

A photograph of a person in a dugout canoe on the water, looking towards a tropical island. The person is seen from behind, and the island is lush with greenery and palm trees. The water is a deep blue color.

**Integrated
community-based
water and land
management:
Experiences from
the Caribbean**

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Acronyms

APUA	Antigua Public Utilities Authority
ANAP	National Association of Small Farmers (<i>Asociación Nacional de Agricultores Pequeños</i>)
ASOAPISAPM	Association of Beekeepers of San Pedro de Macorís (<i>Asociación de Apicultores de San Pedro de Macorís</i>)
C-CAM	Caribbean Coastal Area Management Foundation
CANARI	Caribbean Natural Resources Institute
CMC	Clarendon Municipal Corporation
CO₂	carbon dioxide
CORALL	Coral Reef Restoration Alliance
EMA	Environmental Management Authority
GDP	gross domestic product
GEF	Global Environment Facility
GFACTS	Gideon Force Agricultural Cooperative Society Limited
IWEco	Integrating Water, Land and Ecosystems Management in Caribbean Small Island Developing States
JFB	Jamaica Fire Brigade
MOU	Memorandum of Understanding
MPA	marine protected area
NEPA	National Environment and Planning Agency
NQCL	National Quarries Company Limited
PADI	Professional Association of Diving Instructors
PSF	Philip Stephenson Foundation
PVC	polyvinyl chloride
SDG	Sustainable Development Goals
SGP	Small Grants Programme
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UPOP	Unintentional Persistent Organic Pollutants
USFS	United States Forest Service
UWI	University of the West Indies
ZWAB	Zero Waste Antigua Barbuda





IWEco Foreword

Small Islands Developing States in the Caribbean face multiple development and environmental issues, including high debt burdens, soaring unemployment rates, marine plastic pollution, climate change and accelerating loss of biodiversity. The COVID-19 pandemic exacerbated these challenges through travel restrictions, lockdowns, disrupted supply chains and reduced tourism revenue.

These urgent challenges require immediate attention as the world strives to achieve the Sustainable Development Goals (SDGs) and leave no one behind. Funded by the Global Environment Facility (GEF) and implemented by the United Nations Environment Programme (UNEP) and the United Nations Development Programme (UNDP), the “Integrating Water, Land and Ecosystems Management in Caribbean Small Island Developing States” (IWEco) project was developed to address these challenges.

Implemented by UNDP since 1992, the GEF Small Grants Programme (SGP) played a critical role in IWEco by directly supporting local action led by community-based and other civil society organizations in 10 Caribbean countries. SGP provides financial and technical support for projects that address global environmental issues – such as biodiversity loss, climate change mitigation and adaptation, land degradation, international waters, and chemicals and waste management – while improving communities’ livelihoods and well-being.

Leading the implementation of the community-focused component of IWEco, SGP executed over 59 community-based projects involving baseline assessments, awareness raising, capacity building, technical support and infrastructure provision. These projects often complemented larger national initiatives and their positive impact has already become evident, with significant contributions to local and national development strategies and the SDGs.

For instance, IWEco projects promoted gender equality (SDG 5) as women constituted a significant proportion of the by 1,474 persons trained in business development, watershed management and land restoration. Projects also improved water and sanitation access for 5,109 persons (SDG 6) and promoted decent work and sustainable economic growth (SDG 8) by establishing 81 small-scale businesses, creating 151 jobs and diversifying income for 399 individuals. These initiatives also engaged 3,052 young people and 17 persons with disabilities. Additionally, 59,680 trees were planted (SDG 15) and projects ensured the sustainable management of 13,300 hectares of coastal areas and fishing grounds (SDG 14).

This publication showcases the lessons and successes of these projects through 10 case studies focused on sustainable livelihoods, waste management, ecosystem management and restoration. It underscores the pivotal role of local communities and the effectiveness of integrated programming following the ridge-to-reef approach.

Collective efforts at various levels are essential for meaningful progress in addressing complex environment and development problems like ecosystem degradation, climate change and pollution. With IWEco's success, we expect to explore further partnership opportunities to scale up and replicate these successful community practices globally.



A handwritten signature in black ink, appearing to read 'Midori Paxton'.

Midori Paxton

Director – Nature Hub
Bureau for Policy and Programme Support
United Nations Development Programme



A handwritten signature in black ink, appearing to read 'Christopher Corbin'.

Christopher Corbin

Coordinator – Cartagena Convention Secretariat
Ecosystems Division
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CHAPTER 1

Project Context



PROJECT OVERVIEW: DEVELOPMENT CHALLENGES IN SIDS AND IWEco

The Caribbean SIDS are confronted with significant multidimensional development challenges that require urgent attention. For instance, many Caribbean economies have high and escalating debt-to-GDP ratios that threaten debt sustainability and medium- to long-term economic growth. The latest available data shows that overall public-sector debt for Caribbean SIDS is more than 80 percent of regional GDP¹. The incidence of poverty is significant within the region, with a geographical dimension: the incidence rate tends to be higher among rural dwellers and varies substantially across countries. There are a number of environmental issues that threaten the ecological sustainability of the region. For instance, marine plastic pollution is a major issue in the Caribbean, with the number of floating microplastic and macroplastics estimated to be around 82,000 and 5000 pieces/km², respectively. The COVID-19 pandemic has exacerbated SIDS' development challenges as a result of travel restrictions, lockdowns and loss of tourist revenues, which these countries heavily depend on. This situation has been further exacerbated by climate change and natural disasters such as earthquakes, landslides, hurricanes, and volcanic eruptions.

The IWEco project was developed to address these problems. IWEco is a multi-focal regional project implemented in 10 Caribbean SIDS: Antigua and Barbuda; Barbados; Cuba; the Dominican Republic; Grenada; Jamaica; Saint Kitts and Nevis; Saint Lucia; Saint Vincent and the Grenadines; and Trinidad and Tobago. The project started in 2016, and the community component was completed in 2022. IWEco applies a ridge-to-reef² approach aimed at integrating watershed and coastal areas management, towards addressing the multiple challenges of sustainable



Sea-moss on Mayreau, St Vincent and the Grenadines. Credit: SusGren.

water, land, and biodiversity management as well as climate change. It is an integrated, whole-of-ecosystem management approach to freshwater and coastal area management.

The project was funded by the GEF, UNEP was the lead implementing agency for regional and national sub-projects, while UNDP implemented activities aimed at supporting community-based livelihood opportunities and environmental management. Of the US\$1 million allocated to UNDP, US\$633,309.19 was directly implemented as grants to support local people and communities through the GEF SGP, and the remainder was used for technical support, capacity development, monitoring and evaluation, knowledge management and communications. SGP provided matching funds of US\$1,404,511.01 for disbursement as small grants among participating countries. To note, although Barbados did not receive IWEco funds for national activities, it supported projects aligned with IWEco priorities. The total co-financing mobilized for the small grants, including from the private sector and civil society organizations, was US\$2,507,714.61. Thus, IWEco- and SGP-funded projects registered a co-financing ratio of 1: 1.2.

IWEco was implemented at the regional, national and community levels, to ensure efficient implementation and help address national and community-specific needs while pooling resources to deal with regional challenges. This publication focuses on the community component implemented by SGP.

¹ www.imf.org/en/Publications/WEO/weo-database/2021/April.

² Ridge to Reef (R2R) is an integrated management approach to freshwater and coastal area management. The approach emphasizes the inter-connections between the natural and social systems from the mountain 'ridges' of volcanic islands, through coastal watersheds and habitats, and across coastal lagoons to the fringing 'reef' environments and is characterized by 'whole-of-ecosystem' management. R2R focuses on the close links between land, water, and coastal systems, and promotes effective cross-sectoral coordination in the planning and management of land, water, and coastal uses.

OVERVIEW AND CONTRIBUTION OF COMMUNITY PROJECTS TO THE SDGS

As indicated, the third tier of IWEco involved community sub-projects that were implemented by UNDP using SGP as a delivery mechanism. SGP is well placed to deliver community projects given its well-established presence on the ground, its track record in fostering multi-stakeholder partnerships and high levels of stakeholder engagement, and its ability to empower communities through community-driven sustainable development projects.³ SGP can leverage its grant making to promote large-scale efforts needed to address land, water, biodiversity, ecosystems, and livelihood issues. Moreover, the partnership with SGP helps to increase efficiency of project execution through, for instance, adopting a bottom-up approach, building the capacity of local communities, generating tangible benefits, and the potential for some initiatives to become financially self-sustaining through well-established post-implementation arrangements.

Overall, SGP implemented 59 community sub-projects: 22 IWEco- and 37 SGP-funded projects in support of IWEco implementation. The highest number of community projects was implemented by St Kitts and Nevis, and by Antigua and Barbuda, with

10 projects each (see Table 1). The community projects focused on baseline assessments, awareness raising, outreach and capacity building, technical and technological support, addressed water pollution and scarcity, land degradation, forest cover loss and ecosystem degradation, poor waste management and pollution. Some projects also support the creation and enhancement of sustainable livelihoods, climate mitigation and adaptation, and the blue economy.

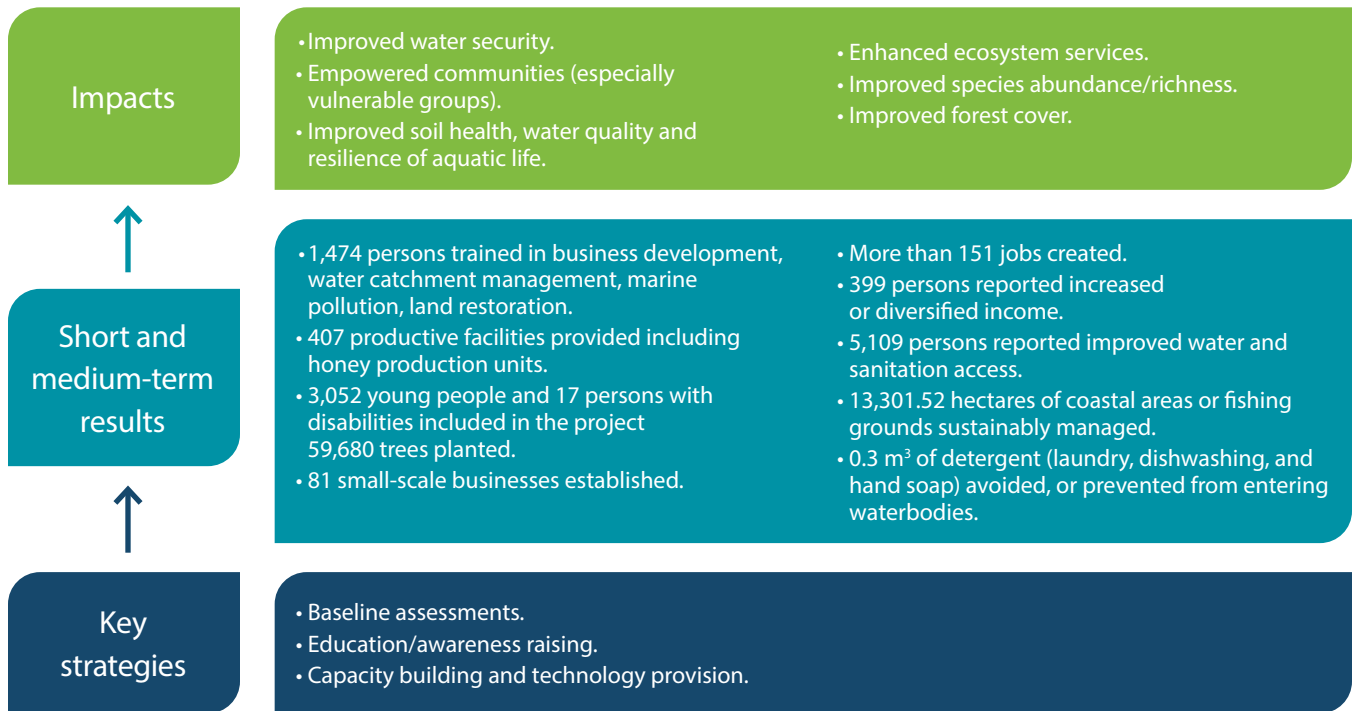
Figure 1 summarizes key results of the community sub-projects. The community projects contributed towards the SDGs particularly SDGs 5, 6, 7, 8, 12, 13, 14 and 15. For instance, SDG 5 (gender equality) was promoted as women constituted a significant proportion of the 1,474 persons trained in business development, water catchment management, land restoration, and now earn a living using the skills acquired through this project. Through the establishment of water catchment management facilities, the community projects have improved water and sanitation access for some 5,109 persons thus contributing to Goal 6 (clean water and sanitation). Some community projects particularly in Cuba contributed to Goal 7 (affordable and clean energy) by helping over 50 households to replace fuelwood with biogas and halved monthly energy expenditure. This project contributed towards the attainment of

Table 1: List of sub-projects under the community component

	COUNTRY	# PROJECTS	GRANT AMOUNT	CO-FINANCING
1	Antigua and Barbuda	10	335,000.00	251,245.00
2	Cuba	5	185,037.19	374,153.00
3	Dominican Republic	9	235,100.00	361,224.50
4	Jamaica	4	179,000.00	150,990.00
5	St Kitts and Nevis	10	395,987.64	657,417.00
6	St Lucia	8	212,372.00	299,762.00
7	Trinidad and Tobago	6	240,432.37	386,307.00
8	St Vincent and Grenadines	4	315,244.00	204,835.76
9	Barbados	3	145,790.00	150,045.00
	Total	59	2,243,963.20	2,835,979.26

³ Since its launch in 1992, SGP has been supporting community-based actions on global environmental issues, while improving livelihood and reducing poverty. SGP provides grants of up to US\$50,000 (and on average US\$25,000) directly to civil society and community-based organizations. Since its inception, the Programme has supported more than 27,000 projects implemented by civil society and community-based groups in 136 countries.

