Building Coastal Resilience for Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) in Small Islands in Concepcion, Iloilo, Philippines

THE GREEN-GREY INFRASTUCTURE (GGI) STORY OF BARANGAY POLOPIÑA

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CONSERVATION INTERNATIONAL Philippines

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The GGI Project in Polopiňa, Concepcion was under the auspices of:

Building Coastal Resilience for Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) in Small Island Communities through Green-Grey Infrastructure (GGI) Project
Municipality of Concepcion, Iloilo Province, Philippines
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Conservation International (CI) Philippines in partnership with the Department of Environment and Natural Resources-Biodiversity Management Bureau (DENR-BMB) and the Local Government Unit of Concepcion in Iloilo Province

The community partners in the implementation of the GGI Project in Polopiňa were:
The Barangay Council of Polopiňa, the Proper-Pasil Guardian of Marine Protected Area (PROPAGAMPA) and the Sitio Looc Small Fisherfolk Association (SILOSFA)

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The green solutions were designed by the Barangay Council of Polopina, the local communities, the Municipal Planning and Development Office and Coastal Resources Management Office of the Local Government of Concepcion, and Conservation International Philippines. Additional inputs were provided by the Department of Environment and Natural Resources-Community Environment Natural Resources Office-Sara.

Overall management of the GGI Project was by Enrique Nunez, Jr., Country Executive Director of Conservation International Philippines.

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Introduction

The Philippines is highly vulnerable to the impacts of climate change that include sea level rise, increased frequency of extreme weather events, rising temperatures, and extreme rainfall. This is due to its high exposure to natural hazards (cyclones, landslides, floods, droughts), dependence on climate-sensitive natural resources, and vast coastlines where all its major cities are located and most of the population reside. This exacerbates the increasingly depleting natural and marine resource base that supports livelihoods and provide critical ecosystem services to communities such as shoreline protection, flood control, soil stability, and habitats for biodiversity. Nature-based solutions (NBS) are considered strategic priorities by the government due to its remarkable potentials for enhancing national and local resilience to various climate change impacts.

The Fonds Français pour l'Environnement Mondial (FFEM) supports projects that strengthen coastal resilience, help coastal communities adapt to climate change, and are replicable and innovative. From November 2015 to June 2022, the agency supported the implementation of the 'Building Coastal Resilience for Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) in Small Island communities through Green-Grey Infrastructure (GGI) Project"[1], in Concepcion, Iloilo, which was one of the severely devastated areas by Typhoon Haiyan in the Philippines in 2013. The project aimed to demonstrate the potential for natural systems to adapt to the consequences of climate change and the relevance of setting up grey (classic/traditional engineering) and green (ecosystems conservation) infrastructures to build resilience into coastal territories and communities especially during typhoons. The combined green-grey solutions are expected to have greater benefits to building climate change resilience and adaptations than the use of just one of two approaches.

To evaluate and select specific sites for green-grey infrastructure (GGI) implementation, a technical feasibility study was conducted, and results were subjected to stakeholder consultations. Based on vulnerabilities to climate change, mitigation potential, and applicability of green-grey engineering solutions, four (4) sites - Bagongon, Tambaliza, Loong and Bacjawan Norte - were selected for green-grey solutions, and one (1) site – Polopiňa - was considered for implementation of green solutions (Figure 1). The green solutions in Polopiňa, however, supported the implementation of green-grey solutions in other sites and contributed to the overall objective of building coastal resiliency in the Municipality of Concepcion.

Conservation International (CI) Philippines adopted a community-build model in the implementation of the GGI Project in Concepcion. The model emphasized the participatory, person-centered approach in designing, planning, implementing, assessing, and evaluating the project. Site-based GGI projects[2] were implemented by community organizations with funding support and technical assistance from CI Philippines. To become effective partners in the implementation of this innovative approach in building coastal resiliency to the effects of climate change, capacity

[1] The implementation of the FFEM-GGI Project was covered by a Memorandum of Understanding (MOU) between the DENR-Biodiversity Management Bureau and Conservation International (CI) Philippines and the MOU between the Local Government of Concepcion and CI Philippines

[2] In addition to the MOU between the Local Government of Concepcion and CI Philippines, site-based implementation was covered by Barangay Resolutions and Conservation Agreements among the Local Government of Concepcion, concerned Barangay Council, concerned implementing community organization and CI Philippines.

building activities on ecosystem-based adaptation and GGI, mentoring support, organizational development programs, and livelihood incentives were provided to partner community organizations.

