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LIVELIHOOD ASSESSMENT OF COASTAL COMMUNITIES IN ACEH

Assessment Report

June 2023

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EXECUTIVE SUMMARY

Over **15 percent of Acehnese households** and **100,000 fishers** are engaged in the capture fishery sub-sector, driven by Aceh's 1,700 km coastline and rich fishing culture. However, despite this significant involvement, the sub-sector contributes only around **5,62 percent to Aceh's Gross Regional Domestic Product (GRDP)**, revealing a gap between labor input and economic return. This highlights the need to improve the welfare and wealth of capture fishery households.

Our research, including literature review and grassroots interviews in Southwest Aceh and Aceh Jaya regencies, shows that these fishery communities — comprised of those working inside and out of the fishery sector, including **small-scale fishers, *Panglima Laot* (sea commanders), and local women's group,** face persistent challenges, such as inadequate infrastructure, season-dependent incomes, and limited access to modern technologies. These issues stem from complex factors which are society and culture, jobs and income, and environment. The presence of formal laws supporting customary institutions has not resolved the challenges of implementation, as issues in coordination, resources, and enforcement continue to affect local communities.

This assessment identifies these challenges and provides a framework for testing and implementing potential solutions for Acehnese coastal communities.

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This report draws on data from desk research, literature review, and direct interviews with local stakeholders in Aceh's coastal communities

Method

Desk research

- We conducted desk research of the **capture fishery sectors and coastal communities** of Indonesia broadly and Aceh province specifically.

Field visit

- Based on initial research, the team visited two regencies in West Coast Aceh to conduct face-to-face interviews. They aimed to understand the activities and challenges of local communities in the fisheries value chain and how these impact their livelihoods and the environment.

Data Collection

Face to face interview: 40 participants

Key stakeholder

- 6 individual fishers
- 11 women of the women group
- 2 sea commanders or *panglima laot*

Other stakeholder

- 1 middlemen
- 6 government officials
- 12 youth
- 1 academia
- 1 NGO

Limitation

- The data collection method primarily relied on self-report interviews, which are subject to response biases, and may not fully capture other relationships between variables.
- As the assessment was conducted in a specific geographic location, it may limit the applicability of our findings to broader context of coastal communities in Indonesia.

Aceh's demographic profile lags behind national averages in GDP and poverty rates, with a widening gap in recent years

Demographic profile of Aceh

The total population reached 5.52 million

15.7% of the population does not receive or finish formal education

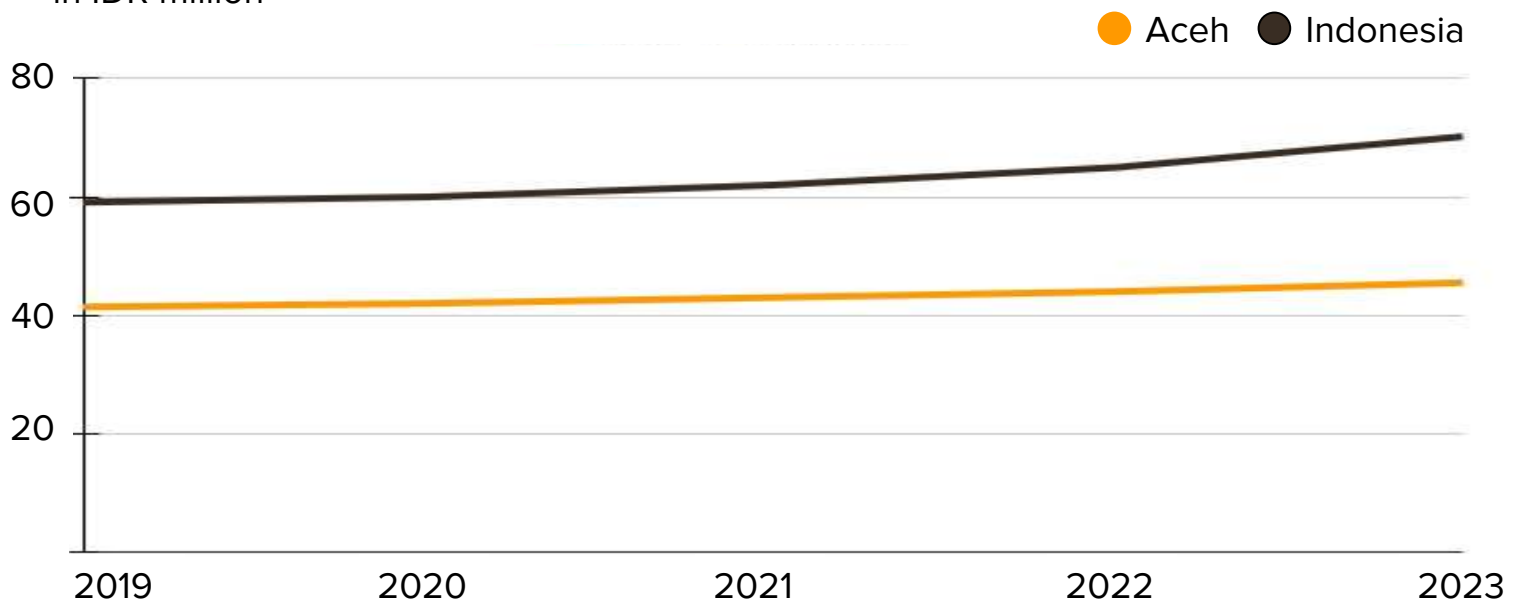
14.45% of the population living in poverty

6.03% unemployed
59.86% of those employed are in the informal sector

source: *BPS Aceh*

Comparison of GDP per Capita: Aceh vs. Indonesia (2019 - 2023)

in IDR million



This data illustrates that over the five-year period, Aceh's per capita income remained **significantly lower than the national average**, with the gap widening from 30% in 2019 to 35.2% in 2023. This trend underscores the need for **targeted economic development strategies to bridge the prosperity divide** between Aceh and the broader Indonesian economy.

Based on the Aceh's GRDP growth in 2023, fishing, agriculture, and forestry sector remains the largest contributor to Aceh's economic landscape

Structure of Aceh's GRDP by sector

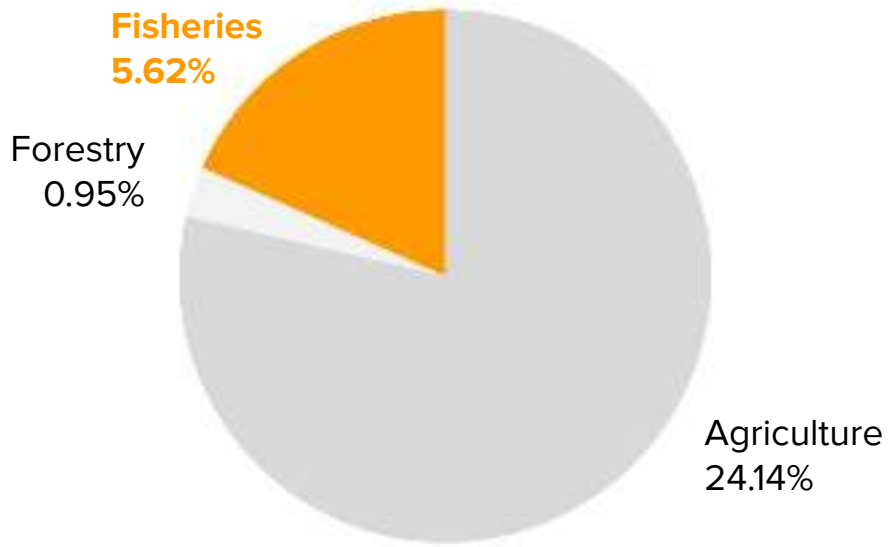
% in percent

No	Sector	
1	**Agriculture, Forestry, & Fisheries**	30,71
2	Wholesale & Retail Trade: Repair of Vehicles	15,16
3	Construction	8,95
4	Public Administration & Defence; Compulsory Social Security	8,75
5	Mining & Quarrying	7,50
6	Transportation and Storage	6,30
7	Manufacturing	4,84
8	Real Estate	3,77
9	Health & Social Services	3,08
10	Information & Communication	2,90

