Case Study for Trinidad and Tobago

National Sub-Project 1.8 Reduce and reverse land degradation at selected Quarry site(s) in the North-East of Trinidad using an integrated water, land and ecosystems management approach

Integrating Water, Land, and Ecosystems Management in Caribbean Small Island Developing States (GEF IWEco Project)

Funded by the Global Environment Facility (GEF)
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FINAL

Prepared by Project Consultant Andrew Harnden

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<thead>
<tr>
<th>Abbreviation</th>
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<tr>
<td>CAR/RCU</td>
<td>Caribbean Environment Programme Regional Coordinating Unit (UNEP)</td>
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<td>CANARI</td>
<td>Caribbean Natural Resources Institute</td>
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<td>CBO</td>
<td>Community-Based Organization</td>
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<td>CEP</td>
<td>Caribbean Environment Programme (UNEP)</td>
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<td>CReW</td>
<td>Caribbean Regional Fund for Water and Wastewater Management</td>
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<td>EMA</td>
<td>Environmental Management Authority</td>
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<td>GEF</td>
<td>Global Environment Facility</td>
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<td>GoTT</td>
<td>Government of Trinidad &amp; Tobago</td>
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<td>IAM</td>
<td>IAMovement</td>
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<td>IDB</td>
<td>Inter-American Development Bank</td>
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<td>IMA</td>
<td>Institute for Marine Affairs</td>
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<td>ISO</td>
<td>International Standards Organization</td>
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<td>IWCAM</td>
<td>Integrating Watershed and Coastal Areas Management in the Small Island Developing States of the Caribbean Project</td>
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<td>IWEco</td>
<td>Integrating Water, Land, and Ecosystems Management in Caribbean Small Developing States</td>
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<td>IWRM</td>
<td>Integrated Water Resources Management</td>
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<td>IWWMM</td>
<td>Integrated Water and Wastewater Management</td>
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<td>LBS Protocol</td>
<td>Protocol Concerning Pollution from Land-Based Sources and Activities to the Cartagena Convention</td>
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<tr>
<td>M&amp;E</td>
<td>Monitoring and Evaluation</td>
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<td>MALF</td>
<td>Ministry of Agriculture Land and Fisheries</td>
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<td>MEEI</td>
<td>Ministry of Energy and Energy Industries</td>
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<td>MPD</td>
<td>Ministry of Planning and Development</td>
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<td>NbS</td>
<td>Nature-based Solutions</td>
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<td>NEA</td>
<td>National Executing Agency</td>
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<td>Acronym</td>
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<tr>
<td>NGO</td>
<td>Non-Governmental Organization</td>
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<td>NFP</td>
<td>National Focal Point</td>
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<td>NPC</td>
<td>National Project Coordinator</td>
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<td>NRM</td>
<td>Natural Resource Management</td>
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<td>NQCL</td>
<td>National Quarries Company Limited</td>
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<td>OAS</td>
<td>Organisation of American States</td>
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<td>PSC</td>
<td>Project Steering Committee</td>
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<td>QATT</td>
<td>Quarry Association of Trinidad &amp; Tobago</td>
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<td>RPC</td>
<td>Regional Project Coordinator</td>
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<td>SDGs</td>
<td>UN Sustainable Development Goals</td>
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<td>SIDS</td>
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<td>SLM</td>
<td>Sustainable Land Management</td>
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<td>Sustrust</td>
<td>The Trust for Sustainable Livelihoods</td>
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<td>TOR</td>
<td>Terms of Reference</td>
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<td>TT</td>
<td>Trinidad and Tobago</td>
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<td>UNDP</td>
<td>United Nations Development Program</td>
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<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<td>USD</td>
<td>United States Dollars</td>
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<tr>
<td>WASA</td>
<td>Water and Sewerage Association</td>
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<td>WCR</td>
<td>Wider Caribbean Region</td>
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<td>WQ</td>
<td>Water Quality</td>
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<td>WRA</td>
<td>Water Resources Agency</td>
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Case Study for Trinidad and Tobago:

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Integrating Water, Land, and Ecosystems Management in Caribbean Small Island Developing States (GEF IWEco Project)

A. Executive Summary

The purpose of this case study for the Trinidad and Tobago National Sub-project ‘National Sub-Project 1.8 Reduce and reverse land degradation at selected Quarry site(s) in the North East of Trinidad using an integrated water, land and ecosystems management approach’ under the Global Environment Facility (GEF)-funded ‘Integrating Water, Land and Ecosystems Management in Caribbean Small Island Developing States’ (IWEco) Project is to capture, analyse, and present in context the lessons learned and good practices in implementing the project as well as aspects suitable for replication in future initiatives at the local, national, and regional level. It also identifies some missed opportunities where activities could have been expanded to enhance project outcomes. IWEco is a multi-focal project implemented in ten countries that addresses water, land, and ecosystems management as well as climate change. It is funded by the Global Environment Facility (GEF) and UN Environment (UNEP) is the lead Implementing Agency. The Secretariat to the Cartagena Convention, UNEPs Caribbean Regional Coordinating Unit (CAR/RCU) and the Caribbean Public Health Agency (CARPHA) are the Project’s co-Executing Agencies. Implementation started in 2016 with a five-year timeframe and was later extended to mid-2024 for activities completion. The Trinidad and Tobago case study is the second in the series of IWEco case studies.

The study was written with the goal of being a user-friendly document with key findings and lessons learned described in a logical and concise way with project themes clearly illustrated and explained. Its format is intended to allow its users to easily understand how project activities unfolded, the degree to which project activities achieved early success and produced a catalytic effect which influenced participants expectations, and how and why certain decisions were made.

This Trinidad and Tobago case study reflects the GEF approach which encourages projects to highlight achievements and lessons in relation to key features such as integrated approaches; gender; engagement of the private sector and stakeholders; knowledge management; and sustainability. Also, it follows the GEF approach of applying the ‘triple bottom line’ lens to projects for assessing social, economic, and environmental benefits while also providing sustainable livelihoods opportunities as described in the National sub-Project Document. The case study is also intended to provide useful information to assist in the project’s terminal evaluation.

This completed case study found that the IWEco TT National Sub-Project achieved its goal of demonstrating interventions for integrated environmental management and protection in Trinidad and Tobago using nature-based solutions. The main contributing factors to this success were completion of a formal project review prior to launch and a rapid environmental diagnosis of demonstration sites prior to commencing activities implementation, engagement of local community residents and stakeholders in
meaningful ‘hands-on’ activities using learning-by-doing, and consistent application of an adaptive management approach with continuous monitoring and regular in-person meetings and site visits.

The fact that the project focused on one main type of intervention being land rehabilitation and restoration, compared to other IWEco national sub-projects involving multiple types of environments and interventions, enabled relatively smooth implementation of activities. The main cause of delay in project activities was the Covid-19 pandemic which forced the main demonstration site to close temporarily and resulted in some disruption of operations for EMA and project partner NGOs. A certain amount of time was required to make needed activities adjustments as well as for setting up effective project teleworking arrangements. It is possible that a greater effort to gain private quarries’ participation in the early stages might have resulted in the trialling of a wider range of rehabilitation practices and methods. This might have resulted in a wider technical learning experience for more stakeholders, greater national visibility, and accelerated adoption of responsible quarry management practices in the private sector.

Over the course of the project, logistical, technical, and other types of challenges were also treated by participants as an important part of the intervention learning experience. Stakeholders expressed the view that the project has had a transformational impact on the quarry sector in TT. Project success has been due in large part to the strong enthusiasm and relatively rapid early rehabilitation led by two effective Non-Governmental Organizations (NGOs) and engaged community members. This, in addition to inspiring other project participants, provided valuable early learnings, and a strong sense of team purpose. Participants felt confident about the potential for expanding quarry rehabilitation to more sites through replicating best practices and approaches from the national sub-project.

