

Blue Food Security Innovation System of The ABCD Based Programme PEKAT SIRAJA (Empowerment of Padaharja Coastal Communities) By PT Pertamina Patra Niaga Fuel Terminal Tegal

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Abstract. Climate change is a global challenge with a direct impact on society. The Meteorology, Climatology, and Geophysics Agency (BMKG) (2026) recorded that the Earth's average temperature has risen by 1.55°C above pre-industrial levels, exceeding the Paris Agreement target. One major impact is sea level rise due to ocean warming and melting ice caps in Greenland and Antarctica (United Nations). In Indonesia, sea level rise is approximately 1.2 cm per year (BMKG, 2024). Padaharja Village, Tegal Regency, is a coastal area affected by prolonged tidal flooding due to sea level rise. This condition threatens and damages the fishponds that are a source of livelihood for the community. This village has a potential 21-hectare milkfish pond managed by 33 farmers belonging to the Sidamulya Farming Group (Pokdakan Sidamulya). Despite frequent losses due to tidal flooding, the farmers continue to strive to maintain milkfish production to meet community needs. Padaharja Village's milkfish production reaches approximately 50.4 tons per year and is a mainstay of the local economy. In addition, there are 189 UMKM, most of which process milkfish-based products, and 521 housewives with the potential to contribute to village economic development. Vulnerable groups affected include shrimp farmers, vulnerable women, the elderly, children, people with disabilities, and the poor.

Keywords: Blue Food Security Innovation System, ABCD, PEKAT SIRAJA.

A. INTRODUCTION

Climate change has become a global reality with tangible impacts on society. A primary consequence is the rise in the global average temperature to 1.55°C above pre-industrial levels surpassing the 1.5°C target set by the Paris Agreement and marking a record high since the Industrial Revolution (Fahmi Dendi Saputra, 2025). Furthermore, climate change has intensified destructive storms, making them stronger and more frequent across many regions; rising temperatures lead to increased evaporation, resulting in extreme rainfall and flooding as evidenced by recent phenomena such as the El Niño and La Niña events spanning 2025 and 2026, which have compromised the resilience of Indonesia's agricultural and fisheries sectors due to unpredictable weather (United Nations Development Programme, n.d.). Additionally, various countries have faced climate-related disasters, such as Typhoon Wipha and Cyclone Senyar in Southeast Asia in 2025, alongside other global catastrophes (Malikhah, 2025). Climate change driven by global warming has also exacerbated drought conditions and water scarcity; intensified droughts can trigger destructive sand and dust storms capable of transporting billions of tons of sand across continents, leading to desert expansion and a reduction in arable land, thereby threatening fertile agricultural areas with desiccation (United Nations Development Programme, n.d.). This is evidenced by a statement on the World Health Organization's website, which notes that an estimated 55 million people worldwide are affected by drought annually, and that drought poses the most serious threat to livestock and crops in

nearly every part of the globe (Tarolli P and Zhao W, 2023). Droughts jeopardize livelihoods, increase the risk of disease and death, and trigger mass migration. Water scarcity affects 40% of the global population, and as many as 700 million people are at risk of displacement due to drought by 2030 (International Rescue Committee, 2023).

Furthermore, climate change has led to sea-level rise, driven by the oceans absorbing the majority of the heat associated with global warming. As global warming intensifies, ocean temperatures rise and water volumes expand (Banerjee S, 2018). Additionally, the melting of glaciers in Greenland and Antarctica increases the flow of water into the world's oceans, raising the total volume of seawater and ultimately causing sea levels to rise. This phenomenon has become a source of concern for the global community, particularly for coastal populations. The severity of sea-level rise is increasingly evident, as demonstrated by the following data on global sea-level rise trends (NASA, 2023).



Figure 1. Global Sea-Level Rise Trends

Source: Smajgl et al., 2015)