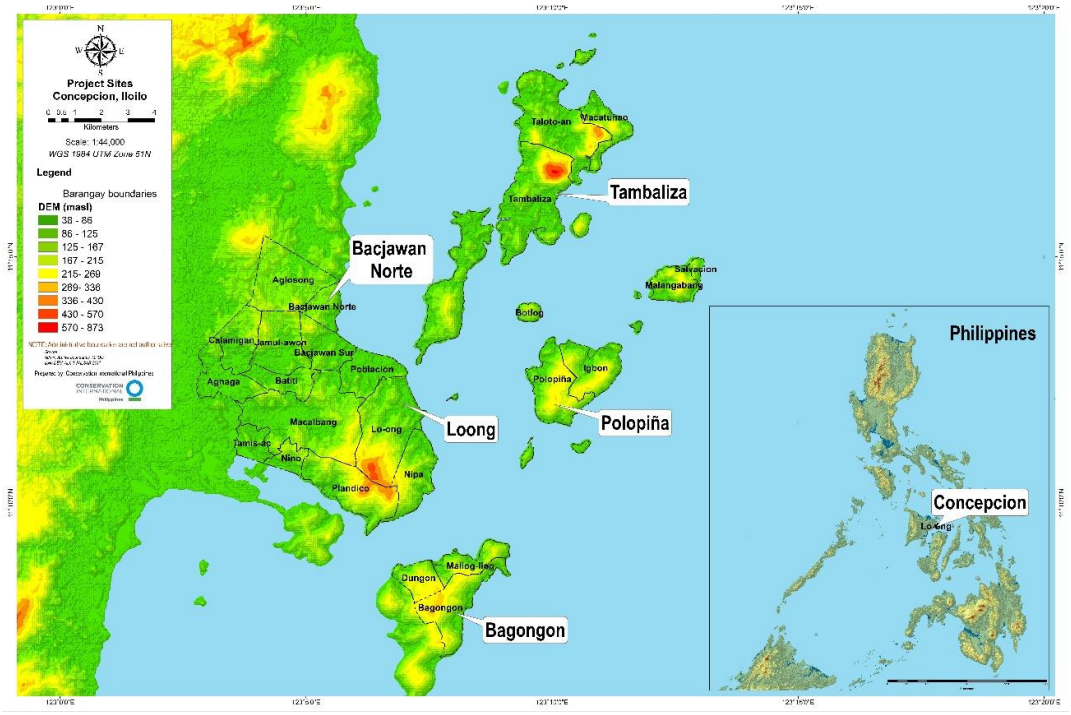

Figure 1. The FFEM-GGI Project sites in Concepcion, Iloilo, Philippines.

The Green-Grey Infrastructure (GGI) Project in Barangay Polopiňa

Rationale for GGI Project implementation in Barangay Polopiňa

Polopiña is an island barangay in Concepcion that has a land area of 447 hectares occupying almost half of Igbon island. It has an approximate coastal length of 6.9 kilometers. Two smaller islets namely Bulobadiangan (2.7 km coastline length) and Danao-danao (1.8 km coastline length) are also part of Barangay. Polopiña. This barangay has nine (9) sitios namely: Looc Bat-os, Pasil, Proper, Guinmisahan, Sanggutan, Bulobadiangan, Danao-danao, Dagaan and Talisay

Polopiña has 860 households per barangay record of 2017. Communities are highly dependent on fishing, which includes both municipal and small-scale commercial fishing. Other fishing related livelihood include crab-picking, seaweed culture and processing, fish drying, fish trading, net making and/or mending. Some residents are also engaged in *sari-sari* (variety) store business, backyard livestock raising, farming, and labor contracting. Despite its distance from the town proper, Polopiña is fairly self-sufficient since the barangay has small farms that produce rice and other agricultural products. Residents also have access to micro-credit financing for livelihood capital and supplemental funds. Some community members have access to Philhealth, senior citizens' and social security pensions, and other government programs that provide conditional cash grants.