B. Background

The Aripo Savannas, located in Northeastern Trinidad, is designated as an Environmentally Sensitive Area (ESA) and Strict Nature Reserve under Trinidad & Tobago’s Environmental Management Act (2000). It includes unique habitats, rare and endemic biodiversity and is of great scientific importance. The Savannas provide important ecosystem services - water resources for both aquifer recharge and direct extraction, high quality sand and gravel deposits for construction, and livelihoods for many associated in the quarrying industry.

Quarrying in this part of Trinidad started in the 1940s to meet national demand for aggregate materials needed for buildings and road construction industries. Poor regulation over the years has led to indiscriminate quarrying, resulting in severe land degradation as existing vegetation and topsoil is cleared, leading to loss of habitat, wildlife, and plants. Watercourses are polluted by large quantities of sediment from erosion and from wash plants, and this eventually is transported to the sea, affecting coastal water quality negatively.

Given the sensitivity of the ecosystems within the Northeast area, focussing attention on the restoration and rehabilitation of the degraded quarry areas was deemed to be of high priority by the Government of Trinidad and Tobago and was the focus of their IWEco National Sub-Project.
C. Trinidad & Tobago Sub-Project Purpose and Description

The Trinidad and Tobago IWEco National Sub-Project focuses on restoration and rehabilitation of selected quarry sites in Northeast Trinidad in order to reduce risk posed by land degradation using an integrated water, land and ecosystems management approach. The overall objective of this sub-project is a reduction in risk posed by land degradation at selected quarry sites in the northeast of Trinidad.

Direct interventions on the ground, improved monitoring and reporting, policy making, institutional strengthening and capacity-building, as well as knowledge exchange are all among its objectives. In addition, on-site land and forest cover investments in a minimum of 40 hectares (originally planned) over the target watershed areas, are expected to contribute to CO\textsubscript{2} sequestration over the life of the project.

The two major outcomes of this project were: 1) To reduce the scarring of the landscape through the implementation of appropriate rehabilitation techniques; and 2) To reduce the impact on the natural and socio-economic environment through the application and adherence to international best practice for quarry operators and improved adherence to local legislation.

The Environmental Management Authority (EMA) is the Executing Agency, and the Project was launched in April 2018 with a 48-month timeline. The project aimed to contribute to long-term sustainability through the development and exchange of best practices in quarry rehabilitation through close collaboration and engagement of local stakeholders, to support compliance of operators to meet the legal requirements for rehabilitation under existing legislation; to build the capacity of key project stakeholders; to support the transfer of knowledge; and to identify livelihood opportunities and enterprise generation.

i. Quarry Rehabilitation Training for Local Residents

The project’s main capacity building activity was hands-on training of local community residents in quarry rehabilitation techniques with a focus on youth development and sustainable livelihoods. The training program was funded by IWEco through the UNDP Small Grants Programme (SGP) and involved classroom and field work at the project’s main pilot site. This included hands-on activities for developing a strong base of skills and knowledge for undertaking rehabilitation activities and for enabling replication at additional rehabilitation sites identified under the national sub-project.

ii. Project Demonstration Site Descriptions

The Trinidad & Tobago National Sub-Project targeted interventions for mitigation of acute land degradation at one government-owned operation, the National Quarries Company Limited (NQCL) sand and gravel quarry in Guaico, and at two privately owned quarries, Carib Glass Works in Matura, Northeast Trinidad, and Trinidad Cement Limited’s limestone quarry in Mayo, Central Trinidad.

