

Stakeholder Analysis of Small-Scale Fisheries in Bunyu Island, North Kalimantan, Indonesia

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ABSTRACT

Keywords:

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Small-scale fisheries in Bunyu Island, North Kalimantan, hold a strategic position in supporting Indonesia's maritime border economy. Various stakeholders are involved in the management of small-scale fisheries in the island. The objective of this study is to analyze stakeholders engaged in small-scale fisheries in Bunyu Island, North Kalimantan, Indonesia. A survey method was employed, with data collection conducted from July to August 2025. Respondents were determined using a purposive sampling technique, comprising parties directly involved in small-scale fisheries on the island. The analysis employed stakeholder categorization, stakeholder analysis by influence-interest matrix, and actor linkage mapping to examine stakeholder positions and interactions. The findings indicate that 14 stakeholders are engaged in the management of fisheries in Bunyu Island. The Marine and Fisheries Office of North Kalimantan hold both high interest and influence due to its authority in fisheries management. Fishers, while having high interest, exhibit relatively low influence in the policy-making process. These findings highlight the presence of power asymmetry and predominantly top-down governance structure. Academic institutions play a role by providing research and recommendations to support fisheries management. To promote collaborative governance, the Provincial Marine and Fisheries Office should institutionalize fisher participation in decision-making forums.

INTRODUCTION

Small-scale fisheries contribute significantly to global fisheries by providing a resilient source of food and income for coastal communities. Biologically and socially diverse, small-scale fisheries underpin the livelihoods of coastal communities (Arthur, 2020). Consequently, small-scale fisheries contribute to poverty alleviation among coastal households (Basurto et al., 2025). As a provider of nutrient-dense seafood, small-scale fisheries also contribute to national nutrient supplies (Kjelleveid et al., 2022). Indonesia has approximately 2,2 million small-scale fishers, representing about 96% of all fishers nationwide (Febrica et al., 2025).

Bunyu Island is a small island located in North Kalimantan Province, Indonesia. The island is bordered by the Sulawesi Sea to the east, Baru Island to the west, Tarakan City to the south, and Nunukan Regency to the north. Bunyu Island is administratively part of Bulungan Regency, North Kalimantan, with a land area of 198.32 km² (BPS Kabupaten Bulungan, 2025).

Bunyu Island serves as a crucial hub for maritime economic activities in North Kalimantan. The island is a major site for oil and gas production, making it a key contributor to the national energy supply (Shiddiq et al., 2021). In addition, Bunyu Island hosts significant coal mining operations in North Kalimantan.

In addition to its energy potential, Bunyu Island also possesses potential commodities in fisheries. Bunyu's capture fishery production in 2024 reached 2,387 tons. Furthermore, 390 fishery households rely on the fisheries sector (BPS Kabupaten Bulungan, 2025). Most fishers use traditional traps (bubu), shrimp mini trawls, and hand lines (Firdaus et al., 2019). They catch various fish species such as red snapper (*Lutjanus* sp.), grouper (*Epinephelus* sp.), threadfin (*Polynemus* sp.), rays, shrimp and lobster (Salim & Kelen, 2017). Most fisheries activities in the island are categorized as small-scale fisheries because the fishing activities were operated by a ≤ 5 GT vessel (Halim et al., 2019).

Despite being small-scale, the fishery commodities from the waters around Bunyu are highly valued. These fishery products are regularly transported to Tarakan, Indonesia and Tawau, Malaysia where they are further exported to broader markets. The fisheries commodities of Bunyu highlight the important role of this island in sustaining both local community livelihoods and the regional trade network.

However, fisheries on Bunyu Island face several issues. Bunyu's fisheries face gear conflicts and weak coordination among involved actors. Catches have declined recently, which many fishers attribute to environmental pollution from nearby coal-mining operations. Additionally, gear conflicts occur among fishing gears involving traditional traps, *rawai senggol* (long lines), and fish trawls, mainly due to the competition over fishing grounds. Moreover, according to the fishers, the governance of fisheries implemented by Fisheries Offices remains ineffective. These problems highlight the importance of stakeholder involvement in managing Bunyu Island's fisheries.

The stakeholder concept refers to any individual or group that influences or is influenced by an organization's objectives (Freeman & McVea, 2001). Stakeholder analysis is a process that identifies the aspects of social and natural phenomena influenced by a decision, determines who is affected or can influence it, and prioritizes them for decision-making (Reed et al., 2009). In addition, stakeholder analysis systematically identifies the individuals and groups engaged in fisheries management and evaluates their interest and influence (Bendtsen et al., 2021). By rendering these interest and power relations, stakeholder analysis supports anticipating and mitigating potential conflict between stakeholders. In the case of Bunyu's fisheries, stakeholder conflicts have already been identified, which highlight the need for such analysis.