Most of the houses are made of light materials. Only a quarter of the total number of households own both the house and lot on which the house is built. Most of the common barangay structures in Polopiňa, which include the new birthing clinic (that also serves as a health center), church, and the high school and elementary schools are in the Sitio Proper. The barangay hall and health center were damaged during Typhoon Yolanda (Haiyan) in 2013 and were rebuilt in 2020. There are also small day care centers established in each of the six (6) sitios. There are 84 small variety stores on the island that sell food items such as rice, noodles, canned goods and other household necessities.

Due to its geographical situation, Polopiňa is not connected to the power grid. Most households source electricity from solar panels. Two hundred eighty-five (285) households use generators and around six households use batteries which they recharge regularly.

The Technical Feasibility Study conducted by CI[3] in 2018 that covered the potential sites for GGI application in Concepcion described the vulnerability of Polopiňa to coastal hazards as it is exposed to storm surge and wind waves. Polopiňa has shallow beach profile and a coastal area, which is subjected to flooding at high tide. It was gathered that the school on the beach was perennially inundated during flooding episodes. At low tide, a large coastal area is exposed. Its shallow bathymetry allows

[3] Conservation International. 2018. Technical Feasibility Study: Building coastal resilience for disaster risk reduction and climate change adaptation in small island communities in the Philippines through green-grey infrastructure. 110 p. + 4 attachments.

for significant wave energy dissipation before reaching the shore. The coral reef is in poor condition. Local residents claimed that seagrass and mangrove covers were historically extensive. But mangroves have been cut down for timber for construction and only remnant communities remained. Patches of *pagatpat* and *bungalo*n and some *Rhizophora* species (*busain/bakawan lalaki/buta-buta*) were found.

It was assessed that applicability of green-grey infrastructure in Polopiňa was moderately high, but implementation was expectedly very costly. Unlike in other GGI project sites in Concepcion, where the use of bamboos and stones for gray structures would suffice, Polopiňa would require the installation of gabion boxes as grey solution and should cover 300 linear meters along the coast. This solution would take up more time and resources than what had been planned out since it would entail the fabrication of the gabion boxes. Also, the coast of Polopiňa proper is rocky and there would be a need to do some digging using heavy equipment to set and hold the gabion boxes in place in portions of the 300-meter coastal area. This procedure required the conduct of full initial environmental impact assessment. Again, that would take up time and resources as that would entail another round of stakeholder consultations and public hearing.

The Technical Feasibility Study (page 43) stated that, "The barangays with the highest score for green-gray stability with the least cost would be considered the most appropriate site for the pilot project." Thus, only green solutions were considered in designing the project in Polopiňa. But these solutions were meant to benefit not only Polopiňa but also the other GGI project sites in Concepcion Municipality in the following ways: (1) support to the implementation of GGI in Concepcion by providing the seedlings required for green solutions (i.e. mangrove planting and rehabilitation) in selected project sites and, (2) contribute to building coastal resiliency in Concepcion through mangrove rehabilitation in Polopiňa and strengthening the management of its community-based marine protected area.

To this end, the project design in Polopiňa consisted of: (1) the establishment of two mangrove nurseries to produce the required seedlings for planting in rehabilitation areas in Loong, Sitio Punting in Tambaliza and Polopiňa (Figure 2); (2) mangrove rehabilitation/enrichment planting in Polopiňa (Figure 3).; and (3) establishment of a community-based Marine Protected Area (MPA).

Figure 2. Proposed mangrove nursery sites in Polopiňa.