Figure 1: Key results



SDG 8 (decent work and economic growth) through the establishment of 81 small-scale businesses, creation of more than 151 jobs, increasing and/or diversifying the incomes of 399 and more importantly, involving 3,052 young people and 17 persons with disabilities in community projects. Some projects have contributed to SDG 12 (responsible consumption and production). For example, a smoothie company in St Lucia has replaced around 4,800 plastic items used per annum with biodegradable packaging materials; and reduced the amount of water used from 16 litres to 9 litres per month by replacing the use of ice with frozen pulp of fruits in smoothie preparation. By helping businesses to reduce their carbon footprint through a strictly 'no dairy' policy for smoothies, using energy-efficient appliances and adopting climate resilient management techniques, this project contributed to SDG 13 (climate action). This project has ensured that 13,301.52 hectares of coastal areas or fishing grounds are sustainably managed and prevented 0.3 m³ of detergent from entering water bodies thus contributing to conservation and sustainable use of the oceans, seas, and marine resources for sustainable development (SDG 14).

The community sub-projects also contributed to SDG 15 through planting 59,680 trees and preventing or reducing solid waste (including plastics, and agricultural waste) from polluting land and water resources.

Following this introductory chapter, Chapters 2-4 focus on 10 community case studies from nine countries: Antigua and Barbuda; Barbados; Cuba; Dominican Republic; Jamaica; St Kitts and Nevis; St Lucia; Trinidad and Tobago; and St Vincent and the Grenadines. All ten case studies have been categorized under three themes – Theme 1: Sustainable livelihoods; Theme 2: Waste management; and Theme 3: Ecosystems management and restoration (see Annex for a summary of the case studies). Each theme has a corresponding chapter: Chapter 2 focuses on Sustainable livelihoods; Chapter 3 presents case studies on Waste management while Chapter 4 captures case studies on Ecosystems management and restoration. Finally, Chapter 5 presents lessons learned and concluding remarks.

CHAPTER 2

Sustainable Livelihoods



CASE STUDY 1

Sustainable employment creation by young people using indigenous fruits from the Qualibou Caldera.

					
COUNTRY	NUMBER OF PEOPLE SERVED	LOCATION	FINANCING	START DATE	END DATE
St Lucia	386 persons, both locals and tourists	Soufrière	US\$36,936	November 2017	May 2018

CONTEXT

The Soufrière district is rich in natural and geological resources, which support the two major economic drivers within the landscape: tourism and agriculture. However, despite its rich geological resources and seeming potential, it is assessed as the third-poorest of the island's 10 districts, with 60-percent youth unemployment, nearly twice the national average of 36 percent (USAID, 2022). This is due largely to: the inability of the public and private sectors to absorb the number of school graduates; inadequacy of new employment creating investments; the local tourism industry operating at almost full employment; the preference of employers to recruit from the neighbouring villages of Canaries and Choiseul, and the poor performance of the banana industry. In addition to these, the relative unattractiveness of traditional agriculture and fishing to young persons, and the lack of skills, training and capital for self-employment contribute to the unemployment problem.

The high level of unemployment has led to rising levels of juvenile delinquency; comparatively high level of mendicancy relative to the national average; land degradation in the watershed due to illegal and environmentally unsound agricultural practices; and high levels of visitor harassment. Fortunately, despite its high unemployment the landscape represents an opportunity for residents, with immense potential in the development of agro-processing and eco-tourism. To address these socio-economic and environmental issues, a community project was initiated in November

2017 in Soufrière. The project's aim was to provide sustainable alternative livelihoods for the youth using indigenous resources.

By doing this, the project hopes to improve conservation and sustainable use, and management of important terrestrial and coastal and marine ecosystems through implementation of community-based landscape and seascape approaches and to lower emissions using low-carbon-energy access solutions. This contributes to the objectives of the Cartagena Convention (Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region), which St Lucia has ratified. The project was executed by Fruitage Jeunesse with financial and technical support from SGP St Lucia, the Caribbean Local Economic Development Project, and Soufrière Regional Development Foundation.

IMPLEMENTATION

The project consists of two main components. The first component involved training and capacity building. From August to September 2018, about 20 young people aged 18-30 were trained in workshops to help them understand the fundamentals of establishing and managing a business. The topics were: food hygiene and preparation; customer service; team building and institutional strengthening; and basic accounting and software. During these workshops, participants were trained on how to prepare smoothies as well as employee and financial management. In addition to this, two Fruitage Jeunesse project managers



Co- Founders of Fruitage Jeunesse Smoothies Christna St Brice & Windia Jaunai. Credit: Fruitage Jeunesse

and four other young persons were trained in sales and marketing. Overall, the project trained and developed the capacity of 26 young people in establishing and managing a small- to medium-scale contemporary business.

In the second component, the equipment and tools needed for the establishment of a smoothie booth were provided to Fruitage Jeunesse. Following this, a youth agro-enterprise smoothie outlet was established at the Sulphur Springs, known as the world's only drive-in volcano. This enterprise is expected to contribute to local economic development by purchasing seasonal fruits from young farmers within the district. Therefore, a strategic partnership was established between five young farmers in Soufrière and Fruitage Jeunesse Smoothies. This partnership is expected to ensure a readily available market for young farmers and guarantee the availability

of raw materials for the smoothie business. Through this project, Fruitage Jeunesse established contacts with about 60 local farmers who have agreed to supply to business with fruits when needed (depending on demand). This arrangement is based on trust and not binding.

ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

This project aimed at providing sustainable livelihoods to help with job creation and youth empowerment. As a result, Fruitage Jeunesse emphasizes and uses sustainable and green practices. For instance, Fruitage Jeunesse uses only biodegradable containers and items to serve their smoothies, from the straws to the smoothie cups. This contributes to reducing plastic pollution, given that about 400 plastic items (cups and straws) used per month have been replaced with biodegradable packaging materials. It is commonplace to find plastic waste in St Lucia's landscape, drains and at the beaches. Thus, by reducing the use of plastics, this project helps to reduce pollution and enhances the quality of the land and seascape. Fruitage Jeunesse has also reduced water use and wastage. Before this project, about 16 litres of water were used per month for business activities. However, this has been reduced to approximately 9 litres per month. The reduction in water use and wastage was achieved through changes in the smoothie-preparation practices. For instance, before this project, ice was used to prepare the smoothies, however now Fruitage Jeunesse uses frozen pulp, which has replaced the use of ice. In addition to this, there are also climate mitigation benefits. For instance, Fruitage Jeunesse seems to have reduced the business's carbon footprint by using energy-efficient appliances, implementing a strict no-dairy policy for smoothies, and avoiding plastic packaging.

Economically, this project has contributed to reducing unemployment and generating incomes in St Lucia. Fruitage Jeunesse has provided employment for more than 25 young persons within the communities of Fond Saint Jacques, Soufrière, and Choiseul. These job opportunities were offered from various aspects

of the project, ranging from the construction of the two kiosks to the day-to-day running of the business. Such employment opportunities included work for carpenters, painters, electricians, plumbers, and masons. In addition to those roles, four young persons have also been employed permanently as smoothie attendants, who also support with business operations. Additionally, through this project, Fruitage Jeunesse partners with five young farmers who provide the business with seasonal fruits for their smoothies. This is a win-win relationship as it ensures that Fruitage Jeunesse has a reliable source of raw material supply while the five young farmers also have a readily available market or buyer. An additional 60 local farmers also benefit indirectly as they supply Fruitage Jeunesse with fruits depending on business demand.

Through sales of the locally made smoothies, about US\$5,280 is generated annually. The income paid to one of the employees of Fruitage Jeunesse has assisted her to create her own small business. This business (Piton Sweets) is a homebased confectionary business providing catering services for parties, funerals, and other social events. Overall, the sustainable livelihoods created through this project is assisting in bringing a decent living to many households in St Lucia, thus contributing to sustainable economic growth.

LESSONS LEARNED, CHALLENGES, UPSCALING AND REPLICATION

As the business depends largely on tourism and other recreational activities, the onset of the COVID-19 pandemic and subsequent lockdown posed major challenges to the booth's activities. The business was closed down for 12 months during the first year of the pandemic. Even when the business was opened later, local and international travel restrictions hit sales due to a substantial reduction in tourists and recreational activities. This impacted the finances of the business. In addition to this, raw materials, mainly seasonal fruits, were not readily available in expected quantities as local farmers could not supply the needed amounts, and this also impacted the success of the project.



Fruitage Jeunesse outlet at the "World's Only Drive-in Volcano", the Sulphur Springs. Credit: Fruitage Jeunesse.

Despite these challenges, the project has been successful due to a number of factors. First, Fruitage Jeunesse's unique strategy of emphasizing health, culture and environmental sustainability makes them stand out and has helped the business to win the hearts of customers. These novel ideas include: 1) creating an agro-tourism business directly at the foot of one of the major tourist sites in St Lucia i.e., the Sulphur Springs; 2) using some of St Lucia's tourist attractions as names of their smoothies such as Sulphur Blast, Qualibou, King Louis XVI, which has attracted customers from around the world with the idea of drinking a local, healthy product and experiencing culture as well; 3) highlighting the need for a healthy diet and wellbeing thus creating an interest for customers to become more health conscious; and 4) emphasizing the need for pro-environmental behaviour, which in turn promotes consumer

awareness and demand for ecologically sustainable alternatives to plastics. All these have contributed to Fruitage Jeunesse's successes including winning prestigious awards: the 2018 St Lucia's Small Business Associations' award for Most Outstanding Youth Entrepreneurship, and the National Youth Council's Youth Entrepreneur Award in 2019.

Another important success factor is the strategic partnership between Fruitage Jeunesse and young farmers, which has helped to address a major business barrier, namely the shortage of fruits. Before this project, farmers were not able to provide enough fruits to the business. As a result, fruits needed to be purchased from as far as Vieux-fort, 17 kilometres away. Purchasing fruits from Vieux-fort was time consuming and uneconomical, and impacted business profitability. The strategic partnership with the five young farmers, created through this project, has helped to establish a reliable supply of raw materials at an affordable cost. Reliability is further reinforced by the good relationship between Fruitage Jeunesse and an additional 60 local farmers who supply the business with fruits when needed.







The success of the project has contributed to Fruitage Jeunesse establishing another branch at the Soufrière Beach Park. There are clear plans to replicate the ideas of the project still further. For instance, Fruitage Jeunesse aims to establish another outlet at St Lucia's international airport and to introduce the business in another developing country within the next few years. The business is working to achieve this through a number of initiatives including: leveraging social media to create awareness and expand their customer base; and developing an app and QR codes that customers can use for online orders. Fruitage Jeunesse also plans to continue to positively impact communities through corporate social responsibilities and giving back through sports, donations, hampers and clean-up campaigns. Fruitage Jeunesse Smoothies also aims to engage in the processing, branding, and manufacturing of local juices in St Lucia. This initiative, if implemented, would have positive socio-economic impacts on the island of St Lucia. With the support of other stakeholders, through projects like this, Fruitage Jeunesse hopes to continue to create sustainable jobs for the youth and enhance living standards while helping to preserve the country's rich natural and geological resources for future generations.



Residents of Soufrière enjoying Fruitage Jeunesse's smoothies at the Soufrière Beach Park. Credit: Fruitage Jeunesse.

CASE STUDY 2

Blue growth on the Grenadines through opportunities for sustainable livelihoods.

					
COUNTRY	NUMBER OF PEOPLE SERVED	LOCATION	FINANCING	START DATE	END DATE
St Vincent and the Grenadines	150	Union Island and Mayreau (St Vincent and the Grenadines), Eastern Caribbean	US\$150,000	January 2019	June 2021

CONTEXT

Coral health monitoring conducted by Sustainable Grenadines Inc (SusGren) and partners in 2014 shows that while there is still relatively high live coral cover throughout the Grenadines, the biomass of herbivorous fish and other commercially targeted fish species is critically low. This is due to overfishing, diseases, and the decline in the quality of water in which these aquatic organisms live. This problem has been linked to poor management of marine protected areas (MPAs) and puts the Grenadines' coral reefs in an extremely fragile situation. With such low herbivorous fish biomass, a major disturbance (such as a hurricane or mass bleaching event) could well result in a phase shift to a degraded algal dominated system (Edwards et al, 2014). Once such a shift occurs, it is extremely difficult to reverse. From an ecological perspective, weaker coral reef systems in general provide a risk to coastal ecosystems, while from a socio-economic standpoint, the decline in stocks of the main commercially targeted species can have a serious negative impact on the livelihoods of fishers and threatens the food security of the people of the Grenadines. Urgent actions are therefore needed to address the socio-ecological problem.

SusGren saw the need to create conditions that will boost alternative livelihood activities and food security in combination with improving ecosystem resilience, hence the implementation of this project in the Grenadines. Given that overfishing is a major cause of the low herbivorous fish biomass, SusGren sought to explore opportunities in the service sectors, especially tourism and marine-based productive sectors such as mariculture (sea moss⁴), and value-added seafood products. By providing such sustainable alternative livelihoods, education, and capacity building on good management practices of MPAs, the project is likely to substantially reduce overfishing, and marine ecosystems will be managed sustainably to ensure the survival and growth of herbivorous fish biomass and ecosystems more broadly.

The specific objectives of the project are: 1) introduce the Flow Hive technology (see following section) to Union Island to reduce labour time and increase honey production from 6 gallons (27.3 litres) per month to 12 gallons during the first year of the project; 2) increase by 40 percent the export of dry sea moss by Mayreau Explorers and the Ashton Multipurpose Cooperative combined; 3) improve the marketing

⁴ Sea moss, or *Chondrus crispus*, is a spiny sea vegetable similar to seaweeds and sea algae. It is harvested for its carrageenan. Seaweed is also used as a natural thickening agent in, as well as for use in consumer health supplements. In the Caribbean region, seaweed is also used to produce value-added products such as punches, ice cream, jams soaps, body washes and even wines.



Flow Hive Facility on Union Island. Credit: SusGren.

and branding of the sea moss and honey production businesses on Mayreau and Union Island, respectively, by re-designing their logos and packaging within the first 12 months of the project; and 4) educate the public on best management practices aimed at reducing water pollution and ecosystem degradation. This project was implemented on Union Island in partnership with a wide range of stakeholders including the Fisheries Division, Ministry of Agriculture, the Lands and Survey Department, Physical Planning Unit, the Mayreau Explorers Multi-Purpose Cooperative, Ashton Multi-Purpose Cooperative Limited, Caribbean Natural Resources Institute (CANARI) and Philip Stephenson Foundation (PSF).