Conflicts between different fishing gears suggest that gear regulation and enforcement remain ineffective. Furthermore, the coral reef degradation, which many attribute to mining activities, has reduced catches for fish-trap fishers, which indicates an ecological conflict between artisanal fishers and the company. The concerns voiced by fishers have not received an adequate institutional response, which points to poor governance. Given these conditions, a stakeholder analysis of Bunyu's small-scale fisheries is necessary to diagnose and mitigate conflicts and to provide a robust basis for future management planning.

Mapping fisheries stakeholders provides the analytical basis for participatory planning and conflict mitigation. Previous studies have investigated stakeholder analysis by mapping actors and assessing their interest and influence. Scrich et al. (2024) examined stakeholders in marine litter monitoring using an interest-power matrix. Solomonsz et al. (2021) combined stakeholder analysis with an interest-influence matrix and Values-Rules-Knowledge framework. Several studies in Indonesia have identified stakeholders and classified them using an interest-influence matrix (Arief et al., 2019; Hasan et al., 2022; Oktaviana et al., 2022; Osmaleli et al., 2022; Suharno et al., 2020; Triyanti & Susilowati, 2019). Muawanah et al. (2020) assessed stakeholder interest through a pairwise comparison scale using the Analytical Hierarchy Process (AHP) in another study. Stakeholder analysis that maps levels of interest and influence can be employed to characterize roles and priorities in Bunyu's small-scale fisheries. However, information on the stakeholders involved in small-scale fisheries on Bunyu Island and their respective interests and influence remains limited. Previous studies tend to treat stakeholder categorization, influence-interest analysis and relational interactions as separate analytical components. This study integrates multiple analytical approach to uncover the structural dynamic stakeholder relationships by combining stakeholder categorization,

influence-interest analysis and actor linkage mapping. Therefore, this study investigates stakeholder involvement and assesses stakeholders' interest and influence on the small-scale fisheries of Bunyu Island.

METHOD

This study employed survey method to obtain primary data on stakeholder's roles and interactions in small-scale fisheries. Data was collected from July to August 2025 on Bunyu Island, Bulungan Regency, North Kalimantan, Indonesia (Figure 1). This study employed the stakeholder analysis proposed by Reed et al. (2009). Stakeholder analysis consists of three main steps, including identifying stakeholders, categorizing stakeholder, and investigating relationship between stakeholders, respectively.

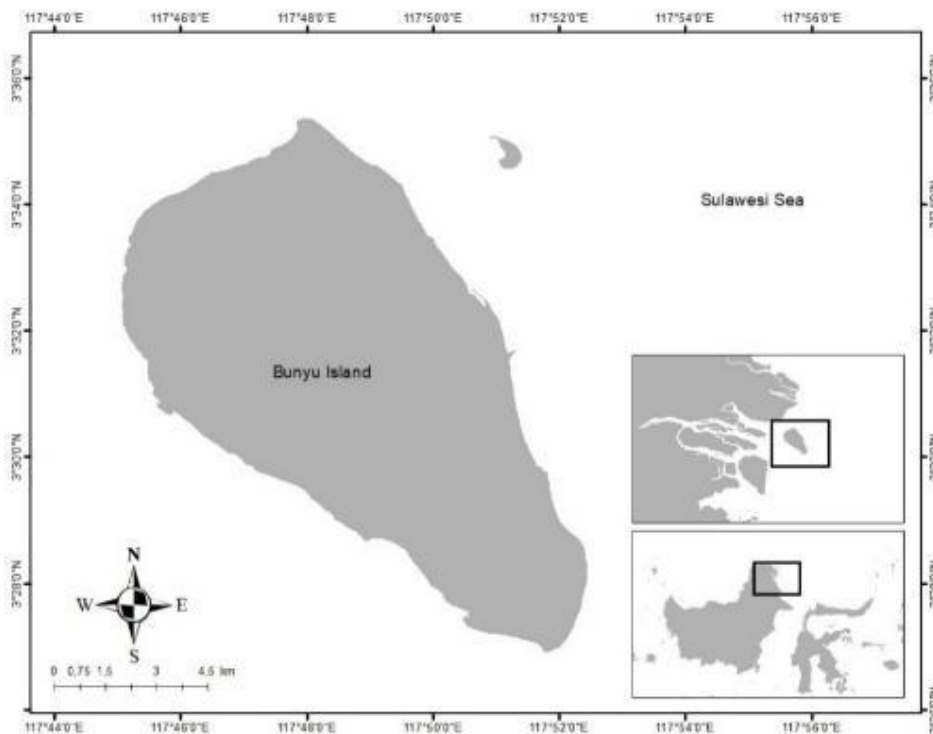


Figure 1. Study area of small-scale fisheries stakeholders in Bunyu Island

The first stage involved identifying stakeholders through interviews with selected respondents. Respondents were selected by purposive sampling to select based on their direct involvement and relevance to small-scale fisheries management in Bunyu Island. The respondents comprise key fishers (n=10), fisher-group representatives (n=10), landing post (n=1), fisheries officers (n=1) and fisheries expert (n=1). Following the identification stage, stakeholders were classified according to the sectoral typology proposed by Scrich et al. (2024), comprising the public, private, third sector, academia and civil society sectors.