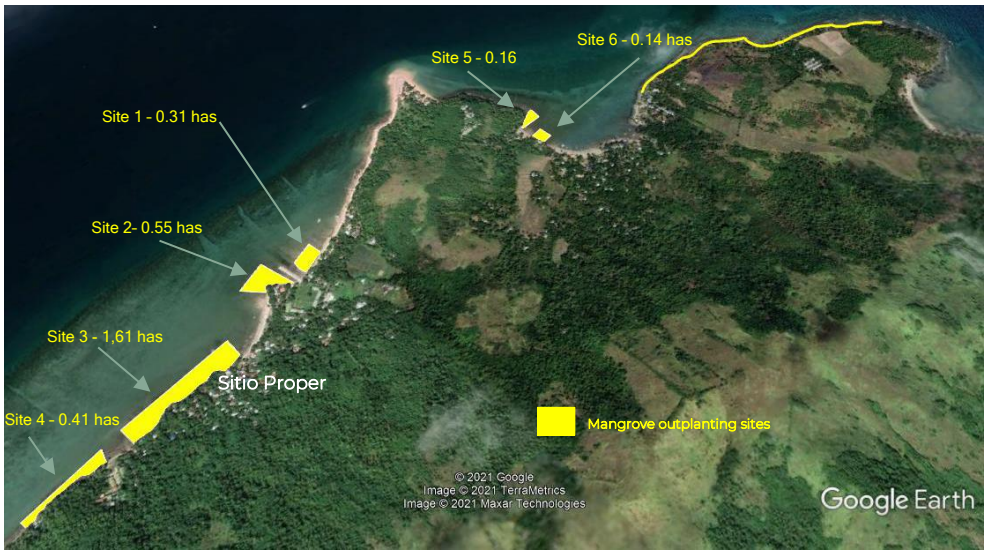

Figure 3. Planned mangrove outplanting sites in Polopiňa.

Results

CI Philippines partnered with two community organizations in Polopiňa, i.e., the Sitio Looc Small Fisherfolk Association (SILOSFA) and the Proper-Pasil Guardians Association of Marine Protected Area (PROPAGAMPA). It was noted that some SILOSFA members were also members of PROPAGAMPA and they participated in project activities of both organizations. Officially, though, CI Philippines' partnership with SILOSFA was on the mangrove nursery establishment and that with PROPAGAMPA was on mangrove planting and rehabilitation and marine protected area management.

Figure 4 summarizes the interventions and accomplishments of the GGI Project implementation in Polopiňa.

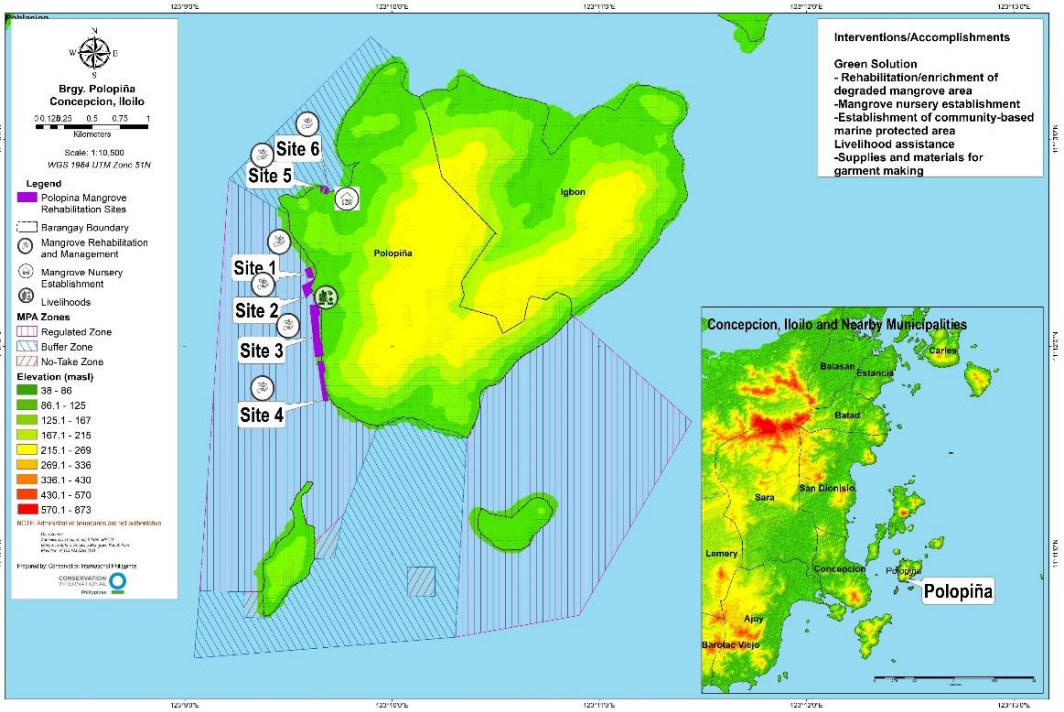

Figure 4. Map of green interventions in Barangay Polopiňa, Concepcion, Iloilo.