Based on the sea-level rise trend graph, there has been an increase in sea levels between 2013 and 2022, with a rate of rise of 4.62 mm per year (Ketabchi H, Mahmoodzadeh D & CT, 2016). Furthermore, climate change is driving species extinction on both land and at sea; according to the United Nations, the global rate of species loss has recently accelerated to 1,000 times the natural rate due to global warming (Masson-Delmotte V et al, 2019). Climate change also leads to food shortages caused by extreme weather events a direct consequence of the changing climate thereby threatening the agriculture, fisheries, and livestock sectors and, consequently, the food security of billions of people worldwide (Food and Agriculture Organization of the United Nations, 2024). Other impacts of climate change include threats to global public health, poverty, mass population displacement, and more (Abdur Rahaman M, 2021). Indonesia is one of the world's largest archipelagic nations, comprising 17,380 islands (Badan Informasi Geospasial, 2024a). the combined length of their coastlines spans approximately 99,093 kilometers (Badan Informasi Geospasial, 2024b). Given this vast coastal expanse, the nation possesses abundant marine and coastal resources. This is evidenced by a national fish production derived from both capture fisheries and aquaculture of 7,845,602 tons annually (Badan Pusat Statistik, 2023). Coastal areas contribute the majority of this output, serving as the backbone of national food security within the fisheries sector. However, Indonesia's coastal regions currently face a serious threat from climate change-induced sea-level rise, which is occurring at a rate of 1.2 centimeters per year (Fahmi Dendi Saputra, 2025). If this trend continues, it could jeopardize food security in Indonesia's fisheries sector a critical concern given that the World Food Programme notes fish accounts for over 15% of the average

protein intake for more than 2.9 billion people (FAO, 2017), and provides more than 50% of animal protein intake in many regions (Food and Agriculture Organization of the United Nations, 2024). Populations in these areas rely heavily on fisheries, making any decline in local catches or aquaculture yields a serious issue (World bank, 2023).

Padaharja, a coastal village in Tegal Regency, is currently facing issues with rising sea levels and prolonged tidal flooding, which have devastated the fish ponds owned by local farmers. The village boasts a significant asset in the form of 34 hectares of milkfish ponds (Padaharja, 2026), cultivated by 33 farmers organized under the "Pokdakan Sidamulya" farmers' group (rinaldy, 2026). However, this entire area is threatened by rising sea levels and tidal flooding, frequently causing financial losses for the farmers who rely on milkfish farming for their livelihoods. Despite these challenges, the farmers remain committed to supplying milkfish to the people of Tegal Regency and the general public. The village has an annual production capacity of 50.4 tons of milkfish (PT Pertamina Patra Niaga Fuel Terminal Tegal, n.d.), which is distributed to the local community in Tegal and beyond (based on an interview with Mr. Hendro, Head of the Pokdakan Sidamulya Farmers' Group). Beyond milkfish farming, the village possesses potential in the form of 189 UMKM most of which produce processed milkfish products and a demographic of 521 housewives viewed as a key resource. Furthermore, there are vulnerable groups in Padaharja affected by the tidal flooding, including fish farmers, flood victims, housewives, socio-economically vulnerable women, the elderly, children, people with disabilities, and low-income residents (rinaldy, 2026).

The name "Padaharja" implies a village characterized by tranquility, peace, and prosperity; however, given the aforementioned challenges and opportunities, PT Pertamina Patra Niaga Fuel Terminal Tegal in collaboration with relevant stakeholders has launched a program named PEKAT SIRAJA (Empowerment of the Padaharja Coastal Community).

B. METHOD

This study employs a qualitative research design with a sociological approach, focusing on gaining an in-depth understanding of social phenomena and interpersonal interactions within a societal context (Gultom et al., 2018). Specifically, this approach is used to explore and comprehensively understand the implementation of the "Blue Food Security System Innovation" part of the PEKAT SIARAJA (Empowerment of Padaharja Coastal Communities) program initiated by PT Pertamina Patra Niaga Fuel Terminal Tegal. Data collection involved: (1) observation, specifically analyzing community development methods based on the Asset-Based Community Development (ABCD) approach within the Sidamulya Fish Farming Group (Pokdakan), the *Bandeng Presto Enak* Fish Processing Group (Poklasar), and the SIBAT volunteer group; (2) interviews using a structured guide to gather direct information from respondents, including PEKAT SIARAJA program administrators and the Community Development Officer from PT Pertamina Patra Niaga Fuel Terminal Tegal's CSR division; and (3) documentation of community development activities under the PEKAT SIARAJA program utilizing the ABCD approach. Data analysis was conducted through data reduction, data presentation, and conclusion drawing (Astawa, 2022).

C. RESULT AND DISCUSSION

Padaharja, a coastal village in Tegal Regency, Indonesia, is currently facing the issue of rising sea levels and prolonged tidal flooding, which have devastated the fish ponds owned by local farmers. While the village possesses significant potential for milkfish farming, its 21 hectares of ponds are threatened by these rising waters, frequently causing financial losses for farmers who rely on this activity for their livelihoods. Despite these challenges, the farmers remain committed to supplying milkfish to the people of Tegal Regency and the general public.