source: *BPS 2024*

Breakdown of Agriculture, Forestry, & Fisheries sector

% in percent

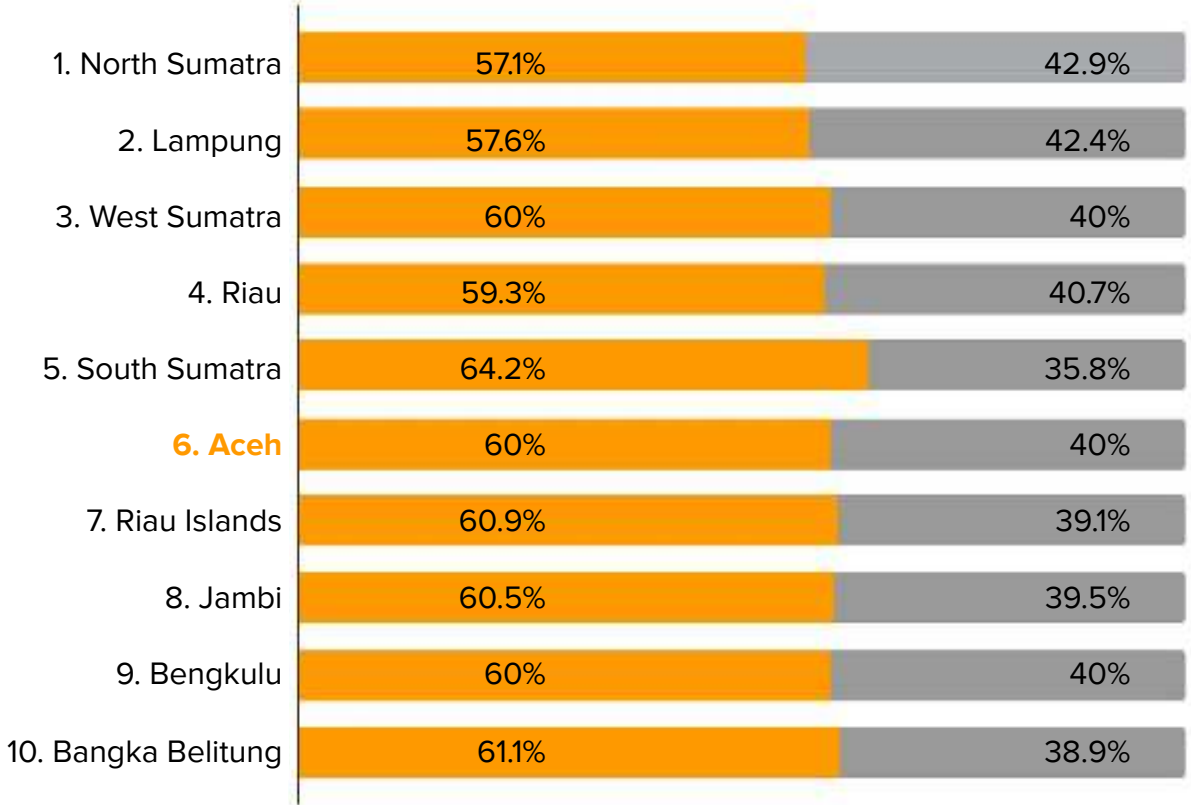


Within this sector, **fisheries contribute a notable 5.62%**, underscoring its importance to Aceh's economy. The fisheries sector plays a vital role in supporting coastal livelihoods and economic development, reflecting the region's rich marine resources. As part of the broader agriculture sector, fisheries offer significant potential for growth, especially if provided with necessary support for sustainable practices and improved infrastructure.

In 2022, 60% of Aceh's fisheries production came from capture fisheries, solidifying its substantial contribution to Sumatra's fishery sector

Capture fisheries and production in Sumatra region

% in percent

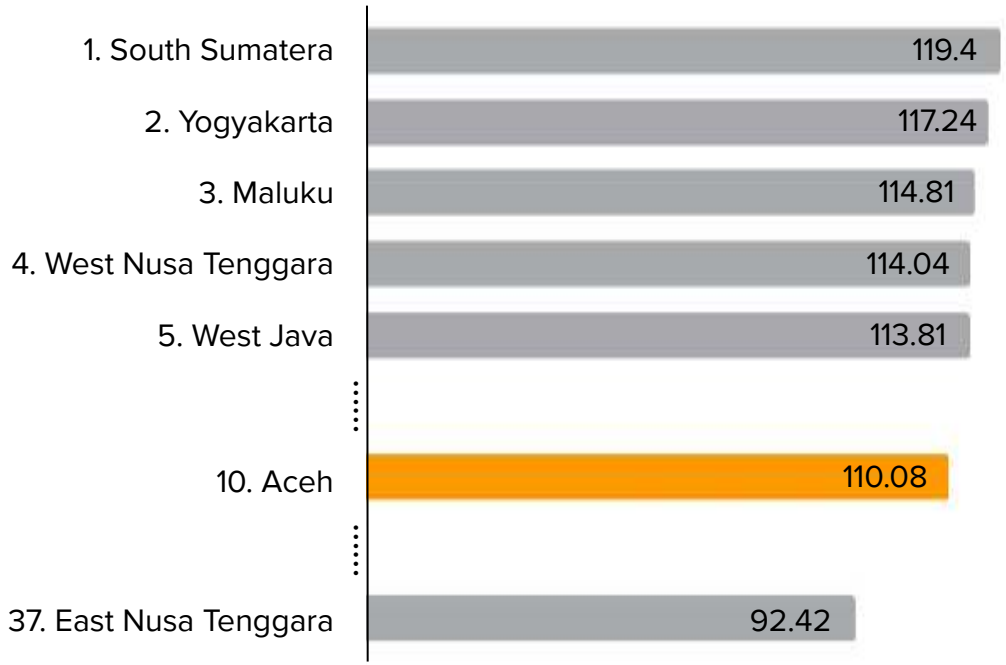


Aceh contributes a total of **250,000 tons**, split between **150,000 tons from capture fisheries** and **100,000 tons from aquaculture**. This places Aceh 6th among the Sumatra provinces

Even though fishers in Aceh have high terms of trade (NTN), poverty is still prevalent, suggesting that income generated from fishing is not enough to alleviate overall poverty in the area

Fishermen's Terms of Trade (NTN) in Indonesia, 2023

N= 100 score



NTN measures fishermen's **purchasing power and reflects the trade value of fishing products** against consumed goods and production costs.

source: *Statistik-KKP*

Poverty Rate in Aceh 2023

Aceh Province - 14.45%
Indonesia's 6th highest poverty rate by province

Southwest Aceh Regency - 15.43%
Aceh's 11th highest poverty rate by regency

Aceh Jaya Regency - 12.42%
Aceh's 19th highest poverty rate by regency

with Indonesia's average poverty rate of **9.36%**

Despite having relatively high purchasing power in the fishery sector (as reflected in the NTN score), they still face significant poverty levels. This suggests that while **fishing may contribute positively to household income**, it may **not be sufficient to lift the broader population out of poverty**.

