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*Regional Case Study*

# A Mapping Outcome Method Using Social Return on Investment (SROI) to Assess the Impacts of Program: A Case Study in Setunak Island

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## Abstract

Climate change as a global phenomenon is inevitable, including in Indonesia. Its impacts include rising sea levels, expanding coral bleaching, and declining coastal ecosystems, particularly mangrove forests and coral reefs. Many research explores the characteristics of vulnerability to climate change in coastal cities and seeks feasible adaptation options for these cities with method used involved surveys of residents, interviews with experts, and statistical analysis and modeling. Although efforts have been made to prevent climate change, there is still a lack of research that explores the broader impacts of these efforts. In this regard, few studies have measured the social, economic, or environmental value that arises from these efforts. This study aims to evaluate, measure, and assess the impacts that have occurred as a result of the implementation of the program from environmental, economic, welfare, and social perspectives comprehensively. The result show that the SROI study results indicate that the Pulau Tahan program has positive economic, social, and environmental impacts. However, the on-field study also found a less positive fact regarding the availability of crab seedlings.

**Keywords**: SROI; climate change; Setunak Island

## 1. Introduction

The amount of water on earth is sustainable at a certain value because water has a continuous cycle or also known as the Hydrological Cycle. The hydrological cycle links interactions between the Climate changes as a global phenomenon is inevitable, including in Indonesia. Its impacts include rising sea levels, expanding coral bleaching, and declining coastal ecosystems, particularly mangrove forests and coral reefs (Hoegh-Guldberg et al., 2017). These impacts significantly affect the lives of people in small islands, who rely on climate conditions such as weather, wind, and water conditions like wave height (Fernandino et al., 2018). Setunak Island, located in the administrative region of Bone Village, Gelam Strait District, Karimun Regency, is a small island beginning to experience climate change impacts. Uncertain weather conditions constrain Setunak Island fishermen from going to sea. This situation significantly affects the socioeconomic vulnerability of their community as their primary income source is fishing, which is influenced by climate anomalies caused by climate change. Even though there are potential resources like agriculture and animal husbandry, limited land and unfavorable land conditions

make it difficult to rely on them. Furthermore, Setunak Island is increasingly vulnerable to erosion due to extreme weather, like high waves that often occur. People's awareness of the importance of preserving mangrove ecosystems could be higher, as they use them as charcoal raw material. Poor waste management habits also contribute to increasing greenhouse gas emissions outside the climate change mitigation efforts.

Robinson (2018) discusses efforts to adapt to climate change in small island developing states, including Indonesia. The study identifies several adaptation strategies implemented by local communities in small islands in the Pacific and Caribbean regions. The research findings indicate that communities in Small Island developing states have developed various adaptation strategies, such as enhancing food resilience through sustainable agriculture and better water management systems and building more resilient to natural disasters such as storms and floods. However, the study also highlights several challenges local communities face in adapting to climate change, such as limited resources, lack of access to technology and information, and insufficient support from governments and international institutions. The study provides important insights into the challenges and opportunities of adapting to climate change in small island developing states.

Additionally, Le (2020) explores the characteristics of vulnerability to climate change in coastal cities and seeks feasible adaptation options for these cities. The research method used involved surveys of residents, interviews with experts, and statistical analysis and modeling. The research findings show that coastal city vulnerability to climate change relates to topography, socioeconomic conditions, and infrastructure. The research also identifies various adaptation options, including infrastructure, spatial planning, natural resource management, and disaster risk reduction strategies. This research contributes to understanding climate change vulnerability in coastal cities in developing countries and provides insights into possible adaptation options.

Although efforts have been made to prevent climate change, there is still a lack of research that explores the broader impacts of these efforts. In this regard, few studies have measured the social, economic, or environmental value that arises from these efforts. Therefore, there is a shortage of information in understanding the wider impact of climate change prevention efforts, which can limit our ability to make better and more effective decisions in addressing climate change.

