BEEJ, e-ISSN 2722-1377, Vol. 4, No. 2, September 2023
BEE JOURNAL
BABASAL English Education Journal
English Education Study Program, Indonesia

Article History
Received: 19-August-2023
Approved: 20-August-2023
Published: 27-September-2023

ECOLOGICAL IMPACTS OF MINING ACTIVITIES: LOCAL KNOWLEDGE OF BAJO FISHERMEN COMMUNITIES

Takwa[1], Zakaria[2], Hendri Yawan[3], Ashari, Sumarlin Rengko HR[4], Muh. Nurtanzis Sutoyo[5]
[1]Universitas Sembilanbelas November Kolaka,[2]Universitas Sembilanbelas November Kolaka,
[3]Universitas Sembilanbelas November Kolaka, [4]Universitas Hasanuddin Makassar,
[5]Universitas Sembilanbelas November Kolaka,[5]Universitas Sembilanbelas November Kolaka,
Email: takwarachman68@gmail.com[1], zakaria.usn'gmail.com[2], hendriyawan'gmail.com[3],
sumarlinrengko@unhas.ac.id[4], ashariarifinari@gmail.com[5], mns.usn21@gmail.com[6]

Abstrak
Penelitian ini bertujuan untuk menentukan sejauh mana perubahan ekologi yang memengaruhi para nelayan di daerah pesisir Kecamatan Pomalaa, Kabupaten Kolaka, dan bagaimana pengetahuan lokal para nelayan Bajo di Kolaka termanifestasi. Hasil penelitian menunjukkan bahwa perubahan ekologi di daerah pesisir disebabkan oleh kegiatan pertambangan nikel masif di pantai, yang berdampak pada kehidupan para nelayan di desa-desa pesisir Kecamatan Pomalaa, yaitu desa Hakatutobu, Tambea, Sopura, dan Oko-Oko. Bentuk-bentuk perubahan ekologi terlihat dalam polusi lingkungan di hutan bakau, padang lamun, terumbu karang, dan biota laut lainnya, bahkan kerusakan pada budidaya perikanan masyarakat seperti teripang, rumput laut, dan budidaya keramba. Studi ini juga menemukan bahwa komunitas nelayan Bajo sangat dilematis dalam menghadapi kenyataan ini, dan tidak ada pilihan bagi para nelayan selain mengandalkan pengetahuan lokal mereka, mencari dan menangkap produk-produk laut sebagai upaya mereka untuk memenuhi kebutuhan mereka.
Kata kunci: *Pengetahuan lokal; Nelayan; Dampak Ekologi; Suku Bajo;*

Abstract
This study aims to determine the extent of ecological changes affecting the fishermen in the coastal area of Pomalaa District, Kolaka Regency, and how the local knowledge of the Bajo fishermen in Kolaka manifests. The results of the study indicate that the ecological changes in the coastal area are caused by massive nickel mining activities on the coast, which have an impact on the lives of fishermen in the coastal villages of Pomalaa District, namely Hakatutobu, Tambea, Sopura, and Oko-Oko villages. The forms of ecological changes are evident in the pollution of the environment in mangroves, seagrass beds, coral reefs, and other marine biota, even the damages to the community's fisheries cultivation such as sea cucumber, seaweed, and floating cage culture. The study also found that the Bajo fishermen's community is very dilemmatic in facing this reality, and there is no choice for fishermen other than to rely on their local knowledge, search for and catch marine products as their effort to meet their needs.
Keywords: *Local knowledge; fishermen; ecological changes; Bajo Community;*

Introduction

Talking about coastal communities cannot be separated from the group of people who live in coastal areas and rely directly on the utilization of marine and coastal resources for their livelihoods. For coastal communities, they generally work in the fisheries sector or work as fishermen, and even so far, they are considered as part of

marginalized groups in society. Kusnadi 2000 (Helmi, 2012) stated that studies on the lives of fishermen generally emphasize poverty and economic uncertainty due to the difficulties faced by fishermen and their families. This situation is caused by the relationship between fishermen and their environment (coastal and marine) which is enveloped in a situation of uncertainty (Adriati, 1992; Kusnadi, 2000; Satria, 2009).

Coastal communities whose livelihoods mainly rely on fishing in the sea have a strong character as fishermen, following the dynamic nature of the resources they deal with. To fulfill their catch, they must have physical strength that knows no exhaustion, no surrender, and a cooperative attitude to survive in their profession. Working as a fisherman and in various other jobs related to the potential of coastal resources is a common practice among communities living on the coast. Essentially, coastal communities have diverse characteristics, but in general, they work as fishermen using various levels of fishing technology.

In managing the sea, coastal communities are highly concerned because the sea is a source of life, and people living near the coast are heavily dependent on it. With their local knowledge system, they can manage the sea with all the wisdom they possess. As a coastal community, the Bajo tribe has inherited local knowledge that has been passed down through generations (regeneration), and it has become a part of their local cultural system. This knowledge is used to understand various marine conditions, and among the forms of local knowledge of the Bajo fishermen include knowledge about fishing locations, knowledge about various marine biota, navigation, and knowledge about environmentally friendly fishing gear as a manifestation of their belief system that governs their lives, even as part of their identity and self-image based on their cosmological views.