IMPLEMENTATION

The first activity involved the acquisition of land for a facility for sea moss processing and honey production. The Mayreau Explorers was leased a piece of land for 20 years (from 2019) for building a sea moss processing facility, and for honey production. Following this, the facility was constructed for these purposes. The facility can process about 1000lbs (450 kilogrammes) of wet sea moss per week. Before this new facility, Mayreau Explorers were processing between 100-500lbs

per week.

SusGren introduced the Flow Hive System, a new technology to harvest honey. This technology is an upgrade of the traditional technology which is the Langstroth Hive. When the honey cells have been filled and capped by the bees, the beekeeper inserts the Flow Key to split the cells, and honey flows out through tubes thanks to gravity. There is also no need to remove the cells or smoke the bees, minimizing the disturbance to them.⁵ The project now has the largest Flow Hive System being operated in the entire St Vincent and the Grenadines on Union Island. It is also producing a unique honey (with a salty taste) from the flowers of black mangroves (rather than traditional wild flowers). Based on estimates of the Agriculture Department, this novel technology is expected to reduce the mortality rate of bees by 80 percent during the harvesting process.

Another first for the country of St Vincent and the Grenadines through the project was the construction of a sea moss processing facility on the island of Mayreau. The sea moss is sustainably grown and harvested using two types of system: either vertically on ropes, or horizontally on ropes. To ensure that the sea moss is managed sustainably, the sea moss (plant) is cut to

⁵ The functioning of the Flow Hive can be seen in a video on [SusGren's Facebook page](#).

a level where it can grow back. It has been observed that when sea moss becomes mature and too heavy for the lines its placed on, it will break off. Sea moss is a very prolific plant and does not need much to grow. In addition, it must be noted that it takes four to six weeks for the plant to mature enough for harvesting. To boost sales and enhance livelihoods from sea moss and honey, SusGren conducted training in marketing and sales for sea moss and honey production groups on the topics of packaging and logo development and markets. A boat engine, drying supplies and expansion materials were purchased for the Ashton Multi-Purpose Cooperative on Union Island, for sea moss farming and processing.

To directly address the declining biomass of fish species, SusGren has been working between Grenada and St Vincent and the Grenadines through their MPA network to provide training and education on best management practices (e.g., encouraging sea-moss farmers not to use plastic bottles as floats, but more environmentally friendly materials) while also offering small grants to actors in the fishing and service sectors. SusGren also updates management plans to help the MPAs address these issues.

ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

This project has the potential to contribute to marine ecosystems management. By providing sustainable alternative livelihoods, this reduces overfishing – a major driver of the decline in herbivorous fish biomass. Moreover, SusGren trains and encourages sea-moss farmers and honey producers to implement best management practices (e.g., farmers using more environmentally friendly materials as floats instead of plastic bottles), and ensure farms are situated away from important sea grass area so sea moss does not compete with seagrass for sunlight. SusGren's recent monitoring activities have shown that small fish and lobsters use sea moss farms as nursery or habitat. Therefore, ensuring that sea moss farms are maintained well help to provide a good habitat for some marine



Bees in Flow Hive facility. Credit: SusGren.

species, with further benefits for marine ecosystems more broadly. Despite these ecological benefits, sea moss could have negative environmental effects if not properly managed. For instance, if not controlled properly, sea moss can grow so prolific that they can take over the seabed. Therefore, SusGren emphasized best management practices to ensure that the socio-ecological benefits of sea moss farming are maximized while preventing potential ecological impacts.

Economically, the project has benefited local people on the islands of Union and Mayreau. It has provided long-term income for more than 30 people and their families who now have a steady source of income in selling raw sea moss to local and international markets. The export value of sea moss from the Southern Grenadines during 2020 was US\$1 million, showing a threefold increase for the first three quarters of that year (Cooke, 2021). Also, the sale of black mangrove honey has provided an additional source of income for some people on Union Island to the tune of US\$500 per month.

This project has also influenced policy in the country as the intervention's recommendations have now been included in the national agenda for development. For instance, the cabinet of the St Vincent and the

Grenadines has approved a National Strategic Action Plan for the sea moss industry through a cabinet memo submitted in May 2021. This plan was prepared by SusGren in collaboration with The Nature Conservancy and the St Vincent and the Grenadines Fisheries Division.

LESSONS LEARNED, CHALLENGES, AND REPLICATION

This initiative was impacted by the COVID-19 pandemic. For instance, procuring necessary items such as bottles and packaging and sourcing construction materials unavailable locally delayed project implementation, resulting in time and cost overruns that were borne by SusGren.

An important lesson from this project is the role of partnership. SusGren collaborated with nine institutions, and this helped to facilitate project activities and resulted in the realization of outputs that would not have been possible without its collaborative approach. For instance, the partnership facilitated the approval of land (by the Lands and Survey Department) to construct the honey and sea-moss facilities as well as the approval for designs of facilities for sea-moss and honey buildings (by the Physical Planning Unit). Indeed, this collaboration helped to pool resources

across different organizations (e.g., CANARI and PSF provided matching funding) and enabled cost savings. Ultimately, this helped to maximize resource use, helping to expand a previous SGP-funded project: the previous project implemented by SusGren involved the construction of a two-level bird-watching tower measuring approximately 4 metres by 4 metres. Cost savings in this project (resulting from the partnership) enabled SusGren to use part of the SGP funds to convert the first floor of one the towers into a honey production facility.







The outstanding results of the project have encouraged other stakeholders to support the sustainability of its benefits. In this regard, other donors such as PSF and CANARI have provided funding to sustain the initiative. In addition to this, PSF provided wetsuits, snorkel gears, ropes, and floats for Mayreau Explorers Cooperative, while the CANARI provided further training for basic booking, mentorship, and purchased a 5000-gallon (22,730-litre) water tank towards supporting activities of the Mayreau sea-moss facility. To further enhance sustainability, direct beneficiaries of the project are also re-investing their profits into buying materials that are needed to keep the sea-moss farming post implementation. These materials include ropes, floats, and packaging (for valued-added products such as sea-moss rum punch, ice cream, and sea moss gel).



Handing over of sea-moss facility on Mayreau, St Vincent and the Grenadines. Credit: SusGren.

CASE STUDY 3

Harvesting and storing water to adequately supply an organic farm system.

					
COUNTRY	NUMBER OF PEOPLE SERVED	LOCATION	FINANCING	START DATE	END DATE
St Kitts and Nevis	2,535	St. Thomas Parish	US\$32,500	December 2018	January 2020

CONTEXT

Crop production is one of the main strategies to ensure food security for St Kitts and Nevis. The production of arugula, mint, basil, sage, papaya, okra, herbs, sweet potato, plantain, banana, pumpkin, and pepper also serves as a major source of income for people on the islands. However, the potential of this economic activity to provide food for the inhabitants of the country and to generate income is negatively impacted by water scarcity, which affects crop production. Rainfall amounts to approximately 1,200 millimetres per year along the coastal area. The rainiest period, when precipitation exceeds 100 mm per month, runs from July to November, while the driest season runs from February to April, when rainfall does not

exceed 60 mm per month. In this context, irrigation is a critical way to address this challenge. However, irrigation infrastructure is not available in many villages and towns, and where it is available, it may be dysfunctional, or it may not supply enough water to produce good crop yields. Irrigation in St Kitts and Nevis is predominantly rain fed.

To address this problem in the village of Verchids, St Kitts, the Gideon Force Agricultural Cooperative Society Limited (GFACS) developed a two-phased project to construct a facility that would provide a constant supply of water for their crops, boost production and improve the economic benefits and overall livelihoods of the organization's members.



Construction of water catchment. Credit: Sankofa, GFACS.



GFACTS Farms. Credit: Sankofa, GFACTS.

IMPLEMENTATION

To address the need for a constant water supply in order to boost crop production and enhance food security, the 17 GFACTS members developed a plan to construct a reservoir. This was a local, context-specific solution. Involving community members gave them a sense of ownership and empowered them to commit their resources to support the implementation and sustainability of the project. With support from the community, a water reservoir was constructed, after which a water pump, and solar panels to provide power for the water pump, were procured and installed. GFACTS contracted a foreman to oversee the daily activities of the project and most of the labour was co-financed (in kind) by the members of the cooperative society. The water reservoir and solar-powered pump were subsequently tested and approved for use.

The roof area of the water catchment is 31ft x 16ft with a depth of 6ft (approximately 9.5 x 5 metres, with a depth of 2 metres). The volume of water that can

potentially be collected from this roof area, per inch of rain, is approximately 260 imperial gallons (about 1.1 cubic meters). Average monthly rainfall in St Kitts is 2 to 10 inches (about 50 to 250 mm), therefore an estimated 520 - 2600 imperial gallons (2.4 - 11.8 cubic meters) of water can be collected from the roof per month. This water catchment has the capacity to store a volume of or more than 18,500 imperial gallons (84.1 cubic meters) of water. The solar-powered water pump channels water through the irrigation system onto the cultivated area.

ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

This project could contribute to sustainable management of ecosystems as the availability of water for year round farming reduces the tendency for farmers to resort to other environmentally destructive activities such as excessive harvesting of forest products, as well as overfishing.

Moreover, farmers were trained and encouraged to adopt sustainable farming practices to prevent water pollution and land degradation.

One of the main barriers to crop production in the Verchids village has been water scarcity. Since crop production and marketing of produce is a major source of livelihoods, the construction of the water reservoir is expected to improve and sustain the livelihoods of the members of the cooperative society significantly. The provision of similar irrigation facilities has been found to increase land productivity and contributed to increasing farmers' income by 50-75 percent (World Bank, 2016). In addition to this, the project has provided GFACTS members with skills that can be used in the construction sector to earn additional income. In future, it will be important to evaluate the impacts of the project on income generation, and the effects on the wider local economy.



GFACS Farms. Credit: Sankofa, GFACS.

LESSONS LEARNED, CHALLENGES, UPSCALING AND REPLICATION

Like other projects, the activities of this initiative were impacted significantly by the COVID-19 pandemic. For instance, lockdowns affected how the project team engaged with community members, due to social distancing rules. These challenges contributed to delays.

One important lesson from the project relates to financial management. By employing efficient financial management strategies, the cooperative was able to reduce costs. The saved funds were then used to facilitate the expansion of the water catchment dimensions from 6.1m x 4.9m x 1.8m to 9.5m x 4.9m x 1.8m. Beyond this, there are additional plans to construct a building that will serve as an assembly area on top of the water catchment. The building will be designed to have a large roof surface area, drained by gutters that will channel the water to the catchment below.

This project has boosted the confidence of the members of the cooperative society. In an interview, some beneficiaries indicated that the initiative has highlighted their strengths and ability to undertake interventions that can address important development challenges within their community. They feel empowered knowing that their efforts have contributed to the development of a water reservoir, which will be an asset to the cooperative and the community at large. The reservoir can accommodate more than 18,500 imperial gallons (84 cubic meters) of water. This provides the cooperative with a stable supply of water to irrigate their crops. There are plans to follow this up with other initiatives which help to diversify livelihoods, increase opportunities, and sustain the benefits of the reservoir. The reservoir needs to be fitted with an overflow pipe and supported with additional equipment to improve its capacity to meet the needs of stakeholders in the catchment. The GFACS has also reached out to a wide range of stakeholders for financial support.

A person wearing a blue jacket and green gloves is holding a black plastic bag. They are standing on a beach with a glass bottle lying on the ground. The background shows the ocean and a bright sky.

CHAPTER 3

Waste Management

CASE STUDY 4

Educational and empowerment pathways for metal recycling in Antigua and Barbuda.



COUNTRY

Antigua and Barbuda



NUMBER OF PEOPLE SERVED

240



LOCATION

St John's, Antigua



FINANCING

US\$50,000



START DATE

September 2018



END DATE

September 2019

CONTEXT

One of the major problems in Antigua and Barbuda is indiscriminate disposal and unsafe management of specialized solid waste, due to the lack of specialized treatment and disposal facilities. This includes a wide range of products containing hazardous chemicals/POPs. E-waste is just an example (but the dominant issue in this case). The burning of electronic waste to extract valuable recyclables such as copper wires and other valuable metal products results in the release of fumes and other unintentional persistent organic pollutants (UPOPs). The burning of such hazardous waste types directly affects the soil, air, water, human and animal health and particularly the nearby communities and the users of the Cooks landfill. Moreover, the leaching of multiple hazardous substances such as mercury products, sewage, or other chemicals into terrestrial and marine waters has substantial negative impacts on water resources and ecosystems more broadly. In addition to this, the open burning of waste releases UPOPs along with other pollutants that contaminate the environment. Such burning therefore needs to be eliminated to protect the environment and human health.

This project was implemented in St John's, Antigua, at Will's Recycling⁶. Special waste recycling equipment in the form of a granulator was purchased and installed to separate copper wire from its insulation, thus

eliminating one of the needs for burning electronic waste. Additionally, Will's Recycling purchased a gas recovery machine to extract the gas from refrigerant air conditioning units to further enhance environmentally sound waste management practices. In addition to the investment in sound equipment, Will's Recycling implemented an ongoing public education outreach component. Will's Recycling partnered with other important stakeholders, namely: Zero Waste Antigua and Barbuda, the National Solid Waste Management Authority, and the Ministry of Tourism and Investment. Overall, the project seeks to identify multiple waste types and utilize them as resources thus diverting them from the landfill, reduce the burning of wires, and eliminate the release of concomitant toxic gases. Ultimately, this is expected to reduce indiscriminate disposal and unsafe management of waste and thus avoid the damage to the environment and human health.

IMPLEMENTATION

The first phase of the project involved an extensive consultation with a wide range of stakeholders including: the Fire Department; the National Solid Waste Management Authority; Antigua Public Utilities Authority (APUA); the Department of Analytical Services; the Environmental Awareness Group; waste pickers; the Marine Ecosystem Protected Areas Trust; the Department of the Environment; Zero Waste Antigua Barbuda (ZWAB); Integrated Health Outreach; the Ministry

⁶ Will's Recycling is a local private entity established in 2011. Will's Recycling has about 10 employees, a customer base of over 100 persons and businesses and has successfully diverted and exported more than 5,000 tonnes of scrap metal from the landfill and communities. The business purchases scrap metal and creates awareness regarding the safe use and management of chemicals and other products.