This study aims to evaluate, measure, and assess the impacts that have occurred as a result of the implementation of the program from environmental, economic, welfare, and social perspectives comprehensively. This study will obtain a picture of the program's positive and negative impacts on all monetized stakeholders. This study is also expected to obtain information on the program's feasibility through the obtained Social Return on Investment (SROI) value. Information on program feasibility will be very useful in planning and decision-making for future program development or replication.

## 2. Methods

Eight stakeholders involved in the "Climate Resistant Island" activity in the Bone Village, Selat District Gelam, Karimun Regency were evaluated in this study (see **Table 1**). This study selects different types of groups, reflecting the different models of peer support in community settings. Groups were selected based on the host organization, funding sources, group size, activities, and staffing. The group must be involved in the activity and must have been running for at least one year. Reliable cost and quality participant data can be collected for SROI analysis. The eight stakeholders evaluated in this study are the Setunak Bersatu Pokdakan, WFG Setunak Jaya, Mangrove Seeds Group, Hydroponic Vegetable Group, Crab Cultivation Group, Spice Group, Eco-brick Group, and Tourism Group.

**Table 1.** Data collection method and katagori stakeholder

| Participant | Data collection |
|---|---|
| PT TIMAH Tbk Metallurgical Unit Gourd (Private Sector) | Interview, Document review related companies planning, implementation, and monitoring program evaluation |

| Participant | Data collection |
|---|---|
| Group Cultivator Fish (Civil Society) | Observation, interview, Forum Group Discussion |
| Group Setunak Peasant Woman Jaya (Civil Society) | Observation, interview, Forum Group Discussion |
| Resident (Civil Society) | Observation, interview, Forum Group Discussion |
| Government Village Tulang (state) | Interview |
| PT Sucofindo Semarang (Private Sector) | Interview |
| PT DAK (Private Sector) | Interview |
| Go Kepri News (Pers) | Interview |

### 2.1 SROI Methodology

The SROI has been explained in detail in the literature (Suryani et al., 2022; KLHK, 2021; Nicholls et al., 2012). SROI methodology originated from analysis methods such as cost-benefit analysis and social accounting and has developed a more holistic and integrated approach to measuring social impact (Hall and Millo, 2018). SROI emphasizes measuring broader social value and not just focusing on financial aspects alone (Williams, 2020). That is done by involving participation from various relevant stakeholders in decision-making and considering the long-term social impact. SROI is a framework that involves the following steps: (1) mapping outcomes, (2) evidencing outcomes, (3) valuing outcomes, (4) setting up an impact map, (5) calculating the SROI ratio, and (6) reporting and using the results to improve practice (Suryani et al., 2022). The SROI analysis in this study focuses on the impacts of the Climate-Resilient Community Empowerment Program on the stakeholders involved, particularly in terms of their social, environmental, and economic outcomes.

The stages in the SROI methodology involve several structured and systematic steps that need to be taken (Courtney and Powell, 2020). The first step is identifying and measuring the inputs or resources required to run the program, such as human resources, finances, or assets. The next step is to map the outcomes of each stakeholder, such as the number of people involved or the number of products or services produced. At this stage, a theory of change analysis is conducted to establish the relationship between inputs, outputs, and outcomes. This stage will result in a list of inputs, outputs, and outcomes for each stakeholder. Outcome mapping is done using materiality principles. In this case, only outcomes that meet materiality criteria, which are relevant to the program and significant, are considered. The third step is to establish indicators and values for each outcome, such as determining indicators or ways of collecting data for each outcome. Additionally, this stage involves determining each outcome's financial approach or monetization. The financial approaches may include market prices, price catalogs, ratios, etc. The next step is to identify the social impact generated by the program or project. Social impact can be measured using various methods, such as causal analysis and empirical research. In this stage, the social impact generated by the program will be calculated in monetary value. This is done to facilitate the quantitative calculation of social impact values and to compare them with the costs incurred to run the program. SROI calculation is performed by dividing the social impact value by the cost incurred to run the program. The final stage of SROI is to report the results of measuring social value to relevant stakeholders. This reporting aims to provide transparent and accurate information to interested parties regarding the social value generated by the program.