In the second stage, stakeholders were characterized based on their interest and influence. The criteria of each dimension of interest and influence were based on Suharno et al. (2020) (Table 1). Each dimension of interest and influence consisted of five criteria and was scored on a scale of 1 to 5 according to their role, involvement and influence in small-scale fisheries. Moreover, they were classified into key players, context setters, subjects and crowd.

Table 1. Criteria of interest and influence dimensions.

Code	Criteria
<i>Influence</i>	

F1	Instruments and sources of strength (power) at each stakeholder
F2	Position of the degree of stakeholders in decision making
F3	Human resources support for the management of fisheries resources
F4	funding and management capabilities for fisheries resources management
F5	interaction with other stakeholders
<i>Interest</i>	
R1	Stakeholder involvement in fisheries management
R2	Reliance of stakeholders on fisheries management
R3	The role of each stakeholder related to fisheries management
R4	Benefits obtained by stakeholders from fisheries management
R5	Stakeholders interest in sustainable fisheries management

Source: Suharno et al. (2020)

In the final stage, the Actor-Linkage Matrix was applied to examine the relationships among stakeholders involved in small-scale fisheries on Bunyu Island (Biggs & Matsaert, 1999; Horschig et al., 2020). Each stakeholder was positioned in a matrix and their pairwise relationships were evaluated on their interactions. These relationships were categorized into three main types comprising cooperation, complementarity and conflict.

RESULT AND DISCUSSION

Stakeholder identification

The survey identified fourteen stakeholders involved in Bunyu's small-scale fisheries. These stakeholders were categorized into four main sectors, which include the public, private, academic, and civil society sectors, comprising regulatory authority, resource beneficiaries, academic institutions, financial institutions, private companies, and law enforcement agencies. Table 2 presents these stakeholder groups along with their roles in fisheries management.

Table 2. Stakeholders in Bunyu's small-scale fisheries and their roles

Actor	Role
Marine and Fisheries Office of North Kalimantan	Main authority in fisheries management, regulation and policy enforcement
Fisheries Offices of Bulungan Regency	Fishers' development and assistance, coordination with the provincial office
Fishers	Primary resource users, main fishing actors, direct beneficiaries
Fisher's group	Collective organization of fishers, organizing fishing activities, advocacy platform for fishers
Landing post	Providing facility for fish landing, catch recording, fish distribution supply chain, financial provider
<i>Toke</i> (Patron)	Capital provider, own boats and fishing gear, provides logistics
Pokmaswas	Community-based surveillance partner, early detection of IUU fishing practices,
Fisheries Field Extension Officers (PPL)	Facilitate government programs, provide training, strengthen fisher capacity, act as liaison between government and fishers
Private sector (PT Pertamina and Coal Mining Companies)	Oil, gas and coal concession holders in Bunyu, potential contributors through CSR programs
Academic Institution	Knowledge provider, research and scientific studies, policy recommendation, evidence-based advocacy, community capacity building

Actor	Role
Bank	Financial service provider, saving and credit access, business investment
PSDKP Tarakan	Monitoring, control, and surveillance authority, compliance oversight, enforcement against IUU fishing
TNI AL	Maritime defense and security, territorial patrols, prevention of IUU fishing
Polairud	Maritime law enforcement, surveillance, patrols and prosecution of IUU fishing

1. Marine and Fisheries Office of North Kalimantan

The Marine and Fisheries Office of North Kalimantan is an implementing body of regional autonomy in marine and fisheries affairs. It is accountable to the Governor of North Kalimantan Province. It has a duty to carry out governmental affairs in the marine and fisheries sector within the jurisdiction of the regional authority, based on the principles of regional autonomy and co-administration. Fisheries management at the regional level is assigned to the Provincial Government through the Marine and Fisheries Office, which is authorized to manage catch fisheries within 0-12 nautical miles.

The duties and authorities of the Marine and Fisheries Office of North Kalimantan are regulated under Governor Regulation Number 21 of 2016. The Office has authority over capture fisheries, which consists of the section for fishery resource management, the section for fisher affairs, and the section for fisheries port management and infrastructure. This mandate and organizational structure make the Office a central stakeholder in regional fisheries governance.

2. Fisheries Offices of Bulungan Regency

According to Law Number 23 of 2014 on Regional Government, the authority of the regency government in the fisheries sector includes the empowerment of small-scale fishers and the management of fish auction sites. The fisheries sector at the regency level in Bunyu Island is authorized through the Fisheries Offices of Bulungan Regency. The duties and functions of the Fisheries Office of Bulungan Regency are stipulated in Bulungan Regent Regulation Number 19 of 2022.

