

The Human Ecology of Livelihood Development in a Small Island Context: Assessing the Social Impact of the Science and Technology Community-Based for Inclusive Development (STC4iD) Project in Brgy. Biga, Magallanes, Sorsogon, Philippines



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Abstract

Small islands are experiencing underdevelopment due to their distant location, vulnerability to natural hazards, and lack of access to social services. This is the reason behind the Science and Technology Community-Based for Inclusive Development (STC4iD) Project 6, which aimed to establish sustainable and resilient agriculture, aquatic and natural resources (AANR)-based livelihoods through science and technology transfer in geographically isolated and disadvantaged areas (GIDA), specifically Brgy. Biga, Magallanes, Sorsogon. This sought to contribute to several Sustainable Development Goals (SDG): SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 3 (Decent Work and Economic Growth, SDG 10 (Reduced Inequalities), and SDG 17 (Partnership for the Goals). The study utilized a mixed methods research design, with quantitative data gathered through a survey and qualitative data collected through key informant interviews. Data were analyzed using descriptive statistics and thematic analysis. The study first conducted socio-economic and biophysical profiling. Second, it determined the factors influencing the participation of local fisherfolks in the livelihood project. Third, it determined the project outcomes and impacts. Fourth, the study identified the enabling and hindering factors that affected the livelihood project. Lastly, recommendations were made to key stakeholders. Findings from this study contributed to determining the outcomes and impacts of STC4iD Project 6, serving as a reference for future initiatives related to providing livelihood opportunities in small island communities.

Keywords

AANR, livelihood development, small islands, sustainability, STC4iD, poverty, economic growth

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1. Introduction

Many small islands comprising the Philippine archipelago are experiencing underdevelopment due to their distant location, vulnerability to natural hazards, and lack of access to social services (Bacud et al., 2023). Fishing is the main livelihood of many small island communities. However, this economic activity is often affected by the frequency and intensity of typhoons and sudden changes in the weather. Their other major problems include food poverty, malnutrition, and stunting. Furthermore, they have limited access to capital, technology, and markets due to their geographic characteristics, remoteness, small size of economy, limited infrastructure, and high exposure to external environmental and economic shocks (Organization for Economic Co-operation and Development [OECD], 2018; Tortora & Soares, 2016).

Designing and implementing a sustainable livelihood program is imperative to promote development. Therefore, the Department of Science and Technology - Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD) developed and funded the Science and Technology Community-based for Inclusive Development (STC4iD) program from 2019-21 (Javier, 2018). It is an innovative technology transfer program that aims to establish sustainable and resilient agriculture, aquatic and natural resources-based communities, and AANR (Agriculture, Aquatic and Natural Resources) technology transfer in geographically isolated and disadvantaged areas (GIDA) through science and technology (Javier, 2018).

