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Blue Economy: Community Case Studies Addressing the Poverty–Environment Nexus in Ocean and Coastal Management

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Abstract: The objective of this paper is to examine how local practices of blue economy succeed in addressing the poverty–environment nexus in coastal communities. While many disciplines touch upon the concept of blue economy, little literature exists on how a sustainable blue economy approach can help bridge poverty–environment challenges, particularly at the community level. To illustrate this, we present three case studies of blue economy practices initiated and implemented by coastal communities in China, Samoa, and Vietnam. The outcomes from each case study are examined based on both their environmental and socio-economic impact. Lessons learned include the significant role of science and technology in innovating solutions, the crucial impact of community leaders in encouraging and amplifying both local needs and solutions, continuous advocacy, fulfilling the very important need for communities to witness tangible benefits of project implementation, and last but not least the availability of resources and know-how resulting from multi-stakeholder partnerships including local governing councils, NGOs, and community members. Local communities have an unrecognized potential for adaptation and innovation and that more proactive public policies are required to achieve environmental and poverty reduction objectives simultaneously.

Keywords: blue economy; ocean governance; international development; local communities; coastal management; ocean sustainability

1. Introduction

Poverty and environmental issues are interconnected and entangled in a complex web of human–environment relationships. Poor people often have no alternative but to degrade the environment to meet present needs at the expense of their future benefits. Conversely, environmental degradation tends to exacerbate poverty through deterioration of their livelihoods, income, and health [1]. It is a significant paradox that poor people often place the least burden on the environment, while disproportionately shouldering the harmful impacts of a rapidly deteriorating environment [2–6]. This poverty–environment nexus is particularly visible in local communities' interactions with coastal and ocean ecosystems. More than 3 billion people in this world directly depend on marine and coastal biodiversity for their livelihoods, and on the oceans as their primary source of protein [7]. Marine fisheries directly or indirectly employ more than 200 million people globally, and the market value is estimated at US\$3 trillion per year. In addition, oceans absorb about 30% of carbon dioxide produced by humans, greatly buffering the impacts of global warming [8].

Human impact on the ocean has been profound, ranging from the destruction of marine ecosystems and loss of biodiversity to degradation of the natural environment, including from unsustainable

coastal development, overfishing, and destructive fishing practices. With more than 80% of the world's wastewater flowing directly into rivers, lakes, and eventually oceans, land-based pollution is also a significant cause of coastal and ocean degradation [9]. Global warming caused by increased anthropogenic greenhouse gas emissions further exacerbate these processes and contribute to rapid ocean acidification, fundamentally altering the world's oceanic systems.

The severe environmental degradation of our coastal habitats and oceans poses great threat to local people and communities whose livelihoods directly depend on marine ecosystem services such as tourism and recreation, fisheries, coastal protection, biodiversity, and climate regulation [10]. If managed properly and used sustainably, these coastal habitats will continue providing ecosystem services to human beings and other living things [11]. While the potential of the oceans to serve the needs of sustainable development is quite high, it can only be made possible if they are maintained in or restored to a healthy ecological state [12–17]. A blue economy approach is proposed to balance between the environmental, economic and social dimensions of sustainable development, and address the poverty–environment nexus in ocean and coastal management [18,19]. Blue economy refers to a concept that seeks to promote economic growth, social inclusion and the preservation and improvement of livelihoods, while at the same time ensuring the environmental sustainability of our ocean and seas [8,20]. In the blue economy, our oceans contribute to poverty eradication by creating sustainable livelihoods and decent work, provide food and minerals, generate oxygen, absorb greenhouse gases and mitigate the impacts of climate change, determine weather patterns and temperatures, and serve as highways for international seaborne trade.

The objective of this paper is to examine and highlight how local practices of blue economy can address the poverty–environment nexus in coastal livelihoods. This paper is written based on a global study of the Blue Economy portfolio of the GEF Small Grants Program, implemented by United Nations Development Programme (UNDP). The study resulted in a UNDP publication “Blue Economy: Community Solutions” [8]. In the blue economy, our ocean contributes to poverty eradication by providing sustainable livelihoods and decent work, supplying food and minerals, generating oxygen, absorbing greenhouse gases, mitigating the impacts of climate change, and serving as highways for seaborne international trade [20]. While many disciplines touch upon the concept of blue economy, few studies exist on the following:

1. How the blue economy finds its application on-the-ground, particularly at local and community level.
2. How local blue economy practices can help addressing the poverty–environment nexus, including by upscaling best practices.

In this article, we present three case studies of blue economy practices initiated and implemented by local coastal communities in China, Samoa, and Vietnam. The outcomes from each case study are examined based on their environmental and socio-economic results. In doing so, we hope to contribute to the literature on blue economy and lessons learned from its application on-the-ground. By demonstrating the success and value of local, community-based blue economy projects, this article not only aims to contribute to the conceptualization of “blue economy” but also offers policy recommendations for civil society and decision-makers about how the application of blue economy principles can benefit coastal communities around the globe and help bridge challenges of the poverty–environment nexus. Finally, this article also draws on innovative community experiences that test and experiment different approaches for achieving economic returns in an environmentally sustainable and socially inclusive manner. These cases demonstrate that effective management can be achieved through local self-governance, as Ostrom theoretically and empirically showed that local communities can devise ways to govern the commons to assure ecosystem sustainability for human needs and future generations [21]. We hope this can add value to the larger conversation on governing local commons with international financial and technical assistance.

2. Materials and Methods

Launched in 1992, the Global Environment Facility (GEF)—Small Grants Programme (SGP) supports innovative local and community-based actions to address global environmental issues, promote livelihoods, and empower local communities. To date, SGP has supported 1147 community projects with more than \$30 million GEF funding and having generated more than \$45 million co-financing for the protection of international waters at the local and community level. SGP works to localize the implementation of the SDGs and contributes to the achievements of almost all SDGs.