The Bajo people's closeness to the sea is due to their daily life being in contact with the sea and completely dependent on nature. Because their entire life revolves around the sea, the characteristics of their social, cultural, and economic life are heavily influenced by their perspective on the natural forces that surround their daily lives, shaping their mindset to be oriented towards the sea. According to Hafid (2014), the Bajo people see the sea as their homeland and source of life, even though they live on land, because of their high dependence on the sea. Bajo fishermen see the sea from several perspectives: as a friend (sehe), as medicine (tabar), and as a dwelling place/location (patambangan/tampa). Although scientific knowledge has advanced, local knowledge about natural phenomena possessed by the Bajo community is still a reference for them in their daily lives at sea. Bajo communities living in coastal areas have an emotional attachment to natural resources, which leads to real behavior that considers ecology in their daily lives.

Permana (2020) states that areas inhabited by local communities who still adhere to cultural traditions in Indonesia and other countries do not experience environmental damage because these communities manage and utilize natural resources and the environment (praxis) based on knowledge (corpus) that is infused with belief (cosmos). Therefore, it is not surprising that the knowledge and practices of local communities receive attention from experts as a biocultural system that has a positive contribution to conservation efforts.

The Bajo fishermen living in the coastal area of Pomalaa Subdistrict, Kolaka Regency, Southeast Sulawesi, are faced with a dilemma due to ecological changes that have inevitable impacts resulting from the interaction between humans and nature, in the context of exchange. Despite the ecological changes, the Bajo fishermen in the four coastal villages, namely Tambea, Hakatutobu, Sopura, and Oko-Oko, continue to preserve their local wisdom in utilizing coastal natural resources, including its application

in their daily lives, as an effort to preserve the marine and coastal ecosystems. Various ecological changes that have occurred in the coastal area of Pomalaa Subdistrict include seawater pollution, sedimentation, and acidification. These events have affected the coastal ecosystem, marine biodiversity, and have impacted the fishing sector, as well as the lives of fishermen in the coastal area.

Based on the description above, this research aims to explore the ecological changes that affect the fishermen in the coastal area of Kecamatan Pomalaa, Kabupaten Kolaka, and how the local knowledge of Bajo fishermen in Kolaka is applied to address the ecological changes and preserve the coastal and marine ecosystems.

Research Method

This research uses a qualitative method, which aims to understand the impacts of ecological changes on the activities of fishermen and the forms of local knowledge of the Bajo community in response to these changes. The approach used in this research is descriptive, which is useful for systematically, factually, and accurately explaining the facts and characteristics of a particular population or area. The research was conducted in Hakatutobu Village, Tambea Village, and Sopura Village, Pomalaa District, and the locations were purposively selected. Data collected include primary and secondary data. Primary data were obtained directly from the field through observation and interviews using a prepared interview guide, while secondary data were obtained from various sources such as documents, regulations, and related research reports. Data analysis techniques were conducted from the beginning of data collection. The results of in-depth interviews and observations are presented in the form of daily notes that were analyzed from field observations and intensively consisted of data collection, data analysis, data reduction, data presentation, and drawing conclusions.

Table 1 : Research Data Collection Procedure

Data Collection										
Interview				**Document**				**Observation**		
Name	Designation	Locus/Date	Types of data	Public Statements	Sources	Locus/Date	Types of data	Location	Date	Types of data
Udding Marannuang	Public figure	Hakatutobu Village, Maret 2023	Primer	Sakti Wahyu Trenggono	The minister of Marine Affairs and Fisheries, online newspaper, Internet	Kolaka, 24-02-2023	Secunder	Fisherman in Hakatutobu Village	Januari-Maret 2023	Primer
				Djabir Teto Lahukuwi,	Online newspaper, Internet	Kolaka, 2015	Secunder	Fisherman in Tambea Village	Januari-Maret 2023	Primer
Anwar	Fisherman	Hakatutobu Village, Maret 2023	Primer	Hamzah	Disertation	IPB dan Kolaka, 2016	Secunder			
				La Ode Kardini	Online neswpaper, Internet	Kolaka, 24 Februari 2023	Secunder	Fisherman in Sopura Village	Januari-Maret 2023	Primer
				Alfian Helmi, Arif Satria	Journal	Jakarta, 2012	Seunder			
					BPS (The Central Berau of Statistic) in Southeast Sulawesi	Kendari, 2022	Secunder			
					BPS (The Central Berau of Statistic) in Southeast Sulawesi	Kolaka, 2023	Secunder			

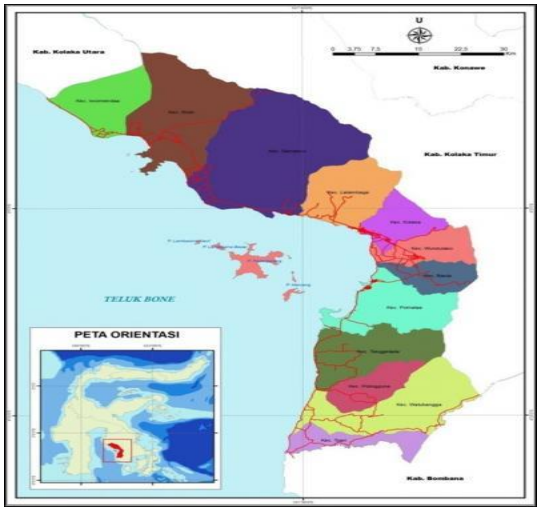
Findings and Discussion

Geographic Condition

The Southeast Sulawesi province, with its capital city of Kendari, is located in a coastal region that includes land, islands, and seas, covering a total area of 38,067.7 square kilometers. As one of the provinces in Indonesia, Southeast Sulawesi has considerable potential with its natural resources, which are a strategic value that contributes to both the national and international level. From these strategic values, several leading sectors can be identified, such as agriculture, fisheries, tourism, and mining. The mining sector is particularly prominent in the region, with various types of mines, including asphalt, nickel, and gold, being a major source of investment.

