

**Community-based Water, Land and Ecosystems Management in  
Caribbean Small Island Developing States: Experiences and Lessons  
Learnt from IWeco-UNDP/SGP Partnership Program**

## Executive summary

The Caribbean small island developing states (SIDS) are confronted with significant multidimensional development challenges including high unemployment rates, poor sanitation, marine plastic pollution, land degradation and travel restrictions and lockdowns due to the Coronavirus (COVID-19). These development problems have negative impacts on human and soil health, ecosystems, livelihoods, and recreational services and affect resilience to natural disasters, and have persisted in SIDS due to their small landmasses, vulnerable economies, and heavy dependence on external energy resources, coupled with rising populations. With financing support from the Global Environment Facility (GEF), United Nations Environment Programme (UNEP) and United Nations Development Programme (UNDP) established a partnership to implement the Integrating Water, Land and Ecosystems Management in Caribbean Small Island Developing States ([IWEco Project](#)), a multi-focal regional project. This project is being implemented in Antigua and Barbuda; Barbados; Cuba; Dominican Republic; Grenada; Jamaica; Saint Kitts & Nevis; Saint Lucia; Saint Vincent and the Grenadines, and Trinidad & Tobago.

IWEco applies a “Ridge to Reef” approach aimed at integrating watershed and coastal areas management towards addressing the multiple challenges of sustainable water, land, and biodiversity management as well as climate change. The project objective is to contribute to the preservation of Caribbean ecosystems and the sustainability of livelihoods. IWEco is implemented at three geographical scales: 1) regional level; 2) national level; and 3) community level. The total GEF grant was US\$20,722,571, of which US\$19,222,571 was allocated to UNEP and US\$1 million funding (including management cost) to UNDP/GEF Small Grants Programme (SGP). UNEP is the lead implementing agency for regional and national sub-projects, while UNDP implements activities aimed at supporting community-based livelihood opportunities and environmental management. To reach the ground level, GEF SGP was used as a delivery mechanism to implement 55 community sub-projects. SGP provided matching funds of US\$1,000,000<sup>1</sup> for disbursement as small grants among participating countries.

The community subprojects focus mainly on baseline assessments, awareness raising, capacity building, technical and technological support and infrastructural provision, and address issues across three main themes: sustainable livelihoods, waste management, and ecosystems restoration and management. The community subprojects have yielded great outputs including: 1) training and building the capacity of 1,474 persons in business development, water catchment management, marine pollution, land restoration; 2) promoting inclusion by involving at least 3,052 young people and 17 disabled persons in the interventions; 3) installing at least 407 productive facilities including honey production units; and planting at least 59,680 trees. Though it is early days yet, the community interventions have already yielded significant outcomes including: 1) establishing 81 small-scale businesses; 2) creating more than 151 jobs; improving or diversifying the incomes of 399 persons; 3) improving access to water and sanitation for 5,109 persons; ensuring that 13,301.52 hectares of coastal areas or fishing grounds are sustainably managed; and that 0.3 m<sup>3</sup> of wastewater is avoided or prevented from entering waterbodies.

It must be noted that these great results were achieved amidst key challenges including the onset of the COVID-19 pandemic, procurement & administrative challenges, and weak local and institutional capacity. Despite these challenges, IWEco has been a great success due to the strong partnership, the multi-focal approach adopted, clear post-implementation plan, gender mainstreaming, action-oriented

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<sup>1</sup> The total amount managed by UNDP was \$1,500,000 from which, \$1,000,000 was being implemented through SGP and the other \$500,000 was for implementing IWEco global knowledge management activities. This report covers the activities and results from the \$1 million financing delivered through SGP.

and peer-to-peer learning, and flexibility. Recommendations for future partnerships have been proffered including using more targeted and integrated approaches in project development and implementation, building the capacity of grantee partners and other stakeholders, and leveraging the benefits of science-practice interface. There are plans to replicate and/or scale up the success of community interventions through other regional partnerships such as PROCARIBE+, which can be seen as part of the IWEco project sustainability strategy.

# CHAPTER 1

## PROJECT CONTEXT

### 1.1. Socio-economic and Environmental Development challenges in SIDS.

The Caribbean small island developing states (SIDS) are confronted with significant multidimensional development challenges that require urgent attention if indeed, the goal is to ‘leave no one behind’ (Smith and Spencer, 2020, UNDP, 2018). For instance, many Caribbean economies have high and escalating debt to gross domestic product (GDP) ratios that threaten debt sustainability and medium to long term economic growth. Available data shows that overall public sector debt for Caribbean SIDS was roughly 79% of their regional GDP (Acevedo et al., 2013). 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. Rural poverty is manifested in the lack of access to physical and financial resources, production support facilities, and social and infrastructural services including electricity, water, sanitation, and roads while urban poverty is manifested in squatter settlements, poor sanitation, and high unemployment rates. In addition to these, COVID-19 pandemic has posed great challenges to SIDS as a result of travel restrictions, lockdowns and loss of tourist revenues that these countries heavily depend on.

There are also environmental issues that threaten the ecological sustainability of the region. For instance, analysis of per capita waste data shows that waste generation in SIDS is increasing considerably: the waste generation rates for SIDS averaged 1.29 kg/capita/day in 2014 – a figure that was lower than the 1.35 kg/capita/day recorded in OECD countries (Mohee et al., 2015). However, in 2019, waste generation in SIDS increased to 2.3 kg/capita/day, roughly 48% higher than the figure recorded in OECD countries. In a recent report, Waste Management Outlook for Latin America and the Caribbean, United Nations Environment Programme (UNEP) found the Wider Caribbean Region (WCR) to be among regions with the highest plastic concentrations given that the number of floating microplastic and macroplastics were estimated to be around 82,000 and 5000 pieces/km<sup>2</sup> respectively. It is important to note that though waste generation is rising in SIDS, much of the waste is not produced by residents; it is generated by tourists and through importation. In the Caribbean alone, it is estimated that about 75 million-night stays per year yield roughly 166 million tons of tourism-related waste per year (GEO SIDS Outlook, 2014). As SIDS continue to depend heavily on imports and tourism, the quantities of waste generated will continue to increase (SPREP, 2016) and the impact on human and soil health, biodiversity, and ecosystems<sup>2</sup>, livelihoods and recreational services will worsen<sup>3</sup> and this will affect resilience to natural disasters.

The above multi-dimensional development challenges have persisted in Caribbean SIDS due to their small landmasses, vulnerable economies, and heavy dependence on external energy resources, coupled with rising populations. Evidence shows that, for instance, land needed for waste management is limited in Caribbean SIDS due to small land area and customary land tenures. This has created an unpleasant situation where many Caribbean states have been compelled to establish waste treatment

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<sup>2</sup> Ecosystem services are benefits individuals and society derive from functioning ecosystems (Millennium Ecosystem Assessment, 2003).

<sup>3</sup> SIDS’ vulnerability to waste is partly because they are at the receiving points of marine debris as they are located near ocean gyres (Lachmann et al., 2017).

and disposal sites along coastal areas. Siting waste management infrastructure close to water resources could result in substantial health and environmental problems particularly where landfill sites are not properly managed (Seadon and Giacobelli, 2019). This situation is further exacerbated by climate change and natural disasters such as earthquakes, landslides, hurricanes, and volcanic eruptions. These climatic events cause huge disruptions and significantly affect existing waste management infrastructure in SIDS. The risk of such disruptions is high given that many landfills are located within vulnerable zones or disaster-prone areas. Moreover, it is well known that SIDS are more impacted directly by climate change than other regions of the globe in terms of scope and intensity of impact. Current and predicted climate impacts imply that urgent efforts are needed to support Caribbean SIDS to make communities and ecosystems resilient to the impacts of climate change. Failing to do this might result in counterproductive results towards water, land, and biodiversity resource management, and will hinder the attainment of the SDGs (Brissett, 2018). As the world strives to achieve the sustainable development goals (SDGs), it is important that we pay attention to all regions particularly developing states. Therefore, the Integrating Water, Land and Ecosystems Management in Caribbean Small Island Developing States ([IWeco Project](#)) was developed to address these problems.

This report documents activities and results achieved under the community component of this regional project, executed by the UNDP/GEF Small Grants Programme (SGP).

## 1.2. Overview of the IWeco Project.

IWeco is a multi-focal area regional project implemented in ten 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 (see Figure 1a). The project started in 2016 and is expected to end in 2023. IWeco applies a “Ridge to Reef”<sup>4</sup> approach aimed at integrating watershed and coastal areas management towards addressing the multiple challenges of sustainable water, land, and biodiversity management as well as climate change. The project was designed to support policy, institutional and legislative reforms, contribute to the implementation of effective appropriate technologies to accelerate contribution to global targets on access to safe and reliable water supplies and improved sanitation, and help to improve ecosystem functioning in the Caribbean.

For operational purposes, the project has four components; (1) Development and Implementation of Integrated Targeted Innovative, climate-change resilient approaches in sustainable land management (SLM), integrated water resources management (IWRM) and maintenance of ecosystem services; (2) Strengthening of the SLM, IWRM and ecosystems Monitoring, and Indicators framework; (3) Strengthening of the Policy, legislative and institutional reforms and capacity building for SLM, IWRM and ecosystem services management taking into consideration climate change resilience building and (4) Enhancing knowledge exchange, best practices, replication and stakeholder involvement.

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<sup>4</sup> 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.

Partnership is a core tenet of IWEco thus, the project is being implemented through a wide network of international, regional, and national stakeholders. The project is funded by the Global Environment Facility (GEF): (i) country GEF STAR allocations under Land Degradation and Biodiversity portfolios for national interventions and supported by (ii) funding from the GEF International Waters and Sustainable Forest Management portfolios for regional-level actions. IWEco is implemented at three geographical scales: 1) regional level; 2) national level; and 3) community sub-projects. UNEP is the lead implementing agency for regional and national sub-projects, while UNDP implements activities aimed at supporting community-based livelihood opportunities and environmental management. The Secretariat to the Cartagena Convention, UNEP’s Caribbean Regional Coordinating Unit and the Caribbean Public Health Agency are the Project’s co-Executing Agencies within the region.

The Project Objective is to contribute to the preservation of Caribbean ecosystems that are of global significance and the sustainability of livelihoods through the application of proven approaches that are

**Box 1: Impacts to be delivered through IWEco.**

1. Measurable stress reduction at project sites across the eight participating countries through appropriate sustainable water, land, and ecosystems management interventions that account for climate change.
2. Enhanced livelihood opportunities and socio-economic co-benefits for targeted communities from improved ecosystem services functioning.
3. Strengthened national and regional systems for monitoring of environmental status with respect to key international agreements.
4. Strengthened policy and legislation for the effective management of water, land and ecosystems resources that account for climate change.
5. Strengthened capacity of national and regional institutions and other stakeholders for water, land, and ecosystems management that accounts for climate change.
6. Improved engagement and information access for practitioners and other stakeholders through targeted knowledge sharing networks.

appropriate for SIDS (see Box 1 for IWEco’s expected impacts). IWEco contributes directly to the SDGs particularly Goals 6 (clean water and sanitation), 13 (climate action), 14 (life on land), 15 (life of land) and Goal 17 (partnerships for the goals). As indicated, IWEco is implemented at regional, national and community levels, to ensure efficient implementation and help address national and community-specific needs while pooling resources together to deal with regional challenges. This document, however, focuses on the community component.

### 1.3. Structure of report

This document is structured into six chapters. Following this introductory chapter, Chapter 2 provides an overview of the community component of IWEco, with a summary of community projects, their funding and expenditure, and implementation success/achievements. Chapters 3-5 focus on 10 community case studies, highlighting project context, implementation, key results, and lessons learned. All ten case studies fall under three themes with each theme having a corresponding chapter: Chapter 3 focuses on sustainable livelihoods, Chapter 4 focuses on waste management, while Chapter 5 focuses on ecosystems restoration and management. Finally, Chapter 6 presents a synthesis of findings and lessons, and concludes with recommendations on capacity building, collaboration, and integrated approaches. The information presented in this document is based on data from different sources (see Box 2).



**Figure 1. IWeco project countries.**

**Box 2: Data sources for this report.**

1. Key reports and peer-reviewed journal articles (see references at the end of this report).
2. IWeco project proposal, monitoring reports and grantees' proposals and monitoring reports for sub-projects.
3. Two sets of self-completed questionnaires by grantee partners (1 for all 55 grantees, and 1 for 10 grantees towards case study development).
4. Ad hoc virtual interviews with grantees.
5. Three interactive virtual sessions with SGP national coordinators (NCs).
6. Project closure workshop with NCs and grantees.

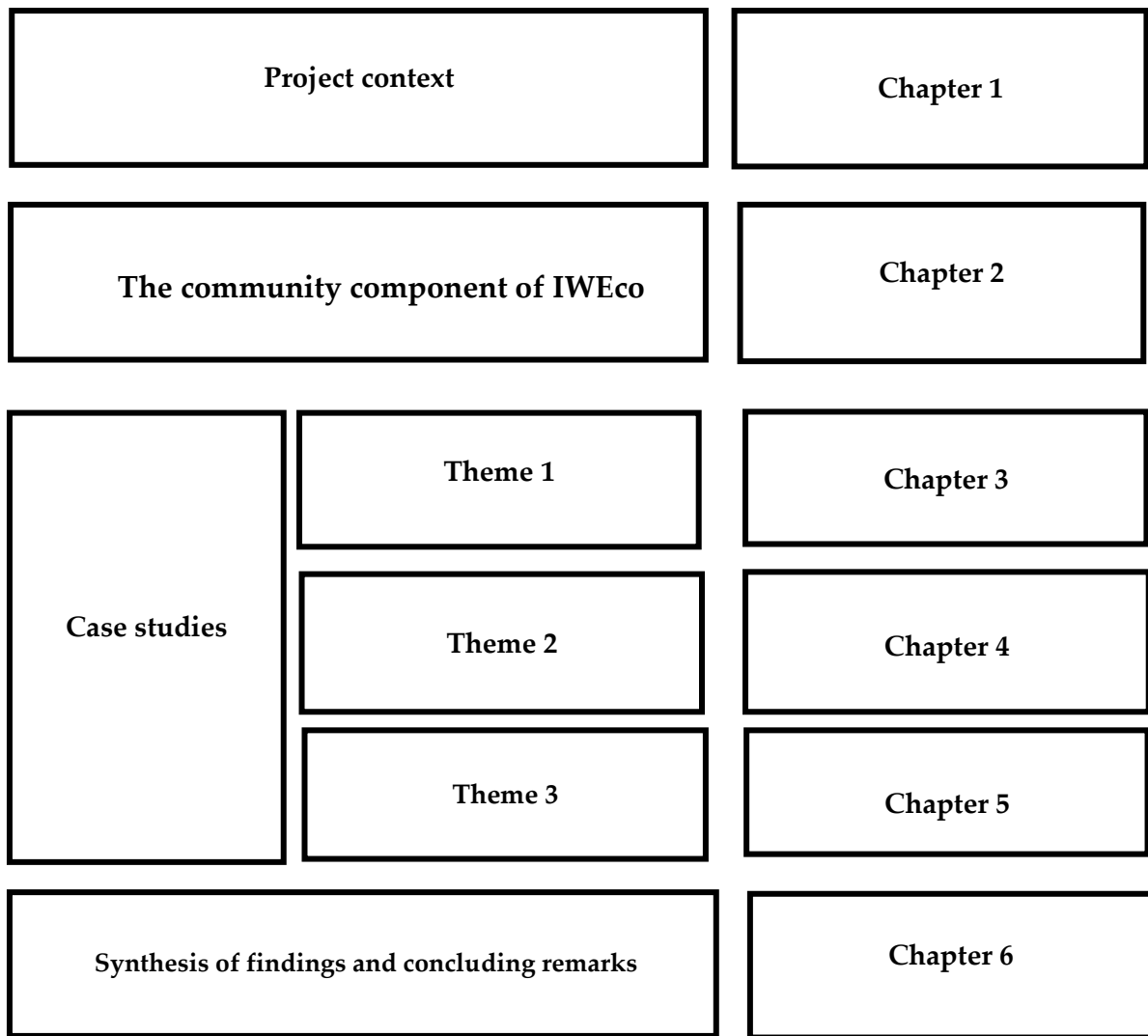


Figure 2. Structure of the document.



## CHAPTER 2

### THE COMMUNITY COMPONENT OF IWEco

#### 2.1. Overview of community component and key results

As indicated in section 1.2, 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 sub-projects given its well-established presence on the ground, its track record in fostering multi-stakeholder partnerships and high levels of stakeholder engagement, and ability to empower communities through community-driven sustainable development projects<sup>5</sup>. SGP can leverage its limited 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.