The Fisheries Office of Bulungan Regency is mandated to formulate and implement fisheries policies at the regency level. Its functions include empowering small-scale fishers, managing and operating fish auction sites, and providing capture fisheries facilities. Furthermore, the Fisheries Office is also responsible for administrative functions related to the fisheries sector.

3. Fishers

In fisheries management, fishers are the main actors who utilize fisheries resources directly. According to data from Statistics Indonesia or BPS (2025), Bunyu Island has approximately 390 fishing households. However, the number of active fishers is currently estimated at approximately 120. Generally, the fishers in Bunyu Island use traditional fishing gears such as fishing traps (*bubu*), shrimp trawls, hand lines and stationary lift nets (*bagan tancap*). These gears are relatively small-scale in size and nature, reflecting the small-scale characteristics of Bunyu's fisheries.

The fisheries commodities caught by Bunyu's fishers vary depending on the type of fishing gear they use. The traditional fishing traps are primarily utilized to target demersal species such as grouper and snapper fish. In addition, these traps occasionally capture high-value species such as lobsters or crayfish. On the other hand, stationary lift net fishing gears commonly catch small pelagic species such as anchovy species (*Stolephorus* sp.)

4. Fisher's Group

Fisher's group plays an important role as a collective organization representing small-scale fishers in Bunyu Island. Currently, Bunyu has 25 fisher groups, with each group

comprising 10 members. The fisher group plays an important role in facilitating government programs, especially in distributing fishing aids, training, and capacity-building activities. In addition, fisher's group possesses a bargaining position allowing them to advocate and represent the fishers' interest to the government.

5. Pokmaswas

The Community Monitoring Group (Pokmaswas) is a participatory institution implementing surveillance activities related to fisheries resources and coastal environments. Its members are comprised of diverse societal elements, including fishers, customary leaders, religious figures, and other local community groups. Its functions include overseeing fishing activities such as illegal fishing and destructive practices. In addition, Pokmaswas is engaged in empowering local communities and encouraging responsibility in safeguarding the environment.

6. Landing post

A landing post functions as a trading hub and a designated site for fishing landings. It serves as the place where fish catches are brought after fishing. The landed fish are subsequently bought by post owners who act as intermediaries before the fish enter the broader market. The post owners serve not only as purchasers, but also as financial providers for fishers. In addition to purchasing landed fish from fishers, they provide financial assistance through loans. This financial support creates a dependency relationship between fishers and post owners. Consequently, the fishers sometimes must sell their fish catch to the post owners.

There are four landing posts on Bunyu Island. Three of them are primarily designated for fish commodities, while one post-landing is focused explicitly on shrimp commodities. These landing posts highlight Bunyu Island's role as a fisheries center that supports the economic livelihoods and the supply chain.

7. Toke (Patron)

Toke, also known as *tengkulak* in other regional terms, serve as the fishers' funding providers. *Toke* exemplifies a patron-client system in their relationship with the fishers. In Bunyu Island, *Toke* can act as the post owner and as a financial provider for fishers. Compared to individuals who act solely as *toke*, most fishers in Bunyu Island are more dependent on the post owners.

8. Bank

Banks, as financial institutions, contribute to the development of fisheries on Bunyu Island. Banks provide access to financial services such as savings, credit and loans. Fishers are able to invest their finance for fishing activities and improve their equipment. Currently, two banks are operating in Bunyu Island, namely Bank Kaltimara and Bank Mandiri.

9. Fisheries Field Extension Officer

Fisheries Field Extension Officers or Petugas Penyuluh Lapangan (PPL) from the Ministry of Marine Affairs and Fisheries are assigned to Bunyu Island to support the development of small-scale fisheries. The Fisheries Field Extension Officer's role is to facilitate, motivate, and partner in supporting fisheries actors. In addition, Fisheries Field Extension Officers mediate between the local fishers and the government.

10. Law Enforcement Authorities and Defence Forces

Security, monitoring, and law enforcement responsibilities in fisheries are delegated to the Water and Air Police (Polairud) and the Indonesian Navy (TNI AL). Polairud carries out surveillance, maritime security, and law enforcement duties across Indonesia's waters. Meanwhile, the Indonesian Defence Forces, through TNI AL, contributes to small-scale fisheries through maritime defence and security functions. Their responsibilities include patrolling waters, preventing illegal fishing practices, and protecting fishers from maritime threats.

11. PSDKP Tarakan

The Monitoring, Control and Surveillance of Marine and Fisheries Resources or PSDKP, is a technical implementing unit under Ministry of Marine Affairs and Fisheries of Indonesia. PSDKP is responsible for overseeing compliance and enforcing regulations in the fisheries sector. The working area of PSDKP in Bunyu, Bulungan Regency, is administratively included within the operational area of PSDKP Tarakan.