Kolaka Regency is one of the administrative areas within the Southeast Sulawesi province. Its geographic location covers 2,959 square kilometers. From an oceanographic perspective, Kolaka is considered to have extensive waters (sea), covering approximately 15,000 square kilometers, with a coastline of 293.45 kilometers. Within these waters, there are several large islands such as Padamarang Island, Lambasina Besar Island, Lambasina Kecil Island, Maniang Island, Lemo Island, and Pisang Island. The land area of Kolaka is around 3,283.64 square kilometers. (Kolaka in Figures, 2023).

Figure 1. Map of Kolaka Regency



Pomalaa is located in the southeastern part of Kolaka Regency, in the southeastern peninsula of Sulawesi Island. Geographically, it is situated in the eastern part of Kolaka Regency, with the following boundaries:

- To the north it borders Baula District,
- To the south it borders Tanggetada District,
- To the east it borders Lambandia District,
- To the west it borders Teluk Bone in South Sulawesi Province.

The Pomalaa sub-district in Kolaka Regency consists of 12 villages with a total area of 333.82 square kilometers and a coastline of 25.13 kilometers. Four of these villages are coastal villages, namely Hakatutobu, Tambea, Sopura, and Oko-Oko. The main activities of the people in these four villages are as fishermen, some of them also develop floating net cages (KJA), ponds, sea cucumber cultivation, seaweed cultivation, and pond fish farming. However, with the ecological changes that have occurred in the coastal area of Pomalaa sub-district, Kolaka Regency, at least in terms of changes in the marine ecosystem, mangrove ecosystems, seaweed cultivation, and floating net cages, along with all the impacts that are felt by the Bajo fishermen community in the area.

Environmental Changes

Environmental changes refer to changes that occur in all biotic and abiotic factors in our surroundings. Biotic factors include all living organisms in the environment, including humans. Meanwhile, abiotic factors concern the non-living components of an ecosystem, such as soil, water, weather, and temperature. Thus, environmental changes can be interpreted as a disruption process of the environment, whether caused by natural factors or by humans. Natural changes caused by humans will affect the balance of nature, and in the end, humans will also feel the consequences of their behavior towards nature.

Humans interact with the environment, so indirectly they recognize and understand the environment. By recognizing and understanding the environment, humans continue their survival in the world. Human survival depends on the ability to recognize the similarities and differences of objects in the environment and even the universe, Raves et al., 1971 (Permana, 2020). Bryant and Bailey, 2001 (Helmi, 2012) stated that environmental change cannot be understood separately from the political and economic context in which the issue arises. Therefore, environmental issues such as those in the coastal area of Pomalaa District, Kolaka Regency, are not just technical management problems, but also involve social-political issues. These social-political issues are evidenced by conflicting laws and regulations, both at the local and national levels, which subsequently cause ecosystem damage.

The government's policy on the implementation of the law regulating Regional Government, with the issuance of Law Number 4 of 2009 (replacing Law Number 11 of 1967), known as the Mining Law. Through this law, a new reference was established in the implementation of mineral and coal mining activities, which previously followed the contract of work system replaced with licensing.

In the Minerba Law, several types of licenses are regulated, including Mining Business Permits (IUP) that apply to cooperative and individual business entities, then the People's Mining License (IPR) that is granted to local residents, whether individuals, groups, or cooperatives with a certain area, as well as Special Mining Business Permits (IUPK) that apply to business entities such as state-owned enterprises, regional-owned enterprises, and private companies. In addition to regulating licenses to open land for mining activities, the law also provides authority for various levels of government, including the division of authority levels between district, provincial, and central governments.

Regulations regarding environmental aspects, divestment, processing and refining in the country (downstreaming) to increase added value, as well as administrative sanctions for violations committed by license holders, as well as sanctions against the issuer or issuer of the license are also included. Even in the Minerba Law, attention has been given to environmental aspects, although not fully covering the principles contained in Law No. 32 of 2009 concerning Environmental Protection and Management (PPLH Law). According to Hamzah (2016), the problems in coastal areas where mining takes place are complex. The mining system used by nickel mining companies in Pomalaa District is open-cut mining. The main disadvantage of this system is the large volume of materials involved, which can have negative impacts on the hydrological cycle, soil erosion and sedimentation, water quality degradation, and disturbance to aquatic biota.

In terms of mining, the presence of soil and rock materials (overburden) due to open-cut mining can significantly affect the ecological conditions of the surrounding areas. This will worsen when heavy rainfall occurs because the materials will erode and

enter the sea, causing sedimentation and changes in water quality along the coastal region (Arsyad, 2010).