In the international waters focal area, Table 1 shows the distribution of SGP's international waters portfolio by region. SGP projects have mainly focused on the following categories of activities:

- conservation and rehabilitation of coastal ecosystems and habitats;
- prevention and reduction of land-based pollution;
- freshwater resources management;
- fisheries, land and forest and other natural resources management;
- capacity development, networking, knowledge sharing and learning

Table 1. Small Grants Programme (SGP) international waters portfolio by region (USD) (1993–present).

Region	Number of Projects	Grant Amount	Co-financing in Cash	Co-financing in Kind
Africa	378	\$10,621,096	\$7,821,842	\$17,822,289
Arab States	93	\$2,945,660	\$2,168,960	\$1,718,592
Asia and the Pacific	421	\$10,674,350	\$2,638,665	\$9,305,024
Europe and the CIS	131	\$2,870,050	\$3,852,820	\$1,377,131
Latin America and the Caribbean	124	\$3,380,948	\$2,142,957	\$3,384,621

Through the international waters portfolio, SGP supports innovative community experiences around the world that test and experiment different approaches to achieving economic returns in an environmentally sustainable and socially inclusive manner in our oceans. Under this portfolio, almost all international waters projects adopt a “blue economy” approach to reconcile the environmental, economic and social aspects of sustainable development.

In order to collect these on-the-ground practices, a questionnaire (Appendix A) was distributed globally to more than 110 SGP National Coordinators (who oversee the implementation of SGP-supported community-based projects in their respective countries). The questionnaire was designed to capture context-specific community-based blue economy practices. The questions were open-ended and covered project description, key activities and innovations, challenges, environmental, policy and socio-economic impacts, indigenous peoples' involvement/leadership, sustainability, partners, replication and up-scaling, lessons learned, and any awards/recognition.

Innovative practices could include customizing technology, cooperation with local scientists and research hubs, indigenous leadership and practices, and application/reworking of cultural practices—as they relate to the environment, local governance and community leadership—to boost key activities. Finally, the open-ended questions allowed for project participants to define what they deemed to be innovative for their community and context. The questionnaire was also attuned to include issues such as gender, climate change and adaptation strategies. The data on socio-economic and environmental benefits gained through the projects was abstracted as input for a UNDP publication on community solutions within a blue economy [8]. We received more than 30 country programs' responses and further conducted multiple rounds of follow-up correspondence to clarify context and results. This also allowed us to filter out any cases of under/over reporting. As most of the respondents are long-time partners of SGP, there exists a high level of trust and transparency. A UNDP technical publication “Blue Economy: Community Solutions” was published in 2018, including 12 case studies from around the world. This article summarizes the results of this global study and includes three cases that reflect

key experiences and lessons drawn from the study [8]. This paper includes three representative cases that can shed light on community-based approaches to blue economy practices while addressing the poverty–environment nexus.

We chose China, Samoa, and Vietnam as cases for this article (see Table 2 for summary), for four reasons. First, they represent main types of activities in the portfolio including eco-tourism, coastal habitat conservation and sustainable fisheries. Broadly speaking, one or more of these three livelihood avenues are present in almost all of our sampled cases. Second, these cases cross-cut through the global experiences registered in our sample, as well as the lessons learned manifested in the portfolio and highlighted in the UNDP publication. Third, the Asia-Pacific region’s high level of vulnerability to climate change behooves us to pay specific attention to local practices and understanding of their biodiversity on the ground as their losses are predicted to be far higher than in other parts of the world. For example, China is expected to lose 76% (9810 km²) of its coastal wetlands in the case of a one-meter sea-level rise [22]. Learning more about the best practices of these communities will shed light over some common challenges for coastal communities and expand our knowledge of potential solutions. Fourth, the three countries (a large mid-income country, a Small Island Developing States (SIDS) and an emerging economy) provide a good representation of the diversity of countries SGP works in. Based on the lessons learnt from these cases, we also make recommendations for policymakers, which include directing greater attention to community practices in high-risk coastal regions.

Table 2. Summary of project cases.

Project Title	Country	Duration	Project Funding	Co-Financing	Environmental Results	Socio-Economic Results
Restoration and sustainable use of seagrass beds for sea cucumber aquaculture	Shandong, China	Oct 2013–Sep 2015	\$50,000	\$39,492	<ul style="list-style-type: none"> Restoration of 3050 ha of seagrass bed Increased density of <i>Zostera marina</i> to 110 plants per square meter 	<ul style="list-style-type: none"> The sea-cucumber cultivation has brought more than US\$70,000 per year to the local community with about 500 people More than US\$7000 has been generated from eco-tourism per year
Coral reef restoration and sustainable fisheries	Lefagaoolii, Samoa	Jun 2015–Mar 2018	\$30,000	\$10,000	<ul style="list-style-type: none"> Expanding MPA from 400 metres to 5 ha Increase in Coral Growth Increase in Fish Stock Seawall construction 	<ul style="list-style-type: none"> 100% Increase in fishing incomes Creation of new partnerships Planning for Ecotourism approaches Long term and sustainable process for biodiversity conservation
Community-based management of coastal and marine resources for livelihood improvement	Thuan Quy, Binh Thuan, Viet Nam	Oct 2014 - Jun 2017	\$48,000	\$31,060	<ul style="list-style-type: none"> Restoration of seabed ecosystem and habitat recovery for 20 aquatic species on a project surface of 500 m² Full rehabilitation and maintenance of <i>Anadara antiquate</i> (clam) population in the same area 	<ul style="list-style-type: none"> 40% income increase for fishers due to new production models 66% income increase for local population due to livelihood diversification through agriculture, ecotourism, and small-scale trading

The analysis of factors influencing the effectiveness of community-based actions to address the poverty–environment nexus is informed and triangulated by two other research methods: participatory research and interviews. The lead author has been working with SGP for thirteen years, having observed actors and factors that work and others that do not at the community level, and having developed and implemented numerous community-based projects over the years. To further analyze the cases, interviews were undertaken with project managers and grantee partners who have been implementing the local actions on the ground. Experiences, lessons and conclusions have been drawn through an inductive approach based on inputs channeled through the above three research methods.