SGP implemented activities under the fourth component of the IWEco project: “Enhancing knowledge exchange, best practices, replication and stakeholder involvement”. The SGP projects are initiatives that are closely associated with and support the national projects of IWEco while other activities support wider IWEco objectives. All community projects under IWEco were completed in April 2022. Overall, there were 55 community subprojects: 22 IWEco and 33 SGP funded projects in support of IWEco implementation (Figure 2, see also Table 1). Figure 2 shows that Saint Kitts and Nevis implemented the highest number of community projects (10) while Saint Vincent and the Grenadines and Barbados implemented the least. The community projects focus on baseline assessments, awareness raising, outreaches and capacity building, technical and technological support, and address water pollution, and scarcity, land degradation, forest cover loss and ecosystems degradation, and poor waste management and pollution. Some projects also support the creation, and enhancement of sustainable livelihoods, climate mitigation and adaptation, and blue economy development.

Of the total GEF grant of US\$20,722,571, \$1 million funding (including management cost) was allocated to UNDP. Of the \$1,000,000, \$633,309.19 was directly implemented as funds to support local people and communities through small grants, and the remainder was used for technical support, capacity

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<sup>5</sup> Since its launch in 1992, the SGP has been supporting community-based actions on global environmental issues, while improving livelihood and reducing poverty. SGP provides grants of up to \$50,000 (and on average \$25,000) directly to civil society and community-based organizations. Since its inception, the Programme has supported over 26,000 projects implemented by civil society and community-based groups in 136 countries.

development, monitoring and evaluation, knowledge management and communications, as well as service cost of the executing agency, United Nations Office for Project Services (UNOPS). SGP provided matching funds of \$1,404,511.01 for disbursement as small grants among participating countries. It must be noted that though Barbados did not receive IWECO funds for national activities, it supported projects that are aligned with IWECO priorities. The total co-financing mobilized for the community component is estimated at \$2,507,714.61 (See Annex 1). Therefore, both IWECO and SGP funded projects registered a co-financing ratio of 1: 1.2. This implies that, for every dollar implemented by IWECO and SGP, another \$1.2 was secured via co-financing by the projects.

Generally, implementation of the community component was satisfactory except for a few cases where significant local challenges resulted in major setbacks. Only one (1) project (*STL/SGP/OP6/Y4/IWECO/IW/18/07 Connecting cooperatives to the SDGs and commencing the formative stages of building climate change resilience in the fisheries sector in Saint Lucia*) was terminated because the grantee folded up.

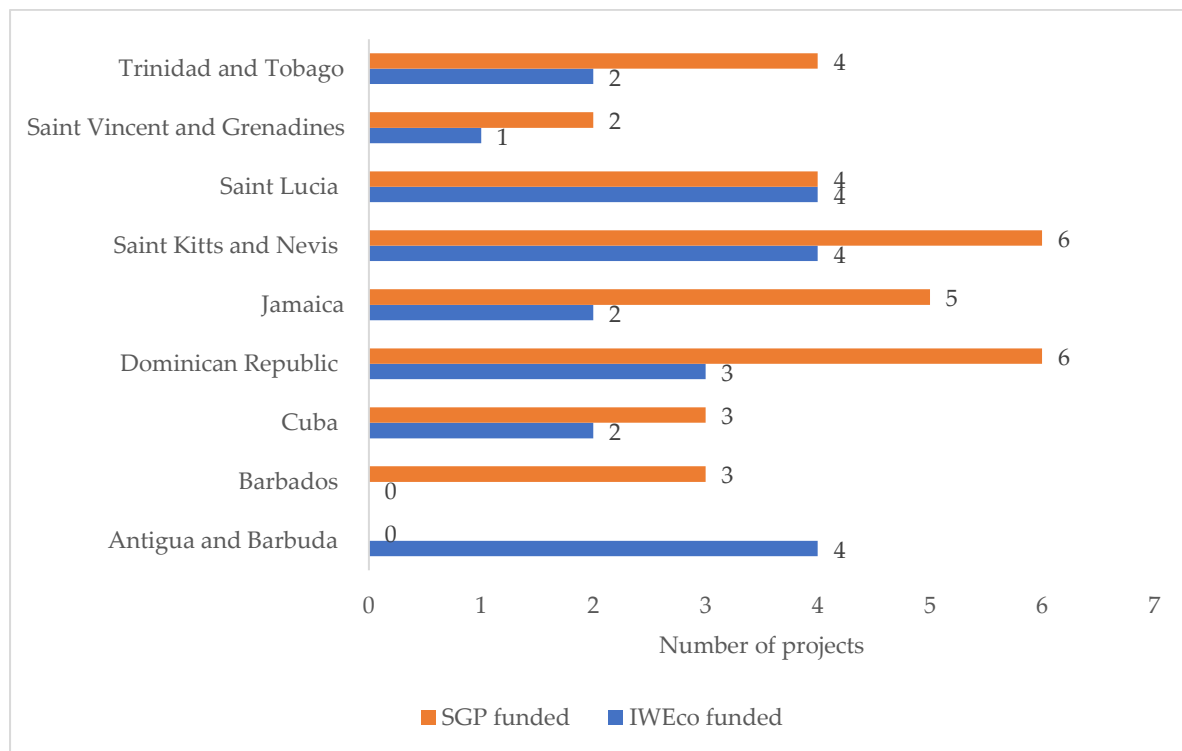


Figure 3. Number of projects by funding source.

**Table 1. List of subprojects under the community component.**

IWEco Countries	Projects	Project Code	Grants (\$)	Co-financing
<b>Antigua and Barbuda</b>				
IWEco Funded	4	ATG/SGP/OP6/IWECO/01 Creating value from coconut waste	5,000.00	2,800.00
		ATG/SGP/OP6/IWECO/02 Innovation in the use of microalgae cultivation, using sequestered CO2 from exhaust gases and nutrients from wastewater treatment	5,000.00	3,000.00
		ATG/SGP/OP6/Y3/IWECO/03 Metal recycling for ecosystem protection and community empowerment	50,000.00	6,000.00
		ATG/SGP/OP6/IWECO/04 Antigua Beekeepers Co-operative Society	25,000.00	0.00
<b>Barbados</b>				
SGP Funded	3	BAR/SGP/OP6/Y2/CORE/BD/17/01 Engaging the community and building capacity for coral reef restoration	49,525.00	95,675.00
		BAR/SGP/OP5/Y4/CORE/BD/16/09 Participatory management for the Barbados Marine Management Area	46,540.00	40,820.00
		BAR/SGP/OP6/Y2/CORE/BD/17/02 Protected areas conservation and management programme for young citizen scientists	50,000.00	13,550.00
<b>Cuba</b>				
IWEco Funded	2	CUB/IWECO/17/01 Conservation and sustainable management of natural resources for the benefit of the community in Rincon de Guanabo	20,932.39	117,000.00
		CUB/IWECO/17/02 Reduction of contaminants from swine farming in areas of the San Juan watershed, Santiago de Cuba province	34,104.80	70,000.00
SGP Funded	3	CUB/SGP/OP5/Y8/STAR/LD/19/04 Reduction of the degradation of the soils of the Community El Mango	50,000.00	107,153.00
		CUB/SGP/OP6/Y4/STAR/BD/19/11 Conservation of fish biodiversity by the marine community "El Perché" in Cienfuegos, Cuba. (PRO-BIOMAR Project)	50,000.00	55,000.00
		CUB/AUSAID/19/01 Apoyo a la transformación digital para la adaptación al cambio climático en la ciudad de Cienfuegos	30,000.00	25,000.00
<b>Dominican Republic</b>				
IWEco Funded	3	DOM/SGP/OP6Y3/IWECO/BD/2018/01 Beekeeping in the communities of the Yerba Buena and Mata Palacio Municipalities	24,500.00	31,205.50
		DOM/SGP/OP6Y3/IWECO/CH/2018/02 Rehabilitation of the Higuamo River	24,500.00	29,577.63
		DOM/SGP/OP6Y4/IWECO/BD/2018/03 Desarrollo de la Apicultura sostenible en Gonzalo, Los Limones y Mango Fresco, Cuenca del río Higuamo	38,500.00	49,343.00
SGP funded	6	DOM/SGP/OP6Y4/STAR/LD/2018/16 Recuperación de la cobertura forestal mediante la conservación de suelos y el manejo sostenible del bosque en la parte media y alta del río Tocino	26,000.00	39,862.60
		DOM/SGP/OP6Y4/STAR/BD/2018/22 Restauración de corales con participación comunitaria en Las Terrenas	25,000.00	28,860.00
		DOM/SGP/OP6Y4/STAR/BD/2018/23 Proyecto Piloto de Captura, Engorde y Liberación de Peces Loro para Incentivar la Recuperación de las Poblaciones	28,000.00	56,260.00
		DOM/SGP/OP6Y4/STAR/BD/2018/24 Apicultura Comunitaria Sostenible	26,000.00	51,924.00
		DOM/SGP/OP6Y4/STAR/BD/2018/25 Producción Agroecológica Integral y sostenible "Cabral Puede"	25,000.00	38,670.00
		DOM/SGP/OP6Y5/CORE/BD/2019/11 Creación de microempresa rural sostenible para empoderar económicamente a la población joven	17,600.00	29,655.87
<b>Jamaica</b>				
IWEco Funded	2	JAM/IWECO/2017/01 Biodiversity restoration through community engagement in the Portland Blight Protected Area	43,000.00	24,704.00
		JAM/IWECO/2017/02 Evaluating coastal water quality at Discovery Bay to improve capacity for environmental management	44,500.00	16,625.00
SGP funded	5	JAM/SGP/OP6/Y4/CORE/IW/2019/01 Persons with Disabilities Protecting the Marine Ecosystems in the Negril Environment Protection Area while Generating Sustainable Livelihoods	50,000.00	57,900.00

		JAM/SGP/OP6/Y5/CORE/YCC/2019/02 Mitigating the Impacts of Climate Change through the Albion Heights Green Community Project	65,000.00	65,000.00
		JAM/AusAID/2019/10 Building Resilience and Adaptation to Climate Change and Disaster Risk Reduction of Persons with Disability and other Vulnerable Groups in Jamaica	47,000.00	59,592.00
		JAM/AusAID/2019/11 Climate Change Training and Capacity Building for NGOs/CBOs and Persons with Disabilities	30,000.00	30,000.00
		JAM/SGP/OP6/Y5/STAR/BD/2020/01 Conserving the Natural Resources through Innovative Agricultural Techniques in the Negril Environmental Protection Area	41,400.00	81,400.00
<b>Saint Kitts and Nevis</b>				
IWEco Funded	4	STK/SGP/IWECO/18/01 Preserving the natural environment and contributing to the Island of Nevis' Reforestation Programme	32,500.00	56,665.00
		STK/SGP/IWECO/18/02 Water harvesting and storage to supply organic farm system	26,400.00	35,129.00
		STK/SGP/IWECO/18/03 Youth involvement to promote the sustainable use of water, land and ecosystem resources in St. Kitts and Nevis	11,350.00	0.00
		STK/SGP/IWECO/18/04 St. Peter's water harvesting and storage community project	5,900.00	3,000.00
SGP funded	6	STK/SGP/OP5/Y4/CORE/LD/15/15 Combating land degradation on the historic New River and Coconut Walk coastline	150,000.00	304,331.00
		STK/SGP/OP6/Y2/CORE/17/04 Addressing the dynamic human/nonhuman primate interface in Nevis with an aim to demonstrate practical measures to alleviate the human nonhuman primate conflict through reforestation, electrified fencing, job creation and training	40,000.00	58,462.00
		STK/SGP/OP6/Y3/CORE/18/01 Youth Creativity for Eco Sustainability	33,255.64	70,800.00
		STK/SGP/OP6/Y4/CORE/18/03 Establishment of the Irma Didier Garden for the conservation of the floral biodiversity of St. Kitts and Nevis and to demonstrate soil conservation practices and the use of green (clean) energy	28,000.00	44,073.00
		STK/SGP/OP6/STAR/19/01 Rehabilitation of the Mansion Bay to support biodiversity conservation, community use and livelihood development	48,582.00	31,501.00
		STK/SGP/OP6/STAR/20/02 Monitoring the Status of Terrestrial Bird Species at the Central Forest Reserve in St. Kitts	20,000.00	53,456.00
<b>Saint Lucia</b>				
IWEco Funded	4	STL/SGP/OP6/Y4/IWECO/IW/18/07 Connecting cooperatives to the SDGs and commencing the formative stages of building climate change resilience in the fisheries sector in Saint Lucia	3,243.00	8,443.00
		STL/SGP/IWECO/LD/19/01 Implementation of an Agro-Tourism Park in the Upper Section of the Soufriere Watershed – Phase 1	28,393.00	28,393.00
		STL/SGP/IWECO/LD/18/01 Building consensus for the establishment of the St. Jacques agro-tourism landscape fond	5,000.00	6,334.00
		STL/SGP/IWECO/LD/17/01 Sustainable employment for youth using indigenous fruits in and outside of the Qualibou Caldera	33,242.00	21,519.00
SGP funded	4	STL/SGP/OP6/Y3/CORE/LD/17/01 Agroforestry and Creation of Livelihoods in the Middle and Lower Stages of the Millet/Roseau River, Saint Lucia.	39,275.00	22,122.00
		STL/AUSAID/2019/12/01 Building Resilience to water shortages in the communities of Lamaze and Monzie, Choiseul, St. Lucia	30,000.00	33,113.00
		STL/SGP/OP6/Y5/CORE/LD/19/10 Contributing to Food Security through Aquaponics among youth by establishing a self-sustaining system	1,148.00	1,186.00
		STL/SGP/OP6/Y5/CORE/IW/20/05 Livelihoods and Sustainable Mariculture (Spiny Lobster and Sea Moss Training) in Savannes Bay, Vieux Fort, Saint Lucia.	3,753.00	4,455.00
<b>Saint Vincent and Grenadines</b>				
IWEco Funded	1	SVG/SGP/OP5/IWECO/LD/19/02 Sandy Bay Eco-Tourism, Cultural and Development Project	85,244.00	19,176.00
SGP Funded	2	SVG/SGP/OP6/Y5/CORE/BD/19/05 Blue Growth on the Grenadines through Opportunities for Sustainable Livelihoods	150,000.00	122,314.81
		SVG/SGP/OP6/Y4/CORE/LD/20/03 Maderia Valley Heritage Park Pilot Phase II: Upgrading for Water Management Infrastructure and Agro-Forest Museum & Cultural Orientation Centre	50,000.00	44,085.66
<b>Trinidad And Tobago</b>				

IWEco Funded	2	TRI/IWECO/2018/02 Abandoned quarry-site rehabilitation at national quarries	43,500.00	14,802.54
		TRI/IWECO/2018/01 Building climate resilience through community-led rehabilitation	43,500.00	0.00
SGP Funded	4	TRI/SGP/OP6/Y2/CORE/BD/17/03 Enhancing National Health Standards in Aquaculture Systems: Increasing Aquaculture Productivity, Improving Industry Sustainability and Reducing Deleterious Aquatic Habitat Impacts	49,955.37	216,117.00
		TRI/SGP/OP6/Y3/CORE/BD/17/04 The Marine Environment Education Programme in Trinidad and Tobago (MEEPTT)	48,499.00	50,448.00
		TRI/SGP/OP5/Y5/CORE/CH/18/07 Community Based Solid and Liquid Waste Reduction Project in Castara	49,978.00	27,216.00
		TRI/SGP/OP6/Y5/CORE/CC/20/01 Cashew Community Composting and Biodegradable Utensils	5,000.00	3,995.00
		Grants / Co-financing	\$2,037,820.20	\$2,507,714.61

## 2.2. Contribution to IWeco objectives and the SDGs

Figure 4 summarizes key results of the 55 community sub-projects. All community projects contributed in diverse ways to the objectives of the IWeco project. For instance, through training, capacity development and the installation and operation of 407 productive facilities (Figure 4), the community sub-projects are contributing to enhance livelihood opportunities and socio-economic co-benefits for targeted communities, an important objective of the IWeco project (Box 1). Other community sub-projects focused on using scientific and participatory techniques to assess and monitor the conditions of water and ecological resources such as the Discovery Bay in Jamaica, and coral reefs on the west coast of Barbados. Such projects are contributing to strengthening regional systems for monitoring of environmental status, another important objective of IWeco. Nearly all 55 community sub-projects involved extensive stakeholder engagement, dissemination of knowledge and capacity building and thus contributed to another objective of IWeco, “improved engagement and information access for practitioners and other stakeholders”. Sub-projects in Antigua and Barbuda, Barbados, and Saint Vincent and the Grenadines have influenced government legislation in ecosystems restoration and management as well waste management. Put together, all 55 projects are expected to contribute to the overall objective of IWeco, “to contribute to the preservation of Caribbean ecosystems that are of global significance and the sustainability of livelihoods”.