Green solutions and benefits. The original plan in Polopiňa was to establish two (2) mangrove nurseries with a total area of 9,655 square meters, i.e., 7,531 square meter-nursery in Sitio Bat-os and 2,124-square meter nursery in Sitio Looc (Figure 2). These nurseries were anticipated to produce at least 150,000 seedlings and wildlings for use in the rehabilitation of the mangrove areas (total of at least 20 hectares) in GGI project sites in Concepcion Municipality, i.e. Loong, Tambaliza and Polopiňa. However, during the implementation of mangrove nursery establishment with SILOSFA, some residents of Sitio Looc refused to include their area as a mangrove nursery site. They were worried that the collection of soil media for the potting of seedlings would cause erosion during flooding. As a result, only the mangrove nursery in Sitio Bat-os with an approximate area of 5,407 square meters was established by SILOSFA in the year 2018 (Figures 5-8).

Figure 5. SILOSFA members engaged in clean-up, layouting and fencing work in mangrove nursery area in Sitio Bat-os.

Figure 6. SILOSFA members collected *Avicennia* propagules, which drifted to the shore.

Since the mangrove nursery area in Polopiňa was reduced by 44% from what was planned to what was actually established and might only be able meet the mangrove planting requirement in Polopiňa, there was a need to figure out alternate sources of seedlings for the mangrove planting and enrichment

activities in Loong and Tambaliza. As part of adaptive management of the GGI Project, CI Philippines and SILOSFA established a work arrangement with the Tambaliza Small Fisherfolk Association (TASFA) in Sitio Punting in July 2018, so that a mangrove nursery could be established in Sitio Punting to supply the seedling requirement of mangrove planting and rehabilitation in Tambaliza. A similar work arrangement was established with the Baskal Operators of Loong Association (BOLA) so that the mangrove rehabilitation activity in Loong could be supported by a locally established nursery. Site-based nurseries and onsite rearing of mangrove seedlings for outplanting in rehabilitation areas proved cost-efficient since no hauling and transport from Polopiña to these two other GGI sites had to be done.


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Figure 7. SILOSFA members bagged collected mangrove propagules for storage and growing in Sitio Bat-os nursery.

Figure 8. Mangrove seedlings and propagules in the SILOSFA mangrove nursery in Sitio Bat-os.

For the SILOSFA-managed mangrove nursery, a total of 57,900 seedlings were collected, bagged, stored and monitored from May 2018 to January 2019. In

March 2019, remaining seedlings in the nursery totaled 46,320, equivalent to 80% survival rate, and sufficiently supported the mangrove rehabilitation in Polopiňa.

As for the mangrove rehabilitation through planting and establishment of community-based MPA, the lead community organization was PROPAGAMPA. The mangrove rehabilitation initiative was part of the Barangay Polopiňa's Marine Protected Area Management Plan for 2021-2025 that was formulated with support from the GGI Project. A series of mangrove rehabilitation and management trainings was conducted with the members of PROPAGAMPA who were to participate in the outplanting activities. Prior to the actual outplanting activities, a mangrove planting orientation was also conducted with group leaders to orient the participants of their assigned zone and species to be planted. The outplanting sites were in Sitio Looc and Proper. A total of 28 community members were involved in outplanting activities (Figure 9.) Planted were species of *Avicennia* and *Rhizophora*. The area covered was a bit smaller than the original target of 3 hectares due to the request of the community to allow space for boat navigation. Unfortunately, two major factors caused high mortality of planted mangrove seedlings in Polopiňa. One month after planting, infestation by sand burrowers, *Sipunculus nudus*, locally known as *sassing* was observed. In the second month, Typhoon Fabian enhanced the southwest monsoon in the Visayan Sea and caused strong waves, floods and damages to property and also damaged 75% of the planted mangroves in Sitio Proper and Looc (Figure 10). Replacement planting had to be done beyond GGI project support.