Furthermore, various vulnerable groups in Padaharja are affected by the tidal flooding, including fish farmers, households impacted by the floods, housewives, socio-economically vulnerable women, the elderly, children, people with disabilities, and low-income residents.

The name "Padaharja" implies a village characterized by tranquility, peace, and prosperity; however, given the aforementioned challenges and potential, PT Pertamina Patra Niaga Fuel Terminal Tegal in collaboration with relevant stakeholders has implemented a program named PEKAT SIRAJA (Empowerment of the Padaharja Coastal Community).

The implementation of the PEKAT SIRAJA program utilizes the Asset-Based Community Development (ABCD) approach a series of activities designed to identify community assets. Once all local assets are recognized, those with the potential for development are selected to enhance community well-being (Suprihatiningsih, 2023). According to Chinyowa et al. (2017), the ABCD approach is the most effective strategy for community-based sustainable development, as it enables communities to explore and identify their own needs by leveraging their inherent strengths, capacities, and capabilities. Community development programs are fundamentally designed to improve quality of life through collaboration that maximizes regional potential and community initiatives, often involving the identification of needs as a core component of the program (Olahkarsa, 2026). The theoretical framework of ABCD in community development comprises five steps: discovery, dream, design (planning), define (determining/mobilizing strengths), and destiny (execution/implementation) (Olahkarsa, 2026). These five steps are illustrated in the following process flowchart:

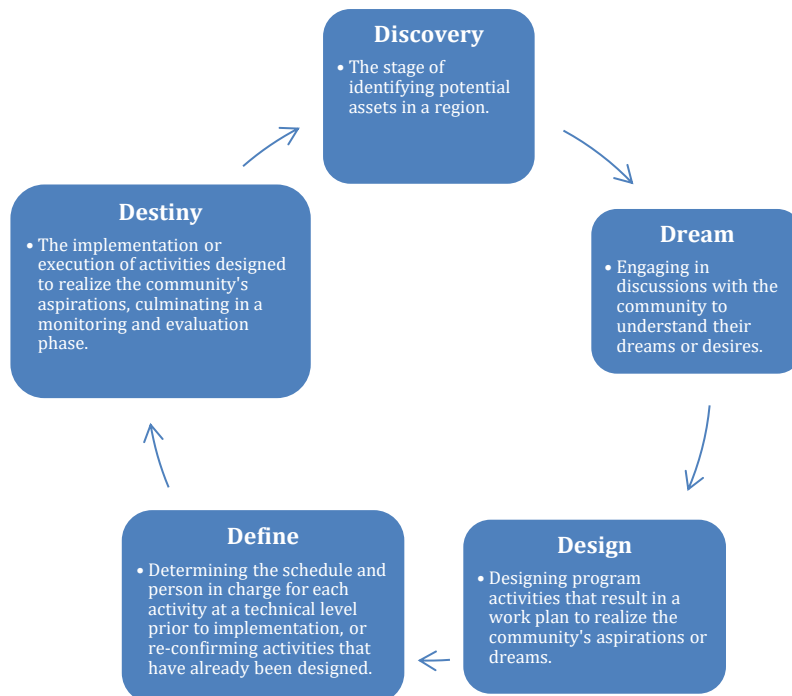


Figure 2. Flowchart of Steps in the ABCD Theory

Source: Olahkarsa (2026)

Based on the ABCD theory's process flow, it can be concluded that the "Discovery" phase allows for the identification of assets with the potential to support sustainability; according to (Olahkarsa, 2026), these assets comprise human, physical, natural, social, and financial assets. Next is the "Dream" phase, where the community is invited to discuss their aspirations and dreams within a Focus Group Discussion (FGD) forum.

This is followed by the "Design" phase, in which the community devises strategies or activity plans to realize their dreams, and the "Define" phase, where they specify the activities

and assign timelines and responsibilities for each. Finally, in the fifth and concluding phase, the community implements their planned actions to achieve their envisioned goals. The application of these five ABCD theory steps also known as the "5D" model within the PEKAT SIRAJA program is detailed below (Chamidi et al., n.d.):

1. Discovery

The Discovery phase is the initial stage of the ABCD approach; it involves an in-depth exploration process conducted via social mapping in 2023 with data gathered through appreciative interviews. Based on the social mapping report, the community development team found:

- a. Identifying the assets possessed by the community of Padaharja Village, including natural resources, human resources, social capital, infrastructure, and economic/financial assets.
- b. Recognizing what holds value in their lives and within themselves.
- c. Understanding the aspirations of the Padaharja Village community regarding the enhancement of their community's strength and effectiveness.