The community projects implemented under IWeco contribute 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 contributes towards the attainment of 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 disabled persons in community projects. SDG 12 (responsible consumption and production) is also being contributed to, as, for example, a smoothie company in Saint Lucia has now replaced around 4,800 plastic items used per annum with biodegradable packaging materials; and reduced the amount of water used from 35 pounds to 20 pounds per month through 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 contributes 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 m<sup>3</sup> of detergent from entering waterbodies thus contributing to conservation and sustainable use the oceans, seas and marine resources for sustainable development (SDG 14). The community sub-projects also contribute 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.



**Figure 4. Harmonized Theory of Change based on TOCs of community sub-projects**

**Note:** The results presented here are based on information obtained on 39 projects. Not all grantee partners completed the final review questionnaire during the survey.

### 2.3. Overview of case studies (selected projects)

Like many projects, the implementation of the community sub-projects was fraught with many challenges and lessons. In chapters 3-5, we present 10 case studies from nine countries: Antigua and Barbuda (1); Barbados (1); Cuba (1); Dominican Republic (1); Jamaica (2); St Kitts and Nevis (1); St Lucia (1); Trinidad and Tobago (1); and St Vincent and the Grenadines (1). 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 (Table 2). Each theme has a corresponding chapter: Chapter 3 focusing on Sustainable livelihoods, Chapter 4 presents case studies on the Waste management theme while Chapter 5 captures case studies on Ecosystems management and restoration.

**Table 2. Summary of case studies.**

Chapter/ Theme	Case study ID and title	Country	Results	
			Environmental	Socio-economic
Chapter 3: Sustainable livelihoods	1. Sustainable employment for youth using indigenous fruits in and outside of the Qualibou Caldera.	St. Lucia	<ul style="list-style-type: none"> <li>- Replaced about 4,800 plastic items (cups and straws) used per annum with biodegradable packaging materials;</li> <li>- Reduced amount of water used from about 35 pounds to 20 pounds per month through replacing the use of ice with frozen pulp of fruits in smoothie preparation;</li> <li>- Contributed to reducing the business's carbon footprint by implementing a strictly 'no dairy' policy for smoothies and using energy-efficient appliances;</li> </ul>	<ul style="list-style-type: none"> <li>- Provided employment for over 25 young people;</li> <li>- Provided readily available market for about 65 local farmers;</li> <li>- About US\$5,280 is being generated annually through sales of the locally made smoothies;</li> <li>- Further impacts on local economy as other small-scale businesses are being created;</li> </ul>
	2. Blue Growth on the Grenadines through Opportunities for Sustainable Livelihoods.	St. Vincent and the Grenadines	<ul style="list-style-type: none"> <li>- By providing sustainable alternative livelihoods, this project reduces over-fishing – a major driver of the decline in herbivorous fish biomass;</li> </ul>	<ul style="list-style-type: none"> <li>- Provided long term income for more than 30 people (in selling raw sea moss to local and international markets);</li> <li>- The sale of black mangrove honey has provided additional source of income for some people to the tune of US\$3,000.00;</li> <li>- Influenced national policy as the project's recommendations have been included in the national agenda for development;</li> </ul>
	3. Harvesting and Storing Water to Adequately Supply an Open Organic Farm System.	St. Kitts and Nevis	-	<ul style="list-style-type: none"> <li>- Provided members of The Gideon Force Agricultural Co-operative Society Limited with skills that can be used in the construction sector to earn additional income;</li> <li>- Improved farmers' access to water;</li> </ul>
Chapter 4: Waste management	4. Educational and Empowerment pathways for metal recycling in Antigua and Barbuda.	Antigua and Barbuda	<ul style="list-style-type: none"> <li>- Installed a granulator expected to divert 30 tonnes of metal waste annually from burning;</li> </ul>	<ul style="list-style-type: none"> <li>- Created employment for 11 persons;</li> <li>- Set up a wire stripping centre that provides cleaner and healthier work conditions under which landfill waste pickers can process their recyclable wire scrap;</li> </ul>
	5. Reduction of pollutants, resulting from the pig production in areas located in San Juan River basin, province of Santiago de Cuba.	Cuba	<ul style="list-style-type: none"> <li>- Prevents the daily dumping of 4,510 kg of pig feces into the basin, without treatment;</li> <li>- Installed and operationalized tubular biodigesters expected to prevent the emission of 1,144,822.5 cubic meters of CO<sub>2</sub> in their 15 years of useful life;</li> </ul>	<ul style="list-style-type: none"> <li>- Reduced over 50 households' monthly electric energy consumption expenditure by approximately 50% (from US\$15.53 to US\$7.77 per month);</li> </ul>



			- Over 50 households switched from using fuelwood (for cooking) to biogas;	
	6. Evaluating Discovery Bay Inshore Coastal Water Quality to Improve Capacity for Environmental Management.	Jamaica	- Helped to identify water pollution hotspots; - Improved awareness due to the dissemination of water quality and survey results among key stakeholders;	- 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 (between \$ 390 and 455) per month;
Chapter 5: Ecosystems management and restoration	7. Engaging the community and building capacity for coral reef restoration.	Barbados	- Rehabilitated coral reef ecosystems to improve the management of the landscape and the seascape within a total area of 13,000 hectares;	- The restoration of the coral reef ecosystems along the coastal stretch of Barbados contributes approximately 12 million US dollars in terms of value to recreation and tourism only; - Influenced the Government of Barbados policy pertaining to coastal zone management and ecosystem restoration;
	8. Beekeeping in communities of the municipalities of Yerba Buena and Mata Palacio.	Dominican Republic	- Restored 15 hectares of land on the banks of the Higüamo and Maguá Rivers.	- 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;
	9. Biodiversity Restoration in the Portland Bight Protected Area through community engagement.	Jamaica	-	- Provided income generation opportunities for 36 persons: 16 males and 20 females;
	10. Abandoned Quarry Site Rehabilitation Project at National Quarries, Turure Road, Sangre Grande.	Trinidad and Tobago	- Restored around nine 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.	- Trained and introduced 30 community members to alternative livelihood opportunities, including the production of sustainable handicrafts made from vetiver grass.

## CHAPTER 3

### SUSTAINABLE LIVELIHOODS

1. *Sustainable employment for youth using indigenous fruits in and outside of the Qualibou Caldera.*
2. *Blue Growth on the Grenadines through Opportunities for Sustainable Livelihoods.*
3. *Harvesting and Storing Water to Adequately Supply an Open Organic Farm System.*

### 3.1. Case study 1

Project Title	Sustainable Employment Creation by Young People Using Indigenous Fruits from within and without the Qualibou Caldera
Project number	STL/SGP/IWECO/LD/17/01
Country and Region	Saint Lucia/ Soufriere
Number of people served	386 persons Both Locals and Tourist
Location	Soufriere
Financing	\$36,936.00
Start Date	November 17 <sup>th</sup> , 2017
End Date	May 31 <sup>st</sup> , 2018

#### 3.1.1. Context

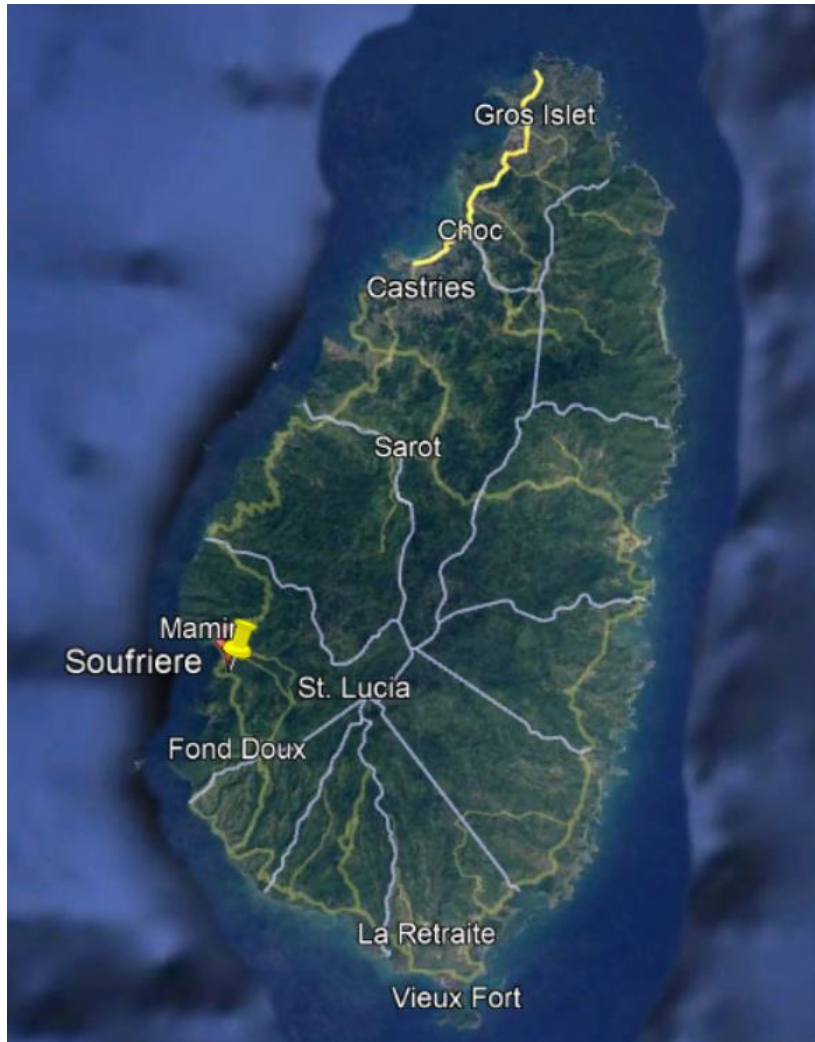
The Soufriere region (Photo 1) is rich in natural and geological resources such as The World’s Only Drive in Volcano, World Heritage Site – The Twin Peaks. These resources support the two major economic drivers within the landscape, tourism, and agriculture<sup>6</sup>. However, despite its rich geological resources and seeming potential, it is assessed as the third poorest on the island, with 60% youth unemployment (nearly twice that of the national average<sup>7</sup>). 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 neighboring 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 in Saint Lucia.

The high level of unemployment is leading to higher levels of juvenile delinquency; comparatively high level of mendicancy; 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, this United Nations Environment Programme (UNEP)-Global Environment Facility (GEF)-funded Integrating Water, Land and Ecosystems Management in Caribbean Small Island Developing States (IWEco) sub-project was initiated in November 2017 in Soufriere (Photo 1). The project aim was to provide sustainable alternative livelihoods for the youth using indigenous resources largely within; but also, outside the landscape. By doing this, the project hopes to improve conservation and sustainable use, and management of important terrestrial and coastal/marine ecosystems through implementation of community-based landscape/seascape approaches and to lower emissions using low carbon energy access solutions. This contributes to the objectives of the Cartagena Convention, with which St. Lucia is a long-term partner. The project was executed by Fruitage Jeunesse with financial and technical support from the Small Grants Programme (SGP) - St

<sup>6</sup> [The service sector is the largest sector, accounting for 82.8% of the country’s gross domestic product \(GDP\).](#)

<sup>7</sup> [USAID Brings Together Youth, Other Stakeholders to Co-Create Education Project in Saint Lucia \(workwithusaid.org\)](#)

Lucia, the Caribbean Local Economic Development Project (CARILED), and Soufriere Regional Development Foundation.



**Photo 1. Map of Saint Lucia showing Soufriere**

### 3.1.2. Implementation

The project consists of two main components. The first component involved training and capacity building. Between August and September 2018, about 20 young people aged 18-30 were trained in workshops on Food Hygiene and Preparation, Customer Service, Team Building and Institutional Strengthening, Basic Accounting and Software to help them understand the fundamentals of establishing and managing a business. 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 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 component 2, the equipment and tools needed for the establishment of a Smoothie Booth at the World's – Only- Drive-in Volcano were provided to Fruitage Jeunesse. Following this, a smoothie outlet, a youth agro-enterprise was established at the World's Only Drive-in Volcano, the Sulphur Springs (Photos 2 - 4). This enterprise is expected to contribute to local economic development by purchasing seasonal fruits from young farmers within the region. Therefore, a strategic partnership was established between five young farmers in Soufriere and Fruitage Jeunesse Smoothies. This partnership is expected to ensure a readily available market for young farmers and, on the other hand, 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 business demands). This arrangement is based on trust and not binding.



Photo 2. Fruitage Jeunesse Outlet at the World's Only Drive-in Volcano, the Sulphur Springs.



Photo 3. Co- Founders of Fruitage Jeunesse Smoothies Chrisna St. Brice & Windia Jaunai



Photo 4. Residents of Soufriere enjoying Fruitage Jeunesse’s smoothies at the Soufriere Beach Park

### 3.1.3. 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 to serve their smoothies; from the straws to the smoothie cups are all biodegradable items. 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 Saint 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 seven bags ( $\approx 35$  pounds) of water were used per month for business activities. However, this has been reduced to four bags ( $\approx 20$  pounds) per month. The reduction in water use and wastage was achieved through changes in the smoothie preparation practices. For instance, before this project, the classical system of using ice was practiced, however, Fruitage Jeunesse now uses frozen pulp of the fruits, which has replaced and avoided 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 strictly ‘no dairy’ policy for smoothies and avoiding plastic packaging.

Economically, this project has contributed to reducing unemployment and generating incomes in Saint Lucia. Fruitage Jeunesse has provided employment for over 25 young persons within the communities of Fond Saint Jacques, Soufriere, and Choiseul. These job opportunities were offered from the construction of the two kiosks, to the day to day running of the business. Such employment opportunities included carpenters, painters, electricians, plumbers, and masons. 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 demands.

Through sales of the locally made smoothies, about \$1200 Eastern Caribbean (≈US\$440) is being generated monthly at both the Soufriere Beach Park and the booth at the World's- Only- Drive- in Volcano, the Sulphur Springs Park. This amounts to an annual income of US\$5,280. The income paid to one of the employees of Fruitage Jeunesse has assisted her to create her own small business. Overall, the sustainable livelihoods created through this project is assisting in bringing a decent living to many households in Saint Lucia thus contributing to sustainable economic growth.

#### 3.1.4. Lessons Learned, Challenges, Upscaling and Replication

As the business depends largely on tourism and other recreational activities, the onset of the COVID-19 pandemic posed major challenges to their activities due to lockdowns. For instance, 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 impacted 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.

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 Saint Lucia i.e., the Sulphur Springs; 2) using some of Saint Lucia's tourist attractions as names of their smoothies such as Sulphur Blast, Qualibou, King Louis XVI; this has attracted customers from around the world who visit their branches since the idea is '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 behavior, which in turn promotes consumers' 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 – 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 as far as Vieux-fort, a community that is 11 miles away from the business. 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 Soufriere Beach Park (Photo 2). There are clear plans to replicate the ideas of the project. For instance, Fruitage Jeunesse aims to establish another outlet at Saint 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 which 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 Saint Lucia. This initiative, if implemented, would have positive socio-economic impacts on the island of Saint Lucia. However, due to the financial constraints that Fruitage Jeunesse Smoothie is facing, as a result of the COVID-19 pandemic, this idea cannot be initiated. 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.



## 3.2. Case study 2

Project Title	Blue Growth on the Grenadines through Opportunities for Sustainable Livelihoods
Project number	SVG/SGP/OP6/Y5/CORE/BD/19/05
Country and Region	St. Vincent and the Grenadines (Eastern Caribbean)
Number of people served	About One Hundred and Fifty (150) persons
Location	Union Island and Mayreau (St. Vincent and the Grenadines), Eastern Caribbean
Financing	US\$150,000.00
Start Date	January 1 <sup>st</sup> , 2019
End Date	June 30 <sup>th</sup> , 2021

### 3.2.1. Context

Coral health monitoring conducted by 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. The critically low status of the biomass of herbivorous fish are due to overfishing, diseases, and the decline in the quality of water in which these aquatic organisms live. These local causal factors are not peculiar to the Grenadines as a global review has shown that biomass is more than twice as high in geographical regions not accessible to fisheries relative to [fisheries-accessible locations](#)<sup>8</sup>. This problem has been linked to poor management of Marine Protected Area sites (MPAs) and puts the Grenadines' coral reefs in an extremely fragile situation. With such low herbivorous fish biomass, a major disturbance at this time – such as a hurricane or mass bleaching event – could well result in a phase shift to a [degraded algal dominated system](#). Once such a shift occurs, it is extremely difficult to reverse. While from an ecological perspective weaker coral reef systems provide in general a risk to coastal ecosystems, from a socio-economic standpoint, the decline in stocks of the main commercially targeted species is having a serious negative impact on the livelihoods of fisherfolk 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 IWeco subproject in the Grenadines. Given that over-fishing 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 mari-culture (sea moss), and value-added seafood products. By providing such sustainable alternative livelihoods, education, and capacity building on best management practices of MPAs, the project is likely to substantially reduce over-fishing, and marine ecosystems will be managed sustainably to ensure the survival and growth of herbivorous fish biomass and ecosystems more broadly.