Figure 9. Mangrove planting activities (top) and planted mangroves (bottom) in Polopiňa.

Figure 10. Planted mangroves in Polopiňa that were damaged by Typhoon Fabian in July 2021.

As for the establishment of a 1,157.97-hectare community-based marine protected area (CB-MPA) composed of 24.77-hectare No Take Zone (NTZ), 565.2-hectare buffer zone (BZ) and 568-hectare regulated use zone (RUZ), the support provided by the GGI project in Polopiňa came in the following forms:

- Review and updating of the community-based MPA Management Plan for 2021-2025
- Provision of basic equipment and supplies (i.e., life jackets, solar light with sensor for marker buoys, life buoy ring, megaphones with sirens, search light, digging bars and blade, and mobile phones) for effective MPA enforcement and patrolling
- Definition of the technical boundaries and coordinates of the MPA as inputs to improved MPA management plan
- Installation of five (5) MPA marker buoys in Bulobadiangan Island, Polopiňa Proper and Bat-os to mark the boundaries of the MPA for monitoring and enforcement of regulations (Figures 11-13).
- Fabrication and installation of MPA signages in six sitios in Polopiňa, namely, Bat-os, Looc, Bulobadiangan Island, Sanggutan, Danao-Danao Island and Proper (Figure 14) to increase community awareness and support to MPA protection.
- Provision of capacity-building support through training and facilitation of community-based formulation of the MPA plan for 2021-2025.

Figure 11. MPA marker installation in Bulobadiangan Island.

Figure 12. MPA marker installation in Polopiňa Proper.

Figure 13. MPA marker installation in Bat-os.

Figure 14. Installed MPA signage in Bat-os (left) and in Bulobadiangan (right).

For its part, the Municipal Government of Concepcion installed ten (10) additional markers on the exterior boundaries of the MPA.

Livelihood incentives. As an incentive for the community participation in GGI project implementation, a livelihood grant was awarded to PROPAGAMPA by CI Philippines. The livelihood project, which was identified for Polopiňa was the

production of garments, such as, school uniforms and jogging pants for physical education. The garment-making livelihood initially targeted public grade and high schools in Concepcion, Iloilo. To prepare the sewers for this livelihood, seventeen (17) members of PROPAGAMPA and SILOSFA were trained on Basic Dressmaking and Tailoring. The training was done in partnership with Technical Education and Skills Development Authority (TESDA).

The project provided the organization with five (5) units of manual sewing machines, one (1) high-speed sewing machine, one (1) zigzag stitching machine and one (1) edging machine (Figure 15). Since Polopiña does not have regular supply of electricity in the island, one unit of solar power system (Figure 16) was also provided by the project to operate the sewing machines.

Textiles required for the school uniform production were also procured. However, because of the COVID-19 pandemic, face-to-face classes were suspended, so the partner organization sought other income-generating activities that could use the equipment they already had. In June 2020, the women members of PROPAGAMPA and SILOSFA accepted orders and produced cloth face masks (1,100 pieces for their barangay; and 1000 pieces for the power plant; 1600 pieces with embroidered logo for Conservation International Headquarters in the United States of America. They also had sales in other barangays and nearby towns and provinces. Aside from face masks, PROPAGAMPA and SILOSFA also produced other clothing products such as kids shorts, cooking outfits such as cook's hat, apron and towels (Figure 17)

Figure 15. Manual sewing machine (left) and electric high speed sewing machine (right) provided to PROPAGAMPA.

Figure 16. Solar panel installed in garments production center in Polopiña.

Figure 17. Face masks and other clothing products produced by PROPAGAMPA.

The production center being used by the partner organization was donated by the Iloilo Code NGOs through Fundación de France. However, the space is limited to accommodate all sewing equipment. Hence, the organization, in collaboration with the project team, requested funding assistance from the Local Government of Concepcion to construct the extension of production center (Figure 18). The lot where the production center is built, is owned by PROPAGAMPA.

Figure 18. Expansion and concreting of the garments production center was supported by the Municipal Government of Concepcion.