The following is an explanation regarding the assets located in Padaharja Village under the PEKAT SIRAJA Program:

2. Human Resource Assets

Human resource potential is reflected in the community's desire to enhance their skills and the high value they place on education. Social mapping results indicate that the community regards higher education as important, reflecting a positive attitude toward the value of education. Furthermore, residents emphasize the importance of training, noting its role in boosting knowledge, competitiveness in the job market, and income levels. A significant number of residents have participated in training such as courses on producing pressure-cooked milkfish (bandeng presto) highlighting an awareness of and motivation for self-development through relevant training programs. Another aspect of human resource potential lies in the large working-age population; this represents a significant asset for driving various economic and social activities in the region.

3. Physical Assets

The physical assets and infrastructure in Padaharja Village are rated favorably; data analysis from the social mapping report indicates that 82% are rated as good, 14% as very good, and 4% as poor. The village features adequate road access and numerous public facilities such as waste collection points, prayer rooms (mushola), communal sanitation facilities (MCK), and security posts as well as educational facilities including early childhood education centers (PAUD), kindergartens, and elementary schools.

4. Natural Resource Assets

Padaharja Village possesses diverse natural resource potential, comprising both biotic components such as flora and fauna and abiotic elements like rivers and the sea. It features 21 hectares of milkfish ponds; however, this entire area is affected by tidal flooding. Geographically, the village is situated close to the sea, a location rich in milkfish resources. Additionally, there is a high-volume river that serves as both a drainage and irrigation channel.

5. Social Assets

Padaharja Village hosts various active social forums that implement diverse programs, such as the Sidamulya Pokdakan (fish farming group), the Poklasar group (Padaharja coastal fishery processing group), the Coastal Disaster Volunteer Group (SIBAT), and the Tourism Awareness Group (Pokdarwis). Strong kinship ties among residents help minimize the escalation of conflicts. Furthermore, the Padaharja community is grounded in the spirit of gotong royong (mutual cooperation) and actively participates in these established forums. This

demonstrates a high level of engagement and collaboration among residents, contributing to strong cooperation and solidarity within the community.

6. Financial/Economic Assets

In terms of economic equity, the community of Padaharja Village is in a relatively good position; data from a 2023 social mapping study indicates that 64% of respondents share this view. Few young people in the village seek immediate employment to support their family's finances upon completing high school (or an equivalent level of education); instead, both the youth and their parents generally plan well for continuing on to higher education. Nevertheless, it is undeniable that some graduates do enter the workforce immediately after high school, typically seeking jobs as factory workers. Padaharja Village offers access to financial institutions such as savings and loan cooperatives (KPS) for aquaculture farmers. These institutions provide access to capital and financial services, thereby creating significant opportunities for business owners to expand their operations.

7. Dream

At this stage, the CSR team from the Pertamina Tegal Fuel Terminal conducted a focus group discussion (FGD) with the residents of Padaharja Village to identify their needs and aspirations. The FGD revealed a desire to establish formal groups specifically a milkfish business group, a pond farmers' group, a milkfish processing group, and a coastal disaster volunteer group. These groups would facilitate access to business capital and financial services, provide a platform for capacity building, and offer significant opportunities for local entrepreneurs and disaster volunteers in Padaharja Village.

8. Design

Program design involves formulating strategies to achieve objectives by leveraging positive community experiences as a source of societal change. This stage follows social mapping; the design for the PEKAT SIRAJA program is outlined below (PT Pertamina Patra Niaga Fuel Terminal Tegal, 2026).