<sup>8</sup> Edwards, C.B., Friedlander, A.M., Green, A.G., Hardt, M.J., Sala, E., Sweatman, H.P., Williams, I.D., Zgliczynski, B., Sandin, S.A. and Smith, J.E., 2014. Global assessment of the status of coral reef herbivorous fishes: evidence for fishing effects. *Proceedings of the Royal Society B: Biological Sciences*, 281(1774), p.20131835.

The specific objectives of the project include: 1) To introduce the Flow Hive technology to Union Island to reduce labour time and increase honey production from 6 gallons per month to 12 gallons during the first year of the project; 2) To increase by 40% the export of dry sea moss by Mayreau Explorers and the Ashton Multipurpose Cooperative combined; 3) To improve on the marketing and branding of the sea moss and honey production businesses on Mayreau and Union Island respectively by re-designing their logo and packaging within the first 12 months of the project; 4) To educate the public on best management practices aimed at reducing water pollution and ecosystem degradation. This project was implemented on Union Island (Photo 1) 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).



Photo 1. Map of St. Vincent and the Grenadines with project implementing site on Union Island and Mayreau highlighted in yellow circle.

### 3.2.2. Implementation

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

SusGren introduced the Flow Hive System, a new technology to harvest honey (Photos 2-5). This technology is an upgrade of the traditional technology which is the Langstroth Hive. The Flow Hive is a designed where the bees fill the honey cells and cap them off. When the cells are full, you insert the

Flow Key which splits the cells, and honey flows out through tubes thanks to gravity. There is also no need to remove the cells or smoke the bees and it also minimizes the disturbances to bees (see link for how the hives work at [SusGren \(Grenadines NGO\) - Flow Hive harvest | Facebook](#)). 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 Apiculturist, this novel technology is expected to reduce the mortality rate of bees by 80% during the harvesting process.

Another first for the country of Saint Vincent and the Grenadines through the project was the construction of a sea moss processing facility on the island of Mayreau (Photo 6). The sea moss is sustainably harvested using two types of system: either vertical on ropes, or horizontal on ropes (Photos 7-10). To ensure that the sea moss is managed sustainably, the sea moss (plant) is cut 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 between 4 – 6 weeks for the plant to mature in time for harvesting. To boost sales and enhance sea moss and honey-based livelihoods, SusGren conducted training in marketing and sales for sea moss and honey groups in the areas 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.

To directly address the declining biomass of fish species, SusGren has been working between Grenada and Saint 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.



Photo 2. Flow Hive Facility on Union Island.



Photo 3. Bees in Flow Hive facility.



Photo 4. Constructed honey facility on Union Island, St Vincent and the Grenadines



Photo 5. GEF – SGP National Coordinator looking at a bottle of honey at the honey facility on Union Island, St Vincent and the Grenadines.



Photo 6. Handing over of sea moss facility on Mayreau, St Vincent and the Grenadines.



Photo 7. Ashton Multipurpose Cooperative Sea Moss farming – Union Island, Saint Vincent and the Grenadines.



Photo 8. Sea Moss Maintenance on Mayreau, Saint Vincent and the Grenadines.



Photo 9. Ashton Multipurpose Cooperative Sea moss farmers on Union Island, Saint Vincent and the Grenadines.



Photo 10. Mayreau sea moss products.

### 3.2.3. Environmental and Socio-economic impacts

This project has the potential to contribute to marine ecosystems management. By providing sustainable alternative livelihoods, this reduces over-fishing – 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 do not compete with seagrass for sunlight. SusGren’s recent monitoring activities have shown that small fish and lobster use sea moss farms as nursery or habitat. Therefore, ensuring that sea moss farms are maintained well helps to provide a good habitat for some marine 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 project implementation was US\$1,000,000.00 as reported in Saint Vincent Times ([Sea Moss Exports From SVG amounted to roughly 1Million In 2020 - NEWS784](#)). Also, the sale of black mangrove honey has provided additional source of income for some people on Union Island to the tune of US\$3,000.00.

This project has also influenced policy in the country as the project's recommendations have now been included in the national agenda for development. For instance, the Cabinet of the Saint Vincent and the Grenadines has approved the components below through a cabinet memo submitted in May 2021. It was prepared by SusGren in collaboration with The Nature Conservancy and the Saint Vincent and the Grenadines Fisheries Division.

- **Component 1** – Assess and determine the most suitable locations for the establishment of sea moss farming sites within the marine space of Saint Vincent and the Grenadines. The main output will be a map depicting the recommended locations for the establishment of sea moss farms along the shorelines of all the islands in Saint Vincent and the Grenadines.
- **Component 2** – Recommend an appropriate licensing system, which will include training and registration of farmers within the sea moss industry. It is hoped that once developed this will be approved by the Cabinet of Ministers.
- **Component 3** – Develop and implement a National Strategic Action Plan for the sea moss industry incorporating the outputs of project Components 1 & 2 above, as well as recommendations related to production, marketing, and distribution of the highest quality sea moss.
- **Component 4** – Implement select activities within the National Strategic Action Plan including farmer training and registration and then provide grants to existing growers to improve their sea moss production.

#### 3.2.4. Lessons Learned, Challenges, and Replication

This initiative was impacted by the COVID-19 pandemic. For instance, procuring needed items like bottles and packaging and sourcing construction materials that were unavailable locally delayed project implementation, resulting in time and cost overruns which 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 facility 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 GEF-SGP funded

project: the previous project implemented by SusGren involved the construction of a two level 12 x 12 ft. bird watching tower. Cost-savings in this project (resulting from partnership) enabled SusGren to use part of the GEF 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 like The Philip Stephenson Foundation (PSF) and the Caribbean Natural Resources Institute (CANARI) have provided funding to sustain the initiative. In addition to this, PSF provided wet suits, snorkel gears, ropes, floats for Mayreau Explorers Cooperative while the CANARI provided further training for basic booking, mentorship, and purchased a 5000-gallon 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, float, packaging (valued added products like sea moss rum punch, ice cream, and sea moss gel).



### 3.3. Case study 3

Project Title	Harvesting and Storing Water to Adequately Supply an Open Organic Farm System
Project number	STK/SGP/IWECO/18/01
Country and Region	St. Kitts
Number of people served	17 Cooperative members
Location	Verchilds Village, St. Kitts
Financing	US\$32, 500.00
Start Date	December, 2018
End Date	January, 2020

#### 3.3.1. Project context

Crop production is one of the main strategies to ensuring food security for Saint 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 in the Federation. 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 millimeters 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 Saint Kitts and Nevis is predominantly rainfed.

To address this problem in the village of Verchilds, Saint Kitts (Photo 1), the Gideon Force Agricultural Co-operative Society Limited (GFACS), a community-based organization which is actively involved in the production and marketing of a wide range of crops, such as those described above, 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. This was done with the support of the SGP-Saint Kitts and Nevis.

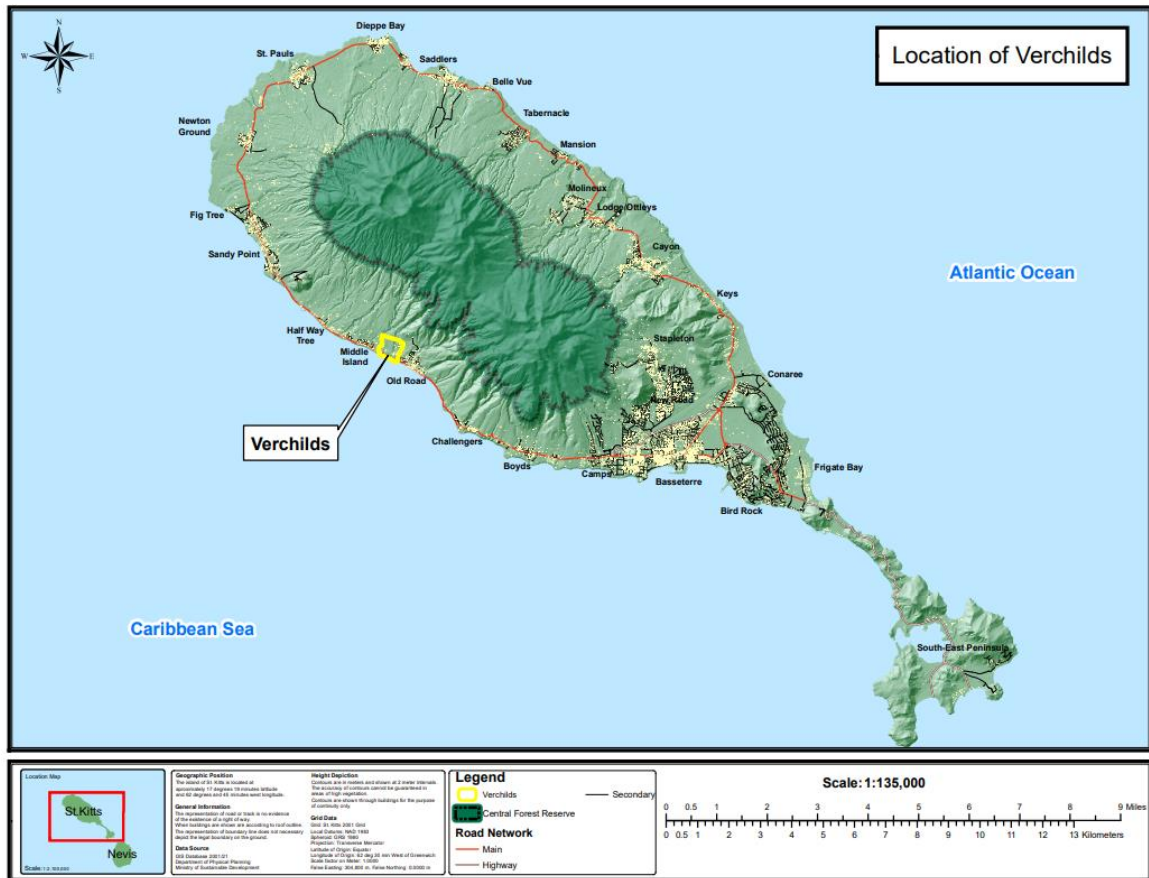


Photo 1. Map of St Kitts and Nevis showing the project location

### 3.3.2. Implementation

To address the need for a constant water supply in order to boost crop production and enhance food security, the 17 members of The Gideon Force Agricultural Co-operative Society Limited 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. Following co-design, a water reservoir was constructed, after which a water pump and solar panels, to provide power for the water pump, were procured and installed. The Gideon Force Agricultural Co-operative Society Limited 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 installed 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 meter). 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 between two to ten 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.



**Photo 2: GFACS Farm**



**Photo 3: Construction of water catchment**



**Photo 4: GFACS farm**

### 3.3.3. Economic impacts

This project has yielded multiple economic benefits. It has provided members of The Gideon Force Agricultural Co-operative Society Limited with training in skills that can be used in the construction sector to earn additional income. One of the main barriers to crop production in Verchids village has been water scarcity. Since crop production and marketing of produce is a major source of livelihood, the construction of the water reservoir is expected to improve and sustain the livelihoods of the members of the cooperative society significantly. This project is expected to improve farmers' income as the provision of similar irrigation facilities have been found to increase land productivity due to sufficient water and contributed to increasing farmers' [income by 50-75%](#). In future, it will be important to evaluate the impacts of the project on productivity, income, and effects on the local economy.

### 3.3.4. 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 time overrun.

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 20ft x 16ft x 6ft to 31ft x 16ft x 6ft. Beyond this, there are additional plans to construct a building which 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 water 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 (more than 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 dam 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.

## CHAPTER 4

### WASTE MANAGEMENT

1. *Educational and Empowerment pathways for metal recycling in Antigua and Barbuda.*
2. *Reduction of pollutants, resulting from the pig production in areas located in San Juan River basin, province of Santiago de Cuba.*
3. *Evaluating Discovery Bay Inshore Coastal Water Quality to Improve Capacity for Environmental Management.*

## 4.1. Case study 4

Project Title	Educational and Empowerment pathways for metal recycling in Antigua and Barbuda
Project number	ATG/SGP/OP6/Y4/IWECO//03
Country and Region	Antigua & Barbuda
Number of people served	11 indirect beneficiaries, and 49 direct beneficiaries (Wire recyclers). This does not include the schools served which is conservatively estimated at 180 students.
Location	St. John's, Antigua
Financing	\$56,000 (\$50,000 from IWECO)
Start Date	September, 2018
End Date	September, 2019

### 4.1.1. 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. 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 - mercury products, sewage, 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 with other pollutants that contaminate the environment and needs to be eliminated to protect the environment and human health.

To address indiscriminate disposal and unsafe management of those special waste types, and to mitigate the resulting soil, air and marine pollution in Antigua and Barbuda, this IWECO subproject was implemented in St John's, Antigua, at Will's Recycling (Figure 1). Special waste recycling/management equipment in the form of a granulator was purchased and installed to separate copper wire from its insulation thus eliminating the need for the burning of 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: Zero Waste Antigua and Barbuda, National Solid Waste Authority, and the Ministry of Tourism. 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 end indiscriminate disposal and unsafe management of waste and thus avoid the damage to the environment and human health.

# ENVIRONMENTAL FEATURES AT COOKS LANDFILL

General Reference Map Showing Location of Cooks Landfill and Wills Recycling, and Proximal Land Use

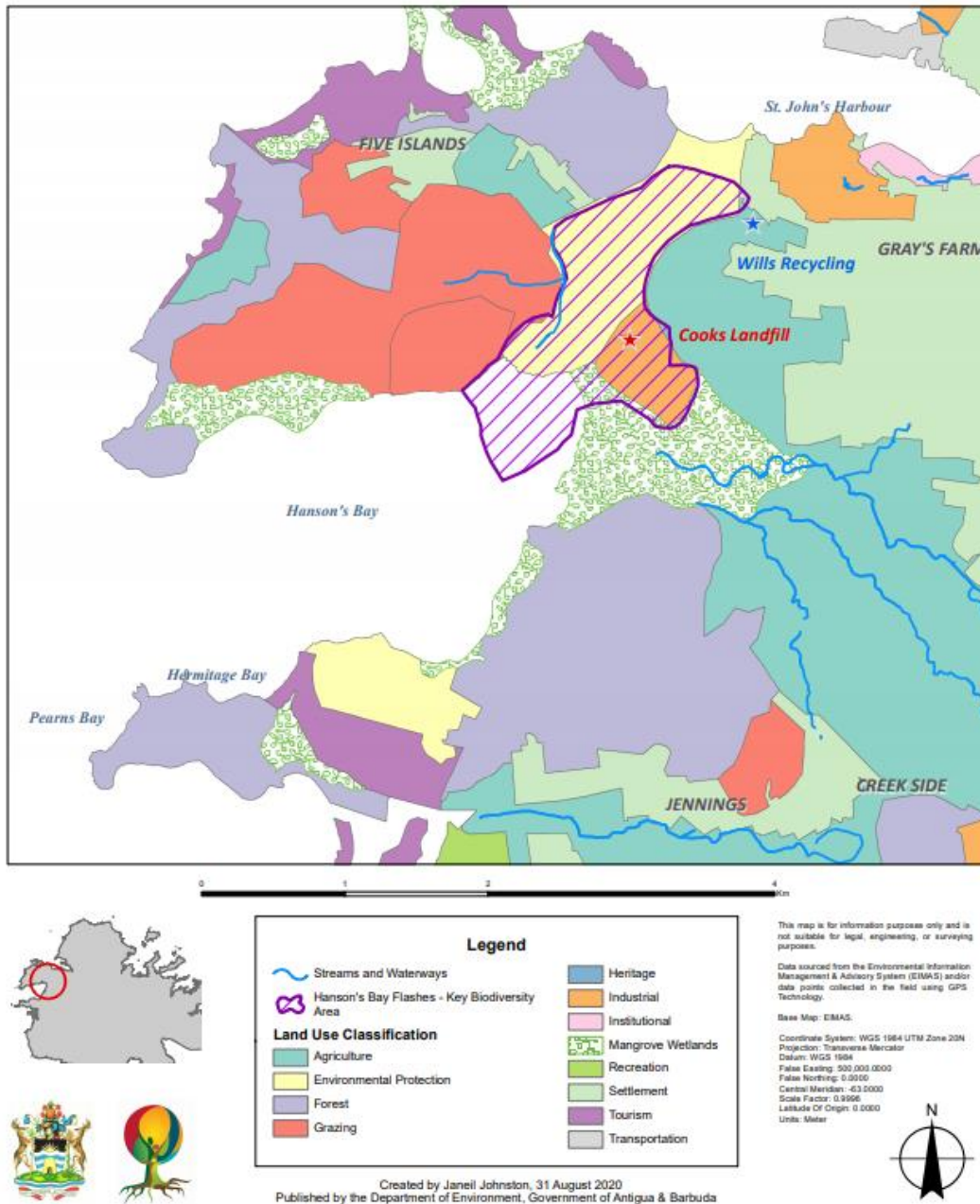


Figure 1a. Project Location



### 4.1.2. Implementation

The first phase of the project involved an extensive consultation with a wide range of stakeholders including the Fire Department, National Solid Waste Management Authority, Antigua Public Utilities Authority (APUA), Department of Analytical Services, Environmental Awareness Group (EAG), Waste Pickers, Marine Ecosystem Protected Areas Trust (MEPA), Department of the Environment, Zero Waste Antigua Barbuda (ZWAB), Integrated Health Outreach (IHO), Ministry of Tourism and Investment and Antigua Barbuda Waste Recycling Corporation (Photo 1). These stakeholders were identified and involved as they can influence and support long term and sustainable changes for improved waste management practices, policies and promoting education and awareness. Main issues discussed during engagements included: plans to enhance sound waste management practises; improving monitoring of the location where burning of electrical cables/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. Following this, a granulator was purchased and installed to separate copper wire from its insulation, and to make both materials fit for re-use (Photos 2-4).

