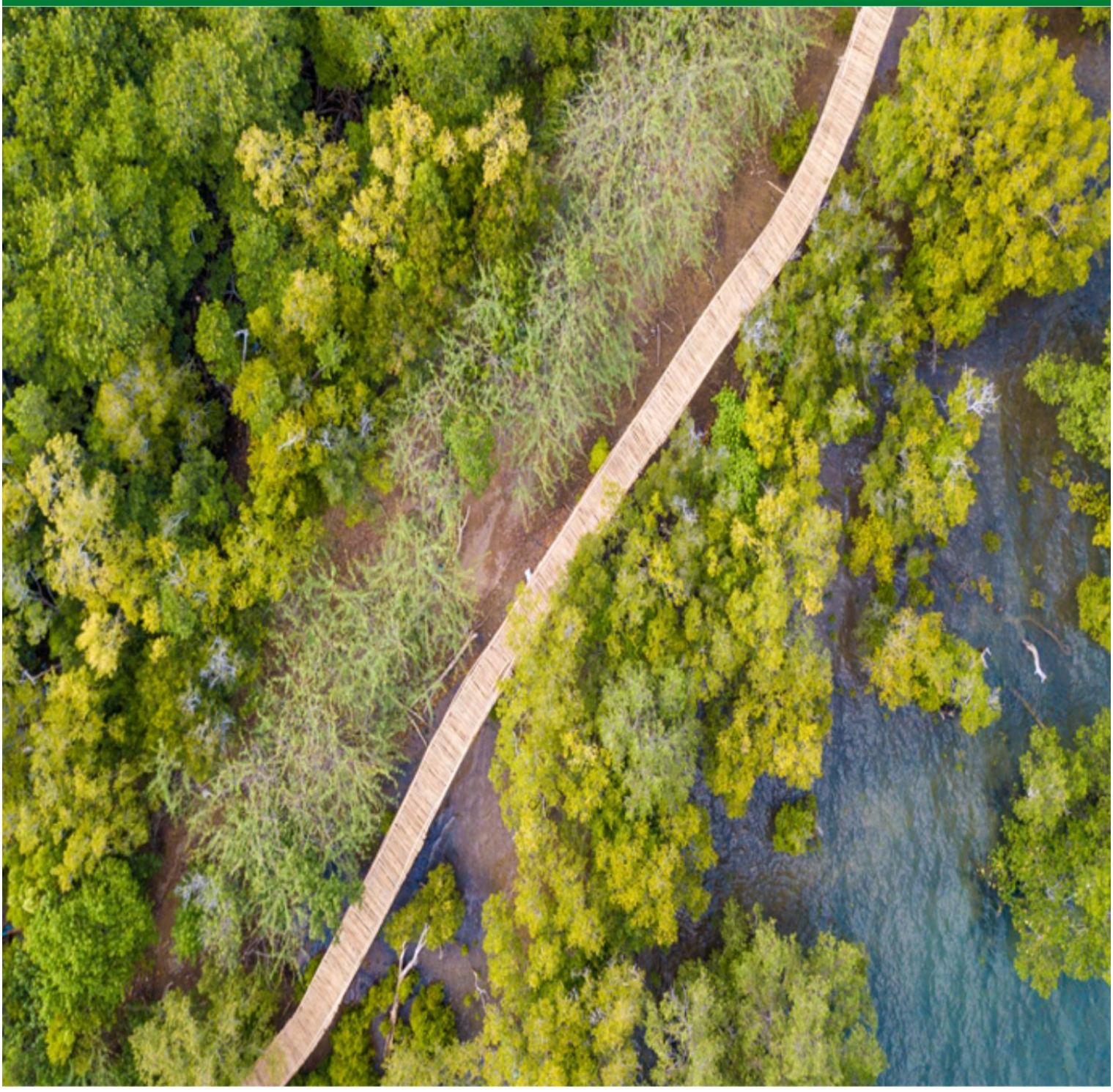
Building Coastal Resilience for Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) in Small Islands in Concepcion, Iloilo, Philippines

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

May 2022



CONSERVATION INTERNATIONAL Philippines

FONDS FRANÇAIS POUR L'ENVIRONNEMENT MONDIAL

The GGI Project in Tambaliza, 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
November 2015-June 2022

Supported by:

Fonds Français pour l'Environnement Mondial (FFEM)

Implemented by:

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 Tambaliza were:
The Barangay Council of Tambaliza and the Tambaliza Small Fisherfolks Association (TASFA)

Recommended Citation:

Conservation International Philippines. 2022. Building Coastal Resilience for Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) in Small Islands in Concepcion, Iloilo, Philippines: The Green-Grey Infrastructure (GGI) Story of Barangay Tambaliza. 19 pages.

Acknowledgment

The GGI story of Tambaliza was prepared by Evangeline Miclat, Maria Josella Pangilinan and Lovella Magluyan of Conservation International Philippines.

The GGI design was prepared by the engineers of Bechtel.org[1] and Conservation International with inputs from the Municipal Engineering Office of the Local Government of Concepcion and the local community of Tambaliza.

Additional inputs to the green solutions were provided by the Municipal Planning and Development Office and Coastal Resources Management Office of the Local Government of Concepcion, and the Department of Environment and Natural Resources-Community Environment Natural Resources Office-Sara.