**BPS*
***BPS Aceh Province*

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Efforts by the central government through various regulations to improve fisheries productivity have not yet reached smallholders effectively for balanced market participation

Presidential Decree No. 18 (2020) National Medium-Term Development Plan 2020–24	Law No. 7 (2016) Protection and Empowerment of Fishers, Aquaculture and Salt Farmers	Regulation of the Maritime and Fisheries Minister No. 12 (2010) Minapolitan Program
• **2020 Priorities:** Improve communication, streamline licensing, strengthen aquaculture, enhance marine management, boost investment, and advance research. • **2021–2024 Priorities:** Raise non-state tax revenue from capture fisheries and support village-based aquaculture development.	• Allocate investments to expand infrastructure, business certainty, management capacity, and financial access of "small-scale fishers." • Define "small-scale fishers" as those who fish to meet their "daily needs," and who operate without vessels or with vessels up to 10 GT.	Develop "Minapolitan areas" (e.g., East Aceh, 2013) to foster collaboration among local fishermen, industry, and government, aiming to balance resource sustainability with higher productivity, improved product quality, and fair income growth for all stakeholders.

Despite all these regulations, the challenges in the field are still evident

Poor equipment and facility conditions highlight ongoing challenges in small-scale fisheries management

Religion, culture, and education, strongly influenced by Islam, shape the identity and daily life of coastal communities in Aceh, forming customary laws governed by the Panglima Laot

Religion based on the Islamic teachings

For the Acehnese, Islam serves as a core belief system, deeply influencing their way of life. This commitment is evident in practices like restricting fishermen from setting sail on Fridays and other specific days. **Daily actions are guided by religious principles**, underscoring Islam's significant impact on Acehnese culture.

Cultural beliefs with ties in occultism and paranormal realms

In Acehnese culture, communal ceremonies play a key role, **blending religious rituals with beliefs in supernatural powers, particularly among fishermen**. Rooted in practical fishing knowledge, these traditions also involve rituals to ward off sea dangers, reflecting a deep integration of culture and daily life.

Learnings from formal, non-formal, and informal education

Education in Aceh is **categorized into formal, non-formal, and informal, each crucial for knowledge and social development.** While parents prioritize formal education, economic barriers often pose challenges. Non-formal education focuses on job skills and religious teachings, while informal education, guided by parents and peers, fosters lifelong values and behaviors.

Working routine is influenced by culture and religion in Aceh

Influence to governance in coastal communities

The deep-rooted connection between Islamic teachings, customary rituals, and learning systems forms the foundation of the livelihoods of Aceh's coastal communities.

Within this cultural framework, ***Panglima Laot*** or sea admiral, a traditional maritime institution, plays a pivotal role. It not only governs the use and conservation of marine resources but also supports sustainable fishing practices and conflict resolution among fishers, aligning with the community's cultural and religious values.

Fisher communities in Aceh place greater trust in the Panglima Laot and the customary laws, or Hukum Adat Laot, they uphold, rather than formal legal systems

Government Jurisdiction

Ministry of Marine Affairs & Fisheries

↓

Provincial Marine & Fisheries Agency

↓

District Marine and Fisheries Agency

Cultural Jurisdiction

*The **Panglima Laot informally** govern customs, norms, and practices within local communities known as Hukom Adat Laot*

Provincial level Panglima Laot

↓

District level Panglima Laot

- While *Hukum Adat Laot* customs share similarities across districts, differences arise from geographical features and unique generational norms, such as varying docking rules
- Complex relations between customary and state institutions slow information flow, reducing influence as new Panglima Laot leaders emerge
- Miscommunication and unclear roles between formal and informal institutions persist

***Hukum Adat Laot* of Lhok Kruet village**

Even with formal laws in place to support customary institutions, implementation struggles with coordination, resources, and enforcement, affecting local communities

Bridging Customary Practices and Formal Regulations in Fisheries

Strengthening Governance Through Customary Institutions

Supporting Local Authority for Better Fisheries Oversight

Expectation	Integrating traditional legal frameworks and local wisdom will support an inclusive and sustainable fisheries governance.	Reinforcing customary institutions with support from formal government will strengthen local governance	By decentralizing marine resource management, local governments will have stronger permits control, sustainable planning, and enforcement actions.
Challenge	The law remains **unclear on collaboration mechanisms** with state bodies and role-specific responsibilities.	**Balancing financial control with customary institutions presents challenges** for state institutions in ensuring effective resource management	**Inconsistent enforcement and lack of clarity** in permit processes limit local governments' effectiveness in managing marine resources.

The research aims to understand the challenges faced by coastal fishing communities through a focus on three aspects: sociocultural, economic, and environmental conditions

Overarching question

What are the challenges faced by coastal communities in Aceh?

Observation point

1 **Society and Culture**
Refers to the norms, attitudes, beliefs, values, and informal institutions in local fishing communities

2 **Jobs and Income**
Refers to the working practices, technologies, tools, and financial conditions that sustain the economy of local fishing communities

3 **Environment**
Refers to the climate, terrain, and external conditions that local fishing communities face in their day-to-day lives

We engage with the fishers group, the Sea Commander or *Panglima Laot*, and the women's group, as part of Aceh's coastal fishing communities

Small-scale fishers

Small-scale fishers are individuals whose livelihoods depend on catching fish, with or without a boat*.

Panglima Laot (Sea Commander)

Panglima Laot is a term culturally used in Aceh, referring to the institution that leads custom and tradition applied to catch fish activities and conflict resolution in the fishery sector.

Women group

Women group refers to the women in the fishery household in Aceh, who are involved in a wide range of activities, such as fishing, processing, marketing, and trading of fish and seafood. They may also play roles in managing household fisheries-related activities.

Source: Badan Pemeriksa Keuangan

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We identified twelve key challenges faced by Aceh's coastal communities across three aspects

Observation Point	Group	Challenges
Society and Culture		1. Limited growth of fisher groups and lack of government support
		2. Lack of coordination with government counterpart
		3. Struggle to obtain financial support due to absence of formally established groups
Jobs and Income		4. Limited infrastructure and access to financial aid
		5. Dangerous sea conditions and lack of safety equipment
		6. The absence of cold chain facilities and limited hygiene
		7. Limited government funding to enforce customary law
		8. Production instability due to inconsistent fish supply
		9. Fish products with low quality and lack of competitive advantage
Environmental		10. Limited infrastructure at harbor for safe harboring
		11. High bycatch due to low awareness of protected species and sustainable fishing practices
		12. Increase in complexity of fishing because of climate change
		13. Unpredictable weather complicates fish processing activities
		14. Waste accumulation due to limited facilities and poor waste management process

Observation point

1 Society and Culture

Informal institutions in local fishing communities and common practices

Fishers typically work in family groups, but must form formal groups to access government support

Current practice

Some fishers operate in small groups, often based on family ties or nearby households, depending on boat size. To support them with tools and capacity building, the government encourages forming formal groups, like KUB (*Kelompok Usaha Bersama*) or JBG (Joint Business Group).

Ideally, these groups consist of fishers using similar tools and facing similar challenges, creating a foundation for development and enabling access to government support. To access the support, fishers must form a Joint Business Group, complete identity verification and legal registration, and submit a proposal to the Department of Fisheries for assistance.

Current challenge

Limited growth of fisher groups due to low participation and minimal activities	Low active participation among JBG members results in temporary group formation. Although Ministry of Fisheries Regulation No. 14/2012 defines competence levels, most fishers' groups stay at the beginner stage and often dissolve due to limited engagement in activities.
Fishers often does not receive support despite submitted proposal	Despite being members of the proposal-submitting group, some fishers claim to have received no support. They have not received feedback on proposed improvements to enhance their chances of securing support.

Low participation results in only a few fishers setting sail, as many groups remain inactive or dissolve early

Panglima Laot faces lack of coordination with their government counterpart, hindering their role to enforce customary laws

Current practice

The autonomy that customary entities like Panglima Laot hold often clashes with the bureaucratic structure of the government, leading to a disconnect in communication and collaboration.