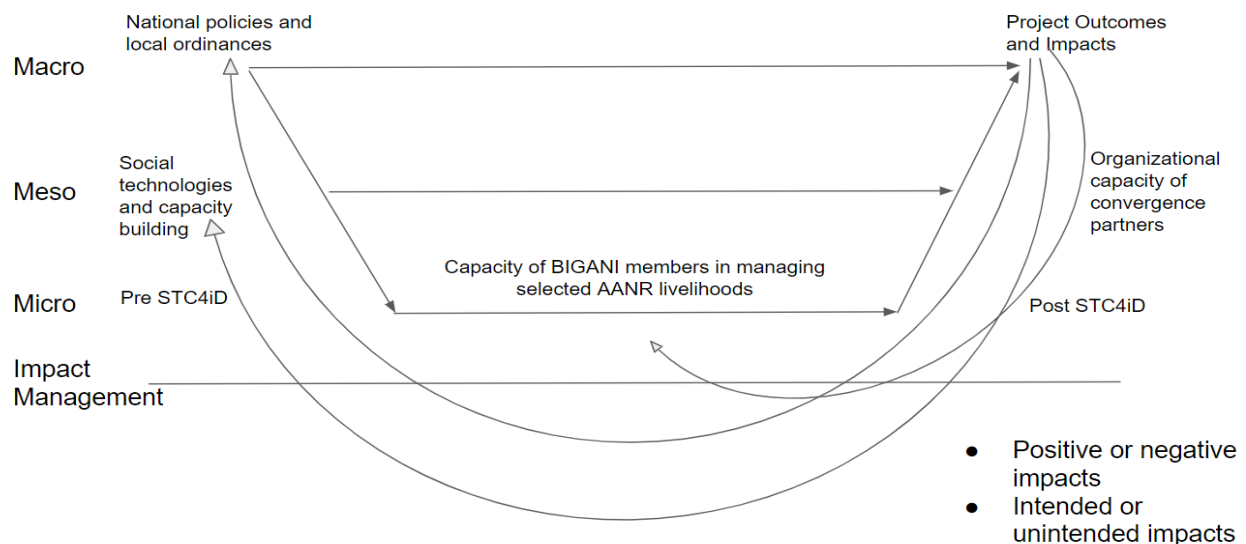


Figure 1. Coleman-SIA Overflowing Tub Framework. Adapted from: Dangcalan et al. (2020), Coleman (1986), and Mahmoudi et al. (2013).

The STC4iD Project 6 was designed and implemented to support disadvantaged farmers and fisherfolk in Magallanes, Sorsogon through technology adoption and processing of Spanish sardines as a potential commodity for developing sustainable livelihoods. This helps in addressing several Sustainable Development Goals (sdgs.un.org/goals,) including SDG 1: No Poverty, SDG 2: Zero Hunger, SDG: Decent Work and Economic Growth, SDG 10: Reduced Inequalities, and SDG 17: Partnerships for the Goals. As such, understanding the outcomes and impacts of this project in enhancing and securing the livelihoods of farmers and fisherfolk is relevant and timely. Social Impact Assessment (SIA) (Mahmoudi et al., 2013; Vanclay, 2003) was used to measure the impacts of the STC4iD Project 6 on farmers and fisherfolk. This will serve as a basis for further improvement of the

STC4iD implementation. The study used Coleman's Boat Model and the Social Impact Assessment framework to examine the multiple variables that influence the positive and negative impacts of the livelihood project.

2. Method

2.1. Study Site

The study was conducted in Barangay Biga, Municipality of Magallanes, Province of Sorsogon. Biga is one of the coastal rural barangays in Magallanes, Sorsogon, and part of the Bagatao Island situated at approximately 12.8352° North, 123.7996° East facing Sorsogon Bay (PhilAtlas, 2023). Magallanes is a second-class coastal municipality consisting of 34 barangays. The Municipality has a poverty incidence of 44.1% (Guarin, 2017, December 21; Philippine Statistics Authority [PSA], 2015) It is one of the six priority municipalities under the Department of Agriculture's top post to alleviate poverty and achieve food security. At the provincial level, it is included in the ten marginal provinces in the Philippines. Its provincial rate of poverty incidence is 31.65% and the poverty threshold per capita is at P10,483 while the food threshold per capita is at P7,320 (PSA, 2015).