Guidance in the preparation of GGI designs was provided by the members of the Scientific and Technical Advisory Group, i.e., Mr. Tam Nguyen (Bechtel Corporation), Dr. Emily Pidgeon and Engr. Emily Corwin (Conservation International), Dr. Severino Salmo III (Ateneo de Manila University), Dr. Earl Dranreb Juanico (Technological Institute of the Philippines), and Engr. Takashi Hino (Taisei Corporation).

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

Partners, consultants, and CI Technical and Operations staff are acknowledged for their valuable support.

1 Bechtel.org is a social enterprise that was established to deliver Impact Infrastructure to help improve the lives of people.

Table of Contents

List of Figures

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"[2], in Concepcion, Iloilo, which was one of the severely devastated areas by Typhoon Haiyan (Yolanda) 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 adaptation than the use of just one of two approaches.

To evaluate and select specific sites for green-gray 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-gray engineering solutions, four (4) sites - Bagongon, Tambaliza, Loong and Bacjawan Norte - were selected for green-gray solutions, and one (1) site – Polopina - was considered for implementation of green solutions (Figure 1). The green solutions in Polopina, 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. All site-based GGI projects[3] 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

[2] 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

[3] 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.

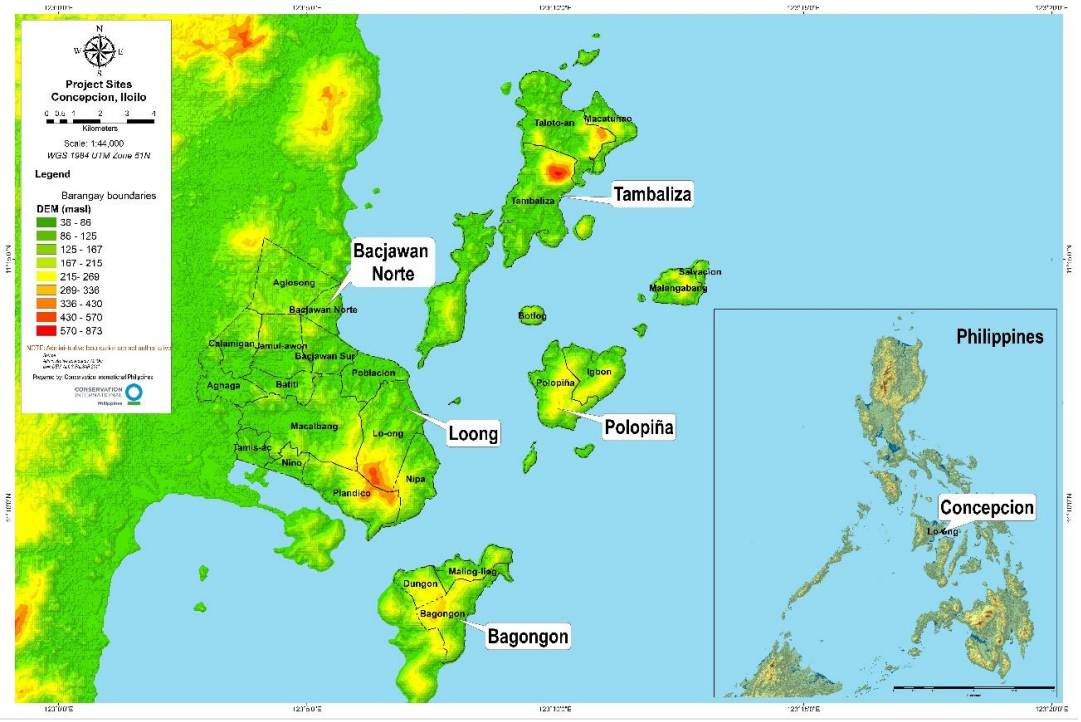


Figure 1. The FFEM-GGI Project sites in Concepcion, Iloilo, Philippines.

THE GREEN-GREY INFRASTRUCTURE (GGI) PROJECT IN BARANGAY TAMBALIZA

Rationale for GGI Solutions in Tambaliza

Tambaliza is an island barangay in Concepcion, Iloilo located at the northeast portion of the municipality. It has a land area of 803.36 hectares with a coastline length of approximately 10 kilometers. It is one of the barangays which occupies Pan De Azucar Island aside from Talotoan and Macatunao. The island is known for Mount Pan de Azucar (Mount Manaphag), a steep volcanic cone and a prominent landmark which is 574 meters (1,883 ft) high.

Tambaliza is composed of 7 *puroks* namely Proper, Bat-os, Banban, Botlog, Guimisahan, Pasil and Punting. It is 9 kilometers away from the town proper of Concepcion, which is around 40-minute travel by outrigger passenger boats. It experiences periodic isolation from the mainland during severe weather conditions. Tambaliza is exposed to wind waves and is vulnerable to high wave heights. It is also exposed to storm surge though prediction is relatively low compared to other island communities in Concepcion. Of 719 households, 313 are located within 50 meters from shoreline and since these houses are made of light materials, they have no capacity to withstand hazard. These households are up for relocation. Much of the land area in Tambaliza is rocky that explains why houses are often built along the coastal area. Fishing is the main source of livelihood. About 70% of the households are directly dependent on fishing and some members, particularly women are involved in fish drying, fish trading and net making and/or net-mending. Fishery-based livelihoods are particularly vulnerable to climate variability such as stronger monsoon winds and typhoons. During the Southwest Monsoon season, usually in June-September, fishing households have limited or no income. Access to basic health and social services, which are available in the mainland, is limited and thus adds to social vulnerability.