3. Results: Community-Based Blue Economy Cases

3.1. China: Restoration and Sustainable Use of Seagrass Beds for Sea Cucumber Aquaculture

3.1.1. Project Context

The Yellow Sea, including the Bohai Sea and Korea Bay, forms a flat, shallow, and partly enclosed marine embayment. The Yellow Sea is famous for its fishing grounds and its rich fishery resources have been exploited by Chinese, Korean, and Japanese trawlers for years. The main species caught include sea bream, croakers, lizard fish, prawns, cutlassfish, horse mackerel, squid, and flounders. All species, however, are overfished, and the catch of particularly valuable species has declined. Water pollution, eutrophication, harmful algal blooms, overfishing, unsustainable aquaculture, and habitat loss and degradation are the main problems the Yellow Sea is facing.

The project site of Chudao is a traditional fishing village on the coast of the Yellow Sea, located in Shidao, Rongcheng City, and surrounded on three sides by the sea. There are 180 households with 460 people in this village. The traditional houses are constructed from packed clumps of seaweed and have been well maintained. Because of this, it is renowned as a famous Chinese historical and cultural village. Fishery and tourism are the main industries in this area.

Coastal habitats have over the years severely degraded. The seagrass *Zostera marina*, once widely distributed across northern China, now has been reduced to small populations, due to lack of awareness of the importance of seagrass bed and the pressure caused by human activities including coastal construction, dredging, destructive fishing, and land-based pollution. The remaining fragmented seagrass beds cannot support sustainable marine biodiversity or local fisheries.

3.1.2. Project Implementation

The objective of this project is to restore seagrass beds and conserve marine biodiversity through providing sustainable alternative livelihoods including both sea cucumber aquaculture and ecotourism development for local communities. Specifically, the project tested new technology to replant seagrass, restore seagrass beds and demonstrate ecological marine aquaculture to improve local livelihoods.

The grantee partner the Pacific Society of China was involved in GEF Yellow Sea Large Marine Ecosystem project, which is a multi-million dollar regional project involving China and South Korea. The Pacific Society of China conducted a baseline study in this area and found that the seagrass bed of *Zostera marina* provides shelter to many marine species including sea cucumbers. However, industrialization, heavy dredging, pollution and destructive fishing practices have reduced the bed. The Pacific Society of China, having received a grant from SGP, has worked with the local community to train them on *Zostera marina* cultivation and conservation of seagrass beds to provide habitat and shelter for breeding sea cucumbers to improve local livelihoods.

With the support of the Oceanic and Fishery Bureau of Rongcheng City, this project gained permission to use 3000 m² of coastal area. Additionally, the First Institute of Oceanography of the State Oceanic Administration provided the technical support to obtain the seeds of *Zostera marina* and plant the seeds on seabeds instead of transferring seagrass from other sites. The Pacific Society of China organized the local community and provided technical training and necessary support to fishers on seagrass bed restoration and breeding sea cucumbers in the seagrass bed. The local community (62 fishers) participated in the seagrass bed restoration and sea cucumber breeding in the bed.

The main activities of this project include:

1. Coordinate with the local management department to obtain permission to use the sea area;
2. Develop and apply the method of sexual reproduction with artificial auxiliary to obtain the seeds of *Zostera marina* for restoring the seagrass beds;
3. Organize technical training for fishers and provide necessary support to restore seagrass beds;
4. Provide training for fishers on technology for sea cucumber culture in seagrass beds;
5. Compile a technical manual of seagrass bed restoration and promote the project model.

3.1.3. Environmental Results

The key innovation of this project was to develop and apply a new method of seagrass reproduction and restoration, i.e., the method of sexual reproduction with artificial auxiliary to obtain the seeds of *Zostera marina*. This method avoided the need to transplant seagrass from another place. The restored seagrass bed provides natural habitats to marine species including sea cucumbers. Sea cucumbers in their natural habitat eat plankton and organic food generated by the seagrass habitat. This way, they grow in the same way as wild sea cucumbers, and there is no need for the food and drugs required by aquaculture pools, which often end up polluting the sea water. Breeding sea cucumber on seagrass beds only uses the natural nutrition in the seagrass bed, which will reduce the negative impact on the sea environment caused by aquaculture.

The project implemented artificial seedling cultivation to restore 3050 m² of seagrass bed, slightly larger than the originally planned area. The restored seagrass provides shelter to many marine species. The project compared the ecological environment inside and outside the seagrass beds. The seagrass bed in the demonstration area has been restored. The density of *Zostera marina* reached 110 plants per square meter, and the number of crabs reached 12 individuals per m² in seabed areas where no seagrass nor crabs were seen before the implementation of this project.

3.1.4. Socio-Economic Results

The project has raised public awareness on marine biodiversity conservation, seagrass use and protection. It has enhanced local capacity in marine conservation, and alternative livelihood development. All the participants are local fishermen and their families. The project has involved and empowered women with its female project team leader.

Sea cucumber cultivation has brought about 500,000 RMB (\$70,000) per year to the local community of about 500 local people. The project also assisted local communities in designing and developing aquatic recreational activities and recreational fishing. About 50,000 RMB (\$7000) has been generated from tourism per year, boosting fishers' enthusiasm for seagrass-bed restoration and protection. Seagrass restoration also contributed to the local culture of seaweed houses, which helps the local community to develop tourism around local features of cultural interest.