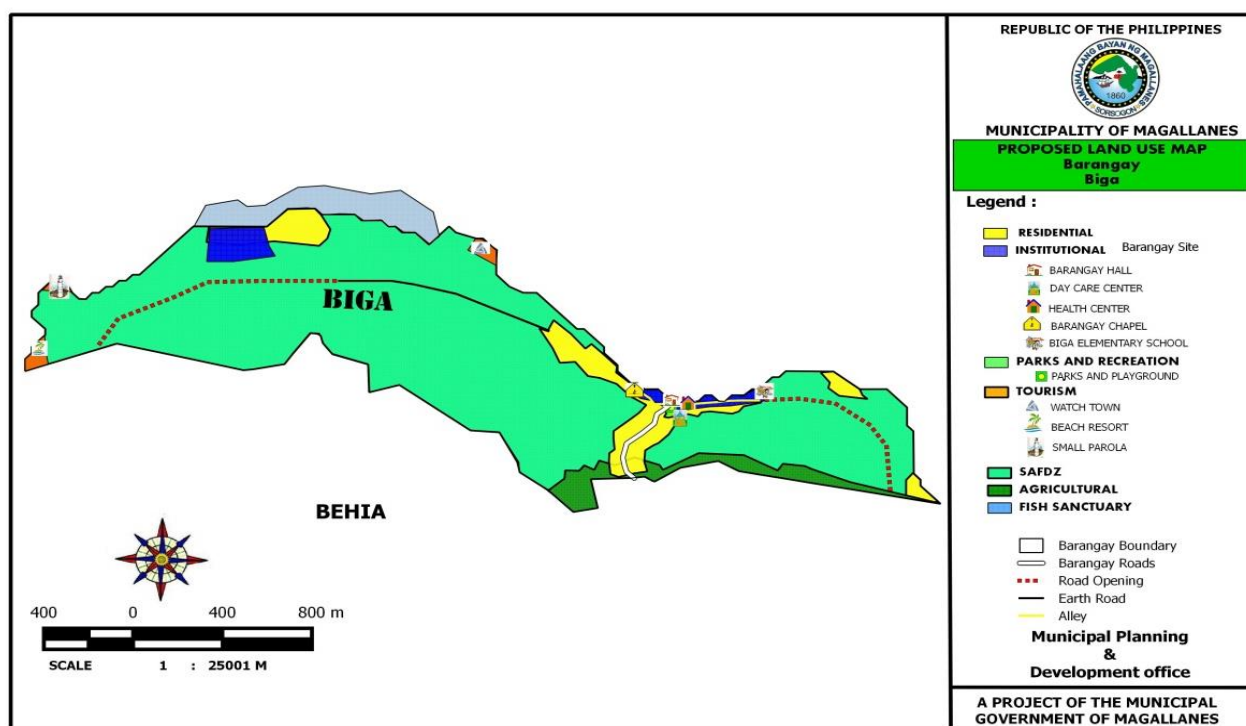


Figure 2. Map of Barangay Biga, Municipality of Magallanes, Province of Sorsogon (2014)
(Map source: *magallanes sorsogon.gov.ph*)

2.2. Research Design and Data Collection

The study utilized a mixed methods research design, integrating quantitative and qualitative research approaches using their complementary strengths and differences (Plano Clark, 2017). In particular, the study used surveys, key informant interviews, and primary documents. The survey was essential in



capturing the project's impacts across all project participants as it is apt for population-based studies (Ponto, 2015). Meanwhile, key informant interviews were critical in capturing the relevant experiences of project participants and triangulating findings from the survey and document review (Homburg et al., 2012). The participants were properly informed, and their consent was obtained before their voluntary involvement in the study. The participants were assured that all their personally identifying information was treated confidentially.

For the survey, attempts were made to enumerate Biga Innovative Group for Advancement and Inclusiveness Association Inc (BIGANI) members completely. However, it only got 29 out of 30 respondents (96.67%) as data collection due to the unavailability of one respondent. Meanwhile, the key informants are representatives of project implementers from the Sorsogon State University-Magallanes, University of the Philippines Los Baños (UPLB) Department of Social Development Services (DSDS) College of Human Ecology (CHE), and three BIGANI officers.

2.3. Data Analysis

The quantitative data was processed and analyzed through descriptive analysis, using tables, frequencies, means, and percentages to visualize the collected data comprehensively. Meanwhile, the qualitative data was also processed and analyzed through thematic analysis. Insights generated from the data were triangulated and examined using the Coleman-SIA framework.

3. Results and Discussion

3.1. Socio-economic Profile and Biophysical Characteristics

Older respondents were expected in postharvest activities as they were more experienced in agriculture and capture fisheries. It was found that most of the respondents already have their own family to support, with an average household size of six. Thus, their engagements in fish processing resulted from a need for a further source of income. In terms of gender, most respondents are female (79.31%). The educational attainment of respondents is shown in Table 1. This suggests that fish processing can be a viable enterprise for the respondents. Their main livelihood activity is fishing (26.67%) owing to the nature of the barangay as a coastal community.

However, some respondents are partially dependent on farming. Their engagement in fisheries, as well as in agriculture, contributes in large part to the food security of households and communities. The monthly income of many respondents (62.06%) is below the Philippine food poverty threshold of Php 8,393. Regarding biophysical characteristics, gravel is the most common type of soil found in barangay Biga, and Purok 7 is the area with fertile soil. The community also has agricultural land that can be used and developed for livelihood development.

There are also various marine ecosystem indicators. The project site, Sorsogon Bay, is generally shallow, with depths of 0.5 to 5 fathoms, but its mouth has a depth of 5.5 to 16 fathoms. Its bottom is characterized as very soft mud and accumulated silt, with few patches of sandy and coarse sediments (Olaño et al., 2009). Existing studies provide data on the bio-physical aspect consisting of fish resources, plankton analysis, soil nutrient level analysis, and water quality. These were done in seven stations along the study site. Water monitoring includes the temperature of dissolved oxygen, potential hydrogen, ammonia, turbidity, salinity, and water velocity.

