angsa Laut KUB began building a partnership with the Meteorology, Climatology, and Geophysics

Institutions	Work programs	Year	Objectives	Impact
Management Agency			only provides weather information to the public but also provides direct education to the community. Communities monitor their own weather before going out to sea.	Agency (BMKG); Weather information became an early warning system within the community; accidents at sea resulting in loss of life and boat damage decreased; the community began shifting from a system of local wisdom that previously relied on intuitive feelings and intuition to a technology-based information system that is artificially scientific.
Kupang City Regional Disaster Management Agency	Tidal Wave Monitoring; Tsunami Disaster Preparedness Training; Disaster-Safe Madrasah Schools	Annually since 2019; 2021; 2024	To meet the drinking water needs of residents.	The community no longer purchased clean water during the rainy season; knowledge about water conservation meant that rainwater was no longer channeled into the ocean but instead injected into wells; flooding, which usually occurred within 6-8 hours, began to subside within 15-30 minutes due to rainwater infiltration into the wells. The community also measures the rise in sea water independently as a strategy to face threats in coastal areas that are vulnerable to the danger of high waves; The community prefers to evacuate together and set up refugee tents when receiving information from the BMKG. Important assets such as boats and fishing gear will be secured first when there is an information warning system; Children in fishing villages participate in planting mangrove trees and learn to understand the weather system from early warning displays and weather information.

Several programs have been carried out by external parties, including governmental and non-governmental organizations, for the fishing village community as part of efforts to strengthen community resilience. The impacts of these interventions on the Oesapa fishing village community are presented in Table 1 above. While different interventions by external parties do create adaptive changes and achieve the desired goals of the intervention, there are indications of conflict within community, such as a lack of capacity and a willingness to accept expert concepts. Instead, the community prefers increased knowledge and awareness so they can address the challenges facing their communities (Fox, 2023).

3.3 The relationship between community knowledge and interventions in community resilience strategies

In practice, community resilience frameworks, particularly in the face of disasters, have been developed internationally, including the Yokohama Strategy (1994), the Hyogo Framework (2005–2015), and the Sendai Framework (2015–2030). The United Nations (UN) Hyogo Framework emphasizes efforts and prioritized actions taken by stakeholders and governments. The Hyogo Framework notes that risk reduction requires the involvement and partnership of all levels of society. Furthermore, empowerment and inclusive participation that are accessible and non-discriminatory are necessary. The framework priorities for building community resilience to disasters, as outlined in the Hyogo and Sendai Frameworks, illustrate that community resilience is a key aspect in facing various disaster challenges.

"Nature creates something we can enjoy, so our duty is to protect it", was expressed by a resident of the Oesapa fishing village in Kupang City to the author. The context of this expression is that the coastal communities of the Oesapa fishing village understand that the sea, their lifeblood, is becoming polluted and sometimes more erratic than usual due to climate change, which triggers disasters. Frequent disasters include high waves, strong winds, and short rainfall, resulting in water shortages (threats of drought). These disasters not only threaten the lives of coastal residents but also the economy and physical environment, particularly for those whose livelihoods are fishermen. The coastal fishing community of Oesapa is making every effort to mitigate the climate and its impact on all aspects of their lives. The knowledge gained through external interventions seems to enhance the community's ability to connect this knowledge with the maritime experiences passed down from their ancestors. Through their interactions with their coastal environment, they are aware of several changes in their livelihoods.

The resilience of a community can be seen from how its internal resources are owned, utilized, and used by community groups to respond to the changes they face (Akamani, 2021). These resources can be economic, social, cultural, environmental, and even political (Chen et al., 2024). The economic, social, and environmental capabilities of community groups are a unified whole, bound together by the concept of community resilience in strengthening their capacity to face disasters (Boston et al., 2024). These three main livelihood assets (Carmen et al., 2022) are seen as the basis for understanding the process of building community-based resilience. Community Resilience and Global Indicators (Scherzer et al., 2019) will be used to provide benchmarks in describing the Oesapa fishing village community in building its community resilience. Knowledge born from community experience can also be seen as human capital (HR), a source of livelihood for fishermen on the coast as economic capital, mangrove plants that are continuously cultivated to protect fishing village settlements from sea winds and high waves, as well as the norms of going to sea that are applied in the KUB Angsa Laut group as social capital as shown in table 2.