3.2. Samoa: Coral Reef Restoration and Sustainable Fisheries

3.2.1. Project Context

For generations, the Lefagaolii lagoon has been a significant breeding area for the fish known as bigeye scad or Akule (*Selar crumenophthalmus*). The reef used to be rich in corals, and the village was famous for the abundance of Palolo worm (*Palola viridis*). However, the coastal area and biodiversity have been gravely affected by climatic events, land-based human activities, and unsustainable fishing practices. With the destruction of fish habitat, the village's fishers saw a considerable decline in their marine harvest in its inshore reef and lagoon.

Realizing the impact of damaged marine ecosystems and biodiversity had on the village's livelihood, Lefagaolii established its Marine Protected Area (MPA) in 2009 with assistance from the Ministry of Agriculture and Fisheries (MAF). Underpinning this initiative was the development of the village's Fisheries Management Plan and undertaking a baseline survey by the MAF Fisheries Division in that same year. From their baseline survey, The MAF Fisheries Division identified that there was low presence of marine life, but that the area was a good environment for coral growth, with the dominance of live-hard and soft corals. They also found that the Lefagaolii marine environment was excellent for an aggregation site of the bigeye scad as a seasonal species, and a potential area for other aquaculture activities such as raising Trochus snails or giant clams, and sea-grape farming.

The restoration of the village's marine ecosystems and biodiversity required a larger scale of management than just the no-take zone stretching 400 m from the coast that the MPA had established.

Lefagaoalii required further assistance through technical expertise and funding. Therefore, the village council and its MPA committee sought help from the SGP in 2014.

3.2.2. Project Implementation

The primary goal of Lefagaoalii for its SGP-funded project was to protect and rehabilitate its marine biodiversity and the ecological environment from the adverse effects of climate change, land-based activities, and unsustainable fishing practices. Moreover, the community aimed to enhance livelihood opportunities for Lefagaoalii villagers who have traditionally relied on marine resources. The project activities included the following:

1. Sustain the protection of the ecological and biodiversity of the Lefagaoalii MPA with the application of sound management practices;
2. Improve the environmental condition of threatened habitat and inshore resources and marine biodiversity;
3. Promote ecotourism and develop income-generating opportunities for the village community;
4. Raise awareness and build technical capacity of the Lefagaoalii community to manage the MPA sustainably;
5. Promote active collaboration and partnership with relevant stakeholders and supporting partners for the effective management of project activities.

The village council, which is made up of chiefs in the village, had the primary responsibility of enforcing the village by-laws that ban dangerous fishing practices. Anyone caught breaking these by-laws would be fined heavily by the village council. The village council meets every month to discuss village issues and matters, including these fines.

3.2.3. Environmental Results

The first visible environmental impact of the Lefagaoalii SGP-funded project is the demarcation and expansion of its MPA to 5 ha. Within the expansion of the MPA, coral growth has increased because of the village's clean-up of the crown-of-thorns starfish that affect corals, and enforcement of by-laws that ban dangerous fishing practices. In addition, the Government of Samoa through the MAF Fisheries Division supplied giant clams and 100 coral plates for coral planting within the reserve. The village also planted at least 700 seedlings of coastal trees from the Ministry of Natural Resources and Environment (MNRE), which now protect the coastline from erosion. The project committee also built a seawall with big rocks (Rockwall), which adds strength to the village's shoreline.

The expanding coral growth within and outside of the reserve will replenish both the lagoon inshore as well as the reef. The villagers can now catch fish in larger sizes and quantities than they did before the MPA and its expansion. They are also collecting many invertebrates and other species they have not found in a long time in their coastal area. Another essential environmental impact is the spring and rock pools located close to the MPA. In their 2015 survey, the MAF Fisheries Division identified that certain coral types grow densely in and out of the MPA in areas that were far away from the freshwater springs and rock pools. The project enabled the village to renovate and maintain their spring pools and prevent any impacts on the MPA.

3.2.4. Socio-Economic Results

The environmental impacts may underpin or undermine the socio-economic development of a community. In the case of this project, the Lefagaoalii MPA strongly supports the villagers' wellbeing. The people of Lefagaoalii had traditionally relied on its coastal area and marine resources to support their livelihood through consumption and income earning. In the years before the establishment of the MPA, villagers observed a massive decline in numbers of fish, invertebrates and sea grapes in their inshore coastal area and reef system. Now that the corals and marine species in the MPA are growing in abundance, the fishers are catching bigger fish in larger numbers from the lagoon surrounding the

MPA and reef area. On average, there has been a 100% increase in their weekly income, from \$160 to \$320.

Another significant socio-economic impact for Lefagaoalii is the increased awareness and capacity of villagers regarding biodiversity conservation and project planning and implementation. The village is considering ecotourism development and the conservation of mangroves. The village's MPA is adjacent to the mangrove area, which covers the entire western coastal area of the Lefagaoalii flat plain. The mangrove area is the nursery site for marine species, and its conservation will have a high positive effect on the MPA. The improved awareness and capacity of villagers; the ongoing conservation efforts; and continuous planning for future initiatives reflect Lefagaoalii's intentions to sustain its natural resource base for unceasing socio-economic development.

A significant policy outcome for Lefagaoalii is the establishment of partnerships not only with SGP in the conduct of this project but also with the Ministry of Natural Resources and Environment, the MAF, the Samoa Tourism Authority, and the Small Business Enterprise Center. Additionally, their leadership and the proactive work of the project committee led to the achievement of other vital policy outcomes—the review of the Fisheries Management Plan and establishment of bylaws and village rules for the management of the MPA. The village council imposes a fine of about \$189 for anyone that enters and fishes in the MPA without permission.