Tambaliza has around 40 hectares of mangroves spread out along different parts of the island. The largest patch of mangroves of approximately 18 hectares is located in *sitio* Banban. The area has been declared as a mangrove eco-park and is covered with mature trees. There are seven (7) true mangrove species with *Lumnitzera sp*. (culasi), *Sonneratia alba* (pagatpat) and *Avicennia marina* (bungalon) as most common. At low tide, abandoned fishponds are visible along the coastline of Tambaliza, particularly in Sitio Punting. These old fishponds have been covered with some old stands of *Sonneratia alba* and other species like *Rhizophora* (bakhaw) and *Avicennia marina* saplings. These are good sites for mangrove planting and rehabilitation. However, there are structures in and around the abandoned fishponds that limited the exchange of water between the sea and the fishponds. These water exchanges are important to the survival of the mangroves to be rehabilitated and seedlings to be planted.

The technical feasibility study conducted by CI[4] showed that the abandoned fishponds in Sitio Punting in Tambaliza were potential as mangrove restoration sites but there would be a need to restore freshwater flow from the mountains, water

[4] 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.

exchanges across the mangrove restoration sites, and tidal flow from the ocean by modifying structures in and around them. These structures were: 1) the berm on the seaward side of the fishpond; 2) a secondary berm within the abandoned fishpond; and 3) the concrete footwalk across the abandoned fishponds, which had only one box culvert as channel through which water flowed.

To this end, the GGI project design in Tambaliza consisted of the removal of berms and construction of additional box culverts for the concrete footwalk to increase tidal and freshwater flows as grey solutions in the mangrove restoration sites (i.e., old and abandoned fishponds) in Sitio Punting, and, mangrove enrichment planting in Sitio Punting and the establishment of Tambaliza Mangrove Ecopark in Sitio Banban as green solutions towards building coastal resiliency in Tambaliza (Figures 2 and 3).

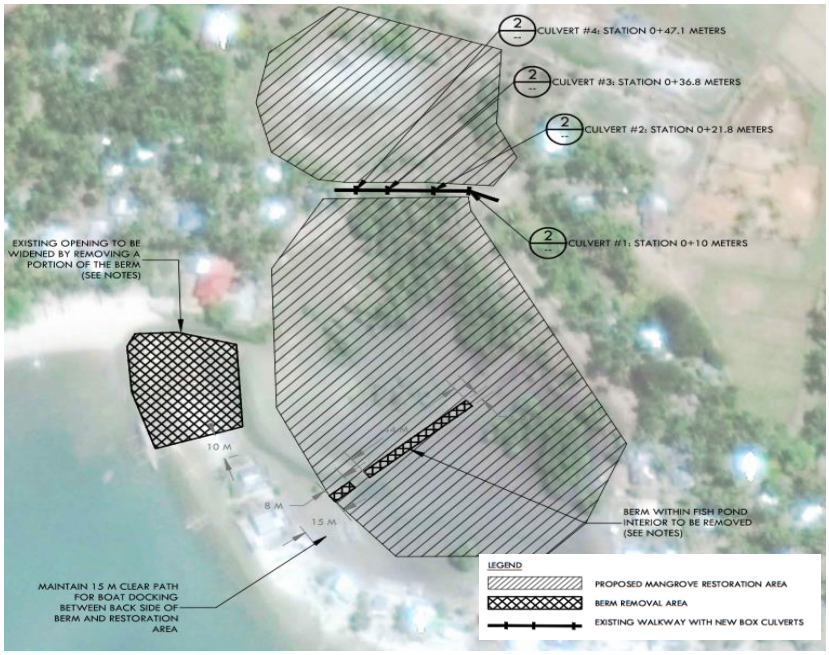


Figure 2. Green-grey infrastructure design in Sitio Punting in Tambaliza.


Figure 3. Proposed boardwalk for the establishment of Tambaliza Mangrove Ecopark in Sitio Banban.

Results

The GGI project in Tambaliza was implemented in partnership with the Tambaliza Small Fisherfolk Association (TASFA). Figure 4 summarizes the interventions and accomplishments of the GGI Project implementation in Tambaliza.