Installed Granulator. Credit: SGP Antigua and Barbuda.

of Tourism and Investment; and the Antigua Barbuda Waste Recycling Corporation. These stakeholders were engaged in the project as they can influence and support long-term and sustainable changes to improve waste management practices, policies and promote education and awareness. The main issues discussed included: plans to enhance sound waste management practices; improving monitoring of the location where burning of electrical cables and wire occurs frequently and enforcing penalties; and the need to introduce policies that ban the burning and/or trading of burnt electrical waste, thus bolstering the country's support of the Stockholm Convention.

Next, waste pickers were interviewed for their feedback regarding the use of a granulator for processing their electrical waste. Based on the feedback received, a granulator was purchased and installed to separate copper wire from its insulation, and to make both materials fit for re-use. The third phase focused on education and increasing awareness on harmful

pollutants, metals, mercury refrigerants, and burning of wires. Videos and fliers were used to communicate messages on pollution, appropriate ways of recycling waste and protecting the environment. In addition to this, the Fire Department educated landfill pickers and members of the public about the dangers of burning waste, about fire hazards, and about risks and prevention; and the prohibition of such activities for which permits are not issued. The last phase of the project involved building and strengthening partnerships with schools, hotels, and APUA.

ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

Will's Recycling has been in operation since 2011 and, since then, has diverted 13,000 tonnes of metal waste from landfill. With the operationalization of the new granulator, it is expected that 30 tonnes of metal waste will be diverted annually from the burning process, towards separation using the granulator. Will's Recycling

will safely separate the metal from its covering and prepare it for shipping, and eventual recycling. This process is expected to improve air quality in surrounding communities as the practice of burning material to get to the metal components would be reduced. This project is also expected to improve soil and water quality as the amount of improperly disposed-of material would be reduced as the waste is delivered to the plant, properly separated, and prepared for shipping.

The project has yielded direct and indirect employment. Directly, 11 persons from various communities were employed during project implementation. In addition to these, one person was fully employed to supervise the operations at the wire-stripping centre. The wire stripping centre provides cleaner and healthier work conditions under which landfill waste pickers can process their recyclable wire scrap while benefiting from increased revenue for better quality materials. Indirect employment is also provided for those with the expertise required to service the granulator in place. There are also economic benefits for people who deliver waste metal to the plant rather than illegally dumping or carrying it to the landfill. Payment is dependent on weight and type of metal delivered.

This project has the potential to influence policy makers. Will's Recycling, in conjunction with several partners mentioned above, are working diligently to influence policy makers regarding a shift towards sound waste management systems and practices, to end indiscriminate disposal and unsafe management of waste. This is being done through consultations with government and non-governmental agencies such as ZWAB, the National Solid Waste Management Authorities, the Department of Analytical Services, and the Department of Environment. It is also being done through key technical waste management workshops, training and conferences jointly organized by regional and international agencies such as the Basel Convention Regional Center, the International Union for Conservation of Nature, and the Norwegian Agency for Development Cooperation. These workshops and conferences often target key local stakeholders who have the influence to convince the policy makers to



Granulator machine in use. Credit: SGP Antigua and Barbuda.

develop and enforce legislation governing the handling, transportation, treatment, processing, and disposal of waste (including wires, plastics, and mercury containing equipment). At these high-level consultation workshops, Will's Recycling discusses and produces alternatives towards sound waste management technologies and systems. Anecdotal data suggests that the Zero Waste movement in Antigua and Barbuda has been gaining traction and it is expected that waste management policy will be bolstered following successful projects such as this.

LESSONS LEARNED, CHALLENGES, UPSCALING AND REPLICATION

Much of the success achieved in this project has been due to the strategic partnerships forged with key organizations. The extensive stakeholder engagement process helped to highlight the benefits of the project to a wide range of stakeholders from government



Scraps ready for processing at Will's Recycling. Credit: SGP Antigua and Barbuda.

and non-governmental sectors, and the need for collective action. This helped to obtain their buy-in and full support. The support of the general public was also critical in ensuring that metal waste was delivered to the plant rather than going to the landfill or being dumped illegally. The participatory and collective approach was useful in facilitating project implementation because it ensured stakeholder involvement and empowerment, project ownership and reduced the burden of implementation or responsibility on any one stakeholder. Stakeholder empowerment and project ownership are expected to enhance the sustainability of the project.

The islands' sole sanitary landfill has reached its designed capacity. The government is presently seeking alternative waste management technologies such as waste to energy, waste recycling, composting and other treatment systems. The division, treatment, and utilization of waste as a resource and not to be landfilled shall provide public/private partnership opportunities for Will's Recycling as a partner to provide some of these solutions towards safe waste management. Will's Recycling has already introduced solutions to safely handle different types of waste.

The project has expanded, particularly with the introduction of the granulator, which separates the copper wires from its plastic coating. There are ongoing discussions on the need for policy to regulate metal waste management and associated materials, including plastic waste. The Department of Analytical Services and the National Solid Waste Management Authority are key partners and supporters of Will's Recycling. They, along with other partners, are working to change policy that would affect the recycling and management of metal waste. Through partnership with these key organizations, results of this project and associated educational materials are being showcased in videos on [Will's Recycling YouTube channel](#), on the local news stations, in published papers (Spencer, 2021) and in the print media, for continued awareness creation. These awareness-creation materials are expected to improve stakeholders' understanding of the environmental and health implications of poor waste management, foster behaviour change and generate interest in the need to replicate and/or scale up such interventions.

CASE STUDY 5

Reduction of pollutants from pig production in the San Juan River basin.



COUNTRY

Cuba



NUMBER OF PEOPLE SERVED

160



LOCATION

Municipality of Santiago de Cuba, province of Santiago de Cuba



FINANCING

US\$37,500



START DATE

June 2017



END DATE

December 2021

CONTEXT

This project was implemented in the municipality of Santiago de Cuba in the San Juan River basin. The San Juan River basin is one of the eight basins of national interest, given its degradation, attributable to large amounts of pollution from the food industry. Many pork producers within this catchment do not treat waste from livestock farming in an efficient manner. Wastewater spills into the basin from large oxidation ponds used for waste treatment. As a result, poor waste management practices contribute significantly to water pollution within the San Juan River basin. This has several implications, including damaging the health of aquatic organisms, diminishing the value of environmental services in the basin, and negatively impacting livelihoods and the health of surrounding communities.

This project was initiated in June 2017, with the aim of addressing water pollution and its associated socio-ecological problems. The project aimed to reduce the release of wastewater into the San Juan River basin as well as to reduce methane and nitrous oxide emissions from the biodegrading of pig manure. This collaborative project was implemented by small private producers (associated with 11 nationally recognized cooperatives) with advisory and capacity support from SGP Cuba and the National Association of Small Farmers (*Asociación Nacional de Agricultores Pequeños*, or ANAP) in Santiago de Cuba.

IMPLEMENTATION

The first activity involved the procurement and installation of polyvinyl chloride (PVC) geomembrane tubular digesters in the anaerobic treatment of pig excrement in 51 farms and other agricultural lands within the basin. This technology consists of the collection and conduction of pig faeces into a tubular geomembrane deposit, so that its anaerobic fermentation occurs there. As a result of this process, methane is generated, which is a gas with high combustion power; hence it can be used as an energy source for cooking food. The liquid and dry organic matter resulting from this process can be used in fertigation of agricultural crops and soil improvement.⁷ It is anticipated that the methane produced by the biodigesters will be used for cooking and lighting, which will contribute to reducing the use of wood for energy. This will not only increase sustainability of household practices, but also improve families' health through the reduction of toxic gasses from the incomplete combustion of wood.

While the project only guaranteed the purchase and installation of digesters, beneficiaries were responsible for securing the equipment and accessories they would need to use gas in their homes. Therefore, it was important to sensitize beneficiaries regarding the benefits of the initiative and the need for their commitment. For instance, it was explained that all effluent resulting from the anaerobic digestion will

⁷ Fertigation refers to the process of injecting the fertilizers, used for soil and water amendments into an irrigation system.



Trench lining process in preparation for the installation of a biodigester at the Julio Trigo Credit and Services Cooperative. Credit: Fabio Fajardo Moros.

already installed biodigesters in the municipality were selected to continue promoting an environmentally friendly culture. Technical advice was always given by those instructors in the province who had already been trained in the assembly and handling of the technology, who contributed to its installation using the farmer-to-farmer method and learning-by-doing workshops.

ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

This project prevents the daily dumping of 4,510 kg of pig faeces into the basin without treatment. By reducing the pollution of rivers and underground water, this project makes an important contribution towards building the resilience of marine life, improving environmental health, and enhancing the value of environmental services in the San Juan River basin. In addition to this, the installation and operation of tubular biodigesters is expected to help prevent the emission of around one million cubic metres of carbon dioxide (CO₂) in their 15 years of useful life.⁸

be used in the fertilization of soil on farms, thereby improving its fertility and helping to address soil productivity issues. An important component of the project therefore involved sensitization and awareness raising. This was done through peer-to-peer learning and mentorship, where experienced users of the technology were paired with people with little or no experience. Word of mouth was also used to educate stakeholders about the benefits of using the technology.

The project also provided training for the beneficiary farmers in construction, management, and operation of the PVC geomembrane tubular digester technology, as well as in the comprehensive use of gas and effluent in the anaerobic digestion. In addition, and as a means to continue mainstreaming the use of technology by farmers in the province, farms with

Because many (50) households relied on fuelwood for cooking, about 11,000 cubic metres of wood was consumed annually in the cooking of food. Through this project, all 50 households have switched to biogas (avoiding the use of 11,000 cubic meters of wood). This helps to reduce pressure on local forest resources and sustain forest cover as eliminating the use of wood for cooking purposes reduces logging, which is a driver of forest cover loss in the locality. Further environmental benefits are expected from the production of biofertilizers rich in nitrogen, phosphorus, and potassium. That is, soil health and quality are expected to improve with the use of biofertilizers with proven quality regarding the input of nutrients. This contributes to reducing nitrogen oxide emissions stemming from the use of chemical fertilizers.

⁸ This was estimated by multiplying the amount of cubic metres of biogas produced in a day by a pig (0.102) by the average number of pigs (2050 pigs). This gives 209.1 cubic meters per day. By multiplying this daily value by 365 (days), an annual figure of 76,321.5 cubic meters was obtained. Overall potential impact over the 15 years was estimated by multiplying the annual value by 15 (years) to this is equal to 1,144,822.5 cubic meters.

There are also direct economic benefits. For instance, before the implementation of this project, 50 households within the project area cooked their food using electric equipment. Following this project, the 50 households have switched from using electric equipment to the use of biogas and therefore use biogas-powered stoves to cook their food. This has reduced their monthly electric energy consumption expenditure by approximately 50 percent, i.e., from an average expenditure of 400 pesos (US\$15.53) to 200 pesos (US\$7.77) per month (based on interviews with 10 households).

LESSONS LEARNED, CHALLENGES, AND REPLICATION

This project faced some challenges. For instance, though 59 tubular biodigesters were procured through importation, only 41 have so far been installed; the installation of the remaining 18 has not been completed (but is expected by the end of 2023). This is due to a lack of adequate building materials (sand, cement, and others) as a result of the low levels of production in the country. The onset of the COVID-19 pandemic also slowed project implementation as in-person interactions with communities were reduced due to social distancing protocols.

The participatory approach used in this project has facilitated implementation and guarantees project sustainability. For instance, the procurement, haulage, and installation of the biodigesters is an expensive endeavour and the funds provided by SGP could not cover all costs. The working system established between ANAP and the coordinating board of the project was essential for the process to assemble the biodigesters. The exchange with producers from other provinces, who already had experience in this type of work, was very useful. It facilitated effective training, using the farmer-to-farmer approach.

Overall, the community is beginning to appreciate the socio-economic and environmental value of the use of biodigesters in pig production. In fact, there is considerable interest in replicating this initiative in other places following this appreciation

by stakeholders. To sustain the benefits of the project, beneficiaries, mainly producers, were trained in the handling, installation, and maintenance of biodigesters. Seventy-five direct beneficiaries and their relatives were trained in this area, which helped in expanding their knowledge of the assembly and use of biodigesters. In addition, through the agro-ecological movement of ANAP and its coordinators, all producers and relatives of beneficiaries were trained in installation through practical work on the actual farm, which allowed them to learn appropriate ways to use biological fertilizers.



A demonstration training workshop for the installation of a 10-cubic-metre geomembrane tubular biodigester on the farm of a producer. Credit: Fabio Fajardo Moros.

CASE STUDY 6

Evaluating Discovery Bay inshore coastal water quality to improve capacity for environmental management.

					
COUNTRY	NUMBER OF PEOPLE SERVED	LOCATION	FINANCING	START DATE	END DATE
Jamaica	~5000 persons	Discovery Bay, St Ann; Discovery Bay Special Fishery Conservation Area	US\$44,500 (SGP grant), US\$16,625.19 (in-kind contribution)	December 2017	October 2020

CONTEXT

Discovery Bay is a roughly circular embayment in the centre of the island's north coast, approximately 1.5 kilometres in diameter and 60 metres deep. It is sheltered from the open sea by a shallow reef crest that prevents large oceanic waves from entering the bay. The local town started developing as a support base for workers at the bauxite company, but it has diversified over the years to house more than 5,000 people.

Anecdotal evidence shows that anthropogenic factors such as indiscriminate waste disposal and poor agricultural land management have contributed to deteriorating the quality of the bay. This threatens the health of aquatic organisms, reduces the recreational value of the resource, and affects the livelihoods of fishers and the health of the wider community. While anecdotal data suggests that the bay might be polluted, scientific evidence of this has previously been lacking, which makes it difficult to intervene. Therefore, this project was initiated to monitor the 162-hectare Discovery Bay Special Fishery Conservation Area to identify pollution hotspots and to initiate a timely intervention. The key partners of this project were SGP Jamaica, Alloa Discovery Bay Fishermen's Association, the University of the West Indies (UWI), Mona Discovery Bay Marine Lab and the community members of Discovery Bay.