Other visible policy outcomes of the Lefagaoalii MPA project is the installation of the project signboard consisting of the village rules, and the building of a committee fale (traditional Samoan house) overlooking the MPA. The signboard stands as a reminder for Lefagaoalii residents of the significance of the MPA, and is visible to traffic travelers and visitors that pass through the village. The fale is the center for the project committee, and it houses the equipment that they use to monitor MPA. The village also built a boat ramp to make it easier for the villagers and their canoes to go out into the MPA or the general lagoon area. The project committee continues to build the capacity and awareness of villagers; conduct ongoing meetings and cooperate with villagers for monitoring the MPA. The policy impacts are evident in the village's increased awareness of environmental protection; their ongoing monitoring and enforcement of village rules; and planning for the future of their MPA.

3.3. Vietnam: Community-Based Management of Coastal and Marine Resources for Livelihood Improvement

3.3.1. Project Context

Vietnam's marine ecosystems provide habitats to an estimated 10,837 species of plants and animals, including several threatened turtle species, corals, endemic fish species and mammals [23]. Due to consistent overfishing the country's marine resources have come increasingly under pressure, which, in turn has led to a decrease in economic performance for small-scale fishers and increased vulnerability of coastal communities. Thuan Quy, a coastal community in southern Vietnam, covers an area of 51 km² and a coastline of more than 4 km. This marine area used to be a rich breeding and feeding ground for aquatic species, with a particularly dense population of bivalve mollusks and clams, making it a regular fishing ground for fishers from Thuan Quy and other localities in Binh Thuan province. However, as the volume of clams (*Anadara antiquata*) sharply declined due to overfishing, one of the main income sources of the local population became unavailable, resulting in increased economic vulnerability and poverty of coastal communities in the area.

Government support for the fishery sector is insufficient and no concrete measures have been taken to implement the 2003 Fisheries Law of Vietnam on co-management. To ensure a more sustainable use of aquatic resources, particularly clams, in the marine area of Thuan Quy, the Binh Thuan Fisheries Association proposed a system of co-management, which envisioned the restoration of the local marine ecosystem through sustainable fishing, while improving the livelihoods of local fishers and their families.

3.3.2. Project Implementation

In 2014, the Binh Thuan Fisheries Association, with the support of the GEF-SGP, embarked on a joint mission to establish a community management program for the restoration and exploitation of marine resources that could serve as an example of sustainable fishery for other communities.

In the first phase, the Fishermen's Community Association was established, consisting of an executive board representing the fishing community, a team for the supervision and enforcement of state and community regulations, and separate communication and livelihood teams. With input from the fishing communities, the Association developed internal rules for meetings, reporting, financial management, and the settlement of disputes. The Association proposed a decentralized approach to aquatic resource exploitation, and enhanced coordination and benefit-sharing among local stakeholders. Activities to restore and maintain aquatic resources included:

1. Breeding and stocking of species;
2. Demarcation of zones for exploitation and protection of parent breeds;
3. Installation of artificial reefs to replace reef habitat;
4. Collection of water samples for environmental quality assessment.

The Association designed sustainable livelihood models by establishing a revolving fund that provides financial support to the community for fishing, trading, aquaculture, ecotourism and agricultural activities. Considerable efforts went into developing outreach and advocacy strategies in order to engage the broader fishing community in the project; knowledge and project information was provided during meetings, dialogues, and public consultations, and communication materials were disseminated in the form of posters, leaflets and radio and television broadcasts. External experts were regularly invited to training sessions and capacity building workshops to share knowledge and technical skills regarding project management and administration, communication and conflict resolution, as well as best practices for the co-management of aquatic resources and marine ecosystems.

The Fishermen's Community Association received additional financial support from the Fisheries Department of Binh Thuan province, the People's Committee and the fishers' community of the Thuan Quy Community. The Tan Thanh Border Guard, the People's Committee of the Ham Thuan Nam District, and local unions of farmers, women, youth and veterans provided support for the implementation of the project. The Nha Trang Institute of Oceanography and the Southeast Asian Fisheries Development Center (SEAFDEC) provided technical support for training about resource protection, demonstrating how Fish Enhancing Devices (FEDs) can be used to create safe habitats for marine species [24]. In addition, the Japan International Cooperation Agency supported the project by dispatching experts to organize training and share Japan's experiences in community-based, sustainable and decentralized fishery management. The GEF-SGP played a crucial role in the execution of this project: It supported local authorities and relevant government agencies in the development and promulgation of policies for co-management of marine resources, assisted in building bridges to other donors, and provided insights on project development.

The project's outcomes and best practices were shared during numerous conferences and seminars, including the National Co-Management Conference in which 15 other Vietnamese provinces participated. Progress and practical results were regularly demonstrated to stakeholders, local authorities, government agencies and fishing communities from other localities. The Thuan Quy community received several delegations from other provinces, and reportages about the coastal management model developed by the project were broadcasted on television and in the media. The results of this project informed the People's Committee of Binh Thuan province's decision to revise the Fisheries Law of 2003 and pilot a policy for allocating exploitation rights to fishers in an attempt to restore and protect aquatic resources while improving the livelihoods of the local population.

3.3.3. Environmental Results

Overall, the project affected people's awareness and behavior about the benefits of marine conservation in a positive way; none of the fishers of the Association violated regulations on sustainable exploitation and protection of aquatic resources, while the number of violations among fishers from other localities decreased by more than 90 percent. As a consequence, the seabed ecosystem and the habitats of more than 20 aquatic species were restored, entailing an overall improvement and enrichment of the local marine environment. The once-depleted clam population, the main income source of the local population, was restored in less than one year's time, reaching an average density of 10 to 15 individuals/m². Today, thanks to continuous monitoring of the marine environment by the association, the clam population has further grown to and stabilized at around 20–25 individuals/m².

3.3.4. Socio-Economic Results

By allocating fishing rights, the livelihoods of the local fishing communities improved and stabilized.