Table 2: Data of Mining Companies in Kolaka Regency

Areas		Names of Mining Companies	Types of Mining Materials
Regency/City	District		
Kolaka	Pomalaa	Akar Mas International, PT	Nickel
Kolaka	Pomalaa	Aneka Usaha Kolaka, PD	Nickel
Kolaka	Pomalaa	Antam Tbk, PT	Nickel
Kolaka	Pomalaa	Bola Dunia Mandiri, PT	Nickel
Kolaka	Wolo	Ceria Nugraha Indotama, PT	Nickel
Kolaka	Tanggetada dan Lambandia	Dharma Bumi Kendari, PT	Nickel
Kolaka	Tanggetada dan Lambandia	Dharma Bumi Kolaka, PT	Nickel
Kolaka	Tanggetada	Pernick Sultra, PT	Nickel
Kolaka	Pomalaa	Putra Mekongga Sejahtera, PT	Nickel
Kolaka	Tanggetada, Watubangga, dan Lambandia	Toshida Indonesia, PT	Nickel
Kolaka	Wolo	Waja Inti Lestari, PT	Nickel
Kolaka	Pomalaa	Wijaya Nikel Nusantara, PT	Nickel
Kolaka	Pomalaa	Mapan Asri Sejahtera, PT	Nickel

(Source: Directory of Mining Companies in Southeast Sulawesi 2021)

Figure 2: Mudflow fills the road from mining activities in Hakatutobu Village, Pomalaa District (Source: Kendari Pos).

PT Aneka Tambang (Antam) Tbk Unit Bisnis Pertambangan Nikel (UBPN) Pomalaa Sulawesi Tenggara, which is engaged in mineral mining, has long collaborated with the Kolaka Regency government and operates in the Pomalaa District concession area covering approximately 10,000 hectares. The presence of this state-owned enterprise has not yet had a significant impact on the environment in the Kolaka Regency. According to a report by the Forsda Kolaka NGO, Djabir Teto Lahukuwi stated that in addition to PT Antam Tbk, several companies conduct mining business activities in the

Kolaka Regency through Mining Authorization (KP) with Mining Business Licenses (IUP) to operate.

"By paying the reclamation guarantee fund, the company can conduct exploitation and build a Jetty port on the coastal area of Pomalaa district, Kolaka Regency. Some of the companies are PT Darma Rosadi Indonesia (DRI), PT Sumber Setia Budi (SSB), PT Putra Mekongga Sejahtera (PMS), PT Akar Mas Indonesia (AMI), which conduct mining business activities in Kolaka Regency through Mining Rights (KP) with Mining Business License (IUP). The construction of the Jetty port also violates the regulations, and in its construction, it should have created a canal to contain the deposits to prevent them from spilling into the sea. However, in reality, this was not done. As a result, the coastal area is affected. The color of the seawater turned red, and sea cucumbers and seaweed that have been cultivated by fishermen as a source of livelihood in the area cannot thrive and even died due to the red mud floods from the mining waste that flows into the sea. The impact of this not only affects the coastal biodiversity of Pomalaa but also has an economic impact on the community, and the community becomes the victim."

Figure 3: Special port (Jetty) on the coast of Pomalaa

The high rate of sedimentation in coastal areas, such as Hakatutobu, Tambea, Sopura, and Oko-Oko villages in Pomalaa sub-district, has prompted various efforts by mining companies like PT Antam Tbk to minimize the environmental impact of mining activities. One of the efforts is by planting mangroves, especially in estuarine and coastal areas around the mining site, and building check dams as temporary storage for water from mining operations.

Minister of Marine Affairs and Fisheries, Sakti Wahyu Trenggono, emphasized during his working visit to Kolaka on February 24, 2023 that mining activities inevitably exploit the sea, making marine ecosystems a crucial concern. The sea is a source of food for us and the most important contributor to Indonesia's food security and self-sufficiency. Therefore, we must preserve our marine resources from practices that damage the environment, including mining activities.

The rampant destruction of natural resources and the environment that occurs both on land and sea as a result of market economic development, population growth, political policies, technological advancements, and the disappearance of local knowledge has consequences for the existing ecosystems. Environmental degradation not only affects biotic and abiotic life but also poses a serious threat to natural disasters and human sustainability if not accompanied by sustainable conservation efforts.

Forms of Ecological Changes

In human life, there is always a reciprocal relationship between the social system and the bio-physical system (ecosystem) (Rambo, 1983; Parson, 1985; Marten, 2001).

Both systems change according to their own internal dynamics, but still maintain their integrity as separate systems. The socio-cultural background can influence human behavior in treating the natural environment. Conversely, due to the influence of the bio-physical environment, humans must adapt to the environment in order to survive (Hutterer & Rambo, 1985). The relationship between the social and bio-physical systems is very dynamic at all times. Changes in the social system of society will automatically result in changes in the bio-physical system (Rambo, 1983).

Environmental degradation problems have a serious impact on human survival, including the survival of small-scale fishermen in coastal villages in Pomalaa District, Kolaka Regency. Forms of ecological change that occur in coastal areas include damage to mangrove ecosystems, damage to coral reef ecosystems, damage to seagrass ecosystems, and disturbances to aquatic biota. The impacts of these ecological changes are now felt by fishermen in the coastal areas of Pomalaa District, as presented in the following table.