This disconnect, driven by historical and cultural factors, affects various aspects of governance, making it difficult for both parties to find common ground. Socio-cultural values in the practices of Panglima Laot may clash with the regulations enforced by the government. As a result, crucial measures related to environmental issues, such as climate change and resource depletion, face resistance and inadequate implementation.

We interviewed a fisherman at the heart of Panglima Laot's unique cultural challenges, shedding light on the need for a nuanced approach in bridging the gap with government policies groups remain inactive or dissolve early

Current challenge

Relationship with government counterpart

The limited connectivity between customary and state entities intensifies the challenges in enforcing policies effectively. Panglima Laot operates within a unique cultural context, and navigating the intricacies of this environment requires a nuanced approach. The government often operates based on broader, standardized policies that may not be attuned to the specific needs and traditions of local communities.

Women groups actively engaged in dried fish production, yet they struggle to obtain financial support due to the absence of formally established groups

Current practice

In Aceh, women play a vital role in the fishing industry, especially in fish processing, which provides a safe and flexible job that allows them to focus on their homes while their husbands fish. In both research locations, women work together in groups to process fish, anchovies, and shrimp, producing dried products to sell in the market. Dried anchovies and small shrimps are traditional products with a long history.

However, despite their experience, the business remains small due to limited management skills and a lack of support for development.

SEPAKAT, a women-led dried fish production house in Aceh Barat Daya, still awaits government support.

Current challenge

Low bargaining power in price setting due to inadequate group management

Operating in informal, unstructured groups forces women to work individually and rely heavily on middlemen for market access. This dependency not only limits their ability to reach broader markets but also significantly weakens their bargaining power in price negotiations, preventing them from securing fair prices for their products and diminishing potential earnings.

Limited support to develop business process

The absence of formal group structures restricts women's access to support from government and non-profit organizations, as assistance is generally provided to groups rather than individuals.

Observation point

2 Jobs and income

The working practices, technologies, tools, and financial conditions that sustain the people's economy

Several value chains for fishery products are available in Aceh, offering various opportunities and challenges to stakeholders in every stages

Value Chain 1

Value Chain 2

Value Chain 3

Fishers

Capture fish and transport it to the beach/ landing dock

2.a. Captured fish are sold or transported to middlemen or *toke bangku*, based on the agreement type.

Middlemen/ *Toke bangku*

3.a Toke bangku sell the fish directly to the end consumer or to a retailer/muge in the fishing port.

Retailer/ *muge*

4.a Retailers/muge sell the fish directly by going around the village by motorcycle.

2.b. Fish, especially tuna, is sold to Medan, a neighboring province, and transported via road.

Factory in neighboring province

3.b. The factory produces and distributes canned and frozen tuna domestically and for export.

Distributor

4.b. The distributor may be the same or a different company from the processor, depending on their permit in Indonesia.

2.c. Fishers or middlemen sell specific catches (e.g., anchovy, shrimp, octopus) to processors.

Processor (women group)

3.c. The processor produces, sorts, and packs dried fish for marketing.

Reseller

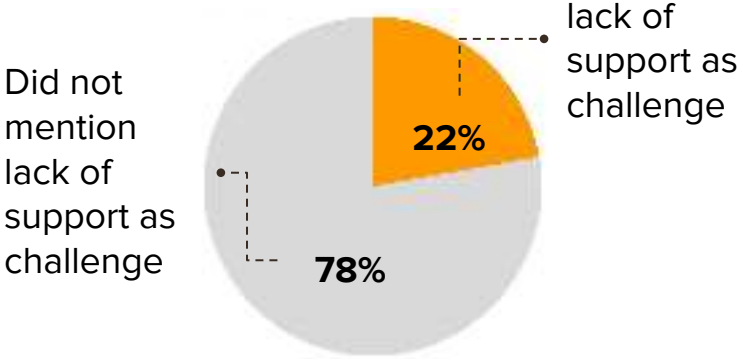
4.c. The reseller collects fish products and sells them to consumers through shops or other channels.

End customer

We found that limited infrastructure support and access to financial aid restrict fishers' ability to improve their tools and processes

Challenges addressed linked to insufficient support.

of respondents, N=9



Many fishers have limited tools and equipment due to a lack of resources and support, hindering productivity and adaptation.

Current practice

Small fishers currently lack savings or allocated resources to regularly update their tools, despite the limited lifespan of their equipment. To make upgrades, they depend on government support or loans from financial institutions. Typically, the government provides assistance in the form of tools such as boat engines, nets, and coolboxes.

Among the fishers we interviewed, one mentioned not receiving boat or infrastructure support, unlike other fishers who received similar aid, highlighting this as a current challenge.

Current challenge

Unequal information distribution

There is a lack of information on available support, highlighting an information gap. To receive assistance, fishers' groups must submit a request proposal; however, not all submitted proposals receive immediate support.

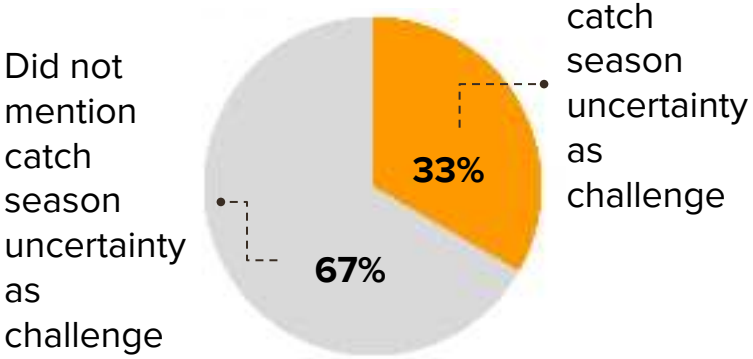
Lack of access to financial institutions

A 2005 IOM survey revealed that only 27% of fishers had access to formal credit services, limiting their ability to upgrade tools, infrastructure, skills, and knowledge to address current challenges; a situation reflected in Aceh Jaya and Aceh Barat Daya.

Dangerous sea conditions and lack of safety equipment increase fishers' risks during extreme weather

Perceive challenge related to unpredictable weather

of respondents, N=9



"Venturing out during the west monsoon is challenging; my boat once capsized from high tides and strong waves."
- Fisher in West Aceh Daya

Current practice

From October to April, the East Monsoon brings calm seas to West-Southern Aceh, creating ideal fishing conditions where fishers can maximize their catch, including tuna, mackerel, and shrimp. However, the West Monsoon introduces extreme weather, making fishing riskier, especially near the Indian Ocean, where waves can reach 1.5-2.5 meters. This seasonal shift emphasizes the need for better safety measures to protect fishers during harsher months.

Improved support and training in safety practices could significantly reduce accidents and enhance resilience among coastal communities.

Current challenge

Lack of protective equipment and safety measures

Despite their skill in reading weather patterns, fishers face increasing sea unpredictability and safety risks. Limited equipment and knowledge, along with complex certification (Certificate of Appropriate Fishing Boat), make mandatory compliance difficult for small-scale fishers

Unsafe sea conditions keep fishers from setting sail

Due to safety concerns, fishers abandon regular fishing, seeking alternative income sources, often relying on loans from middlemen. Those venturing to sea use different methods like staying closer to shore for safety, but catch smaller fish, resulting in uncertain and unstable incomes.

The absence of cold chain facilities and limited hygiene in handling contribute to the low quality and reduced price of fish products

Current practice

The Aceh coast holds significant potential for seafood production, particularly high-value tuna. Currently, tuna from the Aceh Jaya area is mostly classified as grade C/D, despite its abundance. Tuna grade affects both market access and price, with the highest grade (AA) reaching premium markets at elevated prices. This gap highlights an opportunity to improve tuna quality by enhancing cold chain and handling processes. Raising the grade from C to B could open up access to the Japanese market, potentially increasing the product's value to IDR 4 million per kilogram per month.