Barreda et al. (2017) revealed that 61 plankton species existed in the coastal water of Sorsogon Bay from October to January. Meanwhile, Ricafort et al. (2018) also identified 88 marine phytoplankton species, either *Bacillariophyta* or *Dinophyta*. *Skeletonema*, *Bacteriastrum*, *Chaetoceros*,

Asterionellopsis, and *Thalassionema* are the most abundant. This data implies that there is rich phytoplankton diversity existing within the waters of Sorsogon Bay. Planktons are the most important aquatic organisms in the area since they are photosynthetic and food sources of marine organisms (University of California Museum of Paleontology, 1997). However, their abundance is dependent on weather and water quality conditions. The presence of *Dinophyta* might cause massive blooms of *dinoflagellates*, often called “red tide”. The data shows that fishing activities in the locality are vulnerable to adverse biological factors, as Potapova et al. (2015) noted – coastal diatom assemblages are diverse and sensitive to environmental stressors.

Meanwhile, water quality monitoring on seven identified stations from March to June 2019 showed that dissolved oxygen concentrations ranged between 6.0-8.8mg/l. It shows that the waters around Sorsogon Bay are suitable for supporting aquatic organisms. Another parameter is temperature, which ranges from 28.4°C to 31.3°C – subject to variability such as the time of collection, season, and depth of collection. On the other hand, water pH ranges from 6.6 to 7.8ppm whereas water transparency was at 1.5-2.3m, ammonia at 5.0mg/l, and salinity at 32-35ppt. Other physical factors, such as water velocity, range from 3.77m/min to 3.97m/min for all stations. Ricafort et al. (2018) found that the total dissolved solid (TDS) ranges from 53.08mg/l to 64.59mg/l and total suspended solid (TSS) ranges from 51.48mg/l to 57.14mg/l, respectively. This data emphasized that physical and chemical factors are the most important factors affecting plankton diversity and primary productivity.

Fisheries production in municipal water is high because of the nutrients coming from the shore, as compared to off-shore production for commercial fisheries which have lower yields. In the case of Sorsogon Bay, water quality and plankton analysis show that its fish resources have a high production potential. Olaño et al. (2009) supported this finding as Sorsogon is a major route for sardine migration which goes from Buriass Pass down to San Bernardino Strait. The migratory paths of tunas are also within provincial waters. Furthermore, Sorsogon is famous for the blue swimming crab (*Portunus pelagicus*) locality known as “kasag”. Other aquatic species caught within Sorsogon Bay include *Dasyatis sp.*, *Leognatus spp.*, and other species belonging to tuna and tuna-like species “buraw”, “matangbaka”, mackerel, “alatan”, scads, anchovy, leather jacket fish, prawn, Christian crab, grouper, and mullets (Hiloma, 2014). Although, a variety of fish resources might depend on their availability according to the fishers.



Table 1. Socio-economic Profile of Respondents

Socio-economic Profile of Respondents		Frequency	Percentage (%)
Age group	20-29	1	3.45%
	30-39	7	24.14%
	40-49	10	34.48%
	50-59	9	31.03%
	60-69	2	6.90%
Gender	Female	23	79.31%
	Male	6	20.69%
Civil Status	Married	24	82.76%
	Single	5	17.24%
Educational Attainment	Elementary level	2	6.90%
	Elementary graduate	11	37.93%
	High School level	4	13.79%
	High school graduate	8	27.59%
	College level	3	10.34%
	College graduate	1	3.45%
Main livelihood activity	Fishing	8	26.67%
	Vegetable farming	2	6.67%
	Barangay Health Worker	4	13.33%
	Barangay Kagawad	2	6.67%
	Self-employed	2	6.67%
	Barangay Secretary	1	3.33%
	Barangay Nutrition Scholar	1	3.33%
	Utility	1	3.33%
	Unemployed	9	30%
Monthly Income	Php 500-Php5,000	18	62.06%
	Php 6,000-Php 10,000	2	6.90%
	No Income	9	31.04%

Source of data: Alcantara et al. (2024)