Table 3. Ecological Changes affected by Mining Activities

Mining Activities	Ecological Changes	Social, Economical, and Ecological Impacts
Dredging and accumulation/piling up of nickel materials	The increasing turbidity of coastal waters	Excessive erosion sedimentation and pollution of the coastal environment. 1. Hydrological cycle 1. Increased soil erosion and sedimentation 2. Disturbance to aquatic biota."
The construction of jetty ports.	Destruction of mangrove ecosystems and coastal area runoff.	The loss of feeding grounds and nursery grounds for fish, crabs, shrimps, sea cucumbers, seaweed, and seagrass. 1. Coastal shallowing due to sediment deposition. 2. Coastal erosion. 3. Disrupting the regeneration of fish, crabs, shrimps, and other organisms. 4. Disturbing the growth of seagrass beds
Excavation and deforestation of upland areas	Destruction of mangrove ecosystems, erosion pollution	Sediments from erosion pollute the sea, especially those near the coastline up to the radius of coral reefs, and the turbidity of seawater hinders the growth of seaweed cultivation, sea cucumber cultivation, and floating net cages. Additionally, small rivers and river basins experience pollution due to mud erosion during rainfall.
Ship anchor	Coral reef damage	• Physical damage to coral reefs by ship anchors. • Loss of fishing grounds and altered fish migration patterns

(Sources: Compiled from various sources, including fishermen's perceptions)

Based on the table above, ecological changes have social, economic, and ecological impacts on fishermen, which is in line with the opinion of Bedject et al. (2010) that ecological changes in the sea can cause changes in the availability of fishery products as the main capital of fishermen. In addition, it can also affect the income of fishermen and lead to an increase in accessing resources costs.

In line with the research by Hamzah (2016), the increasing turbidity of the waters in the coastal area of Pomalaa District in the villages of Hakatutobu, Tambea, and Sopura, turns the seawater into dark brown. As a result, sea cucumbers cultivated by the community died. This sea cucumber death case has occurred since 2005, 2007, 2008, and 2010. In addition to sea cucumbers, fish farming using floating net cages (KJA) is also disrupted, particularly in the case of grouper fish. It is suspected that the runoff that enters the coast through several rivers has been found to have exceeded the capacity of the polluted assimilation limit to the level of toxicity for aquatic organisms.

Figure 4: "Material (ore) spills on the coast of Pomalaa District (Source: Internet)

Dahuri, in 2003 (Helmi, 2012), mentioned that the increasing human needs, while the natural carrying capacity is limited, have caused the potential for damage to natural resources to become even greater. This has a serious impact on the livelihoods of fishermen, especially small-scale fishermen. This event is a logical consequence of the fishermen's dependence on coastal and marine resources (Satria, 2009).

Minister of Marine Affairs and Fisheries, Sakti Wahyu Trenggono, reminded during his visit to Kolaka that several mining companies operating in Southeast Sulawesi, including those operating in the Kolaka Regency coastal waters and jurisdictional areas, must have a PKKPRL (Approval for Suitability of Marine Spatial Utilization Activity) for their activities utilizing the coastal waters.

Fisheries Management

In general, fisheries management in Southeast Sulawesi province is focused on the conservation of fishery catchment areas. For coastal fishermen in Pomalaa district, Kolaka regency, particularly in the villages of Tambea, Hakatutobu, Sopura, and Oko-Oko, they are traditional fishermen who have relatively limited access to technology and information. The ecological changes occurring in the coastal areas of Pomalaa district have resulted in the loss of fishing grounds and nursery grounds for fish, shrimp, and crabs.

The changing ecological conditions in the coastal environment have implications for the daily activities of fishermen, especially in the four coastal villages of Pomalaa district, namely Tambea, Sopura, Hakatutobu, and Oko-Oko. The fishermen who have been dependent on natural resources have to work hard and fight to meet their daily needs. Some have chosen to switch professions from fishermen to casual laborers or even

to other certain jobs rather than fishing. However, some Bajo fishermen, although their income from fishing is meager, are still fighting to catch fish in the sea as their main livelihood. Although some traditional fishermen in Kabupaten Kolaka have experienced difficult conditions, the government through relevant agencies, such as the fisheries department in the district and province, has made efforts to encourage and support capture fishermen, including traditional fishermen, towards developing a sustainable and advanced marine and fisheries sector.

Minister of Marine Affairs and Fisheries, Sakti Wahyu Trenggono, is optimistic about the increasing productivity of the marine and fisheries sector in Kabupaten Kolaka, Southeast Sulawesi, with the implementation of the measured fish catch quota policy (PIT). Even when visiting the Mangolo Fish Landing Base (PPI) in Latambaga District, Kabupaten Kolaka, the Minister of Marine Affairs and Fisheries assessed the fishing port in the area as a potential location for launching and landing fishing vessels. PPI Mangolo is planned to be developed by the local government (Pemda) to support vessel capacity, including strengthening facilities at the port. The PPI is expected to support the PIT program (Measured Fish Catch Quota). The PIT policy is one of five blue economy programs of the Ministry of Marine Affairs and Fisheries (KKP) in realizing the acceleration of a sustainable and advanced marine and fisheries sector.