The socio-cultural condition of the Oesapa Fishing Village community in Kupang City is highly complex. This complexity stems from the fact that they are migrants, urbanites, and vulnerable groups living on the coast of the Oesapa sub-district in Kupang City. The cultural and ethnic diversity of the Oesapa fishing village community in Kupang City is quite diverse. The Oesapa coast is inhabited by the Timorese (native inhabitants of Timor Island), the Rote, the Sabu, the Alor (immigrant tribes within East Nusa Tenggara), the Bugis, and the Javanese (tribes from outside East Nusa Tenggara). This diversity is also evident in the religions and beliefs of the Oesapa fishing village community. Some are Catholic (some Timorese), some are Christian (Rote, Sabu, and Alor), and some are Muslim (Bugis and Javanese).

The ethnic and religious diversity of the Oesapa fishing village community creates social harmony, especially in matters of basic economic needs. Those who make their living as fishermen have formed a joint venture group (KUB) called Angsa Laut. This group not only serves as a form of community social capital but also fosters social values related to mutual assistance and occupational safety (Liu, 2022). This social capital, fostered through the Angsa Laut KUB, is referred to as a community-based disaster management effort. The social

norms implemented by the Angsa Laut KUB are unwritten but rigorously enforced and closely monitored. The norm in question is, "If another boat experiences an accident at sea and a KUB member's boat witnesses it but does not help, the bystander is obligated to pay the equivalent of the fuel used for the voyage."

Table 2. Capital and Community Resilience Indicators

Community resilience	Information
Social capital	The Oesapa fishing village community is a coastal urban community, not a rural community; Groups are formed to support each other; Social norms are applied to community members; Communication and interaction between group members and stakeholders is less conducive, as most of the information is instructive from stakeholders; When a crisis occurs, response is usually individual-based; Community education and skills are still very low; Health and sanitation are not optimal; Able to carry out service activities simultaneously; Empowerment of women/minorities is still lacking; The ability to accept change needs to be improved; Collaboration between the government, public, and private sector also needs to be improved to continue to improve; Stakeholders are unaware of community conditions; Younger generations are starting to leave fishing; Leadership is more centered on group leaders; Distrust of community members/neighbors; Death and accident rates at sea are decreasing; Poor communication between stakeholders; Poor public space management; Dissatisfaction with policies or steps taken by the government.
Economic capital	Economic well-being is limited for those who own boats, while those who work as fishermen live in poverty; Communities still depend on and rely on external funding; There is no strategy to develop fishermen's businesses; Infrastructure is still relatively poor; Most communities depend on primary production, namely fishing.
Environmental capital	Water availability is insufficient because people have to buy it during the dry season; Lack of sustainable management of natural resources; Very low carbon use; Lack of natural resource utilization; Frequent droughts, especially during the dry season; Poor environmental awareness; Oil is used in fishing boat operations; Mangroves are often used as boat parking and new boat manufacturing sites, but their sustainability is not maintained.

From an economic perspective, in the process of community resilience after a disaster, those with higher economic status typically recover more quickly (Biswas & Nautiyal, 2023). This means that when a community's economy is at a sufficient level of prosperity, it provides the foundation for a more rapid recovery after a disaster. The coastal community of the Oesapa fishing village is predominantly fishing. Fishermen sometimes sell their catch directly at the market, some to fences, and some dry it before selling. The term "fisherman" is often applied to everything related to fishing (Leong, 2024). However, the fishermen in the Oesapa fishing village in Kupang City are somewhat different because, in addition to fishing, they also trade by opening kiosks (grocery stores) in the market area or at their homes. Typically, the husbands are at sea, while the wives sell groceries and other goods.