The project also developed new production models for fishing (e.g., the use of gill nets for catching clams instead of diving and squid fishing) and other economic activities such as small trading, agriculture (particularly by planting dragon fruits) and ecotourism (by organizing recreational fishing tours for tourists) that helped diversify the livelihoods of the fishing community. The new fishing practices increased the income of the local fishers from around \$15 to \$25 per day, while gains from alternative livelihoods rose from \$8 to \$15 per day.

The project mobilized the participation of many local stakeholders and the developed legal and institutional foundations that informed local policies and regulations in Binh Thuan province. Because the association agreed to reserve 20 percent of its revenue for social welfare purposes, such as the establishment of a library for children, a kindergarten, a village house, and student scholarships, the project indirectly benefited the entire community of Thuan Quy. The establishment of a financial mechanism (revolving fund), and with contributions of the fishers' association, the project managed to lay the groundwork for potentially long-term financial sustainability of this new organizational structure and its work.

4. Discussion: Experiences and Lessons Learned

For a long time, development has been often achieved at the expense of the environment. The debate between development and environment has been persistent, largely pitching them as opposing forces. As a result, oceans are under threat from unsustainable exploitation and pollution, even though their marine and coastal ecosystems provide a range of critical services, reaching across supply chains, from food, biodiversity and culture to regulating important functions such as carbon sinks, climate regulation and flood protection [25]. One of the most critical ocean governance challenges is the lack of understanding of the socio-economic benefits generated from healthy ocean ecosystems. How can we reconcile the relationship between development and the marine environment, and implement strategies and practices that balance the needs of both? This is not just a key question for political debate, but also a challenge to daily practices on the ground.

A blue economy includes both established industries such as tourism and fisheries, and emerging industries and technologies such as marine biotechnology, offshore renewable energy, seabed mining, and aquaculture. Despite this potential, developing a blue economy is constrained by serious limitations, including current profit-based exploitative practices of oceanic resources, the need to invest in both the employment and development benefits of the blue economy, to strengthen the concept through theoretical research and on the ground practices and finally, to overcome undervaluation of marine and community-based resources [20] (pp. ix, 10–11), [26,27].

Our findings in this article demonstrate some good on-the-ground blue economy community practices that have been successful in reconciling protection of the oceans and local marine ecosystems

with the safeguarding of community livelihoods, and in addressing the aforementioned challenges associated with the poverty–environment nexus in coastal communities. They illustrate innovation in established industries such as (eco)tourism and (sustainable) fisheries as well as in scientific collaboration, partnership-based scaling up, and community-based management. Our findings also broadly indicate congruence with Dietz, Ostrom, and Stern’s strategies for addressing problems in governing the commons, which included “dialogue among interested parties, officials, and scientists; complex, redundant, and layered institutions; a mix of institutional types; and designs that facilitate experimentation, learning, and change” [28]. “Of course, the application of the blue economy concept in local contexts varies according to the different challenges and needs that communities and the local environment face and, hence, there is no one-fits-all approach to be offered. Each case presents some highly contextual good practices based on local situations and includes specific experiences and lessons learned at the end of each case. However, these cases also share some cross-cutting experiences and lessons learned:

1. Science-based blue economy: The role of science and technology in bridging and reconciling the needs of economic development and ocean sustainability. Science and technology play an important role in designing and implementing blue economy projects in the field. If communities continue business-as-usual schemes, the environment and livelihoods will not be sustainable. Relationships between the economic, social, and environmental aspects of sustainable development are extremely complicated and delicate. Finding new solutions must involve new information, science and technologies, ranging from baseline information collection, management interventions, and design of alternative livelihoods. For example, the replanting and restoration of mangroves and coral reefs may sound easy and simple, but in reality, they are highly technical and scientific measures, involving informed choices with regards to type of species, nursery, timing and spacing. Furthermore, understanding ecosystem functions, identifying flagship species for conservation, and monitoring of species can help gain an understanding of broader ecosystems and their relationships to economic activities to ensure sustainability.

In the China seagrass case, the First Institute of Oceanography of the State Oceanic Administration provided the technical support on sexual reproduction with artificial auxiliary to obtain the seeds of *Zostera marina*, a new innovative technology on seagrass reproduction and restoration. In Vietnam, The Nha Trang Institute of Oceanography and the Southeast Asian Fisheries Development Center (SEAFDEC) provided technical support for training about resource protection, demonstrating how FED (fish enhancing device) systems can be used to create safe habitats for marine species. In addition, the Japan International Cooperation Agency supported the project by dispatching experts to organize trainings and share Japan’s experiences in community-based, sustainable and decentralized fishery management.

2. Community-based blue economy: The role of local consultation and community leadership and ownership. Community ownership and community participation are considered crucial components for the sustained positive impact of development [29]. Recognizing the important role of a participatory approach, many community-based organizations strived for regular communication with stakeholders through periodic meetings, workshops, trainings or other activities through which feedback from community members on project progress could be gathered. To enhance transparency, messages should be conveyed in an understandable way and new rules and regulations should be formulated so that they are easy to implement or follow. In Vietnam, regular stakeholder meetings were important for the Fishermen’s Community Association to receive community feedback, reassess planned interventions and adjust regulations. Within the community, efforts should continuously be made to build trust and develop community mechanisms for conflict resolution.

For the project cases discussed in the paper, it was deemed essential to involve the community in all phases of the project, from the beginning to the monitoring of project outputs. Although science-based input is essential for providing solutions to technical challenges associated with ocean conservation, or highly specialized issues such as coral transplantation, it is also understood that local challenges

often benefit most from local solutions. Giving fishers' associations or local women's cooperatives, for example, a prominent role in problem-solving helps the community to implement but also take ownership over the project.