La Ode Kardini, the head of the Department of Fisheries and Marine Affairs in Southeast Sulawesi, explained that the development plan for the Mangolo Fish Landing Base (Pangkalan Pendaratan Ikan/Mangolo PPI) in Latambaga District, Kolaka Regency includes the addition of dock area, vessel docking facilities, dredging of anchorage pools, and cold storage facilities. The development of this port capacity will be funded by a special allocation fund (Dana Alokasi Khusus/DAK) of IDR 22.5 billion in 2023. Kolaka Regency is part of the Fisheries Management Area (Wilayah Pengelolaan Perikanan/WPP) 713 which includes the waters of the Makassar Strait, Teluk Bone, Lores Sea, and Bali Sea. In 2021, the fish production in Kolaka Regency reached 18,600 tons with a value of IDR 533 billion. The dominant types of fish caught are tuna, grouper, mackerel, threadfin bream, and trevally.

Local Knowledge of Bajo Community

Geographically, fishing communities are communities that live, grow, and develop in coastal areas, which are transitional areas between land and sea. Like the Bajo fishing community in the coastal area of Pomalaa District, Kolaka Regency. As a community whose livelihoods depend directly on the sea's bounty, they engage in fishing activities through either fishing or aquaculture. They reside on the beach, with residential environments near their fishing grounds. For traditional fishermen in the villages of Tambea, Hakatutobu, Supura, and Oko-Oko in Pomalaa District, Kolaka Regency, going to sea to catch fish to obtain their livelihood is their main occupation, even though the coastal environment has experienced changes and weather conditions are uncertain.

Udding Marannuang (64 years old), a community leader in Hakatutobu Village, stated that long before environmental pollution occurred in his village, fishing activities were intensively carried out by the older generations. However, nowadays it is not the case anymore as finding fish in the sea has become extremely difficult, and people have to go far to the sea to meet their living needs. Even children are relied upon to go fishing to provide for the family. He alsox recounted the situation before the environmental changes, as follows:

> " *When the sea water was clear, we could fish not far from the beach and easily get fish. We didn't have to go far to the sea if it was just for food. In the past, we*

used nyulu (fishing using a petromax lamp) on the beach with a spear and could get a lot of fish to support our household needs." (Interview, March 4th, 2023)

According to Udding Marannuang, despite the greatly changed situation and conditions, especially regarding the environmental situation in coastal villages such as Hakatutobu and other coastal villages in Pomalaa District, there is no choice for fishing communities but to rely on fishing for their livelihoods. Fishing activities are still carried out by fishermen in various forms, including fishing, using nets, and other forms of fishing.

Meanwhile, Anwar (28 years old), a fisherman from Hakatutobu Village, said that the community in his village still relies on fishing for their daily livelihood. Although some residents have other professions, such as employees or laborers with a very small percentage, the dominant occupation of the community is traditional fishing. Regarding the massive environmental pollution caused by mining activities of operating companies, several villages on the coast of Pomalaa District have been affected. According to Anwar, a number of consequences have to be accepted by both the community and the company, including the local government.

He explained that due to environmental pollution in Hakatutobu Village, the community has demanded that the company compensate for the losses and handle what the community has suffered. The company and the government have taken steps and efforts to help the community, even through legal and environmental advocacy institutions both from the province and district have struggled with the community to find concrete solutions for the community. The community hopes that the company and the local government can provide what the fishermen really need. So far, the community has not stopped fighting the suffering caused by environmental pollution, even NGOs, such as LSM, LBH, Walhi, and several environmental observers, have helped and supported them.

Table 4: Local Knowledge of Traditional Bajo Coastal Fishermen in Pomalaa

No	Forms of local Knowledge	Activity description	Area/ Zone	Fishing equipments	The fish catch
1.	Ngampe'	Engaging in sea fishing activities using a seine net that is deployed during high tide. Typically, the net is set up at sea, with selected locations above sappa (taka) platforms. During low tide, checking and examination are conducted to retrieve the fish caught in the previously installed net. Besides setting up nets in shallow waters with specific depths, nets are usually also installed along the coastline where there are mangrove forests	Shallow seas and coastal areas	The purse seine/net	Fish, crabs, shrimps, and other marine organisms
2.	Belle	Installing fish traps made of wood or bamboo extending into the sea from the shore, resembling cages with specially crafted doors that allow fish and various other organisms to enter when the tide recedes. The fish traps are lined with nylon nets, similar to floating net cages	Coastal Area	Wood/bamboo and net cages	Fish and other marine organisms
3.	Nyulu	Engaging in nighttime fishing activities along the seashore using kerosene lamps, either	Coastal	Kerosene lamps,	Fish, clams, shrimps,