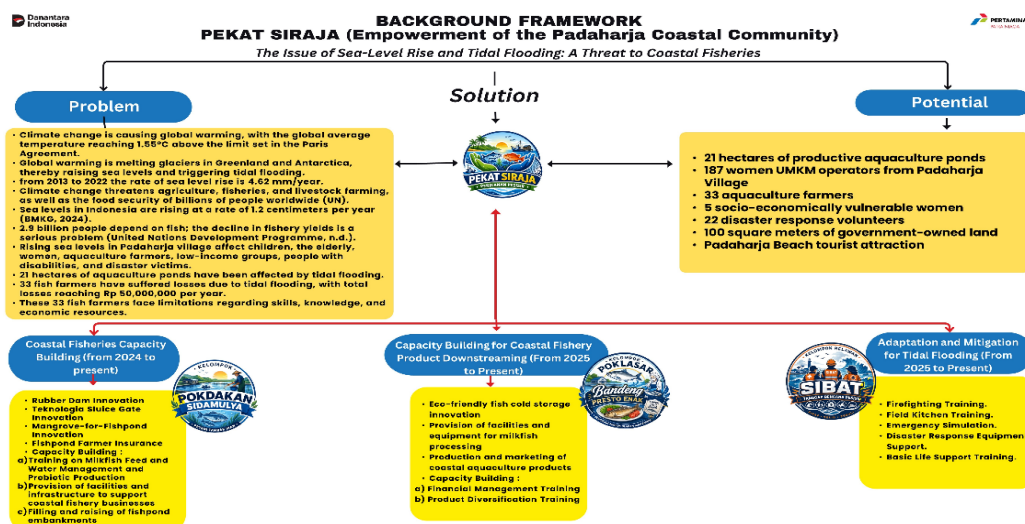


Figure 3. Design program PEKAT SIRAJA

Based on the design of the PEKAT SIRAJA Program formulated to address the issue of tidal flooding in Padaharja Village, which threatens the sustainability of "blue food security" and the coastal fisheries sector PT Pertamina Patra Niaga Fuel Terminal Tegal, in partnership with the local community and the Tegal Regency Government, has developed a collaborative innovation known as the Blue Food Security Innovation System. This innovation embodies a multi-stakeholder synergy aimed at establishing a blue food security system that is adaptive, sustainable, and resilient to the impacts of climate change. Through integrated collaboration

among the company, the government, community groups, and other stakeholders, the Blue Food Security Innovation System is designed as an innovative solution to boost coastal fishery productivity, improve community welfare, and safeguard the sustainability of coastal ecosystems. The design of the Blue Food Security Innovation System is outlined below (PT Pertamina Patra Niaga Fuel Terminal Tegal, 2026):

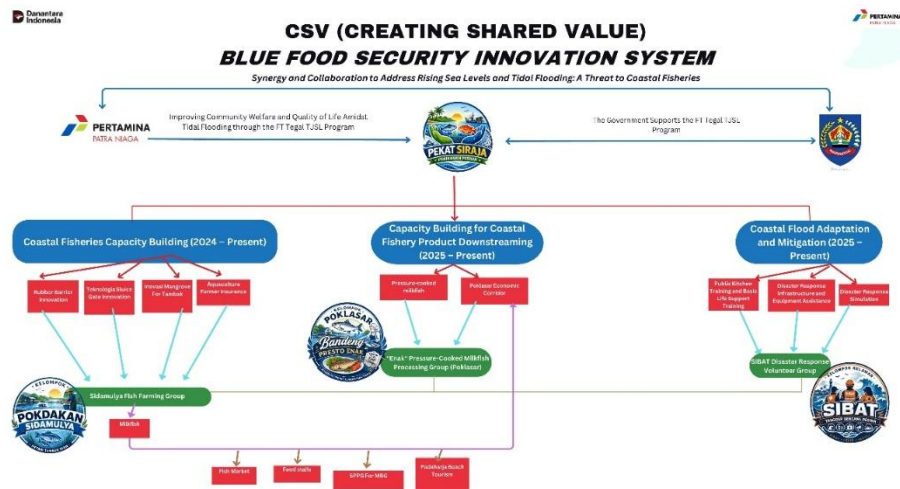


Figure 4. Blue Food Security Innovation System

9. Define

During the Focus Group Discussion (FGD), the CSR team and the community determined the key topics for discussion: the implementation of programs to enhance milkfish farming and downstream processing of milkfish products in Padaharja Village, as well as coastal disaster adaptation and mitigation. Both the CSR team and the community agreed to hold the FGD. The community developed activity concepts based on their available assets specifically, their natural and human resources. The activity concepts designed to realize their vision are as follows:

- Establishing organized groups, specifically the Sidamulya Pokdakan (Fish Pond Farmers Group) with 33 members, a Poklasar group (Milkfish Processing Group) with 5 members, and a Coastal Disaster Volunteer Group (SIBAT) with 22 members.
- Capacity building and mentoring for fish pond farmers, UMKM processing milkfish products, and coastal disaster volunteers.
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10. Destiny

Destine is a crucial component of the ABCD approach; broadly speaking, the program implementation process carried out by the Pertamina Fuel Terminal Tegal CSR team comprises four stages:

- Problem identification and program dissemination phase
 The initial phase of program implementation involved identifying the challenges facing Padaharja Village. Information was gathered through social mapping exercises and Focus Group Discussions (FGDs) with the local community. The findings revealed a range of issues spanning geographical, economic, environmental, educational, social, and security aspects, among others. From these various challenges, the CSR team selected two specific issues to address,

prioritizing them based on urgency and potential for development. The team focused on geographical and economic problems specifically, poor drainage and seawall management which allowed tidal flooding to inundate and destroy fish ponds, resulting in financial losses for milkfish farmers. These farmers faced significant constraints, including limited knowledge and skills, low levels of education among the general population, and restricted pond productivity due to a lack of capital. Subsequently, the CSR team formulated a program and conducted outreach to introduce the planned initiative to the community.



Figure 5. Problem identification and program dissemination phase

b. Knowledge Development Stage

During this stage, the CSR team from PT Pertamina Patra Niaga's Tegal Fuel Terminal provided training to aquaculture farmers on sea dike systems and effective sluice-gate-controlled drainage or irrigation channels. Additionally, they conducted business management training for UMKM involved in downstream milkfish product processing, as well as training on emergency kitchens and disaster response for the SIBAT coastal disaster volunteer team.



Figure 6. Training on Sea Wall Construction via Embankment Filling



Figure 7. Business Management Training for UMKM Involved in the Downstream Processing of Milkfish Products



Figure 8. Training on Soup Kitchens and Disaster Management

c. Skill Strengthening Phase

During this phase, the CSR team from PT Pertamina Patra Niaga's Tegal Fuel Terminal conducted capacity-building training for fish farmers. The program covered fish feed management, seawall construction, and the introduction of innovative sluice gate technology initiatives aimed at addressing the tidal flooding that damages milkfish ponds and the high cost of feed. These efforts successfully reduced farmers' financial losses from tidal flooding, bringing the total annual loss down from IDR 50,000,000 to IDR 25,000,000. Additionally, product diversification training specifically on making pressure-cooked milkfish (*bandeng presto*) was provided to women involved in UMKM focused on downstream milkfish processing, resulting in an average monthly economic gain of IDR 500,000 per participant. Emergency response simulations were also held for the SIBAT coastal disaster volunteer team; collectively, these training programs have delivered significant and sustainable impacts on the community.



Figure 9. Fish Feed Management Training



Figure 10. Construction of a Sea Wall via Embankment Filling



Figure 11. Training on Pressure-Cooked Milkfish Product Diversification



Figure 12. Emergency simulation for SIBAT coastal disaster volunteers

d. Monitoring and Evaluation Phase

Monitoring is conducted to observe or track development and progress, identify issues, and determine how to anticipate or resolve them (Rahmiyati, 2016); meanwhile, evaluation is the process of measuring achievement levels a step that requires optimization as it relies on inputs, outputs, and processes intended to drive continuous improvement in the community's quality of life. During this stage, the CSR team holds weekly Focus Group Discussions (FGDs) with the community to assess whether the imparted knowledge and skills are being applied, identify unimplemented work plans, and discuss the plans and aspirations of the initiated business groups. Internal monitoring and evaluation are also carried out routinely once a month by the management to reflect on the cooperative's progress, covering areas such as planning, the construction of effective sea walls, sluice gate innovations, pressure-cooked milkfish production, and emergency response simulations. *"Every month, we hold regular gatherings with all members of the PEKAT SIRAJA-supported groups to discuss business activities, evaluate operations, and hold meetings regarding milkfish farming, pressure-cooked milkfish production, and the readiness of the disaster response volunteer team,"* explained Mr. Hendro.



Figure 13. Monitoring and Evaluation of All Members of the PEKAT SIRAJA Program's Assisted Groups.

D. CONCLUSION

PT Pertamina Patra Niaga Fuel Terminal Tegal initiated a community development program in Padaharja Village using the Asset-Based Community Development (ABCD) approach. The ABCD method successfully enabled the community to explore their existing assets including natural resources, human capital, physical infrastructure, and social and economic assets. The community's aspiration to transform local milkfish (*bandeng*) into value-added pressure-cooked products was realized through intensive training and mentoring. The CSR team successfully established business groups and disaster response volunteer groups; these serve as platforms for skill enhancement, access to capital and financial services, and knowledge acquisition, thereby creating significant opportunities for entrepreneurs in Padaharja Village to grow their businesses.

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