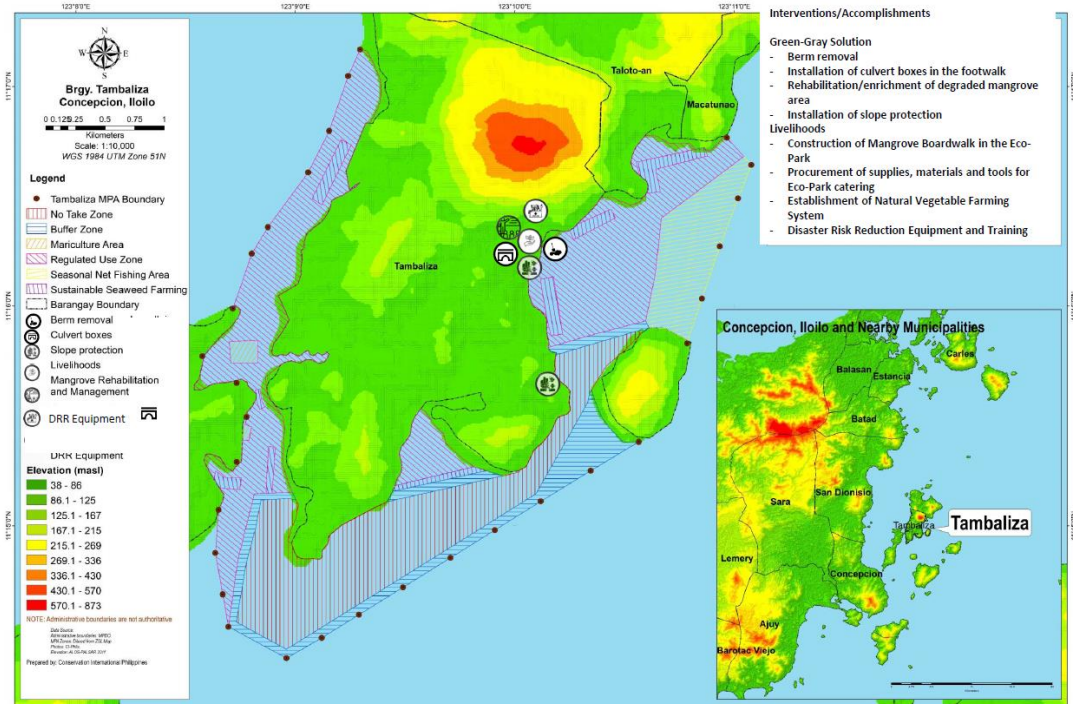


Figure 4. Map of green-grey interventions in Barangay, Tambaliza Concepcion, Iloilo.

Green-gray solutions and benefits. TASFA re-established the hydrological connection between the sea and the mangrove rehabilitation sites (i.e., abandoned fishponds where mangroves would be planted) through the removal of berm (Figure 5) on the seaward side of the abandoned fishponds. The berm removal was done manually by TASFA members and workers using hand tools, such as pickaxe, spade and digging rods. The work was started in November 2020 but was completed only in April 2021 due to interruptions brought about by COVID-19 situation in Concepcion. Approximately 735 cubic meters of the coral berm were excavated. There was no need to work on the secondary berm inside the abandoned fishpond since it naturally eroded and flattened. Hence work only focused on the seaward berm.

Figure 5. View of the berm for removal adjacent to the mangrove rehabilitation area

Approximately 50 cubic meters of the excavated berm were used by TASFA as filling materials for the fabrication of box culverts, which were installed under the 54-meter concrete footwalk, which cut across the mangrove rehabilitation area. From a single opening under the footwalk, TASFA added four box culverts during November-December 2020 (Figure 6). The positioning of the additional box culverts under the footwalk was based on visual observations of low elevation points and flow patterns in the vicinity of the footwalk.

The removal of the berm and the installation of additional openings under the footwalk were the grey solutions to facilitate the flow of water (i.e. freshwater from the mountain and saltwater from the sea) in and out of the mangrove rehabilitation area, which was the abandoned fishpond, and prevent stagnation that would affect the survival of existing mangroves and mangroves to be planted.

The GGI Project also improved the footwalk by widening it from 100 centimeters to 150 centimeters and by installing handrails on one side of the footwalk to ensure safety of users (Figure 7). There have been reports of children falling from the footwalk. The renovation of the footwalk reduces the risk to passers-by in Sitio Punting.

Figure 6. One of additional box culverts installed under the footwalk which cuts across the mangrove rehabilitation area in Sitio Punting, Tambaliza.

Figure 7. The 100-cm wide footwalk before rehabilitation (left) and the 150-cm wide footwalk with handrail after renovation (right) in Sitio Punting, Tambaliza.

In view of the concern of the community over possible soil erosion due to the scouring of the berm, slope protection structure was installed (Figure 8) between March and May 2021 in a place where needed. This was a necessary addition to the GGI design for Tambaliza. About 10 cubic meters of the excavated berm were used to construct the slope protection structure.

Figure 8. Completed slope protection in the berm removal area in Sitio Punting, Barangay Tambaliza.

To complement the grey solutions installed, mangrove enrichment planting was conducted by TASFA in a **2-hectare rehabilitation area**, which was the old, abandoned fishpond in Sitio Punting. A total of **36,000 mangroves were planted** (Figure 9) in the intention to grow a natural buffer against, and minimize impact, of storm surge and wind waves to the community. TASFA established a mangrove nursery in Sitio Punting in 2018 to produce the required mangrove seedlings for rehabilitation activity. Due to extreme heat and prolonged dry season, there was a significant mortality in the mangrove seedlings produced in the nursery. So TASFA members had to gather again seeds, seedlings, and wildlings to meet the target production in the nursery of 36,000 mangroves to be planted in the rehabilitation area. The planting was led by TASFA and the Barangay Council Officers on 11-20 June 2021. Planted were 35,000 *Avicennia sp*. and 1,000 *Rhizophora sp*. Mangroves were planted in rows (strip planting), spaced at 0.5 meter from each individual tree. The short distance was to increase the chances of survival success of the enrichment planting considering the mangrove trees being planted are more than 1 year old. At least fifty (50) community members were able to participate in the outplanting activity. Spaces for boat docking area in the mangrove during high tide were considered. A temporary fence made of bamboo was also installed to prevent community members from entering the newly planted areas (Figure 10).

Figure 9. Planted mangroves in Sitio Punting in Tambaliza.

Figure 10. Bamboo fence installed to protect the mangrove rehabilitation area.