3.2. Factors Influencing the Decision of Local Farmers and Fisherfolk to Participate in the STC4iD Project

Based on the key informant interview, local farmers and fisherfolks joined the STC4iD Project 6 because of poverty and the desire to gain new knowledge and skills. The poverty threshold for a family of five in the first half of 2021 in the Philippines was Php 12,082 per month (PSA, 2021). The participation of local farmers and fisherfolk in the livelihood project suggests their aspiration to increase their living standards. Local farmers and fisherfolk appeared to be open to new projects, especially when they support their livelihood, financial expenses, and self-development if they will benefit from it. Moreover, they wanted to build and create strong connections among the residents of the barangay who joined the same project. Some were interested in community development programs, and some decided to participate to forget their problems at home somehow.

3.3. Project Outcomes and Impacts

Project Target 1: Empowerment

All respondents (n=29) were involved in technical training on appropriate aquatic technology. Technical training was provided to further build the capacity of the community towards sustainable livelihood. The STC4iD Project 6 enhanced and developed the skills of farmers and fisherfolk. Most of them have developed their fish processing skills (89.66%) and enhanced their communication skills (17.24%), organizational skills (10.35%), leadership skills (6.90%), management skills (6.90%), marketing skills (6.90%), and attentiveness (3.45%). These helped farmers and fisherfolk grow as individuals and gave them fulfillment in their work. Moreover, most of them acquired skills in processing sardines and other

fish products, learned to communicate and work with others, and improved their marketing strategy. The knowledge they gained from the project was crucial in effectively and efficiently managing their livelihood activity. On another note, many respondents (51.72%) claimed to be empowered after the STC4iD Project 6 and felt satisfied (79.31%) with the STC4iD project. Moreover, 62.06% felt self-reliant and 44.82% were skilled after implementing the livelihood project.

Project Target 2: Food Security

The STC4iD Project 6 contributed to food security among BIGANI members in Brgy. Biga, Magallanes, Sorsogon. The majority of the respondents (93.10%) agreed that STC4iD Project 6 helped in addressing the food poverty issue in Barangay Biga. As noted earlier, most coastal communities have high levels of poverty. This is because some residents were unemployed, which was one of the main barriers to accessing food. Moreover, these could be attributed to the remoteness and limited economic opportunities on the island. Longitudinal studies showed significant relations between the factors influencing inclusive development, including socio-demographic characteristics, climate change, lack of occupational return, inadequate storage facilities, lack of knowledge, technology, and financial institutions (Agnes Pravina & Radhika, 2024). The government must provide nutrition-sensitive social protection, innovation, and reform to increase resilience among its constituencies. (Haron & Jalil, 2023).

Project Target 3: Income

Many respondents (79.31%) increased their monthly income. However, most of them have incomes below the food poverty threshold of Php 8,393. As such, the livelihood project did not meet its target of lifting 100% of BIGANI members above the food poverty threshold.



Project Target 4: Livelihood



Figure 3. Sardines in oil (Produced by BIGANI Organization)

Spanish sardines were positioned as a commodity for community-enterprise. This was because sardines were abundant in the locality, and the ingredients of sardines could be sourced locally and sustainably, according to the results of the Community Profiling and Needs Assessment (CPNA) conducted by the project team. Since a participatory development approach was used, the project team and BIGANI members jointly decided on the commodity for livelihood development based on the results of the CPNA.

Project Target 5: Sustainability

Spanish sardines as a commodity for community enterprise were deemed to be sustainable. People in Brgy. Biga noted that sardines are abundant in local waters. Region V has the highest average (mt) annual landing of *Sardinella fimbriata* from 2004 to 2008 (Willette et al., 2011). Furthermore, respondents (48.28%) agreed that STC4iD Project 6 had the potential to be sustained. They assured that they would continue to apply the skills they have learned in fish processing to produce and market food products to generate income and secure food availability on the island. They might have foreseen the benefit of the project in the long run.

Project Target 6: Resilience

Multiple sources of income as a buffer to various risks. The diversity of livelihoods available decreased from nine livelihood sources in Year 1 to seven livelihood sources in Year 3. This suggests that the STC4iD Project 6 was not resilient due to several factors affecting livelihood development. For instance, issues concerning water quality (62.06%) and soil quality (51.72%), typhoons (34.48%), strong currents (20.69%), climate change (10.35%), pandemic (3.45%), lack of facility (3.45%), and lack of commitment and motivation of some BIGANI members (48.27%) were cited by respondents.