a. National Quarries Company Limited

The National Quarries Company Limited (NQCL) state-owned and operated sand and gravel quarry, located near the community of Guaico, and adjacent to the Aripo Savannas, in the North Oropuche drainage basin was the main pilot training and rehabilitation site. The NQCL project intervention area includes three individual deforested project intervention sites, each with different characteristics. Sites 1, 2 and 3 occupy +/- 0.68, 4.65, and 1.72 hectares respectively. Site 1 is a mostly flat area which has been
cleared to provide access to other extraction areas. Site 2 is a moderately sloped, back-filled exhausted quarry pit with severe gullying and erosion. Site 3 is a compacted, backfilled, exhausted quarry pit and has a moderate slope. Remaining vegetation on the sites included dry scrub grasses, small plants, bushes, and a small number of trees. Despite the highly porous nature of the predominant limestone geology, removal of vegetation has resulted in increased run-off and sedimentation of the streams fed by the site which connects to the Valencia River (the main river in the project area) and the Quare River which eventually meet the North Oropuche River which empties into the Atlantic Ocean on the East Coast of Trinidad. In addition, waste has accumulated on the sites and downstream in the form of plastic containers and discarded equipment.

b. Privately Owned Sites: Carib Glassworks and Trinidad Cement Limited

To increase project impact, in terms of land rehabilitation and carbon sequestration, protection of surface and groundwater resources, conservation of biodiversity, and to create an enhanced enabling environment for sustainable land management, additional sites for rehabilitation were sought from the private sector. As a result, two privately-owned quarries were added as demonstration sites in 2020 and 2022: 1) Carib Glassworks Limited’s sand quarry operation in the lower Matura area, Northeast Trinidad, for rehabilitation of a 2-hectare former extraction area on a hillside with relatively steep slopes; and 2) Trinidad Cement Limited’s limestone quarry located at Mayo in Central Trinidad for rehabilitation of a 1 hectare pit with moderate slopes.

iii. Increasing Public Awareness and Improving Quarry Management

The establishment and implementation of an effective public awareness campaign to increase voluntary compliance by quarry operators and monitoring of quarries by regulatory agencies was another key activity. A draft document: “Guideline for the Preparation of Rehabilitation Plans” was completed by the EMA in December 2018 and circulated for stakeholder review before finalization for publication and distribution nationally. Since March 2015, the EMA has required that a Rehabilitation Plan be submitted and approved by them prior to the commencement of mining/quarrying operations for which a Certificate of Environmental Clearance (CEC) has been granted. Operators have complained that they needed more guidance to carry out rehabilitation. The project trialed several rehabilitation methods in order to document and promote suitable solutions for replication throughout the quarrying sector, to ensure the sustainability of such solutions and eventually to promote their application across the WCR. The experiences and lessons learnt as a result were used to revise the Guidebook which is designed to assist applicants in submitting succinct and satisfactory Rehabilitation Plans.

In addition, support was provided to Ministries with jurisdical roles in the quarry sector, including for development of a monitoring protocol and improving regulation and enforcement on legislative compliance. These activities to support more regular monitoring are also intended to support national obligations under the United Nations Framework Convention on Climate Change (UNFCCC).

Several public awareness and information dissemination activities were conducted in partnership with Government agencies, and the private and non-profit sectors.

A national stakeholder focus group was established to support the strengthening of legal instruments and institutional capacity building for quarries regulation.
D. Project Schedule, Budget, Executing Arrangements, and Participating Agencies and Stakeholders

a. Project Schedule and Budget

The project was publicly launched in April 2018 with a planting event at one of the NQCL sites involving volunteers from a variety of organizations. It had a planned duration of 48 months, although this was later extended to mid-2024 for activity and reporting completion. The GEF project grant amount was 663,658 USD and the amount of co-funding estimated at 768,875 USD, bringing the total to 1,517,533 USD. Co-funding to the project was ‘in-kind’ and included a variety of Government agencies and other entity contributions (such as the University of the West Indies, St. Augustine) such as staff work time, and use of buildings, vehicles, and equipment. In addition, the UNDP administered GEF Small Grants Programme (SGP), provided direct funding and coordination support for some community-executed activities through a separate allocation from the GEF IWEco project.

b. Execution Arrangements

The Trinidad & Tobago Environmental Management Authority (EMA) is the National Executing Agency (NEA). The Project Management Unit (PMU) consisted of a National Project Coordinator (NPC) contracted for the project duration who worked under the direction of the EMA Managing Director (also IWEco’s National Focal Point, NFP) and in collaboration with the agency’s Project Management Unit. The NPC was directly responsible for project execution and operations guided by approved work plans.