The income of fishing villagers varies greatly depending on the size of the boat, the number of crew members, the cost of fuel and food, and most importantly, the catch. Economic vulnerability is particularly felt by those who work as fishermen (Scherzer et al., 2019) but do not own boats. Often, those without boats are simply employed by the fishermen who own them. Through the Angsa Laut Fishing Community (KUB Angsa Laut), the government has attempted to provide assistance to these fishermen who do not own boats, including boats, fishing gear, and other necessities. However, the government-provided boats are made of fiberglass, which the community doesn't want, as they prefer wooden boats. The reason they don't want fiberglass boats is that they sink more easily and increase their vulnerability at sea, compared to wooden boats, which can float and provide a lifeline when sinking.

Physical and Environmental: The settlements in the coastal area of Oesapa are poorly developed. The only separation between the settlements and the sea is a retaining wall built by the government in 2011 and a 3-meter-wide coastal road. These retaining walls have begun to collapse in several places due to the constant impact of waves. Many houses along the coast of Oesapa still use zinc for both their roofs and walls. These structures are highly vulnerable to wind and waves (Sakar et al., 2024). Some economically well-off communities typically build their homes with permanent concrete. These permanent homes have higher foundations, preventing seawater from reaching them during high waves. Furthermore, wind damage to these permanent homes is not significantly affected by wind compared to those using zinc for their roofs and walls. This situation makes poorer communities even more vulnerable to high waves and strong winds.

Environmental changes are also occurring, such as the death of mangroves and the inability to grow again. This mangrove ecosystem was once very dense and protected the community from waves and wind, but many of these mangroves began to die. The community began trying to replant them, but little growth occurred. They suspected this was due to the sea sand that had begun to cover the mangrove area, preventing it from growing properly. Fishing boats also used the mangrove ecosystem as a safe haven to hide economic assets during high waves and strong winds. Therefore, the community, through school children, as an environmentally conscious generation, continued to try to continuously plant mangroves in the hope that they would grow in the sandy area and protect them from ocean waves. This was despite realizing that the mangroves they were trying to plant were in seawater with sandy sediment, not brackish water with mud sediment.

4. Conclusions

The research on “Resilience Strategies of the Oesapa Fishing Village Community in Kupang City in Facing Disaster Threats” concludes that the Oesapa fishing village community, whose livelihoods depend on fishing and coastal residences, is highly vulnerable to disaster threats. These disaster threats originate from both the sea and land. Disasters can occur due to climate change, which causes nature to cease its production. The Oesapa fishing village community holds a socio-ecological perspective, believing that disasters arise from human actions on the environment, including overexploitation, marine pollution, destruction of the mangrove ecosystem, and even human ignorance. External parties intervening in the Oesapa fishing village community include the PIKUL Foundation, the Benain Noelmina BPDAS (Regional Disaster Management Agency), the Kupang City Regional Disaster Management Agency (BPBD), and the BMKG Tenau Maritime Station. External interventions in the Oesapa fishing village community significantly influence local knowledge, thus significantly impacting the disaster resilience of the Oesapa fishing village community.

The community began to shift from a local wisdom system that was previously based on intuitive feelings and feelings to a technology-based information system that is artificially scientific in nature in developing the knowledge that has been obtained to face disaster risks. The strategy of the Oesapa fishing village community to build community

resilience and disaster management efforts in general to realize a reduction in the number of lives exposed, lost rupiah, and damaged environments. The existence of norms of going to sea applied in the KUB Angsa Laut group as a social capital of the Oesapa fishing village community, the source of livelihood of fishermen on the coast becomes an economic capital supporting welfare, and mangrove plants are continuously cultivated as environmental capital to be able to protect the fishing village settlement from sea winds and high waves.

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Author Contribution

The author was solely responsible for the conceptualization, methodology, data collection, data analysis, interpretation of results, drafting of the manuscript, critical revision of the content, and approval of the final version of the manuscript.

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During the preparation of this work, the authors used Grammarly to assist in improving grammar, clarity, and academic tone of the manuscript. After using this tool, the authors reviewed and edited the content as needed and took full responsibility for the content of the publication.

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