12. Academic institution

As an academic institution, the University of Borneo Tarakan is mandated to implement the three pillars of higher education: education, research and community empowerment. In fisheries management, the University contributes through scientific studies, research dissemination, and community empowerment programs that support sustainable fisheries and community capacity. The University develops human resources through education, especially for the local community. Research conducted by the University produces scientific data and evidence that can support the decision-making process in fisheries management. In addition, a community empowerment program can strengthen the capacity and skills of fishing communities.

13. Private Sector

In this study, the private sector refers to PT Pertamina and coal mining companies operating in Bunyu Island. Their activities influence the coastal and marine ecosystems, affecting small-scale fisheries' sustainability. In addition, the company provides Corporate Social Responsibility (CSR) programs supporting fishermen and fishing activities in Bunyu Island.

Sector categorization

The identified stakeholders were classified into five sectors: public, private, third sector, academia, and civil society. The public sector refers to governmental institutions responsible for providing public goods and services and exercising regulatory authority. The private sector comprises business entities of various scales whose primary objective is economic and market-oriented activity. The third sector includes non-profit and community-based organisations pursuing public interests, such as fisher groups and community surveillance units. Academia represents research and educational institutions that generate scientific knowledge and support evidence-based policy. Finally, civil society refers to citizens and informal community networks, including individual fishers, who represent local interests and are directly affected by fisheries governance.

The public sector consists of governmental and enforcement institutions, including the Marine and Fisheries Office of North Kalimantan, the Fisheries Office of Bulungan Regency, Fisheries Field Extension Officers (PPL), PSDKP Tarakan, TNI AL, and Polairud, all of which play regulatory, administrative, and law enforcement roles. The private sector comprises actors engaged in economic and financial activities, namely the landing post, Toke (patron), PT Pertamina and coal mining companies, and banks, which contribute through capital provision, logistics, or corporate social responsibility programs. The third sector includes collective and non-profit community organizations such as the fisher's group and Pokmaswas, which represent organized local participation and community-based monitoring functions. The academia sector is represented by academic and research institutions that provide scientific knowledge, policy input, and capacity-building support. Finally, the civil society sector consists of individual fishers and informal community networks that act as primary resource users and are directly affected by fisheries policies. The illustration of this sectoral categorization is presented in Figure 2.

Public	Private	Academia
<ul style="list-style-type: none"> Marine and Fisheries Office of North Kalimantan Fisheries Offices of Bulungan Regency Fisheries Field Extension Officers PSDKP Tarakan TNI AL Polairud 	<ul style="list-style-type: none"> Landing post <i>Toke</i> PT Pertamina and Coal Mining Companies Bank 	<ul style="list-style-type: none"> Universitas Borneo Tarakan
	Third Sector	Civil Society
	<ul style="list-style-type: none"> Fisher's Group Pokmaswas 	<ul style="list-style-type: none"> Fishers

Figure 2. Categorization of stakeholders according to the sector in Bunyu's small-scale fisheries

Stakeholder analysis

In order to categorize the stakeholders in Bunyu's small-scale fisheries, an assessment was conducted based on their levels of influence and interest (Table 3). Influence refers to the capacity of stakeholders to affect decision-making processes. Meanwhile, the interest reflects the concern and involvement of stakeholders in fisheries-related activities.

Table 3. Score of stakeholder influence and interest.

Stakeholders	Influence						Interest					
	F1	F2	F3	F4	F5	Total	R1	R2	R3	R4	R5	Total
Marine and Fisheries Office of North Kalimantan	5	5	4	5	4	23	5	5	5	3	5	23
Fisheries Offices of Bulungan Regency	3	4	3	4	4	18	4	3	3	3	3	16
Fisher	2	2	3	2	3	12	5	5	4	5	5	24
Fisher's group	2	3	3	3	3	14	5	5	4	5	5	24
Landing Post	1	1	3	4	1	10	3	3	3	4	3	16
<i>Toke</i>	1	1	3	4	1	10	3	4	4	4	3	18
PPL	2	2	3	2	3	12	3	3	3	3	4	16
Pokmaswas	2	2	3	2	3	12	3	3	4	3	3	16
Private Sector	1	1	1	4	1	8	1	1	2	1	1	6
Academic institution	2	3	3	3	5	16	2	2	3	2	3	12
Bank	1	1	1	5	1	9	2	1	2	1	2	8
PSDKP	3	2	3	1	2	11	3	2	2	2	3	12
TNI AL	2	1	1	1	2	7	1	1	2	2	2	8
Polairud	2	2	1	1	2	8	2	1	2	2	3	10

Source: Processed data (2025)

The stakeholder analysis matrix depicts the distribution of stakeholders in Bunyu's Island small-scale fisheries (Figure 3). Reed et al. (2009) described that there are four stakeholder categories based on their level of interest and influence, namely key players, context setters, subjects, and crowd. Key players are those exhibiting high levels of both interest and influence. These actors typically hold formal legal authority over decisions and should be substantively involved in decision-making (Muawanah et al., 2020). Meanwhile, the subjects have high interest but low influence, whereas the context setters have high influence but low interest. Subsequently, the crowd comprises stakeholders with little interest and influence.