Another green solution in Tambaliza was the establishment of the 17-hectare Mangrove Eco-Park in Sitio Banban. The development of the eco-park is part of the Community-Based Ecotourism Initiative that TASFA and the Barangay Council have been envisioning for Tambaliza. The GGI Project supported the establishment of the community-managed Tambaliza Mangrove Eco-Park for it to serve as center for mangrove conservation advocacy to: 1) increase community awareness on the importance of mangroves in reducing disaster risks and in helping climate change adaptation, and 2) encourage community participation in mangrove protection. To this end, TASFA accomplished two things under the GGI Project, i.e. the construction of the 390.8-meter mangrove boardwalk, which replaced the old boardwalk damaged by Typhoon Yolanda (Haiyan) in 2013, and the establishment of two (2) mangrove nurseries as sources of seedlings for the enrichment planting in the eco-park.

The design of the boardwalk was determined and discussed through series of planning meetings with TASFA and the Barangay Council Officers in late 2020. It was decided that concrete filled PVC with wood support and bamboo plank floor would be constructed in the eco-park (Figure 11; see also Figure 3). TASFA oversaw the procurement and hauling of materials from the mainland, while the Barangay Council assigned 32 workers (i.e., 1 Foreman, 10 Mason and 21 Helper/Laborers) to construct the boardwalk (Figures 12-14).

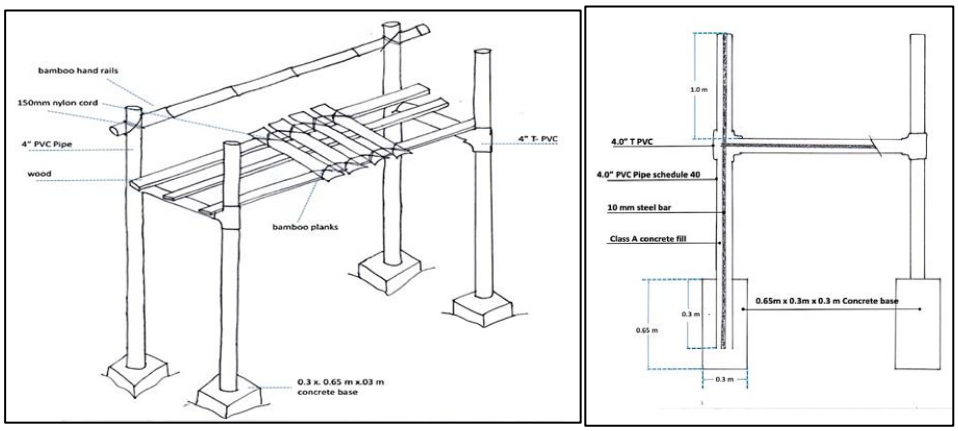


Figure 11. Design of the mangrove eco-park boardwalk in Sitio Banban, Tambaliza.


Figure 12. Lay out of boardwalk in area where no mangroves were growing.

Figure 13. Cement for the concrete base was mixed in platform made of coco lumber and plywood to avoid cement deposits in the eco-park grounds.

Figure 14. Concrete boardwalk bases were casted in a designated area to avoid mixing of cement wash water with seawater.

The boardwalk was completed in 15 workdays in July 2021 (Figures 15 and 16). Of the total boardwalk length of 390.8 meters, 307.8 meters were made of wood and bamboo planks supported by concrete base, while the rest was made of whole length bamboos. The seaward end, which is the entrance to the mangrove, is provided with a ladder. Unintended but necessary features of the boardwalk that were added were: 1) a movable 8-meter bamboo raft to convey residents and visitors from the boats to the boardwalk and vice versa, 2) ladder where visitors can alight from the boardwalk to the boating/kayaking area, and 3) a hanging bamboo bridge supported by strap binders that connects the eco-park with the residential area of Sitio *Banban* and has a clearance of 15 meters to allow pump boats to pass through the water channel (Figures 17-19).

Also in July 2021, two mangrove nurseries were established in Sitio *Banban*. One nursery, which measured 1,000 square meters, is located near the boardwalk (Figure 20). The other, which measured 6,000 square meters, is located near the Mangrove Eco- Park exhibit area. These two nurseries house a total of 25,000 mangrove seedlings of *Avicennia*, *Rhizophor*a and *Sonneratia* species. These are maintained by TASFA and will support mangrove enrichment planting in the eco-park.