The Project Steering Committee (PSC) was responsible for policy input, functional guidance, and overall project coordination and was scheduled to meet every three months or as often as necessary. The NPC served as the PSC Secretary, and the IWEco NFP as the Chair. The PSC was composed of representatives from the Ministry of Energy and Energy Industries (MEEI); the Ministry of Planning and Development (MPD) - Town and Country Division and Environmental Division; the Ministry of Agriculture Land and Fisheries (MALF) - Forestry Division and Commission of State Lands; the Water Resources Agency (WRA) and the EMA.

c. Participating Government Agencies and Community Stakeholders

In addition to the EMA (NEA for the project), government agencies assisting with implementation of project activities included the MALF Forestry Division and Land and Surveys Division (LSD). Other Departments provided inputs in the form of information and data, technical advice, equipment, and other resources; these included the Town and Country Planning Division (TCPD) the Water and Sewerage Authority (WASA), and the Institute of Marine Affairs (IMA).

The United Nations Development Programme (UNDP) Small Grants Programme (SGP), using allocated GEF IWEco funds, facilitated the participation of two Trinidad-based environmental NGOs with reputations as effective natural resource, capacity building organizations to directly assist with implementation of the rehabilitation activities. These were: the Trust for Sustainable Livelihoods (SUSTRUS) for providing technical training and the IAM Movement (IAM) for training and mentorship. As part of this selection process, project staff facilitated discussions between the two NGOs on how they would use their different skills in a complimentary way to help participants develop and grow as a locally-based, member-driven, and capable rehabilitation organization.
E. Case Study Data Summary and Analysis

i. Project Design

a. Incorporation of Learnings from IWCAM

The IWEco TT sub-project design process from 2015 to 2018 included review of the GEF-IWCAM Project for TT which was completed in 2011 as well as previous projects in the environmental and natural resource management sectors to identifying project key learnings. The IWCAM TT project recommendations identified the need for greater attention to environmental issues and awareness activities for changing behaviour and influencing policy outcomes (with a focus on youth in particular so they can become capable leaders for promoting environmental protection); strategically using CBOs that have local legitimacy; and learning through active demonstration. IWEco TT project designers also incorporated the IWCAM TT lessons learned that undertaking a large number of relatively complex project activities is not a realistic goal, and that investing in the local community with “bottom up” capacity building with youth-focused and hands-on activities is more effective for building capacity.

b. Rationale for Selection of Individual Sites for Demonstrating Nature-based Solutions

The IWEco TT project, in contrast to other IWEco national sub-projects with multiple activities and field sites, was intentionally designed to concentrate on one main geographical location with activities being overseen by one Government agency (EMA). This decision considered the potential benefits of concentrating project resources and capacity building efforts in a limited size area and with focus on a local community. Research and ground-truthing revealed that the area contained various quarry sites with different physical characteristics and environmental issues which would be suitable for demonstrating a watershed-based and integrated water, land and ecosystems management approach using a range of ‘hands-on’ rehabilitation and restoration activities for countering land degradation with innovative and nature-based solutions. Also, considering that area communities are predominantly lower-income, quarry rehab activities in addition to providing environmental benefits, could establish a base for long-term livelihoods opportunities and income generation.