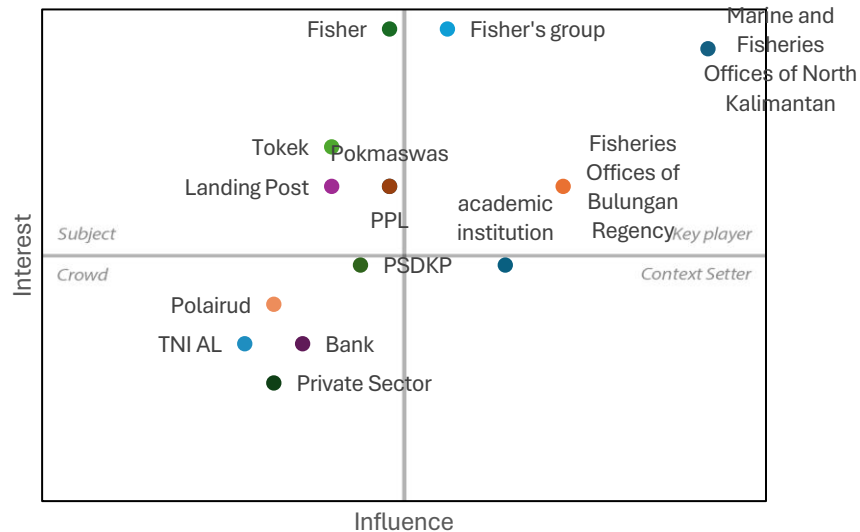


Figure 3. Matrix of stakeholders categorized by influence and interest level

Marine and Fisheries Office of North Kalimantan, the Fisheries Offices of Bulungan, and the fisher's group are key players because they possess high interest and influence. Meanwhile, the subject consists of fishers, *toke*, landing posts, Pokmaswas and Fisheries Field Extension Officer, which illustrate their high interest but limited influence. The academic institution is classified into context setters because they influence by providing data and analysis, despite having a lower direct interest. In addition, the crowd comprises the private sector, PSDKP, Bank, Polairud and Indonesian Navy (TNI AL). The influence and interest of stakeholders are determined by multiple factors, including ecological conditions, bureaucratic structures, political dynamics, and social and economic conditions (Arief & Pradini, 2019).

The results indicate that the Marine and Fisheries Office of North Kalimantan demonstrates both high interest and influence in the fisheries management. As the provincial authority responsible for the sector, it holds a legal mandate to formulate, coordinate, and implement fisheries policies and programs in the Bunyu Island's fisheries. Compared to the Fisheries Offices of Bulungan Regency, the Provincial Office holds broader authority in managing fisheries. Among the responsibilities of the Regency Offices is the empowerment of small-scale fishers. Latief & Wijaya (2025) show that the government plays pivotal roles in fisheries management, acting as a regulator, dynamist, facilitator and catalyst. Stakeholders who serve as key players should be actively involved throughout all stages of the process (Scrich, et al., 2024).

The analysis showed that the fishers were categorized as subject stakeholders. Other studies have also revealed that the fishers were included as a subject category, as they exhibit high interest but possess relatively low influence in the decision-making process (Hasan et al., 2022). Structural barriers between policy-makers and fishers could obstruct the fishers from influencing the policy (Semitiel-García & Noguera-Méndez, 2019). Moreover, the concentration of authority in bureaucratic institutions has marginalized fishers' roles, reducing them to subjects of top-down development (Hart, 2021).

However, this study reveals that fisher groups have greater influence than individual fishers, positioning them as key players. The Fisher group has collective organizational strength. In contrast, structural barriers and a lack of representation often limit individual fishers. On the other hand, the fisher group can consolidate multiple fishers that provide bargaining power to the policy-making (García Lozano et al., 2023; Méndez-Medina et al., 2021).

As the context setter, the academic institution has high influence but relatively low interest. An academic institution such as Universitas Borneo Tarakan holds a strategic role in fisheries management. The university has influence on policymaking and supports community

capacity building. Scientific research conducted by academia generates knowledge that can be applied to fisheries' policies (Msomphora, 2016). In addition, academia can support multi-stakeholder collaborations that reinforce fisheries management (Lomonico et al., 2021).

In this study, *toke* and landing posts are found to have an equal level of influence within the Bunyu fisheries. Both *toke* and landing posts have capital strength that supports fisheries activities. Nearly all Bunyu fishers rely on *toke* or landing posts as a primary source of capital and logistic necessities for their fishing activities. However, in Bunyu fisheries, post-landing owners can also function as *toke* by providing financial support for fishing operations. Therefore, the role of individuals who act solely as *toke* is more minor than that of landing post owners. The patron-client relationship emerges from the reciprocal relationship established between *toke* and fisher (Arief et al., 2024; Hendrik et al., 2024; Pariska et al., 2025). Notably, social stratification in coastal communities is structured by economic power and social capital (Handoko et al., 2022). Consequently, patron-client relationships between fishers and *toke* dominate *toke* over productive assets and capital (Nuris, 2024). The patrons obtain disproportionate benefits, including higher earnings and a strategic creditor role over fishers (Roberts et al., 2022). However, the *toke* and fisher may develop a cooperative relationship shaped by their mutual economic and social necessities, providing a foundation for collaborative management (Ferdous & Nunan, 2025; Pariska et al., 2025).