The SROI methodology can be used to assist social organizations in making decisions and planning more effective programs that provide greater social benefits (Cordes, 2017). SROI can also help social organizations to obtain funding or support from interested parties, as it can provide concrete evidence of the social impact generated (Yates and Marra, 2017). This study used an unstructured interview method, group discussion forums with relevant stakeholders, observation, and a review of company documents related to program planning, implementation, monitoring, and evaluation, as

presented in **Table 1**. The interviews and group discussions with relevant stakeholders used open-ended questions to encourage stakeholders to speak spontaneously about how their involvement with the impacted group had a positive or negative effect. The open-ended questions used in the interviews and group discussions with relevant stakeholders allowed them to freely express how their involvement with the impacted group had positive or negative effects. This approach is useful for collecting rich and detailed data on stakeholder experiences and perspectives.

## 3. Result and Discussion

### 3.1 Stakeholder Identification

Stakeholders are part of the community, individuals who feel the impacts of every human activity. As stakeholders demand that companies be more responsible with their products and the environment, companies must identify stakeholders and understand their interests (Wheeler, Fabig, & Boele, 2002). Freeman (2010) states that the company directly or indirectly influences stakeholders when it achieves its goals (Yuen, Wang, Wong, & Zhou, 2017). Stakeholder identification is done by conducting an inventory or data collection of all actors involved in the Climate-Resilient Community Empowerment Program. The identified stakeholders are then screened using the materiality principle. In this case, stakeholders involved in the study must meet the materiality criteria relevant to the program and significant. Stakeholders who meet the materiality criteria and are considered significant will be included in the stakeholder analysis process. This involves mapping the stakeholders based on their level of influence and interest in the program, and then determining the appropriate strategies to engage with them throughout the program implementation. By identifying and engaging with relevant stakeholders, the program can ensure that their interests and concerns are taken into account, and ultimately enhance the program's effectiveness and sustainability.

**Table 2.** Stakeholder identification

| No | Name and Stakeholder Category | Role | Reason for Involvement |
|---|---|---|---|
| 1 | PT TIMAH Tbk Metallurgical Unit Gourd (Private Sector) | The initiators, drivers, and program donors | PT TIMAH Tbk Metallurgy Unit Kundur fulfills the element of materiality because it is the initiator, driver and donor of the program |
| 2 | Group Cultivator Fish (Civil Society) | Program beneficiaries who carry out crab cultivation and mangrove management | Members of the Setunak Bersatu Pokdakan fulfill the element of materiality because they are the subjects or program actors who carry out crab cultivation and mangrove management. |
| 3 | Group Setunak Peasant Woman Jaya (Civil Society) | Recipients of programs that carry out hydroponic cultivation and waste management | The Setunak Jaya Women Farmers Group fulfills the element of materiality because they are the subjects or program actors who carry out hydroponic cultivation |
| 4 | Resident (Civil Society) | Program beneficiaries who consume vegetables from the hydroponic results of the Setunak Jaya Women Farmers Group | The community fulfills the element of materiality because they are the beneficiaries of program implementation |
| 5 | Government Village Tulang (state) | As the giver of permission to implement the program | The Bone Village government fulfills the element of materiality because it is the provider of group legality, and the |

| | | | |
|---|---|---|---|
| | | | giver of program implementation permits |
| **6** | PT Sucofindo Semarang (Private Sector) | As a consultant who helps provide direction and input related to program implementation | The Bone Village government fulfills the element of materiality because it is the provider of group legality, and the giver of program implementation permits |
| **7** | PT DAK (Private Sector) | Supporters of programs that provide goods in the form of an ecobrick framework for inorganic waste management. | PT DAK does not meet the element of materiality because it only plays a role in providing an ecobrick framework for inorganic waste management. |
| **8** | Go Kepri News (Pers) | Program supporters who help program publications | Go Riau Islands does not fulfill the element of materiality because it only plays a role in publicizing the program. |