Current challenge

Lack of cold chain facilities

In tuna fishing, the cold chain is inadequate, with undersized fiber boxes and a lack of ice for transport. Without an ice factory in Aceh Jaya and only limited facilities in Aceh Barat Daya, fishers must source ice from Banda Aceh and Meulaboh, increasing costs and operational expenses.

Limited knowledge in handling processes

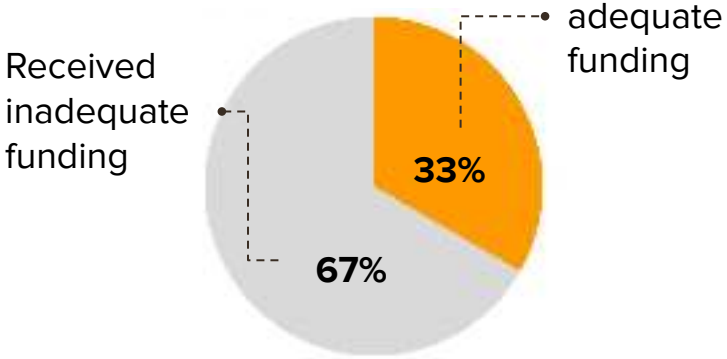
Tuna from Aceh Jaya often has high histamine levels due to limited knowledge of proper cutting techniques. Additionally, fishers have yet to adopt good handling practices in the market, which impacts the tuna's freshness and shelf life.

Inadequate cold chain and handling hygiene in the harbor are contribute to low fish quality and market prices

Limited government funding hampers *Panglima Laot's* ability to provide facilities for enforcing *Hukum Adat Laot*

Received adequate government funding

of respondents, N=9



Despite audiences with the government as well as submitted proposals, Panglima Laot struggles to secure necessary funding

Current practice

The Panglima Laot relies on monthly funding from the local government to enforce customary fishing laws along Aceh's coast, but this support is insufficient for operational costs. Additional income sources, such as aid from organizations and revenue from fines or auctions, also fall short of covering the demands of effective enforcement.

Although some financial aid reaches fishers and the Panglima Laot, it is often inadequate to support sustainable livelihoods.

Current challenge

Insufficient funding limits the ability to enforce laws effectively

Securing funds for coastal fishers and essential infrastructure, such as a well-equipped fish auction facility, remains a major challenge. Limited funding directly hinders Panglima Laot's ability to enforce laws effectively, affecting both daily operations and future initiatives. Addressing these financial and infrastructure needs is critical for sustainable development and law enforcement.

With an inconsistent fish supply, the women's group faces production instability, impacting income and customer retention

Current practice

The women's group's income is closely tied to the fishing success of their husbands. When catches are plentiful, they can process and sell fish products, generating steady income. Due to cultural norms and safety concerns, the women rely on group members' husbands to bring them the freshly caught fish. This dependency affects production capacity and income stability, as it is subject to fluctuations in fish supply and the men's availability. Providing the women with direct access to fish or alternative sourcing options could strengthen their business independence and income reliability.

Current challenge

Inconsistent fish supply

The irregular fish supply leads to unstable production capacity for the women's group. Without a reliable supply mechanism or alternative sources, they have little control over the quantity of fish they receive, making it difficult to rely on this activity as a stable income source.

Unreliable income and low customer retention

Regular customers expect a consistent product supply, but the group's inconsistent availability makes it difficult to meet demand. This unreliability forces customers to seek alternatives, making customer retention a major challenge for the producers.

The catch is taken ashore by fishers, either for sale or for household needs

With fish products lacking in quality and market edge, the women's group hopes to diversify, though training is needed

Current practice

The women's group, primarily fishermen's wives, processes their catches into basic products like dried and salted fish. These items are common in local markets, where numerous small-scale producers compete for a limited customer base, making differentiation difficult. In contrast, modern markets outside coastal areas offer a wider variety of fish-based products, such as fish condiments, packaged dried fish, and fish chips, catering to broader consumer preferences and adding more value. This contrast highlights an opportunity for these women to diversify their offerings, enabling them to access new markets and increase the appeal and competitiveness of their products.

Current challenge

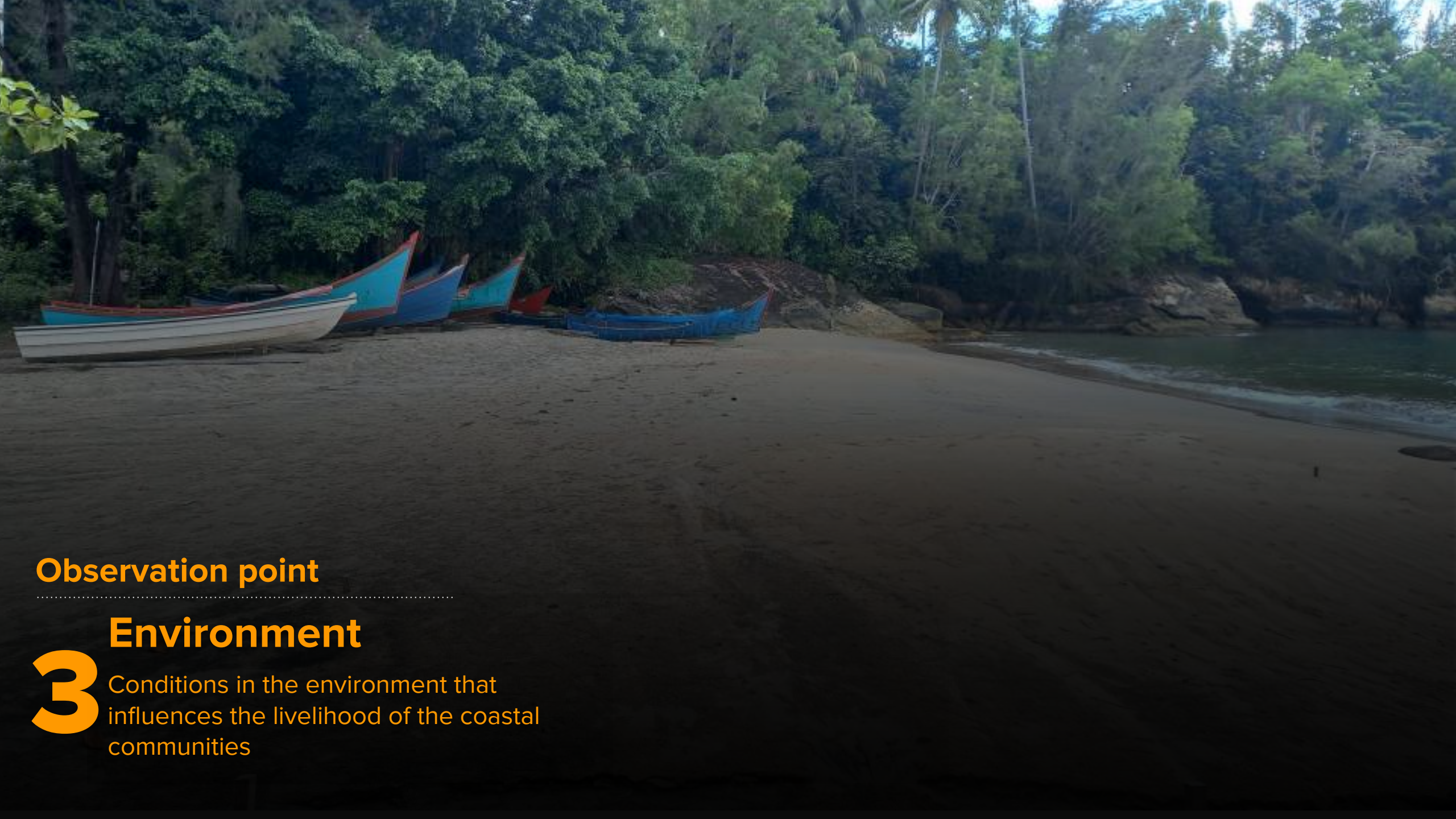
Low product quality

Poor processing and inadequate packaging of dried fish often result in product spoilage. Initial distribution through a local shop proved unsustainable as weak packaging left the products vulnerable to damage from rat infestations.