Community ownership of a project also goes hand-in-hand with giving primary stakeholders the tools and responsibility for independent and continuous monitoring and evaluation, such as fishers in the designation of a protected marine area. Project monitoring in general is important, including surveillance and the gathering of data and statistics. By involving the community in the monitoring process it becomes easier to periodically monitor impact and to answer questions such as, are we reaching all stakeholders and beneficiaries, and are we getting the projected results. Field work and field visits are equally important for effective monitoring and evaluation and are necessary to evaluate and adjust working plans and propose measures to prevent and deal with risks and challenges. Promoting the role of the communities in self- and cross-monitoring proved to be helpful in this process. Finally, community leadership is critical for the design, implementation and continuity of the project. In the case of Vietnam, the rules, regulations and fishing rights set out by the Fishermen's Community Association were developed with input from the fishing communities themselves and as a consequence none of the fishers of the Association violated regulations on sustainable exploitation and protection of aquatic resources, while the number of violations among fishers from other localities decreased by more than 90 percent. Much of this community-driven take on development follows recent scholarship and practice that focuses on putting local communities at the steering wheel of today's commons governance [21,30].

3. Visibility of local benefits and practicality of results: It is essential for communities to witness the tangible benefits of blue economy project implementation. Consistent broadcasting of project developments, both in terms of achievements or setbacks, and the use of social media are considered effective tools for outreach. Stakeholders who were directly earning a living from the local ecosystem services, such as fishers, were also more engaged when they could see tangible benefits and practical results from conservation actions, such as enhanced biodiversity and more aquatic species, or an increase of high-value fish stocks. Temporary closure of marine areas is a powerful management tool that can demonstrate the economic benefits of fisheries management rapidly, to fishers and seafood buyers alike. By producing tangible benefits to coastal communities, this approach can build robust support for broader marine management initiatives. These local livelihood benefits are critical to ensure community buy-in and participation. All projects documented in this publication have reported extensively on the socio-economic benefits for the community.

In China, for example, benefits to the local community were very tangible given the financial benefits of both sea cucumber cultivation and tourism-related activities. In turn, this further boosted fishers' enthusiasm for seagrass-bed restoration and protection. One of the reasons tangible benefits play a critical role in this regard is that they may help to create local project legitimacy, which is in its turn a key component for successful community-based natural resource governance [31].

4. In the sampled cases, communication, awareness raising, and advocacy were found to be key elements for project development, implementation, and sustainability. Introducing new ideas or new approaches to managing natural resources and ecosystem services has always been challenging as people have a tendency to stick to their long-formed attitudes and customs. Setting up a comprehensive communication strategy is important to strengthen communication with and within the community, to increase awareness about project motivation and goals, and to build trust. Engaging specific members of the community such as community elders, village leaders, local champions, non-partisan members of communities and overall people that shared motivation and understanding of the complex issues facing communities is helpful to bring more people on board. In Samoa, the project committee continues to build the capacity and awareness of villagers by conducting joint meetings and cooperation with villagers for monitoring the MPA. The impacts of these activities are evident in the village's increased awareness of environmental protection; their ongoing monitoring and enforcement of village rules; and planning for the future of their MPA.

5. Multi-stakeholders' partnerships involving the civil society, the government, the private sector and other key stakeholders are fundamental to successful implementation and possible scaling up of blue economy projects [19,32,33]. For a successful implementation and potential scaling up of local projects, crucial elements are collaboration and alignment between various international and regional organizations, national governments and local authorities, project implementers or community-based organizations and members of the community. It is beneficial if the roles and responsibilities of each partner or potential stakeholder group is thought-through and clearly defined and agreed upon beforehand. Almost all cases made reference to the important role of the GEF-SGP in supporting outreach of the community and the crafting of relationships with different institutional bodies or partners. In some cases, these relationships were institutionalized by way of a project steering committee that met regularly and helped in solving issues regarding the implementation of the project. Further, working with national institutions has in some cases given a basis for continuity of various initiatives.

6. Partnerships are found to be particularly important for scaling up good practices. Government policies and strategies often play an instrumental role in the scaling up process. Involvement of the private sector could help to expand the blue economy, for example the replication of sustainable aquaculture and ecotourism practices. However, due to the small scale of these blue economy projects, the engagement of the private sector usually remains at an artisanal, small-scale level. In Vietnam, there is a need to increase community understanding of the project's intentions and proceedings in order to motivate the community to contribute their own resources such as boats, equipment and small capital. The local community designed sustainable livelihood models by establishing a revolving fund that provides financial support to the community for fishing, trading, aquaculture, ecotourism and agricultural activities. The model of a revolving fund has offered non-interest loans in the first phase, and priority is given to the persons in difficulty who have clear and potential plans with a high possibility of loan return. After the first round, low interest rates will be applied to reach more members. It should be noted that experiences of developing and managing revolving funds are still evolving and should be further explored.

5. Conclusions

In the first instance, the poverty–environment discourse focused predominantly on “downward spirals” and one-dimensional aspects (how poverty among people causes environmental degradation) or feedback loops (how environmental degradation in return affects the poor). More recent research recognized that the poverty–environment nexus is multi-dimensional, governed by a complex web of factors, and more attention now goes to investigating how marginalized communities are able to invent and maintain protective measures that can help minimize the negative impact of environmental degradation on their ecosystems and associated livelihoods through collective action [34].

As shown in the cases, community practice or implementation of a blue economy is manifested differently in different local contexts; in the three different countries a variety of approaches and activities were developed to address the common challenge of protecting the ocean and its resources and securing human economic welfare. The implementation of internationally accepted principles of the blue economy approach eventually has to be done at the local level, taking into consideration of the conditions, needs, and relationships between local people and the ecosystems. The complexities and challenges of local level interventions should be fully recognized for development interventions to be effective on the ground. We hope that this article conveys the local specificities and complications that sometimes negate any attempts to generalize development pathways. Good practices to address the poverty–environment nexus should be locally designed, community owned and adaptively implemented.