The third phase focused on education and increasing awareness on harmful pollutants, metals, mercury refrigerant, and burning of wires (Photo 5). This was done using video and fliers regarding 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 the Antigua Public Utilities Authority (APUA).





**Photos 1. Meeting with NSWMA, Department of Analytical Services, and the Fire Department**



**Photo 2. Construction of wire stripping center to house equipment**



**Photo 3. Tracking the land to plant underground wire to supply power to the wire stripping centre**



**Photo 4. Granulator machine in use.**



**Photo 5. Wills Recycling educating about waste pollution and management in a school and at the Consumer Affairs Department.**

### 4.1.3. 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 the landfill. With the operationalization of this new equipment, the 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, eleven persons from various communities were employed during project implementation. In addition to these persons, one person was fully employed to man 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 which shall result to bringing an end to indiscriminate disposal and unsafe management of waste. This is being done through consultation with government and non-governmental agencies such as Zero waste, National Solid Waste, the Department of Analytical Services, and the Department of Environment; participation in key technical waste management workshops, training and conferences jointly organized by regional and international agencies such as Basel Convention Regional Center (BCRC), International Union for Conservation of Nature, and Norwegian Agency for Development Cooperation. These workshops and conferences often target key local stakeholders who have the influence to convince the policy makers to 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 (Photo 6). Anecdotal data suggests that the Zero Waste movement in Antigua and Barbuda has been gathering traction and it is expected that waste management policy will be bolstered following successful projects such as this.



**Photo 6. Wills Recycling working with local and international groups on plastic waste pollution**

#### 4.1.4. Lessons Learned, Challenges, Upscaling and Replication

The onset of the COVID-19 pandemic affected project timelines as it delayed the delivery of the granulator. Despite this challenge, project implementation was successful. 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 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 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 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 Wills Recycling as a partner to provide some of these solutions towards safe waste management. Wills Recycling has already introduced solutions to safely handle different types of waste, this plant offers a reliable, green solution to help them achieve this. 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 National Solid Waste Management Authority are key partners and supporters of Will's Recycling, and 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 video (available here: [Wills Recycling - YouTube](#)), on the local news stations, in papers published by Springer, available here: [Improvement of Human and Environmental Health Through Waste Management in Antigua and Barbuda](#)) and in the print media, for continues awareness creation (see an example of these materials in Photo 10). 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.



Photo 10. Awareness creation material on the need to stop open burning.

## 4.2. Case study 5

Project Title	Reduction of pollutants, resulting from the pig production in areas located in San Juan River basin, province of Santiago de Cuba
Project number	CUB/IWECO/17/02
Country and Region	Cuba, Latin America, and the Caribbean
Number of people served	Producers associated with 11 apex cooperatives working in the San Juan River basin
Location	Municipality of Santiago de Cuba, province of Santiago de Cuba
Financing	US\$37,500.00
Start Date	16/06/2017
End Date	31/12/2021

### 4.2.1. Context

This project was implemented in the municipality of Santiago de Cuba in the San Juan River basin (Photo 1). 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. It has been reported that many pig meat producers within this catchment do not treat waste from livestock farming in an efficient manner. Wastewater spills into the basin from big 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 water environmental services, and negatively impacting livelihoods and the health of surrounding communities.

To address the issue of water pollution and its associated socio-ecological problems, this IWECO sub-project was initiated in June 2017. 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. 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 Small Farmers Association (ANAP) in Santiago de Cuba.



Photo 1. Map of Cuba showing San Juan

#### 4.2.2. Implementation

The first activity involved the procurement and installation of PVC geomembrane tubular digesters in the anaerobic treatment of pig excrement in 51 farms and on-farm areas within the basin (Photo 2). This technology consists of the collection and conduction of pig feces 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<sup>9</sup>. 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 provisioning purposes. This will not only increase sustainability of household practices, but also improve families' health through the reduction of toxic gases that result 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 on 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 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 well 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

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<sup>9</sup> Fertigation refers to the process of injecting the fertilizers, used for soil and water amendments into an irrigation system.

of gas and effluent in the anaerobic digestion (Photos 3 and 4). In addition, and as a means to continue mainstreaming the use of technology by farmers in the province, farms with 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.



**Photo 2. Trench lining process in preparation for the installation of a biodigester at the Julio Trigo Credit and Services Cooperative.**



**Photo 3. Training workshop on biodigester assembly given to members of the Israel Reyes Credit and Services Cooperative.**





**Photo 4. A demonstration training workshop for the installation of a 10 cubic meter geomembrane tubular biodigester on the farm of a producer.**

#### 4.2.3. Environmental and socio-economic impacts

This project prevents the daily dumping of 4,510 kg of pig feces 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 water environmental services in the San Juan River basin. In addition to this, the installation and operation of tubular biodigesters (Photo 4) is expected to help prevent the emission of 1,144,822.5 cubic meters of CO<sub>2</sub><sup>10</sup> in their 15 years of useful life.

Because many households relied on fuelwood for cooking, about 11,000 cubic meters of wood was consumed annually in the cooking of food. Through this project, over 50 households have switched to biogas. This helps to reduce pressure on local forest resources and sustain forest cover as eliminating the use of wood for cooking purposes reduces logging – 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 is expected to improve with the use of biofertilizers with proven quality regarding the input of nutrients. This contributes to reducing N<sub>2</sub>O emissions stemming from the use of chemical fertilizers.

There are direct economic benefits. For instance, before the implementation of this project, many households within the project area cooked their food using electric energy via the use of electric

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<sup>10</sup> This was estimated by multiplying the amount of cubic meters of biogas produced in a day by a pig (0.102) by the average pig mass (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.

equipment. Following this project, over 50 households have switched 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%, i.e., from an average expenditure of 400 pesos (US\$15.53) to 200 pesos (US\$7.77) per month (based on data obtained through interviews with 10 households). There are also potential health benefits associated with this project as replacing wood fuel with biogas is expected to reduce the risk of respiratory diseases linked to indoor wood-burning for the concerned households.

#### 4.2.4. Lessons Learned, Challenges, and Replication

Like many projects, 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 to happen by the end of 2022). This is due to 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 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 endeavor 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 stakeholders' appreciation of the socio-economic and environmental benefits it generates. 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.

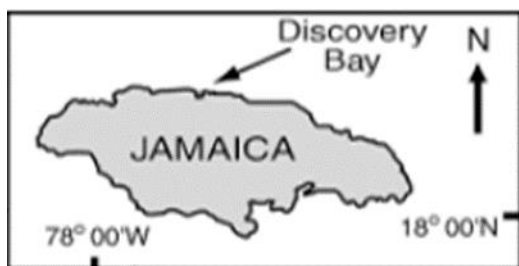
### 4.3. Case study 6

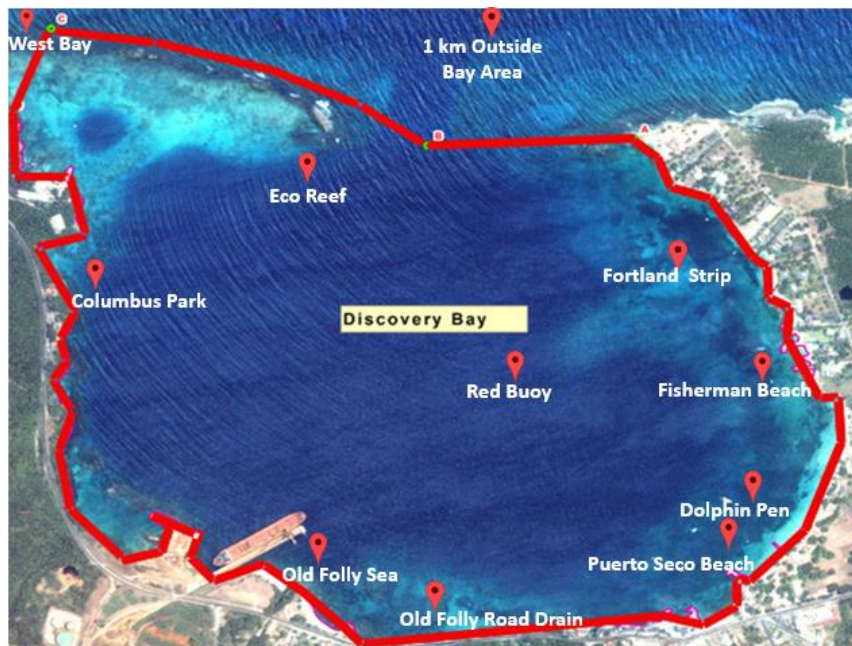
Project title	Evaluating Discovery Bay Inshore Coastal Water Quality to Improve Capacity for Environmental Management
Project number	JAM/IWEco/2017/02
Country and region	Jamaica, Caribbean
Number of people served	~5000 persons
Location	Discovery Bay, St. Ann; Discovery Bay Special Fishery Conservation Area
Financing	US\$ 44,500 (GEF SGP grant), US\$ 16,625.19 (In-Kind Contribution)
Start date	December 2017
End date	October 2020

#### 4.3.1. Context

This project was implemented in Discovery Bay, Jamaica (Photo 1). Discovery Bay is a roughly circular embayment in the center of the island's north coast, with approximately 1.5 km in diameter and 60 m deep. It is sheltered from 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 fisher-folks and the health of the wider community. While anecdotal data suggests that the bay might be polluted, scientific evidence of this is lacking, which makes it difficult to intervene. Therefore, this project was initiated to monitor the Discovery Bay Special Fishery Conservation Area to identify pollution hotspots and to initiate a timely intervention. The Discovery Bay Special Fishery Conservation Area is 162 hectares. The key partners of this project were SGP-Jamaica, Alloa Discovery Bay Fisher's Association, the University of the West Indies (UWI), Mona Discovery Bay Marine Lab and the community members of Discovery Bay.





500 m

Photo 1. Image of Discovery Bay showing the sample points assessed between 2017 and 2020

#### 4.3.2. 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 fishermen from the community were trained to scuba dive to collect samples and survey the reef (Photo 2). In addition to this, three young women were trained in the scientific techniques needed to measure and quantify the relevant physical and chemical parameters (Photo 3). Besides these scientific assessments, a survey was conducted to evaluate the wider community's perceptions about water pollution (Photo 4). 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 – it significantly exceeded Jamaica's National Ambient Water Quality Standard for marine waters – which indicated a possible sewage seepage problem in that area (Photo 5).

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. As of April 22, 2021, this initiative was at 90 per cent completion (Photo 6).

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 (Photo 7). 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 here (Photo 8). 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 concern (Photo 9). The Biological Oxygen Demand for all sites were within the accepted standard range of 0.0-1.16 mg/L. Average coral and macroalgal cover for Discovery Bay was 3.3 per cent and 56.2 per cent respectively, with the Old Folly Road Drain Area having one of the highest algal cover (65 per cent) and lowest coral cover (6 per cent).

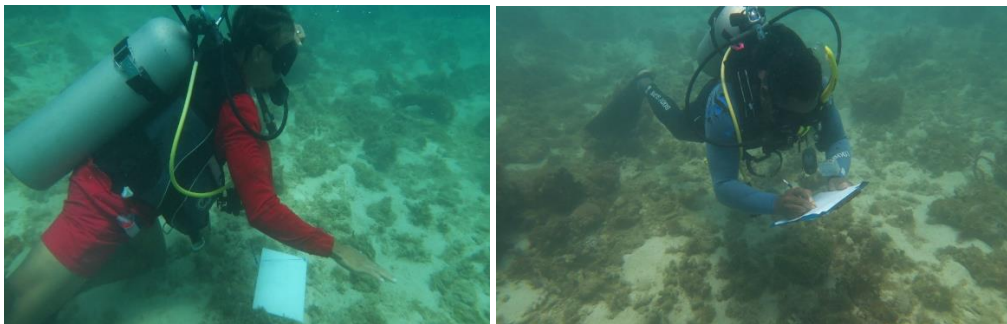


Photo 2. Local fishermen were certified as scuba divers (fishers) to conduct reef surveys and collect water samples



Photo 3. Discovery Bay Marine Lab Staff, interns and community members conducting chemical analyses of water samples



Photo 4. Intern and volunteer conducting a survey

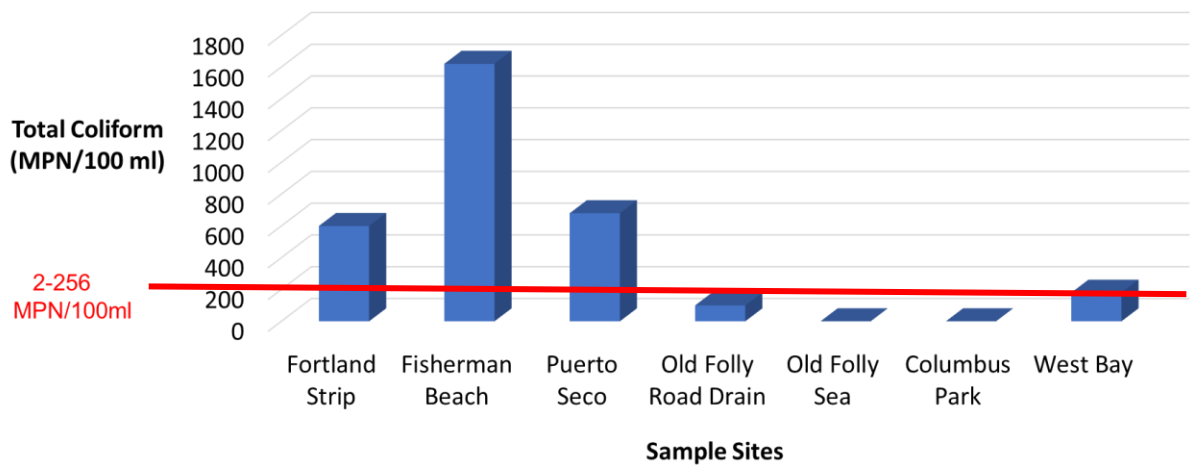


Photo 5: Total coliform levels of key sample points in Discovery Bay, highlighting sample points that exceeded the accepted maximum contaminant levels, defined as 256 most probable number (MPN) of viable cells per 100 millilitres of sample.



Photo 6. Septic tank installation at Discovery Bay Fisherman Beach



Photo 7. Old Folly Road Drain

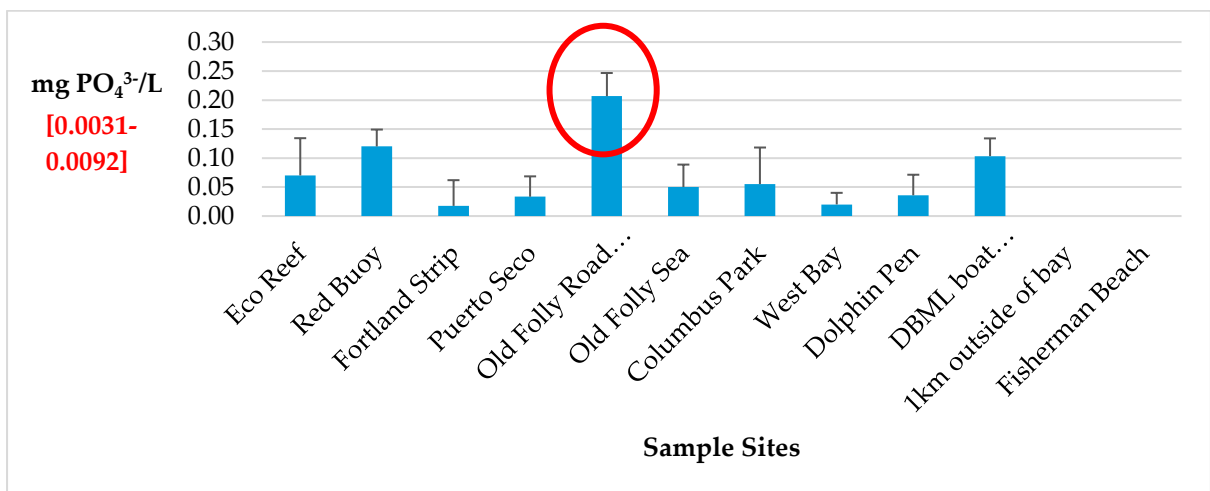


Photo 8. Soluble reactive phosphorus (phosphate) levels for the sample sites in Discovery Bay. Numbers in red refer to Jamaican ambient water quality standard for phosphate in marine water.