Capacity building on Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA). The communities in Polopiňa have been provided with capacity-building support on DRR-CCA by humanitarian and development organizations as part of the Typhoon Haiyan rehabilitation. Although it is in an island, it has better access to the support coming from the Municipal Government of Concepcion compared to Bagongon and Tambaliza. Selected members of the PROPAGAMPA and SILOSFA, and the Barangay Council of Polopiňa also participated in the Training on First Aid and Basic Life Support arranged by CI Philippines under the GGI Project and conducted by Red Cross in 2018. The project also supported the development of the Barangay Disaster Risk Reduction and Management Plan for Polopiňa which also included Climate Change Adaptation.

Challenges and lessons learned in implementing the GGI Project in Polopiña

Polopina ranked 3rd of seven (7) sites assessed in Concepcion in the applicability of green-grey solutions. But the challenge was in the recommended grey structures for the site, which were gabion boxes[4]. Because the substrate where gabion boxes needed to be installed was rocky, there would be a need to carve the substrate with the use of heavy equipment to create indentions where the gabion boxes would be set in place. This approach would require a full Environmental Impact Assessment to determine effects to the environment and if the installation of gabion boxes could be allowed by the government and the community. Moreover, the gabion boxes would have to cover 300 meters of coastline. The procedures required to implement GGI in Polopina (i.e., the impact assessment and the fabrication of gabion boxes to be installed) would be costly and would require additional time and effort that were not figured in the work plan and budget of the FFEM-GGI project. Based on the Technical Feasibility Study conducted for this project, cost is also a factor in selecting sites for demonstrating green-gray solutions. In spite of the limitations of implementing GGI in Polopina, it was recognized that green solutions, such as establishment of mangrove rehabilitation area with mangrove nursery and strengthening of community-based marine protected area could contribute to the overall objective of building climate resiliency in Concepcion. Thus, project activities for green solutions proceeded in Polopina.

Although the green solutions in Polopina were originally designed to support the project implementation in other GGI sites in Concepcion, i.e., the establishment of mangrove nurseries that could supply the seedlings needed by mangrove planting in Tambaliza and Loong, this plan did not fully materialize. The objection of some community members to the establishment of mangrove nursery in their immediate vicinity, for fear of soil erosion, resulted in the reduction of the size of nursery actually established in Polopina by 44% from what was planned. This meant that this nursery could only support the enrichment planting requirement in the Polopina mangrove rehabilitation area. To meet the seedling requirements of Tambaliza and Loong in their mangrove rehabilitation area, SILOSFA and CI Philippines worked with TASFA and BOLA, respectively, in the establishment of their own mangrove nurseries as sources of seedlings for their own outplanting needs. This proved cost-efficient since there was no need to haul and transport the mangrove seedlings for planting from Polopina to these two other GGI project sites.

Providing full focus on the project activities became difficult for the partner community organization, SILOSFA. SILOSFA had other projects to attend to, e.g., SEAFDEC-funded projects on sea cucumber ranching and seaweed culture. SILOSFA also suffered from a reduction in size when some of its members took job opportunities outside of Concepcion Municipality. As a response, CI Philippines partnered with another community organization, PROPAGAMPA, while completing the work with SILOSFA on nursery establishment and monitoring. The partnership with PROPAGAMPA resulted in the completion of the mangrove rehabilitation and strengthening of community-based MPA work in Polopina.

[4] A gabion is a cage, cylinder or box filled with rocks, concrete, or sometimes sand and soil for use in civil engineering, road building and coastal protection.

The COVID-19 pandemic put on halt the project activities in Polopina in 2020. The mangrove rehabilitation and MPA work were picked up only in 2021, but with some difficulties in view of the limitations on movement and gatherings imposed by the government's community quarantine guidelines. Mangrove planting was completed in May 2021. However, it was unfortunate, that in the following month, a sand burrow infestation occurred and damaged the mangroves. Then in July 2021, when the FFEM-GGI Project was just wrapping up activities in the field, Typhoon Fabian enhanced the southwest monsoon in Visayan Sea and caused some more damages on the mangrove rehabilitation area in Polopina and resulted in very low survival rate of the planted mangroves.