		mounted on boats or carried while walking and holding the lamp. The fishing is done in water depths that are about knee-high for adults, either by walking along the shore or circling around	Areas	machetes, spears, and arrows	crabs, sea cucumber fish.
4.	Ngalampung	Engaging in offshore fishing activities at night, using kerosene lamps as illumination. The lamps are specifically installed on the boat for this purpose.	Deep sea	Fishing line, fishing hooks, and other fishing equipment	Fish, and squid
5.	Ngarompoh	Engaging in fishing activities at a fish aggregating device (FAD) deployed in the open sea. The FAD is typically made of stacked and tied bamboo, capable of floating. It is equipped with weighted ropes that extend to the seafloor. The FAD serves as a gathering spot for small fish, attracting larger tuna as a food source.	Deap sea	Fishing line, fishing hooks, and other fishing equipment	Tuna, mackerel, and other fish species
6.	Bubu	The activity of setting up fish traps, known as "bubu," in the sea is quite familiar to fishermen. Bubu is one of the traditional and environmentally friendly fishing gear used to catch fish. It is also referred to as traps and guiding barriers, as it functions as a trap to lure and catch fish	Shallow seas and deep seas	Cage fish trap	Fish, sea cucumbers, and marine organisms.
7.	Nubba	Mencari hasil laut pada saat air laut sedang surut. Meski dominan yang dicari berupa kerang laut, tapi hasil laut lainnya ikut pula ditangkap. Cathing fish during low tide. While the primary focus is on finding seashells, other sea products are also caught.	Coastal area	Machete, spear, and arrows, baskets/buckets for storing sea produce	Clams, sea cucumbers, and fish.
8.	Nngarinta/ Rinta’	Fishing for fish using multiple fishing hooks, starting with a stone attached to a fishing line, and then attaching the fishing hooks to the line with bait. Typically, 7-10 fishing hooks are used when lowered into the water. The fishing line extends vertically from the fishing hooks. The targeted fish species include grouper, snapper, and other rock fish. In fact, fishermen can use this fishing gear during the season of skipjack tuna as well.	Shallow seas and deep seas	Fishing hooks, and fishing line	Fish
9.	Ngutta	Searching for octopus in the sea using simple fishing equipment. In the Bajo fishing community, there have been many innovations in octopus-catching tools. Currently, there are two types of capture tools being developed: one that resembles the shape of an octopus and another that resembles a crab, as crabs are a food source for octopuses. These two capture tools are used with fishing methods.	Shallow sea	Fishing hooks, tablespoon, iron, and spear	Octopus

		Additionally, a third capture tool involves using iron tips and spears.			
10.	Massodo/Nyodo	Searching for nener (milkfish fry) along the coastline using a makeshift net made of dried banana leaves connected together. This activity is usually conducted during high tide and during the west wind season	Coastal area	Dried banana leaves, rattan string, and scoop.	Milkfish fry
11.	Ngengedo/ Kedo-Kedo	Catching fish using tools made of silk thread, marlo (a type of fishing line), and golden thread. Previously, these tools were made from coconut fiber and are considered environmentally friendly. The common fish caught using this fishing method include red snapper, black snapper, white fish, grouper, and barracuda.	Shallow sea	Fishing line, fishing hooks, steel wire, and thread.	Sunu fish, grouper, white fish, and barracuda.
12.	Misi Kende’	Catching squid using a wooden tool shaped like a shrimp, painted with bright colors, and equipped with multiple fishing hooks formed to resemble the shrimp's legs. Nowadays, there is further development in using artificial squid lures made of plastic/fiber material with various attractive colors and shapes, along with lead weights. Fishing for squid of this kind is typically done in shallow waters by casting it into the sea or by towing a small boat. Additionally, squid fishing is also done in deep seas at night, using small battery-powered blinking lights (bahlon) lowered into the water at a depth of 3-5 meters. When the light swings and blinks, deep-sea squid (small red squid) gather around it. As the squid gather, other fish come to feed on the squid, and the fishermen indirectly catch the fish because their fishing hooks are already set.	Shallow sea, and deep sea	Fishing line, artificial shrimp made of wood and fiber, fishing hooks. Small blinking light bahlon and lead weights..	Squid and fish

(Source: Derived from primary data)

Conclusion

Based on the above discussion, the following conclusions can be drawn: 1) Fishermen have experienced ecological changes including: (a) increasing water turbidity in the coastal areas of Tambea, Hakatutobu, and Sopura villages due to runoff, (b) changes in the mangrove ecosystem, seagrass beds, coral reefs, and marine biodiversity, (c) excessive erosion sedimentation polluting the coastal environment. 2) Ecological changes in the Pomalaa coastal area have occurred due to: (a) the construction of special ports (jetties) for transporting and loading ore onto barges; (b) shoreline erosion affecting the regeneration of fish, crabs, shrimp, and other biota; (c) disruption of seagrass growth and coral reef damage due to ship anchors. 3) Ecological changes in the Pomalaa coastal area have impacted the livelihoods of fishing communities, such as the death of sea cucumber and seaweed cultivation, loss of livelihoods for fish, squid, shrimp, and crabs, especially those along the coast, and even mangrove forests have become polluted. 4) The conservation efforts of companies have not shown a correlation with the sustainability of the coastal ecosystem in Pomalaa. 5) Various forms of local knowledge of fishermen are

a manifestation of their lives in maintaining wisdom, caring for the environment, and the foundations practiced by the Bajo fishermen in the area. 6) The concept of local wisdom of Bajo fishermen in Pomalaa is still maintained and sustainable because the fishermen remain steadfast in preserving ancestral traditions in managing natural resources that are the home of their livelihoods.

References

Adriati, R. 1992. *Peranan Wanita dalam Pengembangan Perekonomian Rumah Tangga Nelayan Pantai di Surabaya (Studi Kasus; Kejawan Lor, Kelurahan Kenjeran, Kecamatan Kejeran, Kotamadya Surabaya).* Thesis Magiter, Program Pasca Sarjana Universitas Indonesia, Jakarta.

Arsyad S. 2010. *Konservasi Tanah dan Air.* IPB Press, Institut Pertanian Bogor. Bogor.