IMPLEMENTATION

As the goal was to identify areas where pollutants had exceeded accepted contaminant levels, Discovery Bay was monitored between 2017 and 2020 for nitrates, phosphates, and faecal coliforms, as well as for biological oxygen demand levels. Coral and macroalgal cover were also assessed to identify any links with associated nutrient levels. To do this, three fishers from the community were trained to scuba dive to collect samples and survey the reef. In addition to this, three young women were trained in the scientific techniques needed to measure and quantify the relevant physical and chemical parameters. Besides these scientific assessments, a survey was conducted to evaluate the wider community's perceptions about water pollution.

Results of the surveys and scientific assessments were disseminated among key stakeholders and community members in August 2020. One key finding was that there were continuous elevated levels of coliforms at Discovery Bay Fisherman Beach – significantly exceeding Jamaica's National Ambient Water Quality Standard for marine waters⁹ – which indicated a possible sewage seepage problem in that area. To help mitigate the high faecal coliform levels found in Discovery Bay Fisherman Beach, the soakaway pit at the beach was replaced with two septic tanks, which are expected to reduce the coliform levels in this area.

⁹ This shows that sample points exceeded the accepted maximum contaminant levels, defined as 256 most probable number of viable cells per 100 millilitres of sample.

Another parameter that exceeded the Jamaican National Ambient Water Quality Standard for marine waters was phosphate levels in the bay, especially in the Old Folly Road Drain Area. This drain deposits runoff from the road into the sea and, according to the results obtained between 2017 and 2020, the highest levels of phosphate were recorded here¹⁰. This is of significance because phosphate is the limiting element in the bay, so any significant increase in its levels can lead to overgrowth of algae. The highest levels of total nitrogen were also recorded here, which confirms this as an area of concern¹¹. The Biological Oxygen Demand for all sites were within the accepted standard range of 0.0-1.16 milligrammes per litre. Average coral and macroalgal cover for Discovery Bay was 3.3 percent and 56.2 percent respectively, with the Old Folly Road Drain Area having one of the highest algal cover (65 percent) and lowest coral cover (6 percent).

ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

The point sources of pollution in Discovery Bay's marine waters have been hotly debated in recent times with the introduction of a dolphinarium, and this project has provided scientific evidence to residents, to support or dispel suspected pollution sources. The studies conducted have identified the dolphinarium at Puerto Seco as a hotspot for faecal coliform, along with the Old Folly Road Drain and Discovery Bay Fisherman Beach. This information was published at a [townhall meeting in August 2020](#), as well as through the dissemination of flyers and posters in the Discovery Bay Town Area. To help in the reduction of faecal coliform levels, a soakaway pit was replaced with two septic tanks at Discovery Bay Fisherman Beach. This is expected to reduce faecal coliform levels by 99 percent, since this is one of the pollution sources in the bay.

Moreover, the dissemination of water quality and survey results among key stakeholders and community members is expected to improve their awareness of



Local fishermen were certified as scuba divers to conduct reef surveys and collect water samples. Credit: Abigail Richards, Discovery Bay Marine Lab.

the status of the bay and the need to stop pollutive practices. In addition to this, a newsletter will be issued to the Discovery Bay community to summarize the findings of the project and recommendations. This will also highlight the septic tank installation at Discovery Bay Fisherman Beach and its intended benefits, with the expectation that other people will replace their own soakaway pits with septic tanks. The newsletter will also inform the public that the Alloa Discovery Bay Fishermen's Association is receiving a new boat engine with SGP support and will be able to monitor the bay once again effectively, especially with regards

¹⁰ Soluble reactive phosphorus (phosphate) levels for the sample sites in Discovery Bay was 0.21 mg PO₄³⁻/L, far exceeding the Jamaican ambient water quality standard for phosphate in marine water (0.0031-0.0092 mg PO₄³⁻/L).

¹¹ Total nitrogen levels for the sample sites in Discovery Bay (6.06 mg N/L) far exceeded Jamaican ambient water quality standard for nitrogen in marine water (0.007-0.014 mg N/L).



Discovery Bay Marine Lab Staff, interns and community members conducting chemical analyses of water samples. Credit: Abigail Richards, Discovery Bay Marine Lab.



Discovery Bay Marine Lab Staff, interns and community members conducting chemical analyses of water samples. Credit: Abigail Richards, Discovery Bay Marine Lab.

to poaching. All these measures are expected to contribute to water quality improvement and, more broadly, enhance environmental conditions.

The project has been useful in the creation and/or diversification of livelihoods. For instance, three fishermen from the community were trained and certified as open water divers by the Professional Association of Diving Instructors (PADI). This skill and certification enable the young men to earn an additional income of 60,000 to 70,000 Jamaican Dollars (US\$ 390 to 455) per month as support divers in water sample collections and reef surveys, or even more if they attain advanced certifications.

The replacement of the soakaway pit with septic tanks also employed about five community members of varying skillsets. These livelihood opportunities have contributed to improving the living conditions of local young people and their household members.

LESSONS LEARNED, CHALLENGES, UPSCALING, AND REPLICATION

Two key challenges affected project implementation: first, the slow procurement of equipment at the start of the project, which contributed to time delays. The second challenge was due to the COVID-19 pandemic which affected how the project team engaged with community members as they needed to observe social distancing. The team overcame this challenge by adapting to the situation. Specifically, by relying on online platforms to collect information and disseminate project results.

This initiative has demonstrated the importance of baseline assessments. The assessment of baseline conditions of Discovery Bay has helped to produce scientific knowledge to inform key stakeholders of the status of the resource. This contributed to a timely intervention, namely the provision of septic tanks to



Discovery Bay Marine Lab Staff, interns and community members conducting chemical analyses of water samples. Credit: Abigail Richards, Discovery Bay Marine Lab.

mitigate water pollution, and helped raise awareness, with the potential to trigger positive institutional or individual behavioural changes that could contribute to reducing water pollution.

Another lesson relates to the importance of building the capacity of local communities regarding data collection. Through training, this project has provided selected community members with the skill to conduct surveys and collect water quality data. This has the potential to help them appreciate the causes of environmental pollution in their location and empower them to advocate for behavioural changes needed to reduce water pollution in the bay.

To ensure the sustainability of project benefits, the UWI Discovery Bay Marine Lab, in collaboration with the Alloa Discovery Bay Fishermen's Association, will continue to periodically conduct surveys to assess any changes in water quality, especially in the areas close

to the installed septic tank. This will help to quickly identify any negative changes that require new interventions. Furthermore, the maintenance of the septic tank will be overseen by the Alloa Discovery Bay Fishermen's Association and partially funded by the users of the restrooms through a pay-per-use model.

Experiences from this project have been replicated in seven other special fishery conservation areas on the north coast of Jamaica.



CHAPTER 4

Ecosystem Management and Restoration

CASE STUDY 7

Engaging the community and building capacity for coral reef restoration on the west coast reefs of Barbados.



COUNTRY

Barbados



NUMBER OF PEOPLE SERVED

300,000 persons



LOCATION

Barbados



FINANCING

US\$49,525



START DATE

January 2017



END DATE

August 2021

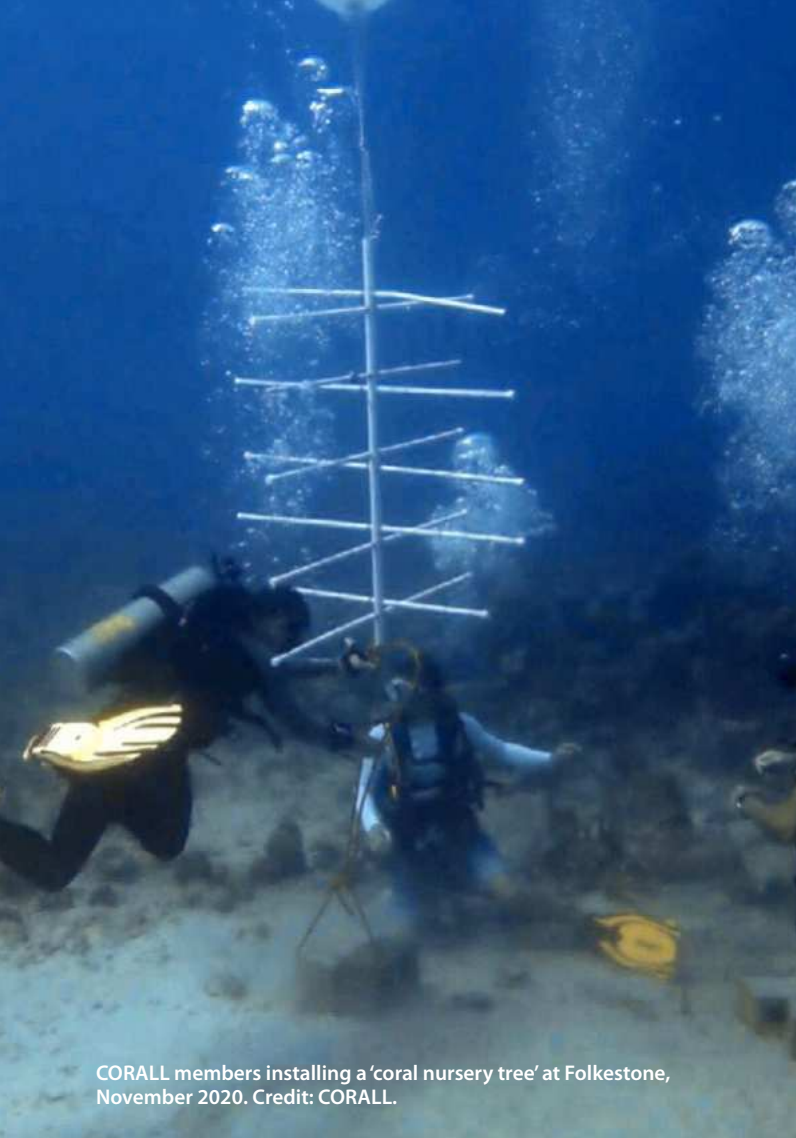
CONTEXT

Recent observational studies have shown that the coral reefs of Barbados are deteriorating and dying. The Barbados Coral Reef Report Card, which collated decades of data until 2020, has given Barbados' reefs an average health score of 2.7 out of 5, indicative of fair condition overall and similar to other eastern Caribbean countries recently assessed (Irvine et al., 2021). However, health scores varied among individual reef sites and reef types in Barbados, with west coast fringing reefs scoring the lowest at 2.2 (considered to be poor). This deterioration has been attributed to a myriad of human-induced factors including pollution, climate change, overfishing, and physical damage. The vital ecosystem services provided by coral reefs implies that their deterioration has critical repercussions on society. For instance, damaged and dead reefs negatively impact the fisheries and tourism sectors of Barbados' economy, including the livelihoods of people who work in those sectors. Conversely, healthy, vibrant reefs contribute to the well-being of society, by regulating climatic conditions, protecting the coastline, serving as a habitat for living organisms, providing jobs, food, medicines, and places for reflection and recreation. The natural services of coral reef ecosystems contribute towards the harmonization of our entire natural world, in terms of chemical, physical, and biological balance. It is therefore important that urgent steps are taken to protect and sustainably manage coral reefs before their deterioration becomes irreversible.

Consequently, this project was implemented on the west coast of Barbados to address the deterioration of coral reefs. The project was executed by the Coral Reef Restoration Alliance (CORALL), an alliance of individuals and entities who care about the conditions of coral reef ecosystems. This project received donations and additional funds from the Canadian High Commission and an international private business (which has requested anonymity). Some members of the academic community voluntarily conducted research for CORALL that is used as a reference for the alliance's baseline surveys, scoping, and water quality assessments. The project focused on community engagement, awareness raising, capacity building, populating nursery structures with rescued coral fragments and monitoring coral reef restoration sites using a science-based approach.

IMPLEMENTATION

The project had three main components. The first component involved community engagement through implementation of outreach programmes based on the ridge-to-reef approach. These outreach programmes were aimed at emphasizing the impacts on anthropogenic activities on land and sea. Following this, awareness-raising events were organized for and with CORALL members, and other individuals and entities. These events included a coral reef symposium and exposition, an assembly of high-level officials at UN House, children's camps, and the launch of CORALL's video highlighting the organization's reef restoration activities (the video [Corals in Living Colour](#) can be viewed on YouTube). Overall, this project engaged



CORALL members installing a 'coral nursery tree' at Folkestone, November 2020. Credit: CORALL.

1,500 members of the community in coral restoration through a combination of physical restoration and the Adopt-a-Coral programme begun in January 2020. This programme encourages people to adopt a coral fragment. Anyone may adopt a coral fragment by clicking the link at Adopt a Coral on CORALL's website. Each person who adopts a coral has his or her name registered in connection with a coral fragment, and CORALL sends updates and photos to advise on how each fragment is progressing. A coral fragment can be adopted for Bds\$30.00 (US\$15). In addition to this, about 75,000 individuals were reached through media promotion of the Coral Reef Symposium held on World Oceans Day 2018.

The second component involved building and populating nursery structures with rescued coral fragments. CORALL established three coral restoration sites on the west coast of Barbados. The sites were

established during a field trial in May 2018, at Port St Charles and Driftwood, by out-planting fragments of coral that had been temporarily cared for in laboratory holding tanks at Bellairs Research Institute of McGill University. A total of 21 and 36 fragments were out-planted at Port St Charles and Driftwood, respectively. Most of these out-planted fragments were symmetrical brain coral (*Pseudodiploria strigosa*).

The final component focused on the use of a science-based approach to monitor all coral restoration sites. All out-plants were monitored at bi-monthly intervals for a period of three months, and at monthly intervals afterwards. The survivorship of fragments was highest on the frame at Driftwood. For instance: 64 percent of out-planted fragments remained alive at Driftwood, compared to 38 percent of fragments on the breakwater at Port St Charles, 10 months after out-planting.

ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

This project has contributed to an increased knowledge base concerning coral reef restoration. Once such restoration is practiced at large scale, it will strongly contribute to environmental conservation. More than 100 fragments of three species of coral at CORALL's three restoration sites have survived and are in demonstrably good condition. CORALL's two field trials at Port St Charles and Driftwood, and the Pilot CORALL Nursery at Vauxhall Reef, have demonstrated that coral restoration is feasible along a stretch of the western coast of Barbados that spans approximately 14 kilometres. This coastal stretch encompasses 24 watersheds and about 10,000 hectares on the terrestrial side, and around 3,000 hectares on the coastal marine side. Rehabilitation of the coral reef ecosystems along this coastal stretch of Barbados, using the ridge-to-reef approach, has therefore improved the management of the landscape and the seascape within a total area of approximately 13,000 hectares. The area is densely populated, with many land-based activities that affect water quality. The rehabilitation is therefore crucial to restoring sustainably managing ecosystem

services in the area. Coral reefs in the area will continue to be monitored through post-implementation arrangements outlined in section 4.

CORALL's restoration sites are all located near to the so-called platinum coast of Barbados, which is distinguished by its prestigious residences, hotels, restaurants, bars, nightclubs, and shopping, all against an iconic backdrop of Caribbean sun, sea and sand. An application that maps ocean wealth, informed by science, communications, and policy work (<https://maps.oceanwealth.org>) suggests that the total US dollar value of coral reefs in Barbados per square kilometre per year (in terms of value re tourism and recreation) is approximately US\$908,000. Therefore, the value of the coastal stretch that spans CORALL's coral restoration area is estimated to be in the order of at least US\$12 million in terms of value to recreation and tourism only.

This project is also influencing policy. CORALL was able to influence the policy of the Government of Barbados by making contributions to national meetings and discussions pertaining to coastal zone management and ecosystem restoration. These recently included: two stakeholder workshops hosted by the Compete Caribbean Partnership Facility of the Inter-American Development Bank, regarding the Integrated Blue Economy Policy Framework and Strategic Action Plan for Barbados, on 9 and 11 March 2021; a public webinar titled Partnerships at the Marine Science-Policy Interface, hosted by the Centre for Resource Management and Environmental Studies of UWI on 8 June 2021 (UN World Oceans Day); and a public enquiry on the Draft Updated Integrated Coastal Zone Management Plan (Sub-Area 6 - Maycock's Bay to Batts Rock), hosted by the Coastal Zone Management Unit, 25 June 2021. CORALL also participated in a high-level political forum titled Unleashing the Potential of the Blue Economy, hosted by UNDP on 7 July 2021. In launching the new Coastal Zone Management Plan for Barbados in June 2021, the Prime Minister mentioned the important work pertaining to the Roofs-to-Reefs Programme which complements the ridge-to-reef approach of CORALL, and the regional IWEco project.



The Minister of Maritime Affairs lauded the work of CORALL during the launch of CORALL's video to commemorate World Environment Day in June 2021.

LESSONS LEARNED, CHALLENGES, UPSCALING, AND REPLICATION

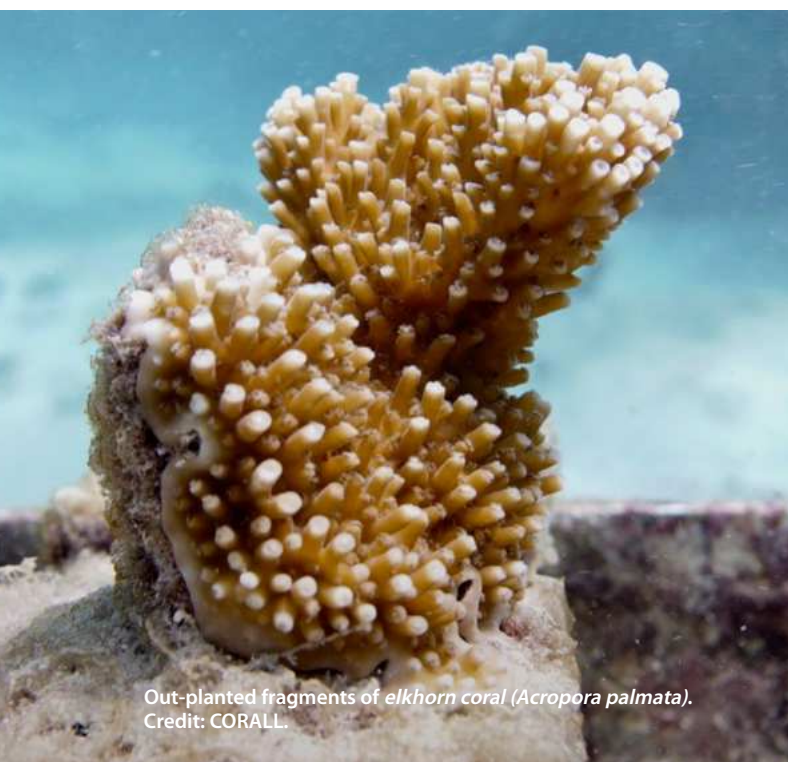
A number of challenges affected project implementation including lockdowns and restrictions pertaining to the COVID-19 pandemic, the eruption of La Soufrière Volcano in St Vincent in April 2021, a freak thunderstorm of record intensity in June 2021, and Tropical Storm Elsa that became a Hurricane as it passed near Barbados during July 2021. For instance, monthly monitoring and maintenance of the fragments were disrupted from March to May 2020 due to the COVID-19 lockdown. Despite these challenges, the fragments were found to be surviving and in good condition during a snorkelling reconnaissance trip

on 3 June 2020. This success was attributed to the innovative way in which CORALL adapted their implementation techniques to suit the changing situation: CORALL used a new schedule to conduct their monitoring and maintenance trips because they could not use boats, or their use was limited to a few passengers. This meant that dives originating from shore were necessary, and that photographic records were obtained more by free-diving and snorkelling, than by scuba divers, who enjoy the advantage of being able to remain underwater for long periods of time. Fortunately, CORALL's restoration sites were at depths of about 15 feet (4.6 metres), and close to shore, so these innovative strategies were possible. Meeting this challenge actually led to an unexpected and welcome change in simpler methodology for the long term, whereby coral restoration sites may be successfully monitored by a combination of free-diving, snorkelling, and scuba diving.

This project has been very successful due to the overwhelming support from a wide range of stakeholders from the public and private sectors as well as community members. An important lesson in this context is that project plans and activities should

be based on the interests, culture, and capabilities of members of the community and other stakeholders. By developing and implementing projects that reflect community needs, interests, and aspirations, stakeholders are more likely to offer their support towards the implementation of the project as observed in this project.







This project's success suggests that coral ecosystem restoration can be successful. The three healthy coral restoration sites established by CORALL on the west coast of Barbados serve as a demonstration of what may be achieved in terms of engaging members of the community in ecosystem restoration by applying both the principles of the ridge-to-reef approach, and the techniques of physical restoration. Additionally, the project has demonstrated that coral growth in these areas is possible, and that this has the potential, if it can be successfully scaled up, to protect habitats and the coastline. The project was scaled up in December 2020, by adding a new coral nursery at Vauxhall Reef to the existing restoration sites at Driftwood and Port St Charles established in May 2018. The number of species of coral was expanded from two to three. It will be important to further scale up the project. Upscaling will require more dedicated volunteers, funding, and time, especially pertaining to growing and out-planting of fragments and sensitizing and engaging more members of the community. CORALL is committed to securing government and other stakeholders' support towards project sustainability, replication, and upscaling. To do this, CORALL continues to work with communities and build stakeholders' capacity for coral restoration through training more volunteers and students to use CORALL's manual as a reference for best practices in coral restoration. In sum, this project has become a great example of ecosystem restoration efforts among the public and in policy discourses and has inspired policymakers to commit resources towards restoring and sustainably managing coral reefs and other environmental resources in Barbados.



Out-planted fragments of elkhorn coral (*Acropora palmata*).
Credit: CORALL.

CASE STUDY 8

Beekeeping in communities of the municipalities of Yerba Buena and Mata Palacio.

					
COUNTRY	NUMBER OF PEOPLE SERVED	LOCATION	FINANCING	START DATE	END DATE
Dominican Republic	935	Municipalities of Yerba Buena and Mata Palacio, in the province of Hato Mayor	US\$24,500	July 2018	June 2021

CONTEXT

Although significant progress has been made in the development path of the Dominican Republic, the country is still faced with major development problems including extreme poverty, hunger, and environmental degradation. By 2030, the Dominican Republic aims to provide full access to proper nutrition, secure a sustainable food system, increase productivity, and avoid food waste. To achieve these objectives, there are measures to strengthen the sustainability of social safety networks and to prioritize local development. In this regard, the promotion of sustainable livelihoods is a viable alternative to existing, environmentally destructive methods of farming. This includes a special focus on strengthening beekeeping, since this activity is mainly undertaken by small producers and has a significant potential to affect both domestic and export markets. The promotion of this activity and the honey produced contributes to the conservation of biodiversity while increasing agricultural productivity in fruit, oilseed, and horticultural production thanks to the pollination by the bees. This is expected to help generate sustainable livelihoods, increase people's incomes in rural areas, promote small-scale family enterprises, and improve the living conditions of beekeepers. Moreover, beekeeping could contribute to the sustainability of ecosystems as bees benefit the reproduction and survival of rare or wild plants.

As a concrete action to reach these objectives, this project was initiated in 2018 to install 17 apiaries, for a total number of 180 hives, with a capacity to produce 800 gallons (3,637 litres) of honey and 3,840 pounds (1,742 kilogrammes) of pollen annually. Furthermore, 15 hectares of land were restored on the banks of the Rivers Higuamo and Maguá. The Association of Beekeepers of San Pedro de Macorís (*Asociación de Apicultores de San Pedro de Macorís*, or ASOAPISAPM), executed these actions with the support of SGP Dominican Republic. The project was co-financed by national public institutions (the Dominican Agrarian Institute and the Ministry of Agriculture), and local institutions (the San Pedro de Macorís Municipal Town Hall).

IMPLEMENTATION

This initiative sought to promote the protection of the middle and upper Higuamo River watershed, while generating sustainable livelihoods, through the protection of forest cover and the promotion of beekeeping in the municipalities of Mata Palacio and Yerba Buena (San Pedro de Macorís province). To reach these objectives, the project included the following activities: capacity building of 17 beekeepers on the following topics: community revolving-fund management,¹² biodiversity conservation, marketing of beekeeping products, and queen bee breeding.

¹² A revolving fund is capital raised with a clearly defined purpose which can be made available to the same users more than once (based on agreed conditions). 'Revolving' denotes that the fund's resources circulate between the fund and the users. Revolving funds are instituted with the intent that they should be self-sufficient and sustainable.



Project participants planting the trees. Credit: SGP Dominican Republic.

Sharing knowledge and experience with other beekeeping associations was promoted throughout the project implementation. Furthermore, new apiaries were installed. Finally, 15 hectares of land were restored on the banks of the Rivers Higuamo and Maguá with endemic and native melliferous species, and a nursery was installed in the area to provide new plants for further reforestation.

ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

This project restored 15 hectares of land on the banks of the Higuamo and Maguá Rivers, which contributes to the conservation of the ecosystem services provided by the target basins, such as clean water provision, flooding protection, and carbon storage. The project is contributing to ecosystem and biodiversity conservation in Yerba Buena and Mata Palacio municipalities (San Pedro de Macorís province).

According to data provided by participating beekeepers, 660 gallons (3,000 litres) of honey have been collected per year on average, for a total production of 1,320 gallons (6,000 litres) during the period 2020-2021. This is a major achievement considering that the project was implemented during the COVID pandemic and drought periods. Honey was sold at an average price of US\$15/gallon or US\$825/tank, which represents a total income of US\$19,800 during the period. Pollen production, which was carried out by only three producers, increased to 600 pounds (272 kilogrammes) in the same period. At a sale price of US\$3.5/pound, the total income was US\$2,100. These results contributed to increasing producers' incomes by between US\$1,170 and US\$1,870 dollars in the period. The generation of new green jobs, as well as livelihood diversification and improved market access, produced additional benefits, despite adverse circumstances related to the drought and COVID-19 pandemic. Overall, this project has yielded direct positive impacts on the living conditions of 85 people, while benefiting more than 850 people (from households within the project location) indirectly.

LESSONS LEARNED, CHALLENGES, UPSCALING AND REPLICATION

Like many projects, this project was impacted by the COVID-19 pandemic. For instance, lockdown measures delayed implementation for an extended period. Despite this challenge, the project was still successful. The participatory strategy and empowerment approach used in this project contributed to exceed the expected results and guarantee their sustainability. At the beginning, ASOAPISAPM, the executing organization, had limited financial, logistical, and technical capacity to implement the project. During the execution, different stakeholders, operating synergistically, contributed to building new capacities and strengthening the organization. Therefore, an important lesson from the project is that collaboration with other stakeholders at different levels is essential for project implementation, upscaling, and sustainability.



Plants in the nursery. Credit: GEF SGP Dominican Republic.

The establishment of a community revolving fund has created proper conditions to expand the project, replicating the actions among the beekeepers' community. Furthermore, knowledge sharing and the creation of links with other beekeepers' organizations throughout the country contribute to the transfer of lessons learned and sharing of technology to reach new producers. Additionally, the installation of a plant nursery in the beneficiary communities guarantees that local beekeepers can continue to produce plants to increase forest cover, with special focus on melliferous species.

It was also observed that promoting and strengthening youth leadership is key to providing relief and opportunities for the younger generation as well as ensuring its sustainability. Involving the youth in this project improved their skillset, empowered them,

and provided employment opportunities for them. This enhanced project ownership and the youth's commitment to sustain project benefits. Moreover, any beekeeping initiative needs to be accompanied by reforestation and watershed conservation, to guarantee the necessary biodiversity that supports the economic activity. It was also observed that some beekeeping units fell victim to theft and vandalism, causing irreparable damage to the units. This was due to the lack of security plan for the apiaries. To reduce risks of theft in beekeeping production units, it is essential to prepare a context-specific security plan. These lessons can help in the successful design and implementation of future socio-economic and environmental interventions to enhance livelihoods and living conditions of the populace while protecting the environment.

CASE STUDY 9

Biodiversity restoration in the Portland Bight protected area through community engagement.