### 3.2 Stakeholder Outcome Mapping

The process maps the results of the theoretical analysis of changes with several interventions carried out by PT Timah Tbk Metallurgical Unit Gourd Kundur as a result of the Climate-Smart Island Empowerment Program. The interventions include community empowerment programs such as training and mentoring in crab farming using silvofishery methods to preserve the mangrove ecosystem, training and mentoring in mangrove conservation, mentoring in hydroponic farming, and training and mentoring in waste management. The expected condition from these interventions is to increase the Setunak Island community's capacity to mitigate and adapt to climate change for sustainable living through crab farming with silvofishery techniques, hydroponic farming, mangrove management, and waste management. The results of these interventions will produce the desired general condition or results, and an overview of inputs, outputs, and results can be seen in **Table 3**.

**Tabel 3.** Outcome mapping for each stakeholder

| **Stakeholder** | **Activities** | **Output** | **Outcome** |
|---|---|---|---|
| Kelompok Pembudidaya Ikan (Pokdakan) Setunak Bersatu (Civil Society) | Kelompok Wanita Tani (KWT) Setunak Jaya (Civil Society | • 1 group namely the Pokdakan Setunak Bersatu is empowered with a total of 10 fishermen.<br>• Construction of 2 crab cultivation ponds used for growing crabs in the mangrove ecosystem area of Setunak Island by silvofishery<br>• Construction of 1 mangrove nursery with an area of 0.0012 ha<br>• Implementation of crab harvest 3 times with total sales of 181.5 kg<br>• Sold 600 mangrove seedlings | • Increased Income through Crab Cultivation and Mangrove Nurseries<br>• Group Cash from sales of crab cultivation and mangrove nurseries<br>• Spending Time during Crab Growing Activities<br>• Increased mutual cooperation among group members<br>• Improved Ability of Members in Crab Cultivation<br>• Improvement of Member Capability in Mangrove Management<br>• Improvement of Member Capabilities in Performing Group Governance |

| | | | |
|---|---|---|---|
| | | • 0.45 Ha has carried out conservation activities on mangrove ecosystems through the CLIMATE RESISTANT ISLAND Program | • Increasing the ability and confidence of members in public speaking<br>• Increasing land productivity<br>• Savings on Transportation Costs for Mangrove Planting Activities<br>• Reduction of regional greenhouse gas emissions from GHG absorption of Mangrove Conservation Activities |
| Kelompok Wanita Tani (KWT) Setunak Jaya (Civil Society | Hydroponic Cultivation | • 1 group namely the Kelompok Wanita Tani (KWT) Setunak Jaya empowered with a total of 27 members (housewives 1 companion)<br>• Construction of 1 hydroponic house infrastructure covering an area of 0.008 ha<br>• Implementation of hydroponic harvests 8 times with the sale of 280 kg of crops<br>• 144 kg of pakcoy vegetables harvested and purchased by the people of Setunak Island | • Group cash from hydroponic cultivation<br>• Taking the time<br>• Increased mutual cooperation among group members<br>• Improvement of Members' Capability in Doing Hydroponics<br>• Improved Ability of Members in Conducting Waste Management<br>• Improvement of Member Capabilities in Performing Group Governance<br>• Increasing the ability and confidence of members in public speaking<br>• Become a resource person regarding hydroponic cultivation<br>• Increasing land productivity<br>• Savings on the cost of consuming food (vegetables) for the people of Setunak Island<br>• The company is better known through program coverage in the mass media (recognition) |
| Kelompok Wanita Tani (KWT) Setunak Jaya (Civil Society | Waste management through composting | • 1 group namely the Kelompok Wanita Tani (KWT) Setunak Jaya empowered with a total of 27 members | • Cost savings for the construction of the Setunak Island landmark |

| | | | |
|---|---|---|---|
| | and ecobrick making | (housewives 1 companion)<br>• Implementation of the construction of the Setunak Island landmark with ecobrick using 440 kg of plastic waste | • Reduction of regional greenhouse gas emissions from Waste Management Activities |