3.4. Enabling and Hindering Factors Influencing the Performance of the STC4iD Project 6

The enabling factors influencing the performance of the STC4iD Project 6 based on the survey were partnerships with DOST PCAARRD, SSU, the local government unit of Magallanes, and the community; teamwork and commitment of BIGANI members; financial resources; human resources; fishery resources; provided information; technical training; fish production; designation of member; and equipment for fish processing were factors influencing the performance of the STC4iD Project 6. Meanwhile, based on the key informant interview, the common vision and interest of the members to make the organization work and the project team's commitment to deliver the project plans appropriately were the enabling factors influencing the performance of the STC4iD Project 6.

Table 2. Enabling factors that influence the performance of the project

Enabling factors that influence the performance of the project	Frequency	Percentage (%)
Partnership with DOST PCAARRD, SSU, LGU, national government agencies, and community	8	27.58 %
Teamwork and commitment of the BIGANI members	6	20.69 %
Financial resources	5	17.24 %
Human resources	1	3.45 %
Fishery resources	1	3.45 %
Provided information	1	3.45 %
Technical training	1	3.45 %
Fish production	1	3.45 %
Designation of member	1	3.45 %
Equipment for fish processing	1	3.45 %
	N=29	100 %

Source of data: Alcantara et al. (2024)



Table 3. Hindering factors that influence the performance of the project

Hindering factors that influence the performance of the project	Frequency	Percentage (%)
COVID-19 pandemic	2	28.57 %
Commitment of the BIGANI members to continue working towards the particular vision of the organization	1	14.28 %
Delayed turn-around time in the processing of documents	1	14.28 %
Difficulty in communicating due to erratic and limited internet access capacity and frequent power outages in the municipality	1	14.28 %
BIGANI demand an outright cash for work system equated with the remuneration for every work accomplished	1	14.28 %
BIGANI members' inherent values or complacent lifestyle	1	14.28 %
	N=7	100 %

Source of data: Alcantara et al. (2024)

Hindering factors include misunderstandings among BIGANI members, a lack of facilities for fish processing, the COVID-19 pandemic, low fish catch, strong currents, the high cost of glass bottles for sardines and other fish products, and no communication among members, which may result in low productivity.

Based on the key informant interview, the COVID-19 pandemic caused delays in the implementation of program activities. These came in the form of travel restrictions, delayed turn-around time in the processing of documents, and difficulties in communication due to erratic and limited internet access and frequent power outages in the municipality. Moreover, conflicts among BIGANI members and their need for outright cash for work were considered hindering factors that influenced the performance of the STC4iD Project 6.

4. Theoretical and Practical Reflections

This research used the Coleman-SIA framework to demonstrate the interplay of macro, meso, and micro-level factors in determining the social impact of the STC4iD Project 6. Given the various social-ecological dynamics, this was particularly helpful in analyzing complex community contexts where livelihood development is often facilitated. National Research and Development (R&D) Agenda (macro) interacted with the organizational context of implementing partners and people's organizations. The data shows that four of the six project targets were achieved. However, while incomes have increased (target 3), the project failed to achieve its intended impact of alleviating food poverty among all project partners. Two critical reflections can be gleaned from this. First, the pandemic hampered efforts to maximize the project activities fully. Consequently, contingency and risk management efforts should have been embedded in the project design. Second, a clear exit or transition plan should be included in the project design to ensure project continuity and sharing of resources to achieve key targets.

Regarding the approaches used, there is much potential in embedding social technologies and human ecology into AANR-based livelihood projects. Social technologies were instrumental in promoting development in small island contexts, especially GIDAs. The case of the STC4iD project came in the form of capacity-building training and the use of social research tools to determine livelihood opportunities and better understand the project's social impact. Social technology has been useful in co-creating AANR-based livelihood programs for small island contexts. These are concrete efforts to ensure just, democratic, and sustainable (Mendoza, 2021) communities in the country.

Human ecology as a discipline is problem-focused and solution-oriented. It provides solutions and alternatives that help individuals achieve a meaningful and satisfying life. It is concerned with change that improves the situation of communities, mainly whether they are ethical or sustainable. Thus, its use as a transdisciplinary approach helps provide a framework for co-creation in addressing wicked problems (Dyball, 2011), especially underdevelopment in geographically isolated and disadvantaged areas. Through the project, BIGANI members realized the importance of conserving their immediate ecosystem as it has a provisioning role in their livelihoods. Moreover, they have learned new skills in developing community-based enterprises, which the data shows most respondents found valuable, and they intended to use them even after the project has ended.