COUNTRY

Jamaica



NUMBER OF PEOPLE SERVED

3,000 persons



LOCATION

Portland Bight,
Clarendon



FINANCING

US\$43,000



START DATE

December 2017



END DATE

September 2020

CONTEXT

Portland Ridge in the Portland Bight Protected Area, Jamaica, is one of the most important areas in the Caribbean region for range restricted endemic biodiversity. It supports 12 species on the Red List of the International Union for Conservation of Nature, including three reptiles, one bat, one frog and five plants. All these species depend on the forest for habitat. The forests of Portland Ridge support the local human population, provide employment and wood (for fence posts, charcoal burning, cutting boards), maintain water supplies and regulate ecosystem services.

An assessment by the Caribbean Coastal Area Management Foundation (C-CAM) has identified threats to the forests of the area from hurricane damage and fire, charcoal burning, timber and thatch harvesting, feral pigs, and crop farming. Further evidence from observational studies has shown that recovery of the forest from a fire that spread over two-thirds of the Ridge in 2005 (following hurricane Ivan in 2004) has been slower than expected. Dry forests are among the most threatened ecosystems in Jamaica and in the Caribbean and Central America. In response to this, C-CAM initiated and executed this IWeco sub-project to restore the dry forests of Portland Ridge and their biodiversity. The key partners of this project were SGP Jamaica, the National Environment and Planning Agency (NEPA), the Forestry Department, Jamaica Fire Brigade, Social Development Commission, Clarendon Municipal Corporation (CMC), United States Forest Service (USFS), Portland Cottage Citizens Association and PWD Gun Club.

IMPLEMENTATION

The project focused mainly on testing and developing approaches to restoration of the dry forest. The project adopted a participatory approach: working with the community to develop and implement a forest restoration plan for Portland Ridge. With the community's support, C-CAM identified target and threatened species and upgraded the conservation nursery at the Portland Bight Discovery Centre to receive new species of plants, grow seeds and sell seedlings. Next, a participatory fire management programme was developed in consultation with the community. As part of this programme, a fire management plan was developed, and community wardens were trained in firefighting and plant identification in June 2019. Training activities were hands-on via group sessions and on-site demonstrations. Furthermore, a three-year memorandum of understanding (MOU) was signed among key agencies C-CAM, NEPA, Jamaica Fire Brigade (JFB), CMC and the Forestry Department to help sustain the management of fires within the Portland Ridge Forest post-implementation. This was followed by the procurement of fire management tools to be utilized by the community.

Another component of the project involved education and awareness raising: C-CAM provided environmental education on forest management and community support for forest conservation as well as general environmental issues and how best to address them. A forest interpretation space was established at the

Portland Bight Discovery Centre to allow for the continuation of the forest education and tours, at a cost to visitors. Lastly, a knowledge management video was created to document the project's challenges, successes and lessons learned.

ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

This project has contributed to improved awareness regarding forest conservation and the causes of ecosystem degradation. The training and capacity building in fire management could contribute to preventing and/or reducing fire outbreaks, which are a major factor contributing to the depletion of forest ecosystems within the project area. In addition to this, the training in tree planting and the establishment of the nursery provides a strong foundation to sustain different species within the Portland Bight Protected Area.

This project has provided income generation opportunities for 36 persons aged 18 - 70: 16 men and 20 women. Of this, 21 persons were casual (temporary) employees who were engaged in seed collection, planting, and management, and construction of a fence for the exclusion plot during project implementation. The remaining 15 persons (seven men, eight women) are certified fire wardens and are a part of the Conservation Garden Programme. The capacity of the 15 fire wardens has been improved and their services in fire management will continue post-implementation.

LESSONS LEARNED, CHALLENGES, AND UPSCALING

Two key challenges affected project implementation: First, drought delayed the implementation of seed collection, and this eventually led to delays. Second, the COVID-19 pandemic and associated restrictions slowed the pace of work, and many community members were not as willing as usual to work. In addition to this, venues used for public education on



Project participants fencing monitoring plot. Credit: C-CAM.

forest conservation were closed. This also affected project delivery timewise. Also, the number of people working on the project were reduced to ensure that social distancing rules were followed. To address these challenges, C-CAM offered a higher daily pay rate to ensure community workers' support. In the future, there will be a need to consider such unforeseen events in project planning and implementation.

An important lesson from this project is the participatory approach used. Involving all key stakeholders in developing project deliverables ensured that they accepted and supported the implementation of the project. Ownership and



Training on plant identification. Credit: C-CAM.







support of the project is what encouraged key stakeholders, namely C-CAM, NEPA, JFB, CMC and the Forestry Department, to sign the MOU. The MOU will last for three years and will focus on fire management and continuous training of community members in the Portland Ridge area. The collaborative approach employed in this project has helped different stakeholders to pool their resources together towards addressing a common problem. Without this partnership, it would have been very difficult for any one stakeholder to mobilize the resources needed for the initiative.

The relevance and positive results of this project have generated interest among other stakeholders and set the basis for expansion. For instance, the USFS has provided funds to expand on the work being done by C-CAM at the Portland Bight Discovery Center. The USFS has also provided training to staff members and technical support to the organization.

NEPA has approved a salary for a gardener in the second half of the 2021-2022 budget allocation to C-CAM. Revenue from visitors to the Portland Bight Discovery Centre (which is expected to increase because of the additional attraction of the permanent forest exhibition) and funding from the Government of Jamaica and other donors will be used to support the continuous monitoring and assessment of trial plots and testing various endangered plant species.

CASE STUDY 10

Abandoned quarry site rehabilitation project at National Quarries, Turure Road, Sangre Grande.

					
COUNTRY	NUMBER OF PEOPLE SERVED	LOCATION	FINANCING	START DATE	END DATE
Trinidad and Tobago	30 direct beneficiaries, up to 100 extended beneficiaries based on households.	Turure, Trinidad and Tobago	US\$ 43,500	August 2018	December 2020

CONTEXT

The latest report on the state of Trinidad and Tobago's economy shows that mining and quarrying represent 18 percent of the country's GDP (Government of Trinidad and Tobago, 2020). Despite this important economic contribution, these activities pose huge environmental costs, which has led to concerns over their impact and the need to ensure environmental stewardship through environmentally sound practices. For longer than two decades, attempts to promote environmental stewardship in the sector have not yielded significant results, as stakeholders were mainly concerned about the economic cost to their activities i.e., the potential negative impact of environmental stewardship on profitability.

Quarrying is a highly contentious political issue in Trinidad and Tobago, with many of the operators not adhering to legal requirements for rehabilitation, which involve implementing restorative measures to reduce the land and water degradation caused by the quarrying (Trinidad and Tobago, 2014). Quarry operators do not believe that they have a responsibility to ensure sustainable rehabilitation, especially those that have been in operation for decades and are accustomed to quarrying without implementing restorative measures. There is a lack of awareness within the mining and quarrying sector about the benefits of implementing environmentally sound

practices and managing environmental resources more sustainably, while enabling sustainable livelihoods. These measures would also benefit society more widely by supporting ecosystem restoration, which is key to improving and sustaining ecosystem services.

The need to raise awareness about these matters, prevent future degradation of land resources and restore degraded areas led to the launch of this project in 2017. The project was executed by the country's Environmental Management Authority (EMA). It aimed to promote local livelihoods, restore natural vegetation, reduce sedimentation, and flood risk, and restore ecological function to up to 20 hectares of exhausted or abandoned quarry pits.

One of the quarries owned and operated by National Quarries Company Limited (NQCL), a state institution, was chosen as the pilot training and rehabilitation site to demonstrate the financial viability and benefits of increased environmental stewardship. The quarry site is in Turure, a watershed and region of Trinidad. The selection of the site and the rehabilitation happened through the establishment of the national industry's first partnership involving the government (namely, the EMA) along with two civil society organizations: the Trust for Sustainable Livelihoods (SusTrust) and IAMovement, which received support from SGP Trinidad and Tobago. This partnership aimed to ensure synergies, complementarity, and sustainability.

IMPLEMENTATION

As the goal was to rehabilitate degraded lands, a series of activities were undertaken to build the capacity of community members and to empower them to support the restoration of 9 hectares of quarried land. First, the project developed a training manual about restoration methods, including theoretical and practical aspects of the causes and consequences of land degradation, approaches to landscape restoration (particularly quarry rehabilitation), and the importance of biodiversity conservation. A total of 23 women and seven men from local communities participated in the four-month programme, which involved lectures and field work at pilot sites.

After completing the course, the “quarry rehabilitation champions” (as they called themselves) were empowered to rehabilitate 9 hectares of abandoned quarried lands, by planting mixed tree species and vetiver, a type of grass that is very effective in soil

binding and water retention. The selection of various species was based on economic and environmental importance. For instance, vetiver was planted to stabilize the soil and prevent further erosion, and local fruit trees to provide food and habitat. They also built a series of check dams to improve water conservation and reduce gully erosion and cleared the sites of weed invasion to reduce competition¹³. The project also established a nursery on the NQCL compound to produce plants for future restoration projects and set up fire traces to reduce the threat of fire spreading to the rehabilitated plot. It must be emphasised that the formation of the “quarry rehabilitation champions” was used to mobilize and empower the community and create a sense of ownership.

ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

The project restored around 9 hectares of degraded lands by planting mainly forest species, mixed with some fruit species, to enhance fauna. Improved forest cover boosts biodiversity, increases carbon sequestration and contributes to mitigating climate change. Moreover, the 10 check dams established are expected to improve water management in the area. Approximately 100 tons of organic waste, much of which would otherwise be sent to landfills, was spread in the rehabilitated plot in order to introduce much-needed nutrients into the barren soil and make rehabilitation easier. There are two main sources of this waste: the first is a government maintenance programme that cleans overgrown vegetation, weeds, and grasses along public roadways; while the second source is a private-sector producing company that is engaged in similar activities. IAMovement negotiated with these two groups and was able to add value to their organic waste, which would otherwise have just been disposed of by burning or in the landfill. The composting was a crucial element to add nutrients and organic matter back into the soil. These aerial photos of the site show how the landscape has visibly changed (Figure 2).

Figure 2: Aerial view of restored landscape.

BEFORE INTERVENTION



AFTER INTERVENTION



Credit: IAMovement.

¹³ A check dam is a small dam constructed across a drainage ditch, or channel to lower the speed of concentrated flows for a certain design range of storm events, control water velocity, conserve soil, and improve land quality.

The project provided an introduction and training for 30 community members regarding alternative livelihood opportunities, including the production of sustainable handicrafts made from vetiver grass, which can be sold to generate income. The “quarry rehabilitation champions” used the knowledge and skills learned in the training programme in the field, where they planted seedlings of mixed tree species and vetiver grass, according to the Vetiver System best-practice specifications. In 2019, they also participated in an activity to replicate their experience at another pilot site, owned by private-sector company Carib Glassworks. This served as an example of how their newly acquired skills could be applied elsewhere, potentially for additional income. Moreover, some of the restored land is now suitable to produce crops, which are being sold in local communities by the “quarry rehabilitation champions”, providing another important source of income.

LESSONS LEARNED, CHALLENGES, UPSCALING, AND REPLICATION.

This project achieved results that would not have been possible without its collaborative approach, providing a great example of why SDGs cannot be accomplished without collaboration between different stakeholders. In this case, the collaborative efforts brought together the national government of Trinidad and Tobago, local and international organizations, and civil society organizations. SusTrust provided capacity development in land rehabilitation and forest management, as well as leadership training and organizational management. IAMovement provided capacity development in vetiver and its value-added products and spearheaded the conversion of organic waste to valuable products. NQCL provided the land for rehabilitation and covered some of the cost of transportation. Private company Carib Glass, as well as the Sangre Grande Regional Corporation and the Community-Based Environmental Protection and Enhancement Programme, an agency of the Ministry of Rural Development and Local Government, provided organic material (tree and leaf cuttings, sargassum seaweed, and fruit-vegetable compost) for the soil regenerative process.



Nursery built to supply plants and trees.
Credit: Trust for Sustainable Livelihoods.

The combination of theoretical knowledge and practical training in land restoration provided the “quarry rehabilitation champions” with the skills needed to rehabilitate degraded lands, besides improving their understanding of the causes of environmental degradation. This shows the important role that hands-on training plays in deepening stakeholders’ understanding of environmental problems, empowering them and improving their chances of engaging in environmental stewardship. The outcome of this project is evidence that, while awareness raising is important, specific training coupled with opportunities to put what is learned into action generates better and sustainable results.

The project’s sustainability was tied to the business opportunities related to providing rehabilitation services and selling crops, handicraft, and other household items.

CHAPTER 5

Lessons and Concluding Remarks



LESSONS LEARNED

Partnership and stakeholder engagement

The first key lesson from the case studies presented is the important role that partnership and high stakeholder engagement play in ensuring project ownership, success, and sustainability. Case studies from all nine countries have shown that involving stakeholders throughout project conception and implementation stages helps to gain their support and commitment, facilitates resource mobilization, empowers communities, and enhances project success and sustainability. In addition to this, the case studies illustrate that stakeholder support is significantly greater when project plans and activities are based on the interests, culture, and capabilities of the targeted stakeholders. This is because people are more likely to be motivated to work towards achieving project objectives when interventions consider stakeholders' needs, interests, aspirations, and capabilities, as observed in the Trinidad and Tobago project. This reinforces the need for context-specific project design and implementation as well as stakeholder engagement.

Gender equality and women's empowerment

The community interventions have also reinforced the importance of gender equality and women's empowerment. Nearly all the case studies ensured that all stakeholder consultations involved both males and females from youth to senior citizens, and that the decision to engage people in project activities was not based on their gender. Both male and female participants were given the same access to training, information sharing, and any other support needed to carry out project activities. Gender equality was key elements of the projects to ensure that women and vulnerable groups were represented in community interventions. For instance, in Trinidad and Tobago, of the 30 persons who participated in the four-month training and capacity building programme, the majority (23) were women. The knowledge and skills gained through the training and capacity building programme



helped these women to set up small-scale businesses including the production of sustainable handicrafts made from vetiver grass. These livelihood opportunities have helped the women to generate income, empowered them economically, and improved their bargaining power in household and community level decision-making. This demonstrates the importance of gender mainstreaming in promoting social inclusion, and of the empowerment of women and girls. These should thus be emphasized in project design, implementation, and evaluation.