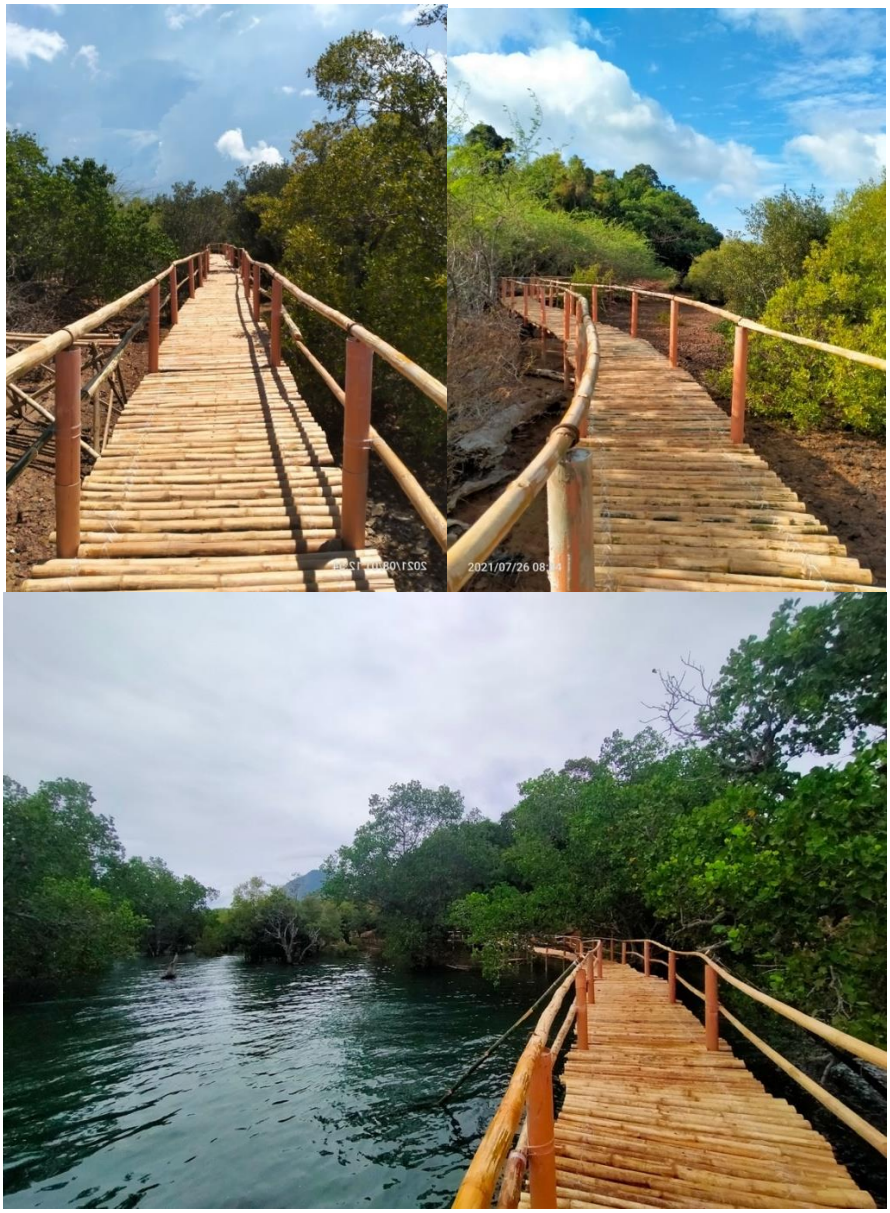


Figure 15. Boardwalk in the Tambaliza Mangrove Eco-park in Sitio Banban.

Figure 16. Ladder at the entrance of the mangrove boardwalk.

Figure 17. Bamboo raft for conveying residents and visitors between the boats and the mangrove boardwalk.

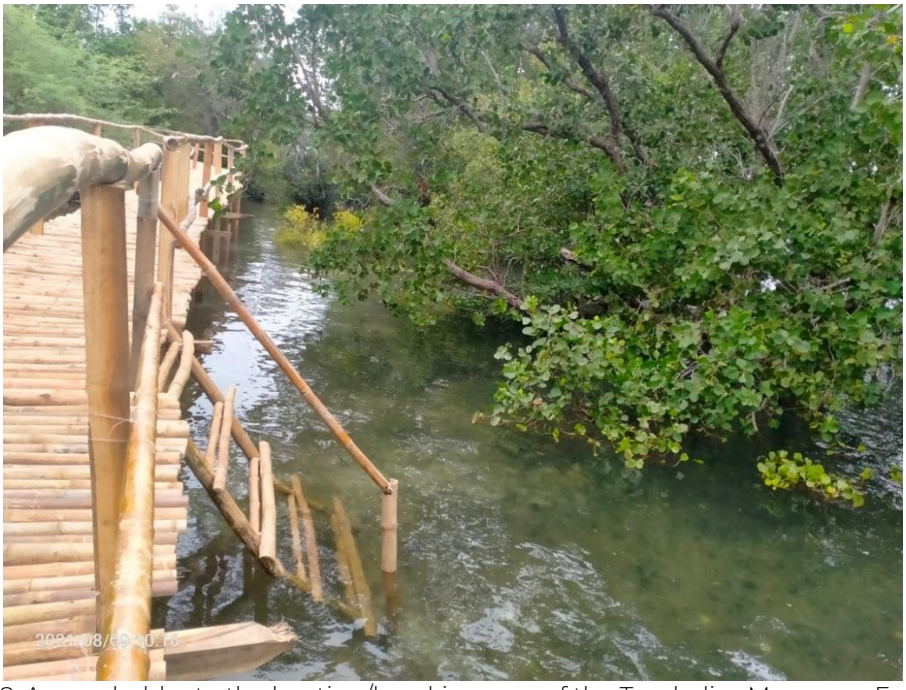


Figure 18. Access ladder to the boating/kayaking area of the Tambaliza Mangrove Eco-park.

Figure 19. Hanging bridge that connects the Mangrove Eco-park to the residential area and allows passage of boats.

Figure 20. Mangrove nursery in Sitio Banban near the boardwalk of the Mangrove Eco-park.

Livelihood incentives. As an incentive for the community participation in GGI project implementation, livelihood grants and in-kind support were awarded to TASFA by CI Philippines. Two livelihood projects developed were: the Natural Farming System (NFS) for vegetables in Sitio Punting, and the establishment of Community Mangrove Ecotourism in the Mangrove Ecopark in Sitio Banban.