5. Conclusion and Recommendations

Most of the respondents are female, and fishing is the main livelihood activity on the island. The top two reasons given by local farmers and fisherfolk for joining the STC4iD Project 6 are poverty and to gain knowledge and skills. The STC4iD Project 6 has achieved four out of six project targets. These are empowerment, food security, livelihood, and sustainability. Meanwhile, resilience and income were not achieved. However, a long-term assessment is needed to determine the project's impact, possibly after five years. The top two enabling factors influencing the performance of the STC4iD Project 6 are the partnership with Sorsogon State University, DOST PCAARRD, and the local government unit, as well as the teamwork and commitment of BIGANI members. The top two hindering factors are misunderstanding among BIGANI members and the lack of facilities for fish processing within Biga Island.

For recommendations, the BIGANI association should strengthen its communication with the project team, LGU, and DOST PCAARRD. This is for them to have a strong connection to the community partners, and communication mechanisms are necessary to ensure regular updating and co-decision-making. Strengthening communication among BIGANI members can be done through programmatic communication capacity building tailored to the context of fisherfolk. The local government unit of Magallanes should provide a facility for fish processing near the residential area of BIGANI members as their counterpart to the project. This includes the provision of solar panels and generators within the island. The livelihood development of the Brgy. Biga should also be included in the municipal planning and development strategies. Most importantly, it is recommended that feedback mechanisms generated from the impact assessment be embedded to inform future post-project evaluations and in the planning of new AANR-based projects both within UPLB CHE, SSU-Magallanes, and DOST PCAARRD.

The project team and DOST PCAARRD must have the foresight to get funding after the project ends by partnering with various organizations, especially in securing fish processing facilities within the island. It is advisable for the project team and DOST PCAARRD to future-proof postharvest technologies, marketing skills, and distribution strategies for the local farmers and fisherfolk to cope with pandemics and disasters, such as online marketing. Moreover, the Sorsogon State University (SSU) Magallanes should adopt BIGANI and BIGA as an organization and community for their



extension program. Future researchers may conduct a social impact assessment of the livelihood project, focusing more on qualitative analysis to unpack project impacts, especially on indicators such as empowerment and resilience. Finally, the use of the Coleman-SIA overflowing tub framework can be enriched using ethnographic and other qualitative research tools to provide greater context in the interface of macro, meso, and micro factors. Such insights are critical in determining ways to overcome challenges in developing and sustaining AANR-based livelihood in GIDAs.

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Declaration of Conflict of Interest

The authors declare that there is no conflict of interest in the conduct of the study

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References

- Agnes Pravina, X., & Radhika, R. (2024). Analysing the factors influencing the inclusive development of fisherfolk concerning southern districts of Tamil Nadu. *Journal of Information & Knowledge Management*, 23(5). <https://doi.org/10.1142/S0219649224500643>
- Bacud, S., Lapitan, A. V., Datoon, R. F., Faderogao, F. J. F., Flores, E. C., & Sarmiento, F. E. (2023). *Delegating fieldwork in a global pandemic to study livelihoods in remote small island communities*. SAGE Publications Ltd.
- Barreda, M.M. et al., (2017). Taxonomic identification of phytoplankton in Magallanes, Sorsogon. Bachelor of Science in Fisheries. [Undergraduate Thesis. *Sorsogon State College, Magallanes Campus*].
- Coleman, J. S. (1986). Social theory, social research, and a theory of action. *American Journal of Sociology*, 91(6), 1309–1335. <https://doi.org/10.1086/228423>
- Dangcalan, R. J., Amparo, J. M., Mendoza, M. E., Jimena, C. E., Torio, D., & Alviar, N. (2020). Critical junctures in disaster governance: lessons from Marikina City, Philippines post-Ketsana. *Asian Journal of Resilience*, 2(1), 1–14.
- Dyball, R. (2011). Human ecology as open transdisciplinary inquiry. *Human Ecology Journal*, 24, 13–20.
- Haron, M. Z., & Jalil, R. A. (2023). Food insecurity during COVID-19: A neglected priority? *IIUM Medical Journal Malaysia*, 22(2). <https://doi.org/10.31436/imjm.v22i2.1933>
- Homburg, C., Klarmann, M., Reimann, M., & Schilke, O. (2012). What drives key informant accuracy? *Journal of Marketing Research*, 49(4), 594-608. <https://doi.org/10.1509/jmr.09.0174>