The PPL and Pokmaswas are categorized as subjects, demonstrating relatively low influence in fisheries management. The PPL functions primarily as intermediaries conveying fishers' problems and aspirations to government officials. According to observation, the fishers perceived that their concerns were not adequately followed up. Therefore, both PPL and Pokmaswas were observed to remain ineffective in fisheries management. However, the involvement of local-level actors such as Pokmaswas is crucial, particularly during fisheries management's planning and implementation phases (Lukambagire et al., 2024).

The defence and surveillance institutions, such as PSDKP, Polariud and TNI AL, were grouped into the crowd category. They have limited influence in managing fisheries and relatively low interest. Despite low interest, their roles in fisheries are crucial in monitoring and enforcing fisheries regulations.

The private sector was categorized as a crowd due to its low interest in fisheries management. Despite their low interest in managing fisheries, the private sector, such as PT Pertamina and coal mining companies, has significant impacts on fisheries, particularly for fishers in Bunyu. For instance, PT Pertamina has contributed to developing infrastructure for the Bunyu communities by developing roads, schools, and livelihood support for fishers. However, their operational activities in mining have an impact on sustainable fisheries. The fishers perceived that their fish catches had decreased due to marine pollution. Establishing mutual partnerships between fishers and the private sector is necessary to support sustainable fisheries.

Relationships between Stakeholders

The relationships among stakeholders were analysed using the Actor-Linkage Matrix (Table 4). The interactions between stakeholders were tabulated into a two-dimensional matrix and described using categorical keywords (Guise et al., 2024). These relationships illustrate the nature and degree of interactions among stakeholders involved in small-scale fisheries on Bunyu Island.

The relationships among stakeholders indicate the presence of several interactions categorized as conflicts. The matrix reveals that fishers have conflictual relationships with both the Marine and Fisheries Office and private companies. The Marine and Fisheries Office, which belongs to the public sector, holds regulatory authority over fishers as the primary subjects of fisheries management. However, fishers perceive that the government's programs and activities remain ineffective, resulting in the emergence of conflictual relationships. Furthermore, conflicts between fishers and private companies arise because fishers believe that mining activities adversely affect fish habitats, thereby reducing their catch yields.

The Marine and Fisheries Office of North Kalimantan as a key player plays an influential part in engaging with other stakeholders. Most of its relationships with other actors are identified as cooperative, suggesting that the provincial office effectively fosters collaboration among multiple parties involved in the management of small-scale fisheries on Bunyu Island. For instance, the Marine and Fisheries Office maintain cooperative relations with the University of Borneo Tarakan. Their collaboration may include providing scientific studies to inform policy decisions, conducting joint research, and delivering educational initiatives.

Table 4. Actor-Linkage Matrix of stakeholders in small-scale fisheries on Bunyu Island

	Fishers	UBT	Pokmaswas	Fisher's group	Bank	Private comp	Toke	Landing post	Polairud	TNI AL	PSDKP	PPL	FO Bulungan
MFO Nort Kalimantan	Green	Green	Green	Green	Blue	Blue	Green	Green	Green	Green	Green	Green	Green
FO Bulungan	Green	Green	Green	Green	Blue	Blue	Green	Green	Green	Green	Green	Green	Green
PPL	Green	Blue	Green	Green				Blue					
PSDKP	Green	Blue	Green	Red									
TNI AL	Green	Blue	Green	Red									
Polairud	Green	Blue	Green	Red									
Landing post	Green	Blue	Blue	Green	Blue		Green						
Toke	Green			Blue	Green	Green							
Private company	Green	Green	Blue	Red	Green								
Bank	Green			Green									
Fisher's group	Green		Green										
Pokmaswas	Blue	Blue											
UBT	Blue												

Colour	Relationship
Green	Cooperation
Blue	Complementary
Red	Conflict
	Not linked

Note: MFO=Marine and Fisheries Office; FO=Fisheries Office; UBT=Universitas Borneo Tarakan

Although serving as a context setter, the Universitas Borneo Tarakan, which also represents the academic sector, has a complementary role with other stakeholders in managing small-scale fisheries. Its relationship with other actor is necessary for fostering collaboration in the provision of data and information related to fisheries management. For instance, although its relationship with the landing post is categorized as complementary, both parties are able to collaborate in research and the collection of fish landing data, particularly from *bubu* fishers on Bunyu Island

Toke and landing posts, which are also classified as subjects, maintain relationship of varying categories with different stakeholders. Their relationship with fishers is categorized as cooperative, as both parties share mutual roles and interdependence. In addition, most of the relationships involving *toke* and landing posts are categorized as complementary.