Lack of competitive advantages

Dried anchovies are usually sold in bulk, mixed with similar products from nearby areas. To boost market presence and prices, the product needs competitive advantages like higher quality, a compelling story, or improved packaging.

Current fish-based products like dried anchovies and fermented fish or *budee* hold promise, but training is needed for wider market expansion



Observation point

3 Environment

Conditions in the environment that influences the livelihood of the coastal communities

Limited harbor infrastructure and the lack of a wave breaker make sailing and harboring difficult during extreme weather

Current practice

Fishers typically set out to sea in the evening, launching from the beach or harbor and choosing calm waters for nighttime fishing. They work in groups, manually pushing the vessel into the water and navigating once it's afloat, then return to shore with their catch early in the morning.

During the day, there are no fishing activities, as they shift their focus to post-production tasks, such as sorting, drying, and preparing the catch for market, ensuring everything is ready for sale or further processing.

Without wave breakers, limited harbor infrastructure makes sailing and docking risky during severe weather

Current challenge

Complicated process of ship docking

The lack of coastal infrastructure, especially breakwaters, creates serious challenges for fishermen. Without protective barriers, sailing and landing become more hazardous, exposing boats to strong waves and tides. This increases the risk of vessel damage and coastal erosion, particularly affecting vulnerable villages lacking protective structures.

Limited support to develop business process

The west monsoon season brings dangerous sea conditions, with strong winds and large waves pushing fishing boats closer to shore. This complicates fishing and heightens safety risks, as the force of the waves threatens the lives of fishermen.

Low awareness of protected species and sustainable fishing practices, along with the use of non-standard tools, contributes to bycatch

Current practice

Many small-scale fishers use traditional fishing tools, and the government has placed information boards in public fishing areas to warn against prohibited and harmful methods. However, protected species continue to appear in markets, showing limited awareness and compliance.

During our survey, we found that sharks and stingrays are often caught as bycatch from August to October, including a protected hammerhead shark captured with other fish. This highlights the need for better education, monitoring, and sustainable fishing practices to protect marine biodiversity.

Current challenge

Bycatch, or unintended capture, can lead to the death of non-target marine species

Protected species are often caught inadvertently due to small fish size, insufficient net mesh, or the use of tiger trawls. Discovered during inspections, these species are usually already dead but are still sold by fishers. Unusual catches are reported to Panglima Laot, who then informs government and local NGOs.

The use of illegal fishing tools by fishers from neighboring areas

Despite low records of using illegal fishing tools documented by Panglima Laot, there have been many occasions of the use of illicit fishing tools by fishers from neighbouring provinces and countries that cannot be reported and solved under customary law.

Despite the installation of information boards to discourage illegal fishing methods, bycatch still occurs, as evidenced by a hammerhead shark found among the catches

Climate change is increasing the complexity of fishing, creating uncertainties in fish stocks, catch yields, and unpredictable weather patterns for sailing

Current practice

The growing impact of climate change has significantly complicated fishing practices, presenting new challenges for fisheries, particularly those guided by Panglima Laot. Uncertainties in fish stocks and catch yields are a major concern, as climate-related factors—such as warming waters, shifting ocean currents, and changes in marine ecosystems—disrupt traditional patterns that fishers have relied on for generations.

Panglima Laot faces heightened pressure to adapt practices and protect fish stocks amidst these shifting environmental conditions.

Current challenge

Uncertain fish stocks leads to a decline in catch yields

The decline in fish stocks is a pressing concern, driven by factors like ocean warming, overfishing, and habitat degradation. This decline directly impacts catch yields, affecting the livelihoods of communities, particularly those led by Panglima Laot, dependent on fishing for sustenance and economic well-being.

Unpredictable weather patterns make the sailing process more complex and challenging

Facing unpredictable weather and uncertain catches, fishermen led by Panglima Laot experience heightened risk at sea. This situation calls for urgent adaptation strategies and improved infrastructure to secure the future of these fishing communities.

Fishermen must work harder to tackle the uncertainty in fish catches caused by climate change

Unpredictable weather complicates fish drying and often leads to increased fish spoilage and disposal

Current practice

In the research locations, dried fish is the primary product made by women's groups, making the drying process essential to product quality. Currently, these groups rely on sunlight as the main heat source, drying fish outdoors during the day. They typically spread the fish on the ground or use elevated trays to improve airflow and drying efficiency.

This traditional method, though effective in good weather, is highly dependent on consistent sunlight, making it vulnerable to disruptions from unpredictable weather patterns.

Fish drying relies on sunlight, but rain interruptions and no cold storage often result in spoilage

Current challenge

Inefficient drying process due to weather dependency

Because the current drying process depends on sunlight, unpredictable weather makes it vulnerable to disruptions. On rainy days, the women must laboriously gather the fish when it starts to rain and then restart the drying process once the weather clears, increasing their workload significantly.

Fish disposal during rainy season due to unavailable alternative drying and lack of cold storage

When it rains, freshly caught fish cannot be immediately dried and are often left at room temperature without other preservation methods. Without access to cold storage, the fish eventually spoil and must be discarded.

We also found poor coastal waste management during our observation, with limited facilities leading to dangerous waste accumulation

Current practice

In the research locations, both land waste and marine litter are highly visible, highlighting the lack of an organized waste management system. Waste separation and transportation services are nonexistent, leading to piles of garbage accumulating in public spaces and on vacant land. With no formal waste management infrastructure, households are responsible for disposing of their own waste, resulting in varied practices.

This unregulated disposal also poses health and environmental risks, as waste often spreads to nearby waterways and coastal areas, adding to the growing problem of marine litter.

Current challenge

The absence of effective land-based waste management

The customary regulation (or Qanun) of Aceh Jaya Regency No. 13/2021 outlines waste management through reduction efforts and waste banks or integrated centers. Currently, Aceh Jaya has four landfills, and Aceh Barat Daya has two, but neither region has waste banks, leaving some coastal waste untreated.

Accumulation of coastal waste potentially endanger marine ecosystem

A similar situation exists with marine litter, as waste accumulates along the shore and is often carried onto the beach. The government is currently running campaigns to reduce ocean plastic waste by 70% from 500 tonnes, in line with Presidential Regulation No. 83 of 2018 on ocean waste management.