- Guarin, L. P. (2017, December 21). *Sorsogon agriculturists and town execs embrace SAAD*. *Bicol Mail*. <https://www.bicolmail.net/single-post/2017/12/21/Sorsogon-agriculturists-and-town-execs-embrace-SAAD>
- Javier, M. B. (2018). *Mentorship for S&T community-based program for inclusive development grantees underway*. *DOST-PCAARRD Portal*. <https://www.pcaarrd.dost.gov.ph/index.php/quick-information-dispatch-qid-articles/mentorship-for-s-t-community-based-program-for-inclusive-development-grantees-underway>
- Mahmoudi, H., Renn, O., Vanclay, F., Hoffmann, V., & Karami, E. (2013). A framework for combining social impact assessment and risk assessment. *Environmental Impact Assessment Review*, 43, 1–8. <https://doi.org/10.1016/j.eiar.2013.05.003>
- Mendoza, M. (2021). *Defining social technology [Paper presentation]*. *Synthesizing our shared ST experience: A brownbag session*, University of the Philippines Los Baños, Laguna, Philippines
- Olaño, V. L., Vergara, M. B., & Gonzales, F. L. (2009). Assessment of the fisheries of Sorsogon Bay (Region 5). *Bureau of Fisheries and Aquatic Resources, Technical Paper Series*, 12(4).
- Organisation for Economic Co-operation and Development. (2018). *Making development co-operation work for small island developing states*. *OECD Publishing*. <https://doi.org/10.1787/9789264287648-en>
- PhilAtlas. (2023). *Biga, Magallanes, Sorsogon Profile*. *PhilAtlas*. <https://www.philatlas.com/luzon/r05/sorsogon/magallanes/biga.html>
- Philippine Statistics Authority. (2015). *Sorsogon*. *Philippine Statistics Authority*. <https://psa.gov.ph/directory/sorsogon>
- Philippine Statistics Authority. (2021). *Proportion of poor Filipinos registered at 23.7 percent in the first semester of 2021*. *Philippine Statistics Authority*. <https://psa.gov.ph/content/proportion-poor-filipinos-registered-237-percent-first-semester-2021>
- Plano Clark, V. L. (2017). Mixed methods research. *The Journal of Positive Psychology*, 12(3), 305–306. <https://doi.org/10.1080/17439760.2016.1262619>
- Ponto, J. (2015). Understanding and evaluating survey research. *Journal of the Advanced Practitioner in Oncology*, 6(2), 168–171. <https://doi.org/10.6004/jadpro.2015.6.2.9>
- Potapova, M., Desianti, N., Velinsky, D., Kiry, P., Zaoudeh, L., Thomas, R. & Zelanko, P. (2015). Diatoms as environmental indicators in Barnegat Bay, New Jersey, *Department of Environmental Protection*.
- Ricafort, W. (2018). Diversity of marine phytoplankton in the municipal water of Magallanes: Basis for Program Development. Bachelor of Science in Fisheries. [Undergraduate Thesis. Sorsogon State College, Magallanes Campus].



Tortora, P., & Soares, R. A. (2016). Climate and disaster resilience financing in small island developing states: Summary. *OECD Publishing*.
<http://documents.worldbank.org/curated/en/956251492596714376/Summary>

University of California Museum of Paleontology. (1997). Introduction to Bacillariophyta diatoms. www.ucmp.berkeley.edu.

Vanclay, F. (2003). International principles for social impact assessment. *Impact Assessment and Project Appraisal*, 21(1), 5–12. <https://doi.org/10.3152/147154603781766491>

Willette, D. A., Bognot, E. D. C., Mutia, Ma. T. M., & Santos, M. D. (2011). Biology and ecology of sardines in the Philippines: A review. *Technical Paper Series*, 13(1), 1–22. <https://nfrdi.da.gov.ph/tpjf/etc/Willette%20et%20al.%20Sardines%20Review.pdf>

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Role of the Authors

^a study conception, data gathering, data analysis, and writing

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