Natural Farming System (NFS) for Vegetable Production

The NFS for vegetable emerged as a priority livelihood project due to the limited production and supply of vegetables in Tambaliza, as well as, in the town of Concepcion. In fact, local vegetables sold in Concepcion are sourced from other neighboring towns. Tambaliza also has vast area of unproductive land that can be used for vegetable production. Moreover, Tambaliza is being developed as a main tourism destination in the municipality, hence the TASFA also saw this as an opportunity to develop products in support of the tourism industry. The demand for vegetable is expected to increase with the influx of tourists in the municipality. Since 2019, TASFA, through the support of the CI, has partnered with the Department of Agriculture Regional Field Office 6 (DA-RFO6). Farm inputs such as vegetable seeds and planting materials were provided by DA-RFO6. A series of training and mentoring activities on natural farming systems for vegetables and legumes were conducted for these communities. Hands-on training on organic vegetables using NFS were conducted with the members of TASFA. The training focused on providing the community with the necessary skills and knowledge on NFS to improve soil fertility in the planting area, keep crops healthy, and produce good quality vegetable and herb products and successfully sell them.

Two sites for the NFS were established by TASFA. Site 1 was established in 2019 and has been fully operational since April 2020. A small plant nursery was established to house the seedlings for planting. TASFA has been producing good quality assorted vegetables such as eggplant, *okra*, chili, squash, spring onions, local *pechay* and bitter gourd (*ampalaya*). Figures 21-22 show the farm set-up in Site 1 and TASFA's harvests. The produce was sold in Concepcion town proper

and within Tambaliza. Site 1 has vermicomposting area to produce the farm's vermicompost requirements and minimize costs on commercial fertilizers. A water pump with housing and irrigation system was also installed. A circumference fence made of 200 pcs bamboo posts and 2 rolls of garden net was also installed to protect the transplanted seedlings from animals such as chicken, dogs and goats which frequent the vicinity of the farm.

Figure 21. Installed trellis for climbing bitter gourd (left) and vegetable plots in NFS Site 1 (right).

Figure 22. TASFA members sorting eggplant harvest (left) and harvesting bitter gourd (right).

Site 2 farm was developed in November 2020 for mung bean production. The Department of Agriculture recommended mung bean due to the acidity of the soil in the area. Mung bean has been gaining attention as a short season crop that can tolerate dryland conditions, and fix atmospheric nitrogen, decreasing soil nutrient depletion. It is also a source of high-quality vegetable protein and can serve as a multipurpose crop. In addition to mung beans, TASFA also planted dragon fruit trees. The market for dragon fruit has been expanding in the Philippines, thus there is potential to market the dragon fruit produce not only in Concepcion but in other areas in Western Visayas. Perimeter fence and a farm signage was also installed in Site 2. Aside from the installing water pump, TASFA also established a well, made of concrete culverts to allow the community to manually draw out water from the well if the water pump is not in order. The *tasuk* (deep hole) is very dependent on the water pump which puts irrigation at risk most especially when the water pump breaks or becomes out of order (Figure 23). An 8 x 10 feet vermicomposting house (Figure 24), enclosed with a net for security, was also constructed in Site 2. The project also provided initial support for the allowances of the farm manager and helpers.

Figure 23. Installed deep well made from culverts for the NFS irrigation system.

Figure 24. Vermicomposting house in Site 2.

Community-based Ecotourism: The Mangrove Eco- Park

Prior to Typhoon Haiyan (Yolanda) in 2013, the Barangay government of Tambaliza managed the Mangrove Ecopark and Resort in the area. It had a pavilion, an exhibit area and mangrove bamboo board walk but were destroyed by Typhoon Haiyan. The Community-Based Ecotourism initiative supported by the GGI project aimed to revitalize tourism in Tambaliza by rebuilding the mangrove boardwalk (which has been described in the foregoing section as a green solution) and retrofitting of the exhibit area in the Mangrove Eco- Park (Figure 25). Supplemental income is expected from tourist visitations. TASFA also hopes to sell mangrove seedlings from the nurseries established under the GGI Project to the Department of Environment and Natural Resources, the local government and others for their mangrove planting and rehabilitation activities.

Figure 25. Rehabilitated exhibit area in the Tambaliza Mangrove Eco-park

Capacity building on Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA). Communities in Tambaliza have been provided with capacity-building support on Disaster Risk Reduction and Climate Change Adaptation (DRR-CCA) by humanitarian and development organizations as part of the Typhoon Haiyan rehabilitation. However, Sitio Punting, a community which is relatively far and isolated from village center remains to have very limited capacities. Based on the results of Participatory Capacities and Vulnerabilities Assessment (PCVA) and the Barangay Local Climate Change Action Planning facilitated by CI Philippines, lack of awareness on and understanding of DRR and CCA emerged as one of the weaknesses of the Sitio Punting community. Thus, a training on First Aid and Basic Life Support was provided to residents from Sitio Punting and other remote areas in Tambaliza. After the training, a network of community emergency response volunteers that could be mobilized by the Barangay Council during emergencies was established. Key community members, barangay officials and schoolteachers participated in the training. An emergency response simulation drill was also conducted to test how much learning was derived by participants from the training. The project also supported the development of the Barangay Disaster Risk Reduction and Management Plan for Tambaliza that also included Climate Change Adaptation. Basic DRR supplies, materials, and tools were also provided to the community so that they can immediately and properly initiate and support the emergency response actions without largely depending on external support from the mainland. These included hand-held radios, cervical collars, emergency hardhats, emergency handheld lights and rescue gloves.