Photo 9. Total nitrogen levels for the sample sites in Discovery Bay. Numbers in red refer to Jamaican ambient water quality standard for nitrogen in marine water.

#### 4.3.3. 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 publicized 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 per cent, since this is suspected to be 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 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. Another recommendation included is about the proper use of fertilizers to prevent leaching of nutrients. The newsletter will also inform the public that the Alloa Discovery Bay Fishers Association is receiving a new boat engine with GEF SGP support and will be able to monitor the bay once again effectively, especially with regards 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 PADI open water divers. This skill and certification enables the young men to earn an additional income of at least 60,000 to 70,000 Jamaican Dollars (between \$ 390 and 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 soak-away 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.

#### **4.3.4. 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 overrun. The second challenge relates to unforeseen events, in this case, the onset of the COVID-19 pandemic. This 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 — the provision of septic tanks to mitigate water pollution – and helped raise awareness, with the potential to trigger positive institutional or individual behavioral 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 behavioral 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 Alloo Discovery Bay Fisher’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 Alloo Discovery Bay Fisher’s Association and partially funded by the users of the restrooms through a pay-per-use model.

There are further plans to replicate the water quality aspect of this project in seven other special fishery conservation areas on the north coast of Jamaica. The aim is to determine if and how the marine water quality is being impacted during the COVID-19 pandemic, versus post and pre-COVID. Funding is being sought from other funding agencies to facilitate this.

## CHAPTER 5

### ECOSYSTEMS MANAGEMENT AND RESTORATION

1. *Engaging the community and building capacity for coral reef restoration.*
2. *Beekeeping in communities of the municipalities of Yerba Buena and Mata Palacio.*
3. *Biodiversity Restoration in the Portland Bight Protected Area through community engagement.*
4. *Abandoned Quarry Site Rehabilitation Project at National Quarries, Turure Road, Sangre Grande.*

## 5.1. Case study 7

Project Title	Engaging the community and building capacity for coral reef restoration on the west coast reefs of Barbados
Project number	BAR/SGP/OP6/Y2/CORE/BD/17/01
Country and Region	Barbados, Caribbean Region
Number of people served	300,000 persons
Location	Barbados
Financing	US\$49,525
Start Date	Friday, January 20 <sup>th</sup> , 2017
End Date	Tuesday, August 31 <sup>st</sup> 2021

### 5.1.1. Context

Recent evidence from 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 up 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 type 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 as well as 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 (Photo 1). 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. The main source of funding is the GEF-SGP, with donations and additional funds from the Canadian High Commission and an international private business (which has requested anonymity). Some members of the business community also contributed in-kind, while 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, building, populating nursery structures with rescued coral fragments and monitoring coral reef restoration sites using a science-based approach.



Photo 1. Map of Barbados showing project locations.

### 5.1.2. Implementation

The project had three main components. The first component involved community engagement through implementation of outreach programs based on the Ridge to Reef approach. These outreach programs 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 expo, an assembly of high-level officials at UN House, children's camps, and the launch of CORALL's video that highlighted the reef restoration activities of CORALL (this video may be seen at [Corals in Living Colour - YouTube](#)). Overall, this project engaged 1500 members of the community in coral restoration through a combination of physical restoration, and the Adopt-a-Coral program begun in January 2020. This program 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/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 (\$US15). In addition to this, about 75,000 individuals were reached through promotion in the media of the Coral Reef Symposium held on World Oceans Day 2018.

The second component involved building and populating nursery structures with rescued coral fragments (Photos 2-5). 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: sixty four percent of out-planted fragments remained alive at Driftwood, compared to 38 per cent of fragments on the breakwater at Port St Charles, ten months after out-planting.



Photo 2. Out-planted fragments of coral photographed by CORALL member, Lucy Agace, (February 2019). Shown are: Fragments of Symmetrical Brain Coral (*Pseudo-diploria strigosa*); and, Elkhorn Coral (*Acropora palmata*). (Photo by Lucy Agace)



Photo 3. Fragments of Symmetrical Brain Coral after 10 months of out-planting onto substrate at Port St. Charles. (Photo by Lucy Agace)



Photo 4. Fragments of coral after 10 months of out-planting onto a frame at Driftwood. (Photo by Lucy Agace). Note that most of the fragments are brain corals. Elkhorn coral fragments are mounted on the second and third rows from the bottom, on the right-hand side of the photo

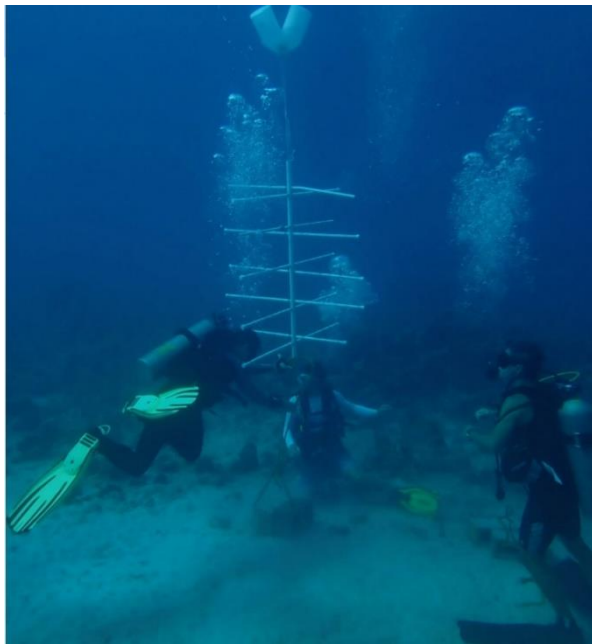


Photo 5. CORALL members installing a 'coral nursery tree' at Folkestone, during November 2020. (Photo by Zoe Lisk)

### 5.1.3. Environmental and socio-economic impacts

This project has contributed to an increased knowledge base concerning coral reef restoration. Once practised at large scale, it will strongly contribute to environmental conservation. A total exceeding one hundred 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 water sheds 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, therefore improves 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 which affect water quality. The rehabilitation is therefore crucial to restoring sustainably managing ecosystem services in the area. Coral reef in the area will continue to be monitored through post-implementation arrangements outlined in see section 4.

CORALL's restoration sites are all located nearshore to the so-called 'platinum coast of Barbados' which is distinguished by, "world famous mansions, hotels, restaurants, bars, nightclubs and shopping, all sprinkling stardust on a stunning backdrop of sun, sea and sand" ([The History of Barbados' Platinum Coast - One Caribbean Estates](#)). 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 km squared per year (in terms of value re tourism and recreation) is greater than \$US908,000. Therefore, the value of the coastal stretch that spans CORALL's coral restoration area is estimated to be in the order of at least 12 million US dollars. This area will continue to be monitored by CORALL and partners of the Alliance through post-implementation arrangements outlined in Section 4.

CORALL's project has already involved has involved the staff, managers and owners of tourism properties and service providers along the west coast and in other areas of Barbados, as well as students, teachers, professors, developers, fishers, journalists, and hundreds of other individuals and organizations – all of whom have been engaged in environmental stewardship to protect the coral reef ecosystems. This is expected to improve their awareness of the conditions of coral reefs, enhance their knowledge of best sustainability practices and foster behaviour change.

There were also economic benefits. For instance, women and men involved in the project, including boat operators, divers, fishers, and other service providers, earned income by providing services to CORALL during the project. The GEF-SGP grant enabled people to benefit by being paid honoraria for their services to coordinate monitoring of sites, and Ridge-to-Reef activities; and, by renting boats and gear for CORALL's restoration activities. The grant was supplemented by counterpart cash contributions that exceeded the value of the grant. A portion of these contributions also went towards paying people for their services. About one third of the total funding was paid towards the use of boats and gear; one half was directed towards paying coordinators for their services; and the remainder of the funding was used to pay for materials, equipment, and facilities to implement the project.

Through this project, CORALL built the capacity of at least two of its members who operate in the dive industry to undertake projects of a similar nature, thereby resulting in a change in local employment opportunities and incomes. For example, one member who is a Master Diver with his own business, was supported to participate in an overseas PADI workshop where he learned how to become certified in coral restoration. He subsequently became formally certified as a PADI instructor in coral restoration. This dive operator is now encouraging his clients – mainly tourists and some locals – to rescue corals. Similarly, another member has 'hands-on learning' about restoration as he provides boats and gear for fieldtrips to monitor and maintain CORALL's restoration sites, as well as shared knowledge on



geographical information systems mapping and nature interpretation at their sites. This dive operator offers visitors the opportunity to dive near CORALL's nursery within the Folkstone Marine Reserve, as a unique experience.

The restoration of the coral reef ecosystems along the coastal stretch of Barbados contributes approximately 12 million US dollars 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 IDB re the Integrated Blue Economy Policy Framework and Strategic Action Plan for Barbados - March 9<sup>th</sup> and 11<sup>th</sup> 2021; a Public Webinar: "Partnerships at the marine science-policy interface" hosted by the Centre for Resource Management and Environmental Studies (CERMES of UWI), 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 (CZMU) 25 June 2021.

Also, 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 Program" which compliments 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. CORALL also participated in a High-Level Political Forum (HLPF) on "Unleashing the Potential of the Blue Economy," hosted by United Nations Development Program on 7 July 2021.

#### 5.1.4. Lessons learned, challenges, upscaling, and replication

There were a number of challenges (including lockdowns and restrictions pertaining to the COVID-19 pandemic, the eruption of la Soufriere 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) that affected project implementation. For instance, monthly monitoring and maintenance of the fragments was disrupted from March to May 2020 due to the COVID-19 lockdown. Despite these challenges, the fragments at Driftwood and Port St Charles were found to be surviving and in good condition during a snorkeling reconnaissance trip on the 3<sup>rd</sup> of June 2020. The corals were in good shape and did not seem to have needed too much cleaning around them. Most of the fragments had grown, and this was especially evident with respect to the elkhorn fragments on the frames at Driftwood (only one fragment was lost from the Pilot Nursery at Vauxhall after the volcanic eruptions during April 2021). This success is attributed to the innovative way in which CORALL adapted their implementation techniques to suit the changing situation.

CORALL used an innovative strategy and 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 ('shore dives') were necessary, and that photographic records were obtained more by free-diving and snorkeling, than by 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, 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, snorkeling, and SCUBA diving.

CORALL continues to refine our training manual and to conduct training sessions through the strategy of "learning by doing". Members of CORALL and our guests learn about reef restoration through their activities in building and populating our coral nurseries with fragments of opportunity; monitoring and maintaining our restoration sites; interacting with the regulatory agencies of Government and refining our protocols and procedures to suit; and reporting on our successes and challenges. This implementation strategy works well for CORALL in their capacity as practitioners, as well as researchers.

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. It was also observed that traditional methods of engaging the community, such as radio programs and word-of-mouth, were effective in complementing CORALL's social media platforms as it helped to reach people who are not active users of social media.

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 upscaled 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 were expanded from two to three, by adding Vauxhall. It will be important to further upscale the project. Upscaling will require more dedicated volunteers, funding, and time – especially pertaining to growing and out-planting of fragments, and sensitising 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 will continue to work with communities and build stakeholders' capacity for coral restoration through:

- 1) Training more volunteers and students to use CORALL's manual as a reference for best practices in coral restoration; and continue to refine the manual;
- 2) Refining and customizing CORALL's protocols for establishing, monitoring, and maintaining CORALL's nurseries based on experience and research voluntarily conducted by CORALL's Nursery Building Team and input from members of the Coastal Zone Management Unit;
- 3) Participating in more conferences and workshops to gain insights into the type of coral restoration that is being undertaken in other areas of the world, gaining practical knowledge and experience

regarding coral restoration techniques and funding mechanisms; and increasing networking opportunities with foremost experts in the field;

- 4) Enhancing and strengthening the capacity of CORALL to engage in consultative processes, apply knowledge management to ensure adequate information flows, and monitor and evaluate environmental impacts and trends;
- 5) Increasing visibility via social media to attract funding and in-kind contributions; building partnerships with donors and patrons including agencies of the Government of Barbados, private sector companies and trusts, aimed at access to further funding; and,
- 6) Merchandising CORALL products including locally made purses, T-shirts, and tea towels; soliciting donations for the Adopt-a-Coral program; and collecting more membership fees.

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.

## 5.2. Case study 8

Project Title	Beekeeping in communities of the municipalities of Yerba Buena and Mata Palacio
Project number	DOM/SGP/OP6Y3/IWECO/BD/2018/01
Country and Region	Dominican Republic, Caribbean Region.
Number of people served	17 families (85 people) directly and more than 850 people indirectly
Location	Municipalities of Yerba Buena and Mata Palacio, in the province of Hato Mayor.
Financing	US\$24,500.00
Start Date	July, 2018
End Date	June, 2021

### 5.2.1. Project 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, reduce stunted growth among children, 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, with 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, especially, its main product, honey, contributes to the conservation of biodiversity while increasing agricultural productivity in fruit, oilseed, and horticultural production. 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.

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

### 5.2.2. 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<sup>11</sup>, biodiversity conservation, marketing of beekeeping products, and queen bee breeding (Photo 1). Sharing knowledge and experience with other beekeeping associations (ASOAPIFRONDA, in the northwest of the country) was promoted throughout the project implementation. Furthermore, new apiaries were installed, with a capacity to produce 800 gallons of honey and 3,840 pounds of pollen per year (Photos 2-4). Finally, 15 hectares of land were restored on the banks of the Rivers Higuamo and Maguá with endemic, native and melliferous species, and a nursery was installed in the area to provide new plants for further reforestation (Photos 6-8).



**Photo 1. Local producers taking part in a basic course on beekeeping.**



**Photo 2. Apiary maintenance and conditioning work.**

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<sup>11</sup> Revolving Fund' is a 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.



**Photo 3. One of the intervened apiaries, where double boxes substituted barrels to increase productivity.**



**Photo 4. Panoramic view of an apiary based on the use of double boxes.**



**Photo 5. Apiary expanded with the installation of new hives with two and three risers.**



**Photo 6. Plants in the nursery**



**Photo 8. Project participants before tree planting**



**Photo 7. Project participants planting the trees**

### 5.2.3. Environmental and socio-economic impacts

This project restored 15 hectares of land on the banks of the Higüamo 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 restoration activities contributed directly to one of the principal goals of the IWeco project under the GEF Land Degradation Focal Area: Integrated landscape management practices adopted by local communities. 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 of honey have been collected per year on average, for a total production of 1320 gallons, during the period 2020-2021. This is an outstanding result if we consider the incidence of drought and the COVID-19 pandemic. 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 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 livelihoods diversification and improved market access, produced additional benefits, despite adverse circumstances related to drought and COVID-19 pandemics. 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.

### 5.2.4. 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.

The establishment of a community revolving fund creates 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 learnt 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 people caused irreparable damage to beekeeping units, and this was due to the lack of a security plan for 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.

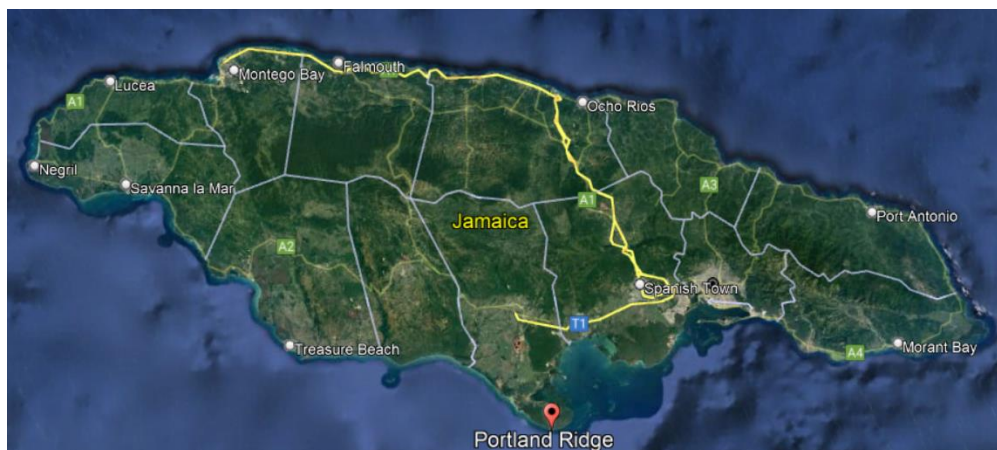
### 5.3. Case study 9

Project title	Biodiversity Restoration in the Portland Bight Protected Area through community engagement
Project number	JAM/IWEco/2017/01
Country and Region	Jamaica, Caribbean
Number of people served	3,000 persons
Location	Portland Bight, Clarendon
Financing	US\$43,000
Start Date	December 2017
End Date	September 30,2020

#### 5.3.1. Context

Portland Ridge (Photo 1) 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 red-listed by the International Union for Conservation of Nature (IUCN), including three reptiles, one bat, one frog and five plants, among others. All these species depend on the forest for habitat. The forests of Portland Ridge support the local human population, providing 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 (C-CAM) Foundation has identified threats to the forests of the area due to 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 & Planning Agency (NEPA), the Forestry Department, Jamaica Fire Brigade, Social Development Commission, Clarendon Municipal Corporation, United States Forestry Department, Portland Cottage Citizens Association and PWD Gun Club.