### 3.3 Mapping the Outcome of Each Stakeholder and Setting Indicators and Values for Each Outcome

To calculate the value of each outcome, it is necessary to determine the indicators and financial valuation techniques to be used. Indicators are a way of knowing that a change has occurred. Meanwhile, financial valuation approach is a monetization technique or changing values. Impact approach is done by rechecking the calculation of outcomes for each stakeholder by considering the following factors (Arvidson, Battye, & Salisbury, 2014) :

a. Deadweight or changes that would have happened anyway without the program.
b. Attribution or the contribution of others in achieving the results.
c. Displacement or an assessment of how much one result replaces another.

The determination of indicators and financial approach for each outcome can be seen in the following table:

**Tabel 4.** Outcome mapping for each stakeholder

| **Stakeholder** | **Outcome** |
|---|---|
| PT Timah Tbk Metallurgical Unit | - Companies were better known through program coverage in the mass media (recognition) |
| Gourd (Private Sector) | - Savings on Transportation Costs for Mangrove Planting Activities |
| Group Cultivator Fish (Civil Society) | - Revenue Increase through Crab Cultivation and Mangrove Breeding<br>- Group Fund from Sales of Crab Cultivation and Mangrove Breeding<br>- Time Allocation for Crab Cultivation Activity<br>- Improved Mutual Assistance among Group Members<br>- Improved Skills of Members in Crab Cultivation<br>- Improved Skills of Members in Mangrove Management<br>- Improved Skills of Members in Group Management<br>- Improved Confidence and Public Speaking Skills of Members<br>- Increased Land Productivity |
| Group Setunak Peasant Woman Jaya (Civil Society) | - Group income from hydroponic cultivation<br>- Time allocation<br>- Increased collaboration among group members<br>- Improved skills in hydroponic cultivation<br>- Improved skills in hydroponic cultivation<br>- Improved skills in waste management<br>- Improved skills in group management<br>- Enhanced public speaking skills and self-confidence of members |

| Stakeholder | Outcome |
|---|---|
| Resident (Civil Society) | - Opportunities to become a resource person on hydroponic cultivation<br>- Increased land productivity<br>- Cost savings on food consumption (vegetables) for the community of Setunak Island<br>- Cost savings on the development of the Setunak Island landmark |
| Government Village Tulang (state) | Reduction of regional greenhouse gas emissions from mangrove conservation activities and waste management activities. |

### 3.4 Impact Fixation Analysis of Activities

Impact fixation is done by re-checking the outcome calculations of each stakeholder, taking into account deadweight, attribution, and displacement. The determination of deadweight value is done by comparing or benchmarking similar conditions or groups of people who have the same benefit recipients of the program (Nielsen et al., 2021). By looking at similar conditions or groups of people as a control, a picture of the program's benefit recipients' condition can be obtained if they do not receive program interventions (McManus et al., 2022). Meanwhile, attribution is determined by analyzing the role or contribution of other parties in the program. The determination of the attribution amount can be seen from the percentage of budget contributions in the program, the percentage of time contributions, and the percentage of other input contributions. Whereas, displacement is determined by looking at the possibility of the displacement of results that replace other results (Guerette and Bowers, 2009). In this case, for example, the program provides benefits by eliminating or reducing a negative condition, it is necessary to ensure whether there is any displacement of the negative condition to other areas that are not the target of the program. The size of the displacement will determine the value of displacement. The values of deadweight, attribution, and displacement expressed in percentage in this study are each generated at 0%, indicating that the verification of the outcome to stakeholders shows no deadweight, attribution, and displacement on the resulting outcomes. Meanwhile, the outcome calculation after impact fixation resulted in a total calculation of Rp 216,218,923.