With no proper facilities, waste is discarded in open spaces and accumulates in illegal landfills

source: *BPK*

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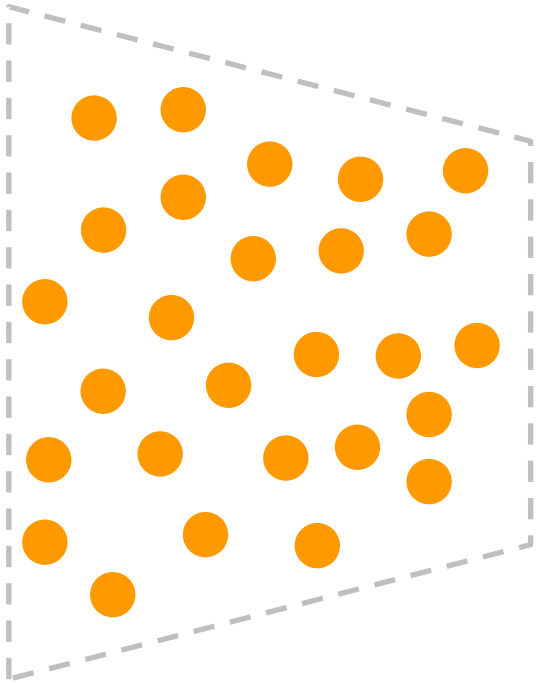
The Kopernik team generated a long-list of potential solutions to these 14 challenges which were then prioritized into a list of 7 using Kopernik's Innovation Funnel framework

Generating Potential Solutions

- Research on interventions in similar conditions
- Learning from Kopernik's past projects
- Ideas from Kopernik team

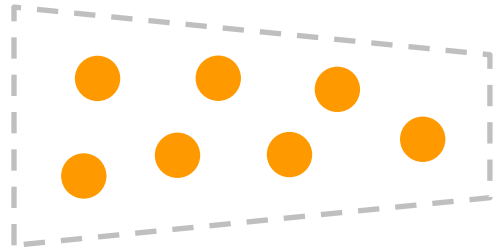


Identified potential solutions

Prioritization

- **Ease of Implementation: Operations**
  How straightforward, quick, and resource-efficient it is to execute the experiment?
- **Ease of Implementation: Cost**
  How financially feasible and cost-effective it is to carry out the experiment?
- **Potential Impact**
  How straightforward and achievable is it to carry out the experiment in comparison to its anticipated results, benefits, or influence?
- **Novelty**
  How does the experiment introduce a unique approach, solution, or method that differentiates it from existing or previous initiatives?

Experiment Ideas



7 experiment ideas

The most feasible solutions to be tested are Climate Change Adaptation (CCA) training, a solar fish dryer 4.0 for women's groups, and mini solar technologies

Experiments	Challenges to be addressed	Group	Community Readiness	Cost	Novelty	Complexity	Results
I: Climate Change Adaptation (CCA) training	12. Increase in complexity of fishing because of climate change		*3*	*2*	*3*	*2*	***10***
II: Fish solar dryer 4.0	13. Unpredictable weather complicates fish processing activities		*3*	*2*	*2*	*2*	***9***
III: Mini sonar	5. Dangerous sea conditions and lack of safety equipment		*2*	*2*	*3*	*2*	***9***
IV: Shared Cold Storage	6. Absence of cold chain facilities and limited hygiene		*3*	*3*	*1*	*1*	***8***
V: Access to market	9. Fish products with low quality and lack of competitive advantage		*2*	*2*	*1*	*2*	***7***
VI: Faith-based waste management	14. Waste accumulation due to limited facilities and poor waste management		*2*	*2*	*1*	*1*	***6***
VII: Tetrapod as wavebreakers	4. Limited infrastructure at harbor for safe harboring		*1*	*1*	*1*	*1*	***4***

Score Index *3: High/Easy/Lean*
1: Low/Difficult/Complex

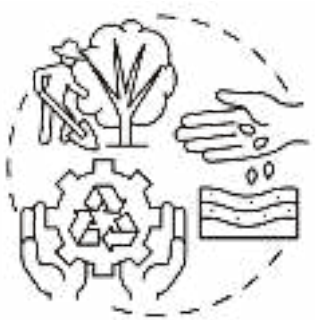
Design of Experiment Idea 1: Climate change adaptation (CCA) training for Panglima Laot and fishermen to better adapt with unpredictable scenarios at sea

Experiment design (before & after assessment)

Participant Criteria

- Active fishermen and Panglima Laot

Intervention

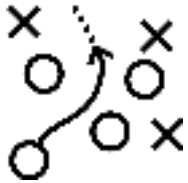


Climate change adaptation (CCA) training that comprise of:

- Understanding local climate changes
- Adapting fishing practices
- Mechanisms to cope with extreme weather
- Safety at sea

Output

Improved understanding of climate change and its effects to the local settings



New strategies to adapt with scenarios driven and influenced by climate change

Outcome

Fishers are more safe and confident to set sail (number of days)

Project period: 6 months

Cost estimation: USD15.000-20.000

Design of Experiment Idea 2: Set up the LITTORAL environmentally-friendly tetrapods as wavebreakers across the shoreline to protect community shore area

Experiment design

Control

- 100m^2 size area of scare shore line scarce with no wave breakers

Treatment

- 100m^2 size area of installed wavebreakers in shoreline

Output

Reduction in wave height behind the tetrapod wavebreakers

Increase in marine diversity as indicator of ecosystem resilience

Outcome

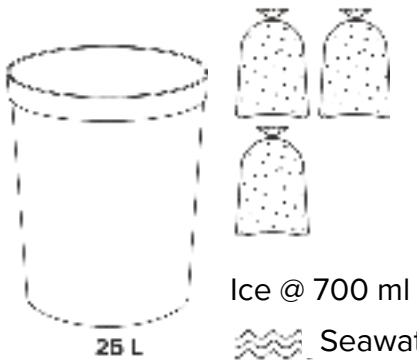
Preserved land and property from erosive impact of waves on the coastline

Project period: 1 year	**Cost estimation: > USD20.000**

Design of Experiment Idea 3: A shared cooling storage to improve fish preservation, allowing a higher sales revenue and longer sales time than the current method

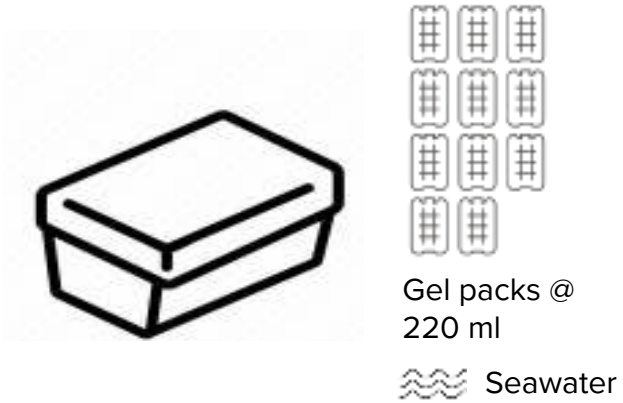
Experiment design

Control



- Currently stored fish
- 25 kg of fish catch
- 700ml of packed ice

Treatment



- Freezer box
- 25 kg of fish catch
- 220ml of gel packs

Output

Higher fish quality measured by the Quality Index Method

Higher adoption rate by users

Outcome

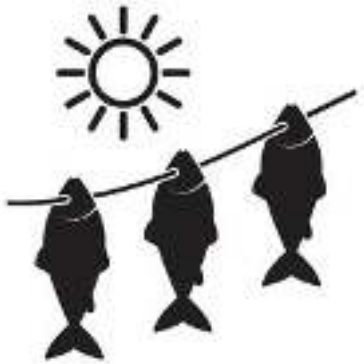
Better fish preservation leading to higher quality and value

Project period: 2 months	Cost estimation: < USD15.000

Design of Experiment Idea 4: Fish Solar Dryer 4.0 as solution to dry fish in a controlled environment, minimizing decreasing fish quality that leads to its disposal

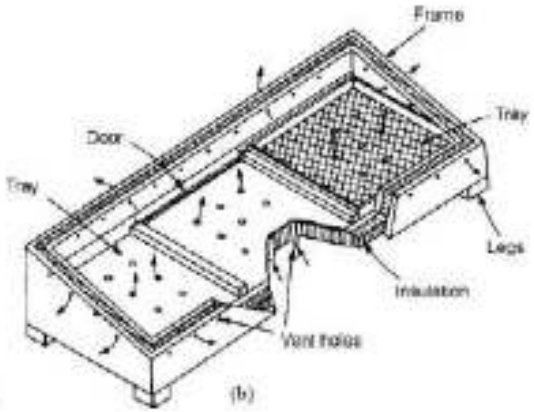
Experiment design

Control



- 10 kg of fish catch placed on the floor, directly under the sun

Treatment



- 10 kg of fish catch placed inside the solar dryer
- Automatic heater with thermostat