The COVID -19 pandemic also affected the livelihood provided by the GGI Project to PROPAGAMPA as incentive for their participation in the GGI Project implementation. The garment-making livelihood was intended to produce student uniforms for primary and secondary schools. Textiles had already been purchased when the face-to-face classes were suspended. Thus, the lost opportunity for PROPAGAMPA to generate income from this supposed livelihood incentive. From voluntary donations from CI staff, PROPAGAMPA was able to purchase materials to produce other much-needed items, i.e., face masks, and somehow generate income. The textile for school uniforms were set aside for future use when face-to-face classes resume.

Sustainability, conclusion and recommendations

Even if the project implementation in Polopina was beset with many challenges, the following were accomplished:

- The establishment of a 2.84-ha mangrove rehabilitation area where enrichment planting was conducted but will require replacement of damaged planted mangroves.
- The establishment of a mangrove nursery, which if managed can supply the seedling requirements of replacement planting as needed.
- The establishment of a 1,157.97-hectare community-based marine protected area (CB-MPA) composed of 24.77-hectare No Take Zone (NTZ), 565.2-hectare buffer zone (BZ) and 568-hectare regulated use zone (RUZ) through the updating of the MPA Management Plan, definition of the technical boundaries and demarcation of the MPA for enforcement of regulations and management actions, and installation of information materials for public awareness and support.
- The establishment of the garment-making livelihood and development of community capacity to provide sewing services not only for production of school uniforms but of other sewn products, e.g., house garments.
- The enhancement and deepening of the understanding by the community of climate change issues and the significance of ecosystem-based adaptation and innovative approaches like GGI, in mitigating the impacts of climate change and related disasters and risks.
- The enhanced preparedness of the community to CCA and DRR.

Polopiña is undeniably vulnerable to variabilities brought by changing climate. The GGI project has demonstrated that green solutions alone are not sufficient in building coastal resilience in Polopina. Thus, there will be a need to study further the area and determine options for grey solutions to go with the green. In the meantime, without the grey solutions, the Polopina community will need to put in more effort than other communities in the other GGI project sites to maintain the 2.84-hectare mangrove rehabilitation area. Maintenance means continuous replacement planting of mangroves that do not survive, monitoring of the planted mangroves and the entire rehabilitation area, maintenance of the mangrove nursery as source of seedlings for mangrove planting and enforcing regulations to protect the mangroves and nursery. Also, the Local Government and other potential partner institutions will need to put in more funds than what a single project can provide, for combined green and grey solutions in Polopina. The implementation of the MPA management plan, where mangrove planting is among the strategies for habitat rehabilitation can also help in increasing the mangrove cover in Polopina. The MPA management plan also includes installation of oyster reefs as solutions to habitat rehabilitation. Designs and appropriate placement areas for these structures have to be determined for them to truly deliver to their intended purposes.

Addressing social vulnerability through capacity building like training is a vital contribution of GGI Project in Polopina since community members are the first to respond during disasters in their locality. The role of the Local Government of Concepcion is crucial in providing sound technical assistance and ensuring the

involvement of the community members in advocating for mangrove conservation, disaster preparedness and mainstreaming climate change adaptation into the local plans and policies. Participatory and community-based strategies are effective when local leaders and organizations are actively involved.

The by-laws of PROPAGAMPA consider saving a portion of income from livelihood activities for environmental and community projects. The full operationalization of the garment-making livelihood can help build funds to support PROPAGAMPA's community projects.

The green solutions in Polopina are covered by a Conservation Agreement signed by CI Philippines, the Local Government of Concepcion, Barangay Council of Polopina and PROPAGAMPA. The roles of each signatory in the implementation and maintenance of the green solutions for a period of five (5) years beginning 2021 are stipulated in the Conservation Agreement. The implementation of the agreement is just one modality to sustain the initiative of building coastal resiliency in Polopina.

The Local government of Concepcion is at the forefront of promoting the good results of the GGI project. These results can be utilized in leveraging further support from other government agencies, funding institutions, and would-be partners in the academe and private sector to sustain and expand ecosystem-based adaptation in Polopina to increase coastal resiliency in Concepcion.

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