Integrating Stakeholder Analysis to Reveal Power and Governance Dynamics

The integration of stakeholder categorization, influence-interest analysis, and actor linkage reveals a structured pattern of power relations in Bunyu's small-scale fisheries. Stakeholder categorization reveals a structural differentiation among actors, where public institutions function as regulators, private actors control financial and market, and fishers serve as resource users. This categorization highlights a distribution of authority and resources, which suggest an unequal structural within the fisheries governance system.

Bunyu's fishers, despite being the most directly dependent on fisheries resources, are positioned as subject due to low influence. This condition can be explained through the concept of power asymmetry, which refers to the unequal distribution of access and control over resources (Crona & Bodin, 2010). In terms of access, fishers on Bunyu do not fully possess the

financial capital required for fishing activities and rely on landing post or *toke* (patron) to support their operations. Based on interviews, many fishers in Bunyu Island obtain loans to purchase boats, fishing gear, or fuel for fishing. In return, fishers are obligated to sell their catch to these patrons. This pattern indicates that fishers have limited access to market, which contributes to their weak influence within the fisheries system. According to the linkage matrix, fishers exhibit cooperative relationships with landing post and *toke*. Nevertheless, these cooperative relation mask a deeper economic dependency.

In contrast, the government institutions, such as Marine and Fisheries Office of North Kalimantan and Fisheries Office of Bulungan, occupy the key player, demonstrating both high interest and strong influence over decision making process. At the same time, fishers show conflictual relationships with government institutions. Government actors maintain broad and cooperative linkages with multiple stakeholders, showing their central position within the network.

There are three main models of fisheries governance, namely top-down (centralized management), market-based governance, and participatory governance (Dudayev, Hakim, & Rufiati, 2023). Based on the governance structure observed in Bunyu, the fisheries system still predominantly follows a top-down approach. Such an imbalanced governance structure leads to unequal access to power relations, where authority is largely concentrated within government and formal institutions. Meanwhile, fishers primarily act as implementers rather than decision-makers, resulting in their limited role and influence within the governance system (Mozumder et al., 2020). By linking these analytical dimensions, the stakeholder positions are not merely the result of functional roles but are shaped by unequal access to power, economic resources and social network.

The results of this study suggest several policy implications relevant to improving the management of small-scale fisheries on Bunyu Island. The Marine and Fisheries Office of North Kalimantan, fisher group, and Universitas Borneo Tarakan as an academic institution should be prioritized as key actors in decision-making process. The participation of fishers in decision-making process needs to be institutionalized. The Marine and Fisheries Office of North Kalimantan should formally include fisher group representatives in fisheries management forums. In addition, fisher group should be strengthened with capacity building to enhance their ability to engage with both government and private sectors. Strengthening fisher group as partners in governance can enhance bottom-up participation and improve the representation of local interest. Collaborative mechanisms between the government, academia, and local fishers are therefore essential to ensure that fisheries management is both inclusive and evidence-based.

Strengthening collaborative governance among stakeholders is necessary to ensure sustainable fisheries in Bunyu Island. Evidence from multiple studies indicates that stakeholder engagement improves fisheries management effectiveness (Bausero-Jorcin et al., 2024; Bryhn et al. 2017; Dudayev et al., 2023; Retnoningtyas et al., 2021). The effectiveness of stakeholder engagement in Bunyu Island's governance hinges on the extent to which relevant public and stakeholder interests are substantively and fairly represented (Reed et al., 2017). Moreover, broadening participation to a diverse set of stakeholders enables collaborative governance to mobilize richer knowledge, deeper experience, and greater resources for evidence-informed policymaking (Bodin, 2017). Key players comprising the Marine and Fisheries Office and fisher group should be actively engaged in policy formulation and implementation. Universitas Borneo Tarakan, an academic institution in North Kalimantan, can support evidence-based policymaking. Meanwhile, partnerships with the private sector should be directed toward sustainable fisheries.

CONCLUSION

This study highlights the diverse roles among stakeholders in Bunyu's small-scale fisheries and demonstrates their distribution according to their influence and interest. Key players, including the Marine and Fisheries Office of North Kalimantan and Bulungan Regency,

and the fisher group, hold a crucial role in Bunyu's small-scale fisheries due to their high interest and influence. The subject category such as fishers, demonstrates high interest but limited influence, suggesting that engaging and empowering fishers is essential to enhance their role in decision-making. The participation of fishers in decision-making process should be institutionalized through formal inclusion in fisheries management forums. This measure is necessary to reduce existing power asymmetries. Strengthening collaborative governance that integrates key players, subjects, context setters, and crowd stakeholders is crucial to ensure more inclusive and sustainable management of Bunyu's small-scale fisheries.

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