**Photo 1. Map of Jamaica showing Portland Ridge**

### 5.3.2. 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 Foundation 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 (Photo 2). Next, a participatory fire management program was developed in consultation with the community. As part of the fire management program, a fire management plan was developed, community wardens were trained in firefighting and plant identification in June 2019 (Photo 3). All training activities were mainly in group sessions, on-site demonstration, and hands-on. Apart from this, a 3-year memorandum of understanding was signed among key agencies C-CAM, National Environment and Planning Agency (NEPA), Jamaica Fire Brigade (JFB), Clarendon Municipal Corporation (CMC) and the Forestry Department (FD) 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 (Photo 4).

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 (see Photo 5 for samples of educational materials). Lastly, a knowledge management video was created to document the project's challenges, successes and lessons learned.



**Photo 2. Project participants planting native species (left) and fencing monitoring plot (right).**



**Photo 3. Training on firefighting (left) and plant identification (right).**



**Photo 4. Handing over of the firefighting tools to the PWD Gun Club, Portland Ridge, Clarendon**



**Photo 5. Samples of awareness creation materials inside the Forest Interpretation space.**

### 5.3.3. Economic impacts

This project has provided income generation opportunities for 36 persons within the age range of 18 - 70: 16 males and 20 females. 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 males, eight females) 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. Though

it is thought that these activities have contributed to income generation, no formal evaluation has been carried out to quantify changes in income.

#### 5.3.4. Lessons learned, challenges, and upscaling

Two key challenges affected project implementation: first, drought delayed the implementation of seed collection, and this eventually led to time overrun. 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. Venues used for public education on forest conservation were closed. This also affected project delivery timewise. 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 the 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 support of the project is what encouraged key stakeholders – C-CAM, National Environment and Planning Agency (NEPA), Jamaica Fire Brigade (JFB), Clarendon Municipal Corporation (CMC) and the Forestry Department (FD) to sign a memorandum of understanding (MOU) for training and fire management. 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 one stakeholder to mobilize the amount for resources needed for the initiative.

The relevance and good results of this UNEP- GEF-funded IWeco sub project has generated interest among other stakeholders and set the basis for expansion. For instance, the United States Forestry Service (USFS) has provided funds to expand on the work being done by C-CAM at the Portland Bight Discovery Center (PBDC). 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.

## 5.4. Case study 10

Project title	Abandoned Quarry Site Rehabilitation Project at National Quarries, Turure Road, Sangre Grande
Project number	TRI/IWECO/2018/02
Country and region	Trinidad and Tobago
Number of people served	30 direct beneficiaries, up to 100 extended beneficiaries based on households.
Location	Turure, Trinidad and Tobago
Financing	US\$ 43,500
Start date	August 2018
End date	December 2020

### 5.4.1. Context

The latest report on the state of Trinidad and Tobago's economy shows that mining and quarrying represent 18 per cent of the country's gross domestic product (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 over 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](#)<sup>12</sup> which would involve implementing restorative measures to reduce the land and water degradation caused by the quarrying. 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.

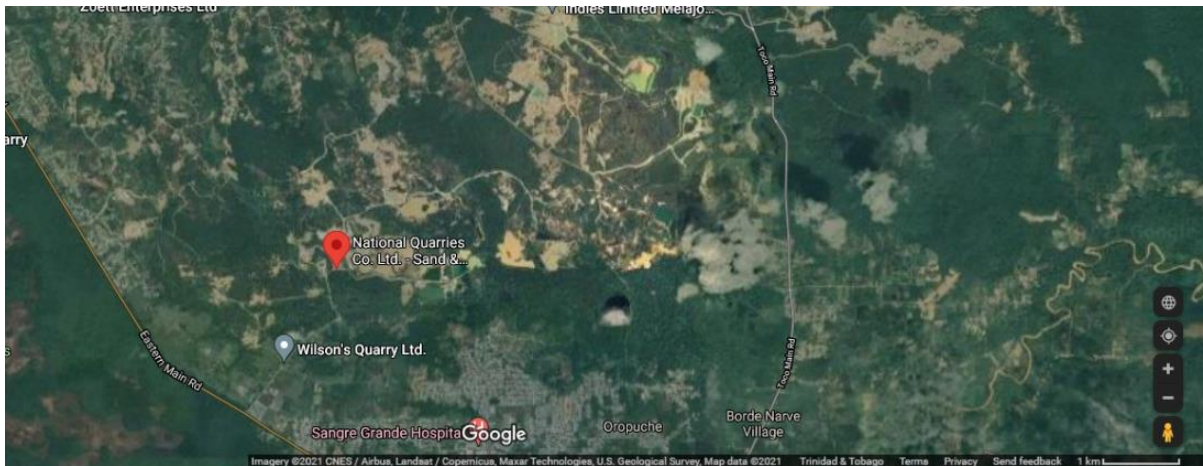
The need to raise awareness about these matters, prevent future degradation of land resources and restore degraded areas led to the launched of this project in 2017. The project was executed by the country's Environmental Management Authority (EMA). It aimed to promote local livelihoods, restore natural 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

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<sup>12</sup> [61.03 \(legalaffairs.gov.tt\)](#)

secondary-forested region of Trinidad (Figure 1b). The selection of the site and the rehabilitation happened through the establishment of the national industry's first partnership involving the government and two civil society organizations: the Trust for Sustainable Livelihoods (Sustrust) and IAMovement, which received support from SGP-Trinidad and Tobago, and the EMA. This partnership was to ensure synergies, complementarity, and sustainability. It should be noted that this Turure project is a national, upscaling of an SGP IWECO sub-project ([Building Resilience Through Community Led Rehabilitation: TRI/IWECO/2018/01](#)) completed by grantee IAMovement. The approach, project activities and learnings of the smaller project were expanded and applied to the Turure IWECO project.



Location of National Quarries in northeast Trinidad.

## 5.4.2. 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 nine 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 which 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, local fruit trees to provide food and habitat. They also build a series of check dams to improve water conservation and reduce gully erosion (Photo 1) and cleared the sites of weed invasion to reduce competition (Photo 2). The project also established a nursery on the NQCL compound (Photo 3) to produce plants for future restoration projects and set up fire traces in order to reduce the threat of fire spreading to the rehabilitated plot. It must be established that the formation of the “quarry rehabilitation champions” was used to mobilize and empower the community and create a sense of ownership.



Photo 1: Live check dams installed to reduce erosion.



Photo 2: Quarry rehab champion clearing and cleaning in the quarries space.



Photo 3: Construction of nursery on-site.

### 5.4.3. Environmental and socio-economic impacts

The project restored around nine 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 who are engaged in similar activities as the government institution. IAMovement negotiated with these two groups and was able to add value to their organic waste which would 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 (Photo 4) show how the landscape has visibly changed.



Photo 4: The Turure National Quarries

The project trained and introduced 30 community members to alternative livelihood opportunities, including the production of sustainable handicrafts made from vetiver grass (Photo 5), 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 (Photo 6). In 2019, they also



participated in an activity to replicate their experience at another pilot site, owned by a private sector company Carib Glassworks. This served as an example of how their newly-acquired skills could be applied elsewhere, potentially for additional income (Photo 7). 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.



**Photo 5: Planted vetiver.**



**Photo 6: Harvesting of vetiver production.**



**Photo 7. Products made by participants using vetiver.**

#### 5.4.4. 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 the Sustainable Development Goals (SDGs) cannot be accomplished without collaboration by different stakeholders. In this case, the collaborative efforts brought together the national government of Trinidad and Tobago, local and international organizations (UNEP and GEF) 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. A private company, Carib Glass as well as local municipal entities Sangre Grande Regional Corporation and CEPEP, is 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.

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. However, the COVID-19 pandemic has stalled all livelihood activities and negatively impacted economic progress. Since March 2020, Trinidad and Tobago has been through a series of government restrictions, including lockdowns. These have affected for extended periods the quarry rehabilitation champions' access to nursery and crops sites, significantly affecting project outcomes and participant livelihoods.

## CHAPTER 6

### A SYNTHESIS OF FINDINGS AND CONCLUDING REMARKS

This final chapter presents a thorough discussion of key challenges and lessons learned from the implementation of the 55 community subprojects as well as recommendations for future interventions. In Section 6.1, we synthesize and reflect on the main challenges that affected project implementation and, in some cases, project outcomes. Section 6.2 presents key lessons learned from the implementation of community subprojects. Finally, in Section 6.3, we discuss the way forward by echoing the importance of partnership, capacity building and stronger connection between science and practice.

#### 6.1 Challenges

##### 6.1.1. COVID-19 pandemic and other unforeseen events.

The most predominant challenge was the COVID-19 pandemic, reported across all nine countries (Table 3). The COVID-19 pandemic triggered a series of government restrictions (including lockdowns) and this stalled project implementation, and in many cases, impacted project benefits. For impact on project implementation, it was observed that because of a nationwide lockdown in Jamaica, venues for community education and outreach events were closed and this impacted key project activities. In addition to this, the observation of social distancing measures (including physical distancing) meant that laborers needed to stay at least two meters apart; this resulted in a significant reduction in the number of people working together in enclosed spaces, and further slowed the pace of work. Moreover, the economic activities of many project volunteers were impacted, and they had to abandon the volunteer work to find income generating activities.

As indicated earlier, the COVID-19 pandemic also impacted project outcomes. For instance, it was observed that, in Trinidad and Tobago, the land restoration project resulted in business opportunities such as selling crops, handicraft, and other household items. However, for an extended period, these businesses were halted due to lockdowns - substantially impacting the livelihoods of project beneficiaries. Therefore, while the true impact of the pandemic on project outcomes is yet to be ascertained, it is clear that the pandemic has substantially affected project benefits. In some countries, the impacts of the COVID-19 pandemic on project implementation and outcomes were further exacerbated by natural disasters and climate events such as volcanic eruption in Saint Vincent and the Grenadines, and Barbados, hurricane (in Barbados) and drought (in Jamaica). In fact, in the case of Saint Vincent and the Grenadines, the volcanic eruption led to the termination of the *Sandy Bay eco-tourism, cultural and development* project (STV/SGP/OP6/IWECO/18/01) which was later replaced (by project SVG/SGP/OP5/IWECO/LD/19/02). The occurrence of these events and their impact on project implementation and outcomes is a reminder of the high vulnerability of SIDS to natural disasters and climate impacts, and the need to urgently improve their capacity towards building their resilience.

##### 6.1.2. Limited supply of inputs, procurement, and administrative challenges.

Project implementation was affected by limited availability of materials that were needed for project execution, as well as procurement and other administrative challenges. Like many projects, the execution of some activities depends on the availability of key materials needed at that stage. Where

such important materials are not readily available, project implementation is stalled, and this could cause cost and time overruns, reduce the scope of the project as well as the quality of deliverables. These challenges were observed in Cuba, St Lucia and St Vincent and the Grenadines (Table 3). For instance, the installation of tabular biodigesters in Cuba was delayed due to limited supply of building materials (including sand and cement) in the country. As a result, only 41 out of 59 tabular biodigesters were installed within the stipulated timeframe of the project. In Antigua and Barbuda, there was administrative challenge, a banking issue that delayed access to project funds and procurement of materials needed for project execution, and this in turn caused time overruns. These challenges reinforce the need for comprehensive planning, and proactive procurement strategies. During project planning, it is important to identify alternative sources of materials for project execution, to help mitigate such unforeseen challenges and associated impacts on project implementation and results.

### 6.1.3. Weak institutional capacity

Some projects faced major setbacks due to weak local and institutional capacity challenges in areas such as project development and implementation, data generation, and other technical expertise. While this challenge appears to be a common problem across participating countries, it was particularly prevalent among grantee partners in Barbados, Dominican Republic, Jamaica, and St. Kitts and Nevis (Table 3). To address capacity gaps, some grantees tend to rely on volunteers such as pro-bono services of academics and labor from community members. Over reliance on volunteerism is not helpful as it could delay key project activities (such as community surveys and water quality monitoring) where volunteers are not readily available due to other commitments. For instance, in Jamaica, C-CAM relied heavily on community members for labor during the implementation of their forest restoration project. At some point, volunteers were reluctant to provide such voluntary services as their primary jobs were impacted by the COVID-19 pandemic; as a result, they needed to engage in other activities that will help them generate incomes. This slowed project implementation and C-CAM had to address this challenge by offering a higher daily pay rate to ensure community workers' support, and to facilitate project implementation. Similarly, in Barbados, overreliance on volunteerism caused time overruns. In other cases, such as Saint Kitts and Nevis, there were capacity issues regarding data collection to support project monitoring and evaluation. Here, SGP provided further support to grantee partners by helping them to develop a post-evaluation survey tool. Put together, these local and institutional capacity challenges suggest that many grantee partners need handholding and mentoring throughout the project cycle. It is also important that additional resources are provided to support their efforts in community development.

### 6.1.4. Status quo bias and resistance to change

Some stakeholders (including some farmers) are used to a particular way of doing things and are less likely to take up new practices and technologies; such people prefer to keep land management techniques that have been passed on from generations and are resistant to change in many cases. This attitude has a substantial negative impact on pilot projects that aim at introducing relatively novel practices or technologies (Okumah et al., 2021). Apart from limited knowledge of the environmental costs and benefits of such practices (Blackstock et al., 2010), financial (transition cost; cost of inputs; price for organic outputs not sufficiently attractive) and other agronomic factors (longer growth and production time) were identified as major drivers of farmers' unwillingness to move away from current

toxic, chemical dependent forms of farming (Okumah et al., 2021). This observation is not unique to farmers in IWEco project area given that various studies elsewhere have reported that, a substantial proportion of farmers fail to accept change as new practices are (sometimes) perceived to have potentially negative consequences on land management, output, and profitability (Burton et al., 2008; Dessart et al., 2019; Barreiro-Hurle et al., 2018). Status quo bias and limited openness to change are therefore factors influencing project success and need to be addressed. The impact of status quo bias could be reduced by conducting a rigorous stakeholder analysis, identifying the different categories of farmers based on their attitudes, interests and behaviors and offering more targeted advice. For instance, some farmers are 'conditional co-operators' – 'people who would do it if others do' (Fischbacher et al., 2001) while others are more environmentally concerned. Following a rigorous stakeholder analysis, a good strategy could involve using more interested or environmentally concerned farmers as mentors and providing evidence of the importance of new sustainable practices; this could help conditional cooperators and laggards to appreciate the benefits of new concepts or practices. This could in turn motivate them to adopt the recommended practices.

**Table 3. Challenges**

Countries	Challenges			
	COVID-19 pandemic	Limited supply of inputs, procurement & administrative challenges	Weak institutional capacity	Status quo bias
Antigua and Barbuda	X	X		
Barbados	X		X	
Cuba	X	X		
Dominican Republic	X		X	
Jamaica*	X	X	X	
Saint Kitts and Nevis	X		X	
Saint Lucia	X	X		X
Saint Vincent and the Grenadines	X	X		
Trinidad and Tobago	X			
<b>Total</b>	<b>9</b>	<b>5</b>	<b>4</b>	<b>1</b>
<i>Note: There were 2 case studies for Jamaica.</i>				

## 6.2. Lessons learned

### 6.2.1. Partnership and stakeholder engagement

The first key lesson from the case studies presented is important role that partnership and high stakeholder engagement play in ensuring project ownership, success, and sustainability. Case studies from all nine countries (see Table 4) have shown that involving stakeholders throughout the project conception and implementation stages helps to gain their support and commitment, facilitates resource mobilization, empowers communities, and enhances project success and sustainability. In Saint Lucia, we learnt that engaging stakeholders at a later stage could lead to having a low political will, a major barrier to project success. It is therefore important to engage stakeholders at the conception stage, to obtain greater political buy-in at the inception of projects. Additional evidence from the CORALL case study in Barbados shows that stakeholder support is massive when project plans and activities are based on the interests, culture, and capabilities of the targeted stakeholders particularly members of the community. This is because by developing and implementing interventions that consider stakeholders' needs, interests, aspirations, and capabilities, stakeholders are more likely to be motivated to work towards achieving project objectives as observed in the CORALL project. This reinforces the need for context-specific project design and implementation, stakeholder engagement and collaboration.