Project period: 2 months

Cost estimation: USD15.000-20.000

Output

Drying performance under different weather conditions

Quality of fish measured by moisture content and drying uniformity

Outcome

Improved process for fish preservation

Design of Experiment Idea 5: Fish finder (mini sonar) to assist fishers map fishing grounds & locate bountiful fishing areas

Experiment design

Control

- One boat of fishermen with traditional method to locate fish

Treatment

- One boat of fishermen equipped with mini sonar to locate fish
- Sonar sensors are equipped in under the boat, with a display monitor on the fisher's dock

Output

Decrease in time to locate fish in fishing grounds

Decrease rate of fuel consumption

Outcome

Increase in efficiency of catching fash

Project period: 2 months

Cost estimation: USD15.000-20.000

Design of Experiment Idea 6: Faith-based waste management program to systematically address waste issues

Experiment design

Participant Criteria

- Traditional fishing village with poor waste management system

Treatment

- Integrated waste management system of sorted waste in community household
- Mobilizing collection system in community mosque by mosque youth

Project period: 1 year

Cost estimation: > USD20.000

Output

Increase number of sorted waste in household

Increase number of collected waste

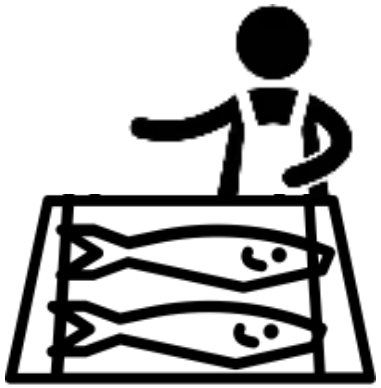
Outcome

Improved community waste management system

Design of Experiment Idea 7: Facilitate Market Access to Women Group to improve the reach of fish products and increase the income

Experiment design

Participant Criteria



- Women group selling products to traditional marketplace

Treatment

- Facilitate women group to new marketplace through new networks
- Specifically tailored trainings, include product diversification and marketing

Output

Increase in new customer base

Increase in income

Outcome

Improved welfare of women groups

Project period: 1 year	**Cost estimation: > USD20.000**

This assessment highlights the need for immediate action to support coastal communities in Aceh, particularly fishing communities facing social, economic, and environmental challenges

Background

Over 15 percent of Acehnese households and 100,000 fishers are engaged in the capture fishery sub-sector, driven by Aceh's 1,700 km coastline and rich fishing culture. However, despite this significant involvement, the sub-sector contributes only around 5.6 percent to Aceh's Gross Regional Domestic Product (GRDP), revealing a gap between labor input and economic return. This highlights the need to improve the welfare and wealth of capture fishery households.

Challenges

Our research, including literature review and grassroots interviews in Southwest Aceh and Aceh Jaya regencies, shows that these fishing communities face persistent challenges, such as inadequate infrastructure, season-dependent incomes, and limited access to modern technologies. These issues stem from complex socio-cultural, economic, and environmental factors. Current government policies, focused mainly on boosting production and exports, have yet to address these underlying problems effectively.

Potential Solutions

This assessment provides a framework for testing and implementing potential solutions for Acehnese coastal communities.

A total of seven potential solutions have been identified and prioritized based on their complexity, novelty, cost, and community readiness. The most feasible solutions to be tested include Climate Change Adaptation (CCA) training for fishers and Panglima Laot, a solar fish dryer 4.0 for women’s groups, or a Mini Sonar technology for fishers.

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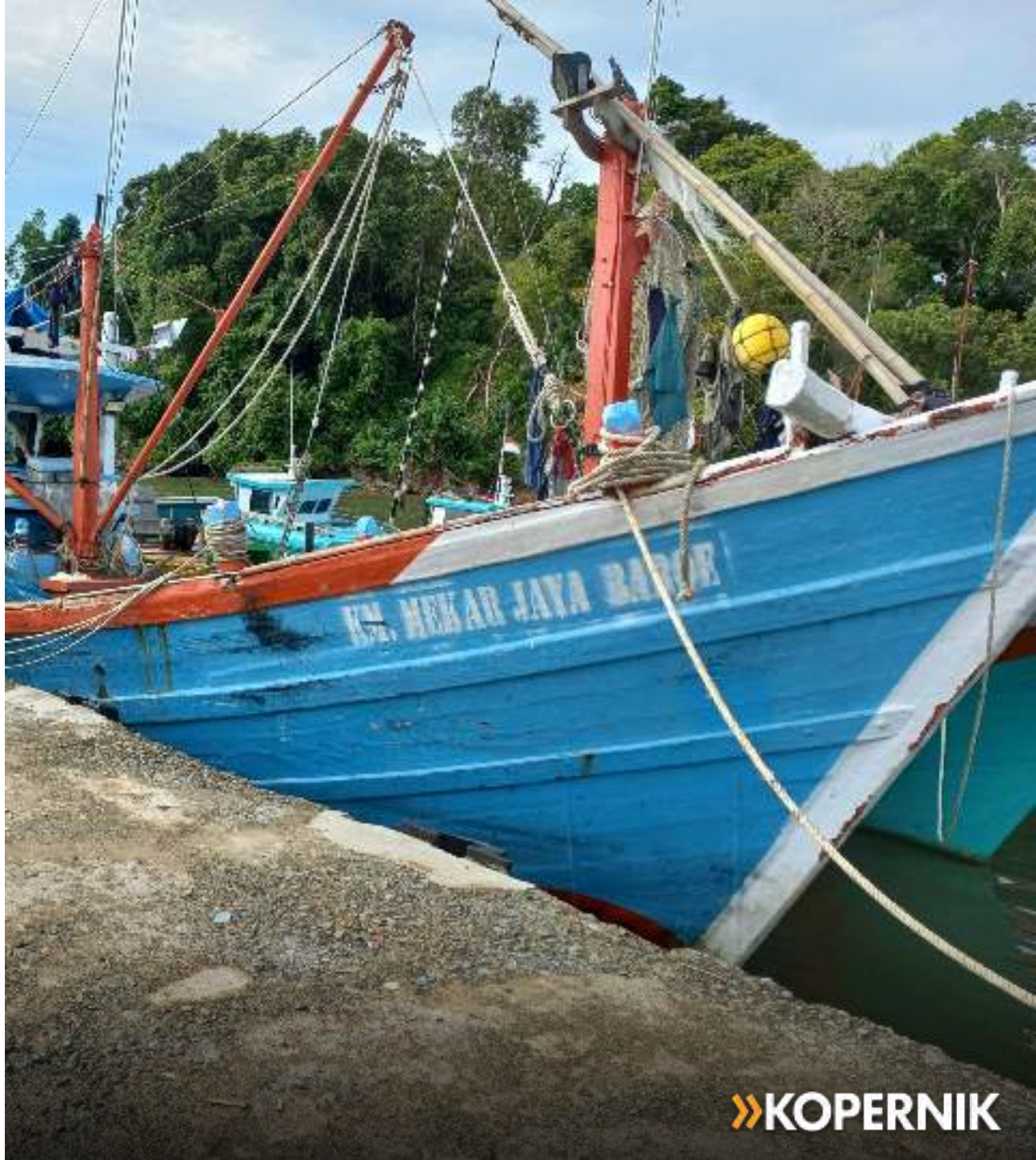

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Government offices	Non-Government organization	University
Government of Aceh Jaya	Yayasan Haka	University of Syiah Kuala
Government of Southwest Aceh	Yayasan YABUMI	
	ICAIOS (International Center of Aceh and Indian Ocean Studies)	
	Wildlife Conservation Society	


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