The cases in this article demonstrate how vulnerable coastal communities may be uniquely positioned to be stewards of the environment and how community intervention and innovation in these communities helps to preserve the environmental resources on which their livelihoods depend. More proactive measures are necessary to enhance the access to and productivity of vulnerable

coastal communities' natural resource assets and to engage them as partners in natural resource management. This article presents several ways to do so in the field of blue economy to address the poverty–environment nexus.

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Appendix A Questionnaire for Case Studies

Project Title:

Grantee:

Country:

Type of organization:

Number of people served:

Location:

SGP Contribution:

UNDP contribution:

In-Cash Co-financing:

In-Kind Co-financing:

Start Date:

End Date:

Project Description

- Please tell us about how the initiative started?
- What was the main goal of the initiative?
- What was the primary focus of the initiative(s) and how did they become a reality?
- Who were the key players?
- What are the main objectives of the initiative?
- What was the mission? Has the vision changed at all? If so, why?
- Give a brief description of the country context.
- Provide any other relevant information.

Key Activities and Innovations

- Please list and explain which are/were the main project activities and how they were completed.
- What was the main objective of the work?
- Who were the target beneficiaries?
- What would you say are the key innovations that make your project stand out and were critical to successful environmental, social and economic outcomes?
- How did you engage the local community and key stakeholders to participate in the project?
- Where applicable please provide engineering drawings and dimensions of the equipment/technology produced/used?

Challenges

- What were the main challenges the community faced when implementing the project?

- What did the organization do to overcome these challenges?
- At what phase of the project did these challenges arise (planning/implementation/evaluation)?
- What could have been done differently or better?
- What would you recommend for improving on future programming?

Gender

- Was there any special participation by women (e.g., as project proponents, implementers, beneficiaries). If yes, how vital was their participation in the project's success?
- Please elaborate on the nature of the women's active participation in this project (e.g., what were their roles, did they drive decision making)?
- Were the women economically empowered by the project activities? If yes, please include specifics (e.g., increase in income, increased financial management capacity, access to a long-term revenue source)
- Were the women's social status improved as a result of the project activities? Please explain how. Has their participation in the decision-making process of their community increased?
- Please provide any statistics on the number of women involved in the project, or the number of women benefitted by the project?
- Did SGP assist grantees to acquire gender training?
- What action did SGP take to overcome gender barriers in achieving SGP project goals? In case any project created a gender issue (e.g., gender imbalance), what were those issues and what action did SGP take?
- Does SGP have a strategic partner to strengthen gender equality and gender empowerment in your projects?

Environmental Impact

- What measurable impact has the project had in terms of environmental protection since the beginning of the project? Where possible, please provide statistics and numbers that document the change or impact of the project over time.
- (Biodiversity) Have species, habitat or ecosystems been protected through your work? If so, please describe.
- How does your group measure the environmental impacts?

Socio-economic impacts

- What measurable change has there been in local incomes and job opportunities (change in average household income, job creation, revenues, livelihood diversification, livelihood/income diversification, market access, etc.)? Where possible, please provide statistics and numbers that document the change or impact of the project over time.
- Have there been secondary benefits (investments in infrastructure, poverty reduction, higher awareness, etc.)?
- Have revenues from the project been reinvested into school fees, hospitals, local infrastructure, etc.?

Policy Impacts

- In what ways has your initiative advocated for policy change?
- Has there been success in influencing policy at what level (community, institution, municipal, regional) and what were the critical factors that made that success possible?
- What have been the barriers and the successes removing these barriers?
- Have there been any regional (subnational) or national policies or laws that were enacted or changed as a result of your project?

- (Biodiversity specific) Has your community engaged in the planning, implementation or review of National Biodiversity Strategic Action Plans?
- (Climate Change specific) Has your community engaged in the planning, implementation or review of the National Adaptation Programmes of Action (NAPAs)?

Indigenous Peoples (IP)

- Was there any special participation by IP (e.g., as project proponents, implementers, beneficiaries)? If yes, how vital was their participation in the project's success?
- Please provide any statistics on the number of IP involved in the project, or the number of IP benefitted by the project?
- Did you use a special methodology or approach to work with Indigenous communities such as participatory video?

Sustainability

- What are the key components that make this project sustainable (e.g., training, human resources, financial resources, capacity building, community participation, awareness, organizational support)?
- Which partner agencies and organizations, if any, are furthering project sustainability?
- What is needed to make the project more sustainable?
- What would you advise other communities who wish to create an effective and sustainable project to ensure sustainability?

Partners

- List of partners and their roles in the project/initiative success, how have they assisted in achieving the project's goals?
- Lessons on the critical contributions of certain partners (e.g., universities for sampling, and monitoring and evaluation)

Replication and up-scaling

- How easy would it be to replicate the successes in a different context or country?
- What mistakes should be avoided if the project were to be replicated?
- Has your project been up-scaled? If yes, please explain how and which organization lead the up-scaling process
- Have you shared your successful model with other communities?
- What was the vehicle for knowledge exchange?
- How many new communities and beneficiaries are applying your model?
- If the model has been replicated, please explain how, with what support from which stakeholders, and how many beneficiaries.
- In your opinion, how important is exchanging peer-to-peer knowledge?
- Have you experienced barriers to successful knowledge exchange? If so, what are they, and how could they potentially be overcome?

Lessons learned

- Give a brief description of the good practice (300 words maximum) highlighting the innovative features and results achieved by the project/activity.
- What are the lessons learned on Implementation, work with communities, technical lessons, policy lessons, M&E?
- Briefly describe SGP involvement and the technical support provided.
- Describe what worked well and how it was done.

- What were the key successes of this project?
- What factors supported the success?

Awards/Recognitions

Has this project been awarded a prize or recognized by other groups/agencies/organizations?

If so, please provide the information:

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