The relatively easy access and moderate size of the National Quarries Company Limited (NQCL) quarry sites 1, 2, and 3 were conducive to managing activities efficiently, and fostering a relationship with quarry operators and area residents whereby potential concerns could be addressed as they arose. Also, NQCL had recently been certified as ISO14001:2004 compliant and had developed an Environmental Policy and Environmental Management System (EMS). The EMS would provide a framework for measuring improvements in the management of sites’ environmental aspects including releases to water and land and use of raw materials. NQCL viewed the idea of providing demonstration sites as a valuable opportunity to support EMA efforts for better quarry management and to build a relationship with nearby communities, including employment generation considering they provide few junior-level positions and most of their staff are trained engineers, environmental specialists and machinery operators. The later addition of privately-owned quarry sites at Carib Glassworks Limited and Trinidad Cement Limited to the project was seen as a valuable opportunity and important step towards achieving the long-term goal of private sector adoption of best management practices and increasing project impact. The range of quarry sites would also provide the opportunity to demonstrate installation of soil conservation measures using a broad range of methods, materials and techniques to reduce erosion, scouring, and sedimentation and improve downstream water quality.
c. Revision of Project Design Aspects in Early Project Stages

In 2018, prior to the start of activities implementation, the RPC and the EMA undertook a formal review of proposed project activities for any needed adjustments to be identified and made. At the beginning of activities implementation in early 2019, at the suggestion of the NPC and PSC, more in-depth diagnostic assessments were conducted at key sites to ground-truth information. The initial project area had been defined as Valencia, however, by increasing the scope to include the municipality of Sangre Grande, interventions could also be employed in degraded areas such as Tamana and Turure. Also, the ecosystems within the Northeast area – not limited to the Aripo Savannas - are highly sensitive and restoration and rehabilitation of these additional degraded quarry areas was deemed to be of high priority by the Government. It was decided that the intervention area would be reduced from approximately 40 ha to about 20 ha allowing rehabilitation activities to be implemented in greater detail, given available project resources and potentially providing a deeper learning experience.

ii. Project Governance, Management and Coordination

The NPSC held its first meeting in August 2018. An outline of the project was reviewed and participants agreed on priority activities for the early project stages including focusing on development of a team of dedicated local quarry rehabilitation specialists as an intervention point to address the disconnect between area quarries and local residents and provide sustainable livelihoods. Committee members also discussed the roles of participating government departments, NGOs, and local organizations stakeholder expectations, and how material and knowledge resources could be leveraged to maximize the benefits and potential outcomes from project activities.

NPSC members and the NPC visited several quarries and visualized how rehabilitation interventions could be undertaken to include trialing different types of ‘hands-on’ activities, monitoring progress and
recording results, and capturing best practices for sharing and disseminating to the wider public and stakeholders.

In early 2023, following discussions between the RPC and EMA about the value of holding workshops on the Comprehensive Quarry Rehabilitation Guidelines for quarry operators, the project was extended to August 2023 to enable more time for these to take place. In May 2023, a further extension to December 2023 was proposed in order to more completely capture metrics on restored sites at NQCL and TCL, to carry out maintenance works at the Taungya agro-forestry site, and to enable promotion of the resources created by the project to improve quarry rehabilitation.

a. Quarry Rehabilitation Training for Local Residents

Starting in May 2018, as the first step in preparing training for local residents, CANARI, based on its livelihoods development model, provided training to two NGOs - IAMovement (IAM) and the Trust for Sustainable Livelihoods (Sustrust) - to assist them as project trainers and mentors in the development and approach to working with local enterprises using capacity assessment, business strengthening, technical skills training for livelihoods activities, and monitoring.

IAM and SUSTRUST conducted outreach to local communities to promote and explain the purpose of the IWEco national sub-project and to propose a ‘partnership’ approach which invited local residents to apply to become part of a quarry rehabilitation team. Outreach focused on messaging that would ‘connect’ with local residents, including paid employment for important work restoring lands and creating environmental benefits for their local area and developing valuable skills for future livelihoods opportunities and income generation. A variety of media was used and community-level canvassing was done. Interviews were held, with the main selection criteria being eagerness and motivation. Participants selected were primarily members of lower income households from surrounding communities and included single mothers, youths, and differently abled persons.