Challenges and lessons learned in implementing the GGI Project in Tambaliza

Tambaliza's geographical location brought logistical challenges in the project implementation. The travel from the mainland to Tambaliza is very difficult during strong monsoon seasons and during localized weather disturbances like squalls. Due to its distance from the mainland, hauling of materials like tools and stones from the grey grant became costly. There were instances when delivery of stones needed for construction from the mainland to Tambaliza were delayed or postponed as the delivery had to be timed during very fair weather to avoid risks. This resulted in postponement of construction work that resulted in irritation among workers as they were daily earners, and no work meant no pay. To ease the tension the Barangay Council held dialogues and helped explain the difficulties that were not within the control of the project.

Communication and coordination with TASFA officers were also limited since there is no cellular reception in the area.

Tambaliza also has limited water sources. When the mangrove eco-park facilities were constructed, freshwater had to be sourced from another sitio. The hauling of fresh water every day from Sitio *Pasil* to Sitio *Banban* was labor intensive, required time and entailed costs, which were not anticipated and thus were not originally figured in the construction plan.

Threats to implementing conservation projects include Illegal fishing activities and domestic trash from neighboring communities that are brought by waves and tide to the mangrove ecopark. The trash gets stuck in between *Rhizophora* prop roots or settle in the mangrove area.

Due to covid-19 pandemic, which started in 2020, mobility became limited leading to postponement and cancellation of some activities, e.g., coordination meetings.

One of the objectives of the GGI project is to prove that ecosystems when conserved and/or restored and aided by gray solutions can provide measurable social, environmental, and economic benefits. However, these cannot be measured within the lifespan of the GGI project as these benefits can only be demonstrated over longer period of time.

Sustainability, conclusion and recommendations

The GGI Project funding support contributed to building coastal resilience of the communities of Tambaliza to climate change and disaster risks through:

- The establishment of a 2-ha mangrove rehabilitation area from abandoned fishponds where mangrove enrichment planting was conducted.
- The re-establishment of the flow of seawater into the mangrove rehabilitation area from the seaward side, and the flow of freshwater from the mountain side, and out, to maintain the existing mangrove stands and planted mangroves. These hydrological connections were re-established through the removal of berm on the seaward side of the mangrove rehabilitation area and increasing the water channels under a concrete footwalk that cuts across the rehabilitation area.
- The establishment of slope protection to prevent soil erosion from berm removal. The expected combined benefits of the gray and green solutions, if maintained, are to increase mangrove cover as nature-based solution to reducing impacts of extreme weather events on the coastal communities.
- The establishment of 17-hectare Tambaliza Mangrove Ecopark as support to community-based ecotourism development, through the construction of a boardwalk to provide access of visitors and residents to the ecopark facilities (i.e. exhibit area, kayaking/boating area, and mangrove planting area). It is expected that once fully operational, the community will derive supplemental income from tourism. TASFA can also explore additional income from the sale of seedlings grown in two nurseries, which were established by the GGI Project, to government and non-government mangrove planting activities.
- The establishment of natural farming system and vegetable production with necessary farm facilities to provide the community in and outside Tambaliza with sources of fresh and organically grown vegetables that are less costly, and TASFA members with supplemental income.
- 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.

Small island communities like in Tambaliza that are isolated from mainland by harsh sea and weather conditions face multiple layers of social, economic and physical vulnerabilities. Building local capacities to enable these communities to prepare for emergency situations and respond immediately until external assistance comes in, is critical and should be a sustained process.

The GGI project contributes to this capacity building process through the green-grey infrastructures that helped address physical vulnerability, the provision of livelihood support to partly address economic vulnerability, and the various training and direct involvement in project implementation using the capacity-build model towards addressing social vulnerability.

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.

Coastal resiliency benefits from GGI interventions will not be realized right away but in the coming years. A pre-condition however is that these green-grey infrastructures should be maintained for it to provide coastal protection in the long term. Maintenance means continuous replacement planting of mangroves that do not survive, removing trash and debris that settle in the mangrove rehabilitation area, ensuring that the natural flow of saltwater and freshwater in and out of the rehabilitation area is not obstructed, enforcing regulations to protect the mangroves and support facilities from degradation, sustaining community awareness building and participation in relevant activities, and incorporation of these green-grey solutions in policies and development programs of the local government to facilitate budget allocation and funding support.

The GGI Project in Tambaliza is covered by a Conservation Agreement signed by CI Philippines, the Local Government of Concepcion, Barangay Council of Tambaliza and TASFA. The roles of each signatory in the implementation the GGI project and the maintenance of the infrastructures 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 GGI in Tambaliza. Its successful implementation beyond FFEM-GGI Project life can be instrumental in leveraging support from other government agencies, non-government partners and funding institutions.

For more information, you may contact:

Municipal Planning and Development Office (MPDO)
Local Government of Concepcion
Concepcion, Iloilo
Email address: rsobremonte.mpdc18@gmail.com

Maria Josella Pangilinan
Director for Climate Resilience Program
Conservation International Philippines
Units 401-A&D, Culmat Bldg.
1270-1330 E. Rodriguez Sr. Avenue
Quezon City, Philippines
Contact details: mpangilinan@conservation.org
(+6392855079223)
ci-philippines@conservation.org (+63 2 8571 3761;
+63 2 8571 3767)