Artanto, Yohanes K. 2017. *Bapongka, Sistem Budaya Suku Bajo dalam Menjaga Sumber Daya Pesisir.* Dalam Jurnal Sabda Volume 12, Nomor 1, Juni 2017. Balai Karantina Ikan, Pengendalian Mutu dan Keamanan Hasil Kelas II Semarang.

Badan Pusat Statistik Sulawesi Tenggara. 2022. Provinsi Sulawesi Tenggara Dalam Angka 2022. BPS.

Badan Pusat Statistik Kolaka. 2023. Kolaka Dalam Angka 2023. BPS.

Badjeck, M., Allison, E., Halls, E. 2010. Impacts of climate variability and change on fishery-based livelihoods. *Jurnal of Marine Policy* 34 (2010) 375–383

Bryant, L.R, & Sinead, B. 2000. *Third World Political Ecology.* London and New York: Routledge.

Dahuri, R, Rais J, Ginting, S.P, & Sitepu, M.J. 1996. *Pengelolaan Sumber Daya Wilayah Pesisir dan Lautan Secara Terpadu.* Jakarta: PT. Pradnya Paramitha.

Hafid, Anwar. 2014. *Pengetahuan Lokal Nelayan Bajo.* Makassar: Pustaka Refleksi.

Hamzah. 2016. *Pengembangan Masyarakat Pesisir di Kawasan Tambang Nikel Pomalaa, Sulawesi Tenggara.* Disertasi Sekolah Pasca Sarjana Institut Pertanian Bogor (IPB).

Hamzah. 2009. Studi Kualitas Air Lokasi Pertambangan Nikel Pomalaa Sulawesi Tenggara [Tesis]. Bogor: Sekolah Pascasarjana, Institut Pertanian Bogor.

Helmi, Alfian dan Arif Satria. *Satrategi Adaptasi Nelayan Terhadap Perubahan Ekologis.* Dalam Jurnal Makara Seri Sosial Humaniora, Tahun 2012, Vol. 16 Nomor 1.

Jumari, dkk. 2012. *Etnoekologi Masyarakat Samin Kudus Jawa Tengah.* Dalam Jurnal BIOMA, Juni Tahun 2012, Vol. 4 Nomor 1. (Diunduh, 15 Februari 2023).

Kusnadi. 2000. *Nelayan; Strategi Adaptasi dan Jaringan Sosial.* Bandung: Humaniora Utama Press.

Kusnadi. 2009. *Keberdayaan Nelayan dan Dinamika Ekonomi Pesisir.* Jogyakarta: Lembaga Penelitian Universitas Jember dan Ar-Ruzz Media.

Marten GG. 2001. *Human Ecology. Basic Consept for Sustainable Development*. Earthscan Publication Ltd, London Martin, G.J., 1996. Etnobotani. Chapman and Hall, London

Nontji, A. 2010. *Pengelolaan dan Rehabilitasi Lamun Program Trismades, xa.yimg.com.*

Parson, JR., 1982. Primitive Polluters. Semang Impac on The Malaysian Tropoical Rain Forest Ecosystem. *Anthro[poplogical Papers*. Museum Anthropologi, University of Michigan. No 76

Permana, Sidik. 2020. *Etnoekologi; Pengetahuan Pengelolaan, dan Konservasi Alam Berbasis Masyarakat Lokal.* Yogyakarta: Graha Ilmu.

Pusat Penelitian Lingkungan Hidup (PPLH) Universitas Sulawesi Tenggara. 2009. Kajian Dampak Pembukaan Lahan Pertambangan Nikel Pomalaa Terhadap Kawasan Pesisir [Laporan Penelitian]. Kendari: Pusat Penelitian Lingkungan Hidup Universitas Sulawesi Tenggara.

Ramadhani, Nurtasya K, 2022. *Strategi Adaptasi Masyarakat Suku Bajo Terhadap Perubahan Iklim (Studi Kasus Desa Terapung Kecamatan Mawasangka Kabupaten Buton Tengah, Sulawesi Tenggara*. Skripsi, Fakultas Ilmu Kelautan dan Perikanan, Unhas Makassar.

Rambo T.A.1983. Conceptual Approach to Human Ecology. Research Report No.14. East West Environment and Institute, Honolulu Hawai

Satria, dkk. 2017. *Laut dan Masyarakat Adat.* Kajian Praktik Pengelolaan Sumber Daya Laut Berbasis Kearifan Lokal oleh Masyarakat Adat Pulau-pulau Kecil Terluar. Jakarta: PT. Kompas Media Nusantara.

Satria A. 2009a. *Globalisasi Perikanan; Reposisi Indonesia.* Bogor: IPB Press.

Satria A. 2009b. *Pesisir dan Laut untuk Rakyat:* Bogor: IPB Press.

Siaran Pers, Menteri Kelautan dan Perikanan dalam Kunjungan Kerja di Kabupaten Kolaka, 24 Ferbruari 2023 (Acara Peninjauan Pelabuahan Pendaratan Ikan (PPI) Mangolo, Kecamatan Latambaga, Kabupaten Kolaka.

Undang-undang No. 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup (PPLH).

Undang-undang No. 4 Tahun 2009 tentang Pertambangan Mineral dan Batu Baru.

https://www.kompasiana.com/jendelakh.blogspot.com/54f6e907a3331158748b4587/metamorfosa-masyarakat-pesisir-hakatutobu-di-tengah-terjangan-tambang (Diunduh, 21 Januari 2023).