### 3.5 SROI Calculation, Sensitivity, Analysis, and Payback Period

Sensitivity analysis is a technique used to test how sensitive the calculation results are to changes in assumptions or certain variables in the calculation model (Antoniadis, Lambert-Lacroix, & Poggi, 2021). This technique is useful to understand the impact of uncertainties and to identify which assumptions or variables have the most significant influence on the calculation results. Sensitivity analysis is often performed by varying one parameter at a time while keeping all other factors constant. In program or activity evaluation studies, sensitivity analysis is often conducted to ensure that the calculation results obtained are robust and accountable (Igos, Benetto, Meyer, Baustert, & Othoniel, 2019). According to Mauskopf et al. (2018), sensitivity analysis help identify assumptions or variables that have a significant impact on the calculation results, providing guidance for decision-makers in determining the appropriate actions. In program or activity evaluation studies, sensitivity analysis can be conducted in various ways, such as reducing or increasing the value of outcomes, increasing or decreasing investment, and increasing or decreasing the value of fixed impact factors such as deadweight, attribution, and displacement. In a study conducted by Zhu, Biddy, Jones, Elliott, and Schmidt (2014), sensitivity analysis was performed by reducing the outcome value by 25%, increasing investment by 25%, and increasing the value of fixed impact factors by 20%. By conducting careful sensitivity analysis, we can obtain more comprehensive information about the evaluation of program or activity calculation results, thereby minimizing the risk

of decision-making errors. The results of the sensitivity analysis by reducing the outcome value after impact fixation are as follows:

**Table 5.** Results of outcome value reduction sensitivity analysis

| **Parameter** | **Outcome Value Reduction** | | |
|---|---|---|---|
| | 10% | 20% | 30% |
| Present Value Outcome After Fixation | Rp 170,450,724 | Rp 151,511,755 | Rp 132,572,786 |
| Present Value Investment | Rp 78,798,396 | Rp 78,798,396 | Rp 78,798,396 |
| SROI | 2.16 | 1.92 | 1.68 |

**Table 5** shows that with the same input value, the reduction in the outcome value impacts changes in the SROI value, which is getting smaller. For every 10% reduction in the outcome, the SROI value decreased by about 0.24. However, the simulation results of reducing the outcome value by up to 30% still get SROI results classified as good or acceptable, namely above a value of 1.

### 3.6 Analysis of Program Qualitative Impact & Achievement of Social Innovation

The Climate Resistant Island project is implemented on Setunak Island, Tulang Village, Gelam Strait District, Karimun Regency. This project aims to increase the people of Setunak Island's capacity to mitigate and adapt to climate change for a sustainable life. The project also involves stakeholder participation and sensitivity analysis to ensure the effectiveness and sustainability of the program. The success of the project is measured through outcome indicators such as reduced greenhouse gas emissions and increased community income, as well as impact indicators such as improved community well-being and ecological sustainability. This project is conducted by empowering fishermen in the fish farming group, commonly called the Setunak Bersatu Pokdakan, to carry out crab cultivation and conserve mangrove ecosystems through the application of the silvofishery method as an alternative livelihood. In addition, this program empowers homemakers in the Setunak Jaya Women Farmers Group (WFG) to manage hydroponic gardens to increase food security and waste management in line with climate change mitigation. The activities carried out in this program have correlations such as the following scheme:

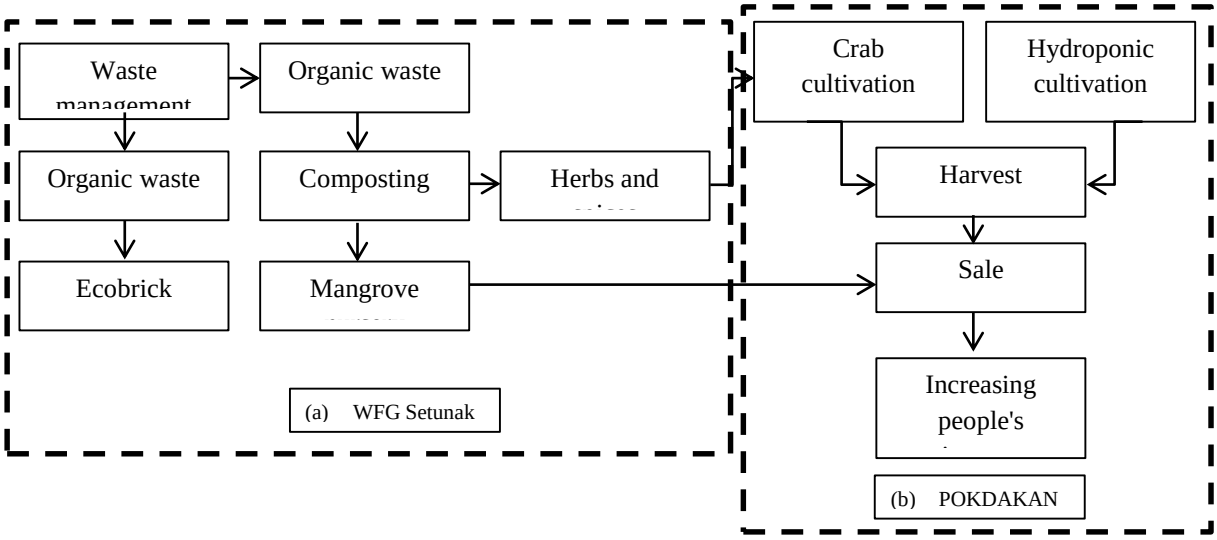


**Figure 1.** Project scheme

Based on the above scheme, it can be seen that the waste management that WFG Setunak Jaya has carried out is by composting for organic waste and making eco brick for inorganic waste. The Setunak Bersatu Pokdakan utilizes the compost produced by WFG Setunak Jaya in mangrove nurseries. The resulting compost is also used to plant spices used as raw material for probiotic crab feed, which Pokdakan Setunak Bersatu cultivates. Mangrove seeds, crabs, and hydroponic vegetables are sold as additional

community income and group coffers. Thus, the waste management scheme not only reduces the amount of waste produced but also generates additional income for the community. It also promotes a circular economy where waste is turned into valuable resources, such as compost and eco-bricks, and utilized in various ways, such as for planting and crab feed production. This approach also contributes to environmental sustainability by reducing the amount of waste sent to landfills and promoting the use of organic fertilizers for plant cultivation.

(a) Spreading Crab Seeds

(b) Mangrove Nursery on Setunak Island

(b) Hydroponic Cultivation Activities

(d) Ecobrick on Setunak Island

**Figure 2.** Activities conducted in the climate resistant island Project

## 4. Conclusion

The Climate-Resilient Community Empowerment Program in Pulau Tahan has a Social Return on Investment (SROI) value of 2.474, indicating that every Rp 1 invested generates a benefit or impact worth Rp 2,474. The SROI study results indicate that the Pulau Tahan program has positive economic, social, and environmental impacts. However, the on-field study also found a less positive fact regarding the availability of crab seedlings. The Fish Cultivator Group (Pokdakan) had to order crab seedlings from outside the area (Jambi or Medan) because of limited local seedlings. The quality of seedlings from outside the area is not as good as local seedlings because they have not yet adapted to the surrounding environment. In addition, purchasing seedlings from outside the area also increases the risk of seedling death during transport. The company can implement a more effective solution by developing independent crab seedling breeding efforts in Pokdakan Setunak Bersatu. Seedling breeding is not widely practiced by crab farming entrepreneurs due to the difficulty of breeding treatment, making it a high opportunity for Pokdakan Setunak Bersatu to breed local seedlings. The SROI value calculation over three years of

implementation of the Climate-Resilient Community Empowerment Program in Pulau Tahan indicates good performance. Therefore, the program is worth continuing, with several recommendations to enhance its benefits or outcomes. These recommendations include conducting research and development on crab seedling breeding with higher survival rates, increasing capacity in crab farming and mangrove breeding through market expansion, expanding hydroponic capacity by adding more vegetable variations and widening the market, and developing various derivative products from hydroponics and crabs, such as chips or frozen foods.

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