Action-oriented, peer-to-peer learning

These community interventions have also shown that peer-to-peer learning and hands-on training have a higher chance of deepening stakeholders' understanding of environmental problems, empowering them, and improving their chances of adopting sustainable practices. Communities were informed on how they could change their practices and why they need to change. Therefore, where advice is unclear to stakeholders (such as farmers), they are less likely to apply the advice effectively. Evidence suggests that where experts send general recommendations,

many laypersons often do not understand the advice because it tends to be presented in a technical manner. On the other hand, when peer-learning and more straightforward language is used, the advice presented is often context-specific, practical, and relatable information. Many farmers in Cuba highlighted this benefit following their participation in a peer-to-peer training in the use of tubular biodigesters, as well as other best management practices. The farmers mentioned that it was helpful to have the jargon broken down into lay terms, rather than to have technical and complicated language.

In addition to this, allowing stakeholders to engage in hands-on learning gives them a first-hand experience of the activity and offers an opportunity to reflect on the experience. Such action-oriented learning techniques enhance people's chances of taking up the recommended practices.

Adaptability

A team's ability to adapt their plan in make-or-break circumstances plays a crucial role in project success. This is particularly important in complex and highly uncertain project contexts and was observed in many projects where activities and/or outcomes were impacted by the COVID-19 pandemic and other factors. For instance, the monthly monitoring of coral fragments in Barbados was disrupted from March to May 2020 due to the COVID-19 lockdown. Despite this, CORALL were able to adapt their project plan and used a new schedule and technique to conduct their monitoring and maintenance trips because they could not use boats, or their use was limited to a few passengers. This adjustment helped to maintain the fragments in good condition. Without such flexibility and the project team's adaptability, this success would not have been realized.

Awareness raising and capacity building

It can be noted that, while knowledge of a development issue (such as water pollution) and mitigation strategies is important, advice does not guarantee uptake of the actions needed to address

the problem. For instance, in Jamaica, a baseline assessment of pollutant levels in the Discovery Bay revealed that water bodies in the area were polluted. Following the dissemination of these findings, a wide range of stakeholders including community members and civil society groups were interested in addressing the problem. However, they lacked the technical and financial resources to do so. Through capacity building in the form of training in data collection and water quality monitoring, and financial assistance, the community was able to gather data and constructed a sanitation facility, which together with advice on pro-environmental behaviour, is helping to reduce water pollution. This indicates that the provision of evidence and awareness-raising initiatives are more likely to succeed when combined with capacity building strategies, as this reduces barriers caused by situational factors such as cost.

Science-practice interface

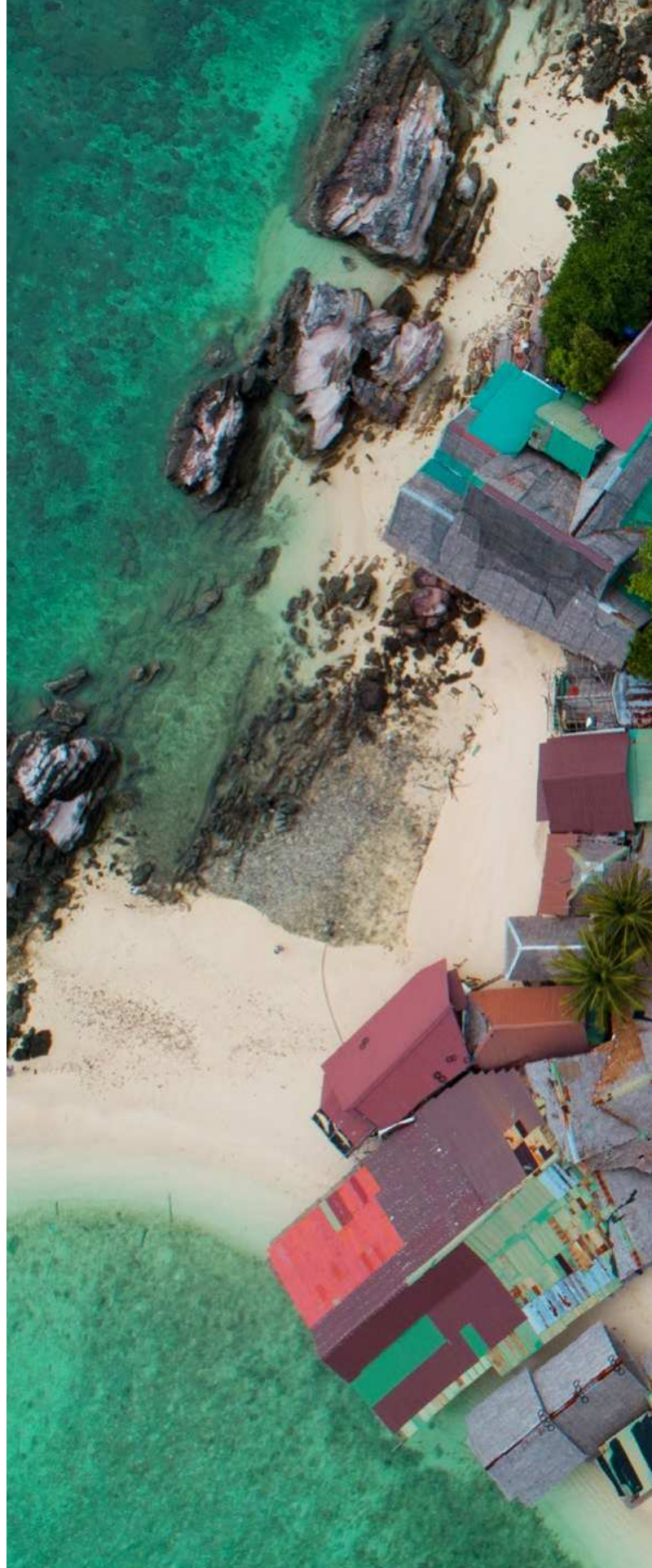
The gap between science, decision-making, and practice is widely recognized as a barrier to development. The science-practice gap has contributed to, on the one hand, some scientists failing to produce decision-relevant research while on the other hand, many practitioners make critical decisions without scientific basis. Given the complexity of many development problems such as water pollution, a close relationship between scientists and practitioners is needed to help generate decision-relevant data for interventions. IWEco has shown that, indeed, a close collaboration between scientists and practitioners is useful. For instance, in Barbados, CORALL worked closely with Bellairs Research Institute of McGill University, using a science-based approach to monitor all coral restoration sites. The high-quality data generated helped to decide on the most appropriate interventions needed as well as the techniques best suited to the restoration of coral reefs on the West coast of Barbados. This lesson emphasizes the value of science in decision-making and practice and the need for strong partnership between the scientific community and practitioners.

CONCLUDING REMARKS

The success of the community portfolio of this joint UNDP-UNEP partnership programme could be attributed to the strong partnership with a wide range of stakeholders including SGP, which has a well-established presence on the ground. SGP has been working with and building the capacities of local communities and civil society organizations to address a wide range of socio-economic and environmental issues. Leveraging SGP's networks, huge community experiences and using a bottom-up approach, have proven to be key drivers of project success.

There are also synergies between IWEco and other current and future projects such as the Caribbean Regional Fund for Wastewater Management Plus project, and the Strategic Action Programme of the UNDP/GEF project titled PROCARIBE+. The huge numbers and the scope of global development problems in the face of limited technical and financial resources suggest that stakeholders need to pool resources together to address development challenges.

The results shown in this publication demonstrate the important complementary role of local action in water resource management. Local people have lived in their communities for years, have obtained a good understanding of the socio-ecological systems, and are well placed to contribute to the development of effective solutions to resource management problems. Also, increased community involvement in resource management helps to transfer some authority to resource users: this has the potential to improve social inclusion and restructure power relations between local actors and national and international stakeholders. Local action is also important for project sustainability, as it empowers communities to manage the outputs of projects post- implementation. Therefore, SGP remains committed to working closely with communities to empower them through capacity-building initiatives, and will continue to explore partnership opportunities to scale up good practices from the local to the global level.



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Annex: Summary of Case Studies

CHAPTER/ THEME	CASE STUDY TITLE	COUNTRY	RESULTS	
			ENVIRONMENTAL	SOCIO-ECONOMIC
Chapter 2: Sustainable livelihoods	Sustainable employment for youth using indigenous fruits in and outside of the Qualibou Caldera.	St Lucia	<ul style="list-style-type: none"> Replaced about 4,800 plastic items (cups and straws) used per annum with biodegradable packaging materials. Reduced amount of water used from about 35 pounds to 20 pounds (16 kilogrammes to 9 kilogrammes) per month through replacing the use of ice with frozen pulp of fruits in smoothie preparation. Contributed to reducing the business's carbon footprint by implementing a strictly 'no dairy' policy for smoothies and using energy-efficient appliances. 	<ul style="list-style-type: none"> Provided employment for more than 25 young people. Provided readily available market for about 65 local farmers. About US\$5,280 is being generated annually through sales of the locally made smoothies. Further impacts on local economy as other small-scale businesses are being created.
	Blue growth on the Grenadines through opportunities for sustainable livelihoods.	St Vincent and the Grenadines	<ul style="list-style-type: none"> By providing sustainable alternative livelihoods, this project reduces overfishing, which is a major driver of the decline in herbivorous fish biomass. 	<ul style="list-style-type: none"> Provided long-term income for more than 30 people (in selling raw sea moss to local and international markets). The sale of black mangrove honey has provided additional source of income for some people to the tune of US\$3,000.00. Influenced national policy as the project's recommendations have been included in the national agenda for development.
	Harvesting and storing water to adequately supply an open organic farm system.	St Kitts and Nevis	<ul style="list-style-type: none"> Farmers were trained and encouraged to adopt sustainable farming practices, and this could prevent nonpoint source water pollution and land degradation. 	<ul style="list-style-type: none"> Provided GFACS members with skills that can be used in the construction sector to earn additional income. Improved farmers' access to water.
Chapter 3: Waste management	Educational and empowerment pathways for metal recycling in Antigua and Barbuda.	Antigua and Barbuda	<ul style="list-style-type: none"> Installed a granulator expected to divert 30 tonnes of metal waste annually from burning. 	<ul style="list-style-type: none"> Created employment for 11 persons. Set up a wire-stripping centre that provides cleaner and healthier work conditions under which landfill waste pickers can process their recyclable wire scrap.
	Reduction of pollutants from the pig production in San Juan River basin, province of Santiago de Cuba.	Cuba	<ul style="list-style-type: none"> Prevents the daily dumping of 4,510 kg of pig faeces into the basin without treatment. Installed and operationalized tubular biodigesters expected to prevent the emission of 1,144,822.5 cubic metres of CO₂ in their 15 years of useful life. More than 50 households switched from using fuelwood (for cooking) to biogas. 	<ul style="list-style-type: none"> Reduced more than 50 households' monthly electric energy consumption expenditure by approximately 50% (from US\$15.53 to US\$7.77 per month).
	Evaluating Discovery Bay inshore coastal water quality to improve capacity for environmental management.	Jamaica	<ul style="list-style-type: none"> Helped to identify water pollution hotspots. Improved awareness due to the dissemination of water quality and survey results among key stakeholders. 	<ul style="list-style-type: none"> Improved the capacity of three fishermen in water diving. Created employment for eight community members. Improved income of at least 60,000 to 70,000 Jamaican Dollars (US\$ 390 to 455) per month.
Chapter 4: Ecosystems management and restoration	Engaging the community and building capacity for coral reef restoration.	Barbados	<ul style="list-style-type: none"> Rehabilitated coral reef ecosystems to improve the management of the landscape and the seascape within a total area of 13,000 hectares. 	<ul style="list-style-type: none"> The restoration of the coral reef ecosystems along the coastal stretch of Barbados contributes approximately US\$12 million in terms of value to recreation and tourism only. Influenced the Government of Barbados policy pertaining to coastal zone management and ecosystem restoration;
	Beekeeping in communities of the municipalities of Yerba Buena and Mata Palacio.	Dominican Republic	<ul style="list-style-type: none"> Restored 15 hectares of land on the banks of the Higuamo and Magua Rivers. 	<ul style="list-style-type: none"> Contributed to increasing pollen producers' incomes by between US\$1,170 and US\$1,870 dollars in the period. Yielded direct positive impacts on the living conditions of 85 people, while benefiting more than 850 people indirectly.
	Biodiversity Restoration in the Portland Bight Protected Area through community engagement.	Jamaica	<ul style="list-style-type: none"> Training and capacity building in fire management could help prevent and/or reduce fire outbreaks, which contribute to forest degradation. Training in tree planting and the establishment of the nursery provides a strong foundation to sustain different species within the Portland Bight Protected Area. 	<ul style="list-style-type: none"> Provided income generation opportunities for 36 persons: 16 men and 20 women.
	Abandoned quarry site rehabilitation project at National Quarries, Turure Road, Sangre Grande.	Trinidad and Tobago	<ul style="list-style-type: none"> Restored around 9 hectares of degraded lands by planting mainly forest species. Established 10 check dams. Prevented about 100 tons of organic waste from being sent to landfills. 	<ul style="list-style-type: none"> Trained and introduced 30 community members to alternative livelihood opportunities, including the production of sustainable handicrafts made from vetiver grass.



The Small Grants Programme (SGP) is a corporate programme of the Global Environment Facility (GEF) implemented by the United Nations Development Programme (UNDP). Established in 1992, SGP is currently active in 127 countries and promotes community-based innovation, capacity development, and empowerment through sustainable development projects of local civil society organizations with special consideration for Indigenous Peoples, women, and youth. SGP has supported over 27,000 community-based projects on biodiversity conservation and sustainable use, climate change mitigation and adaptation, sustainable land management, conservation of international waters, and chemicals and waste management, while generating sustainable livelihoods.



The GEF is a family of funds dedicated to confronting biodiversity loss, climate change, pollution, and strains on land and ocean health. Its grants, blended financing, and policy support helps developing countries address their biggest environmental priorities and adhere to international environmental conventions. Over the past three decades, the GEF has provided more than \$22 billion and mobilized \$120 billion in co-financing for more than 5,000 national and regional projects.

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