### 6.2.2. Gender mainstreaming

The IWeco community interventions have also reinforced the importance of gender mainstreaming. 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 discussions and project activities was not based on their gender. Participants, both males and females were given the same access to training, information sharing, and any other support needed to carry out project activities. Gender equity was prioritised to ensure that women and vulnerable groups were represented in the intervention. For instance, in Trinidad and Tobago, of the 30 persons who participated in the four-month training and capacity building program, the majority (23) were women. The knowledge and skills gained through the training and capacity building program helped these women to set up small scale businesses including the production of sustainable handicrafts made from vetiver grass. Similarly, in Jamaica, of the 36 persons who were directly offered income generation opportunities, the majority (20) were females. As part of the forest restoration project, these women were trained and engaged in seed collection, planting, and management, and construction of fence, and integrated into a Conservation Garden Programme. These skills and livelihood opportunities have helped these 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, gender equality and empowerment of women and girls in development. Gender mainstreaming should thus be emphasized in project design, implementation, and evaluation (Parpart and McFee, 2017).

### 6.2.3. Clear post-implementation plan

The IWeco community interventions have also shown that having clear post implementation arrangements and objectives helps with project sustainability, replication and/or upscaling – an observation that was made across eight participation countries (Table 4). Showing post-implementation plans – such as project sustainability strategies, plan for replication and/or scaling up – to stakeholders and highlighting their different roles in the process engenders project ownership, empowers stakeholders, and motivates them to contribute towards the achievement of project goals. For instance, in Saint Vincent and the Grenadines, donors like the PSF and the CANARI were impressed by the impact of the project and plan for sustainability, and this encouraged them to provide funding and other materials (such as wet suits, snorkel gears, ropes) to sustain the initiative. Beneficiaries of the project also re-invest their profits into buying materials (such as ropes, float, packaging) that are needed to keep the sea moss farming post-implementation. Therefore, having a clear post-implementation plan, with specified roles for different stakeholders facilitates project implementation and enhances project sustainability, replication, and upscaling.

### 6.2.4. Action-oriented and peer-to-peer learning

The IWeco community interventions have also shown that peer-to-peer learning and hands-on training has a higher chance of deepening stakeholders' understanding of environmental problems, empowering them, and improving their chances of adopting sustainable practices. Many lay persons need to understand what they are required to change and the need for such changes. 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 lay persons often do not understand the advice because they tend to be technical. On the other hand, when peer-learning and 'simple' language is used, it offers 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 great to have the jargon broken down into lay terms 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 experimented activity (Okumah et al., 2021). Such action-oriented learning techniques enhance people's chances of taking up the recommended practices. The combination of theoretical knowledge and practical experiences proved to be useful in a land restoration project in Trinidad and Tobago where quarry rehabilitation champions obtained skills needed to rehabilitate degraded lands through peer and experimentation. It was further observed that, providing evidence of an environmental problem is very useful. This was observed in a case study in Jamaica where evidence of water pollution in the Discovery Bay helped to convince community members of the extent of the problem and the need to act urgently.

### 6.2.5. Adaptability and flexibility

A team's ability to adapt their plan in make-or-break circumstances plays a crucial role in project success (Abankwa et al., 2019). This is particularly important in complex and highly uncertain project contexts. This was observed in many sub-projects of the IWeco project where project activities and/or



outcomes were impacted by the COVID-19 pandemic and other factors. For instance, the monthly monitoring of coral fragments Barbados was disrupted from March to May 2020 due to the COVID-19 lockdown. Despite this, CORALL adapted 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 at Driftwood and Port St Charles in good condition. Without flexibility and the project team's adaptability, this success would not have been realized. A similar observation was made in Jamaica where the project team moved all in-person surveys and community engagements to virtual online activities – an adjustment that helped the team to continue with project activities despite national lockdowns and other COVID-19 protocols.

#### 6.2.6. Multi-focal approach

This project has also shown that applying a multi-focal, integrated approach to interventions enhances project success and reduces risks of counterproductive results. For instance, we observed from the Dominican Republic case study, that, beekeeping initiatives need to be complemented with reforestation and watershed management, to guarantee the kind of biodiversity needed to support the economic activity in the medium to long term. This was also observed in Saint Vincent and the Grenadines where a project aimed at boosting agricultural livelihoods (fishing and farming) also included a training and educational component on best management practices to encourage sea moss farmers not to use plastic bottles as floats, but more environmentally friendly materials. This helps to ensure sustainable fishing and farming activities while protecting biomass of fish species and preventing water pollution from farms. Such integrated approaches particularly the ridge-to-reef approach applied in IWEco has been very useful in achieving project outcomes.

#### 6.2.7. Security, health, and safety

Security, health, and safety issues are paramount. In Trinidad and Tobago, dangerous wildlife was a threat to the safety of project participants during the restoration of a degraded quarry land. Similarly, in Dominican Republic, it was observed that some people caused irreparable damage to beekeeping units, and this was linked to the lack of a safety plan for apiaries. Therefore, there would be the need for a safety and security plan to mitigate hazards during project implementation.

**Table 4. Success factors and lessons.**

Countries	Success factors and lessons						
	Partnership and stakeholder engagement	Gender mainstreaming	Clear post-implementation plan	Action-oriented and peer-to-peer learning	Adaptability and flexibility	Multi-focal approach	Safety and security
Antigua and Barbuda	X	X	X				
Barbados	X	X	X		X		
Cuba	X	X	X	X			
Dominican Republic	X	X		X		X	X
Jamaica*	X	X	X		X		
Saint Kitts and Nevis	X	X	X				
Saint Lucia	X	X	X				
Saint Vincent and the Grenadines	X	X	X			X	
Trinidad and Tobago	X	X	X	X			X
<b>Total</b>	<b>9</b>	<b>9</b>	<b>8</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>

## 6.3. Way forward

### 6.3.1. Using more targeted and integrated approach

Spreading the little resources across too many countries appears to be a weak approach in terms of impact generation. Based on lessons learnt from this project, injecting limited resources across several countries fails to offer the needed capacity to address some critical issues in a comprehensive way. For instance, in some cases, it was observed that efforts to enhance livelihoods through capacity building could yield counterproductive results. For instance, agricultural activities could contribute to the pollution of waterbodies, while agro-enterprises such as Smoothie businesses could generate plastic waste along beaches. This underscores the need for emerging multi-focal approaches such as marine spatial planning, and ridge to reef approaches that support blue economy development (IUCN, 2017). Indeed, while not much has been done towards the adoption of such approaches, the case studies from Barbados, Cuba, Dominican Republic, Jamaica, and Saint Vincent and the Grenadines (Table 2) have shown the potential for blue economy development. This is because all five case studies address the tension between economic activity and marine resource governance, with the goal of supporting healthy and productive oceans for humanity while exploring opportunities for enhanced or new sustainable economic activity. These projects have been successful and could be replicated and/or scaled up towards blue economy development (Chen et al., 2020; UNDP, 2018).

It must be noted, however, that although many countries have commonalities, the nature and extent of the development challenges may differ across countries depending on their hydrogeological and climatic features, land management systems, culture, existing policies, and resource capacity (Deasy et al., 2010; Hollis et al., 2009). This suggests that blanket approaches to addressing socio-ecological and economic challenges (such as blue economy development) are likely to fail due to contextual difference (Hollis et al., 2009, Dolan et al., 2014). It is thus essential that future UNDP-GEF partnerships such as PROCARIBE+ employ place-based (Billick and Price, 2010) and integrated approaches that take care of local differences while helping to address common regional and global issues.

It is also important to consider broader challenges along value chain or production and distribution systems. For instance, where projects involve agricultural production, project design and implementation must integrate access to raw materials and market accessibility concerns and strategies. Where possible, support on how to use food products could be explored with farmers. As observed in the Fruitage Jeunesse case study in Saint Lucia, the Smoothie business had a major barrier – shortage of fruits, their most important raw material. This barrier affected production and business activities as fruits needed to be purchased as far as Vieux-fort, a community far 11 miles from the business, which was time consuming and expensive to the business. However, following the implementation of the project, Fruitage Jeunesse went into partnership with young farmers, and this ensured a reliable supply of raw materials at an affordable cost. Future interventions should therefore consider integrating key challenges, constraints, potentials, and opportunities along the value chain.

### 6.3.2. Capacity building

We observed that while knowledge of a development issue (such as water pollution) and mitigation strategies is important, advice does not guarantee the implementation of actions needed to address the problem. For instance, in Jamaica, through baseline assessment of the Discovery Bay, it was revealed

that, waterbodies in the area were polluted above acceptable levels. 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 needed to address the problem. 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 behavior, is helping to reduce water pollution. Therefore, 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 (Bloomfield et al., 2019; Franco and Tracey, 2019). Information provision should therefore work in tandem with capacity building strategies to maximize the benefits of baseline assessments and awareness raising efforts. This could strengthen local communities to contribute towards addressing key socio-ecological and economic challenges.

Also, many grantees have capacity issues regarding data generation and the estimation of co-financing. Many grantees therefore need handholding to be able to effectively develop the appropriate tools for data generation. Regarding co-financing, some grantees underestimate the value of community support. Thus, grantees need capacity building in data generation and the estimation of co-financing that could be useful in other future projects.

### 6.3.3. Science-Practice interface and community development

The gap between science, decision-making, and practice is widely recognized as a barrier to development (Kettle et al., 2017). The science-practice/policy 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 including non-point source water pollution, and climate change, a close relationship between scientists and practitioners is needed to help generate decision-relevant data for programs, and projects (Martin-Ortega et al., 2015; Nkiaka and Lovett, 2019; Nkiaka et al., 2019). 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 tools and techniques best suited to the restoration of coral reefs on the West coast of Barbados. Similarly, in Jamaica, a close collaboration between Alloga Discovery Bay Fisher's Association, the University of the West Indies, Mona Discovery Bay Marine Lab, and the community members of Discovery Bay made it possible to monitor water quality in a baseline assessment. The scientific water quality assessment revealed the different pollutants and pollution hotspots which would not have been known to the community members and Alloga Discovery Bay Fisher's Association. The science-based baseline assessment has therefore helped to provide a foundation for more targeted and cost-effective strategies needed to address water pollution in the Discovery Bay. This lesson emphasizes the value of science in decision-making and practice and the need for strong partnership between the scientific community and practitioners/policymakers. Generating decision-relevant data and integrating this into societal-decision-making could support communities in their efforts to reduce ecosystems degradation, improve water resources management, adapt to climate change, and build resilience to climate shocks.

In addition to this, it must be noted that local people have interacted with their environments for decades, have observed and reflected on a wide range of socio-ecological and cultural processes, and are thus likely to have gained knowledge of their environment (Okumah et al., 2020). As the need to provide context specific advice increases, scientists and practitioners need to work with local communities throughout the research and solution identification process. Such bottom-up approaches are expected to make communities part of the process, enhance their understanding, allow for knowledge co-production and exchange, empower communities, and ensure project ownership. This approach also improves the capacity of local stakeholders to ensure that they take responsibility for independent and continuous monitoring and evaluation of projects post-implementation thus enhancing chances of sustainability.

#### 6.3.4. UNDP/SGP bottom-up approach for upscaling and replication

The success of IWEco could be attributable to the strong partnership with a wide range of stakeholders including UNDP/SGP that 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 intervention experiences and using a bottom-up approach to project design and implementation has proven to be a key driver of project success and has laid the foundation for project sustainability, replication and/or upscaling. SGP remains committed to partnering with stakeholders to address socio-economic and environmental problems through various collaborative interventions. We believe that there are synergies between IWEco and other current and future projects such as the GEF CReW Plus project, and the Strategic Action Programme of the UNDP/GEF Caribbean and North Brazil Shelf Large Marine Ecosystems (CLME+) Project. The huge numbers and the scope of global development problems in the face of limited technical and financial resources suggests that stakeholders need to pool resources together to address development challenges. SGP therefore motivated to support collaborative programs to maximize resource use. By identifying synergies and pooling resources together to address common development problems, we will be making strides towards achieving the SDGs and making life better for humanity while protecting our planet (Franco and Abe, 2020; MacDonald et al., 2018).

The presence of UNDP through its country offices reinforces and strengthens the SGP bottom-up support, guaranteeing that community-based interventions can create momentum to be scaled up at national level, informing public policies preparation, new interventions (replication), research, among others. The UNDP partnership through IWEco project has proven to be successful and SGP intendeds to replicate it in other regional and global interventions. Given that SIDS are confronted with significant development problems, it is important to replicate this in the region. Therefore, UNDP/SGP intends to undertake similar community interventions through PROCARIBE+ and other regional projects.

The Water and Ocean Governance Programme at UNDP uses both bottom-up to top-down approaches in its interventions, helping countries achieve integrated, climate-resilient, sustainable and equitable management of water and ocean resources, and universal access to safe water supply and sanitation. It is done through guaranteeing policy development and agenda setting, institutional strengthening, and capacity development on shared waters and oceans, and policy change/creation at community/local, national, regional and global levels. Additional efforts will be needed to support regional and global partnerships towards addressing multidimensional problems in SIDS.

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## ANNEXES

### Annex 1. IWeco project grants and expenditure

#	ANTIGUA AND BARBUDA	Grant Amount (US\$)	Payments Made
1	ATG/SGP/OP6/IWECO/04	\$ 25,000.00	\$ 25,000.00
2	ATG/SGP/OP6/IWECO/01	\$ 5,000.00	\$ 5,000.00
3	ATG/SGP/OP6/IWECO/02	\$ 5,000.00	\$ 5,000.00
4	ATG/SGP/OP6/Y4/IWECO//03	\$ 50,000.00	\$ 50,000.00
	<b>Sub-total</b>	<b>\$ 85,000.00</b>	<b>\$ 85,000.00</b>
	<b>CUBA</b>		
5	CUB/IWECO/17/01	\$ 20,932.39	\$ 20,932.39
6	CUB/IWECO/17/02	\$ 34,104.80	\$ 34,104.80
	<b>Sub-total</b>	<b>\$ 55,037.19</b>	<b>\$ 55,037.19</b>
	<b>DOMINICAN REPUBLIC</b>		
7	DOM/SGP/OP6Y3/IWECO/BD/2018/01	\$ 24,500.00	\$ 24,500.00
8	DOM/SGP/OP6Y3/IWECO/CH/2018/02	\$ 24,500.00	\$ 24,500.00
9	DOM/SGP/OP6Y4/IWECO/BD/2018/03	\$ 38,500.00	\$ 38,500.00
	<b>Sub-total</b>	<b>\$ 87,500.00</b>	<b>\$ 87,500.00</b>
	<b>JAMAICA</b>		
10	JAM/IWEco/2017/01	\$ 43,000.00	\$ 43,000.00
11	JAM/IWEco/2017/02	\$ 44,500.00	\$ 44,500.00
	<b>Sub-total</b>	<b>\$ 87,500.00</b>	<b>\$ 87,500.00</b>
	<b>SAINT KITTS AND NEVIS</b>		
12	STK/SGP/IWECO/18/01	\$ 32,500.00	\$ 32,500.00
13	STK/SGP/IWECO/18/02	\$ 26,400.00	\$ 26,400.00
14	STK/SGP/IWECO/18/03	\$ 11,350.00	\$ 11,350.00
15	STK/SGP/IWECO/18/04	\$ 5,900.00	\$ 5,900.00
	<b>Sub-total</b>	<b>\$ 76,150.00</b>	<b>\$ 76,150.00</b>
	<b>SAINT LUCIA</b>		
16	STL/SGP/IWECO/LD/17/01	\$ 33,242.00	\$ 33,242.00
17	STL/SGP/IWECO/LD/18/01	\$ 5,000.00	\$ 5,000.00
18	STL/SGP/IWECO/LD/19/01	\$ 28,393.00	\$ 28,393.00
19	STL/SGP/OP6/Y4/IWECO/IW/18/07	\$ 3,243.00	\$ 3,243.00
	<b>Sub-total</b>	<b>\$ 69,878.00</b>	<b>\$ 69,878.00</b>
	<b>TRINIDAD AND TOBAGO</b>		
20	TRI/IWECO/2018/01	\$ 43,500.00	\$ 43,500.00
21	TRI/IWECO/2018/02	\$ 43,500.00	\$ 43,500.00
	<b>Sub-total</b>	<b>\$ 87,000.00</b>	<b>\$ 87,000.00</b>
	<b>SAINT VINCENT &amp; GRENADINES</b>		
22	SVG/SGP/OP5/IWECO/LD/19/02	\$ 85,244.00	\$ 85,244.00
	<b>Sub-total</b>	<b>\$ 85,244.00</b>	<b>\$ 85,244.00</b>