Introductory level training of quarry rehabilitation participants began in May 2018 conducted by IAM and SUSTRUST. Training used an inclusive and ‘hands-on’ approach which encouraged participants to ask questions and share ideas. Instructors illustrated environmental challenges presented by quarry sites, basic instruction on rehab techniques, and practical examples of the benefits to the environment and for human health and livelihoods.

Several participants were interested in further advancing their skills and growing together as a group. These persons undertook a visioning exercise regarding what the group should aspire to be and achieve in the long-term. These participants proposed and adopted the name “Quarry Rehabilitation Champions” (hereafter referred to as the Champions) which they felt reflected how they wanted to be perceived and would strengthen members’ sense of ownership. Also, by including the term ‘Champions’ they set a high level of expectation for themselves in terms of commitment and overall skills development.

In September 2018, IAM and SUSTRUST began developing a quarry rehabilitation training programme for the Champions for acquiring more advanced skills as part of the project’s livelihoods programme. Between September and December, 27 of the Champions underwent a 4-month programme of classroom and field work at the NQCL pilot sites. Training included site preparation and planting, erosion control and fire-tracing, nursery development, top-soil conservation and management, mulching and implementing vetiver as a rehabilitation intervention. Training included the value of trees and forests to life and the
environment, how human resource extraction activities degrade the environment, what land restoration methods are possible, climate change causes and impacts, and the importance of, and methods of biodiversity conservation. This component aimed to develop community capacity, thereby enabling replication at other sites, to be identified during the course of the national sub-project.

Training activities for the Champions were also aimed at building team spirit and sense of community. In the sessions, participants described their experiences living with environmental degradation in their communities such as loss of arable land and biodiversity, and how this affected health and livelihoods. Some already had skills from their own farms or community gardens to share. More participants felt encouraged to join in discussion, including what could be done to overcome environmental challenges in their own communities. Participants, in returning to their homes shared their new knowledge and ideas with neighbours. By the end of the training, the Champions expressed they were eager to continue making rehabilitation progress at the NQCL site and wanted to be recognized as an expert community-based rehab organization at other sites nationally.

b. Coordinating and Managing Demonstration Sites Activities Implementation with Community Stakeholders

Rehabilitation Activities Undertaken at NQCL Sites

Demonstration Sites Rehabilitation Methods and Challenges

Initial work began in May 2018 at NQCL demonstration sites 1, 2 and 3, involving some land clearing and vegetation removal to prepare them for project rehabilitation activities. The project team set goals that rehab activities would result in revegetation of 2.7 Ha over the ensuing 12-15 months and that canopy closure would result in five years.

Rehabilitation activities at the sites began in October 2018 by the Champions with hands-on training and oversight by IAM and SUSTRUST. Participants’ ground-truthing confirmed the condition of the sites as backfilled, exhausted, and compacted quarry pits, mostly denuded and devoid of surface nutrients with severe gullying, and almost no signs of wildlife. Rehab activities focused on erosion control and soil stabilization activities such as check dams using natural timber found on site and vetiver (which has a deep root system) with the goal to slow down and stop erosion, and to catch water and organic matter.
At Site 1, the main demonstration site, a mostly flat area straddling the main access road, rehab activities focused upon planting of fruit trees for food production, creation of wildlife habitat and regeneration of original forest species. Existing unwanted vegetation was removed from one small section of land through scraping with a bulldozer, and at a second, by hand, which took substantially more time. Planting used native seedlings from the Forestry Division nursery. Significantly greater vegetation growth was achieved at the hand-cleared site. As part of a topsoil amelioration study initiated by EMA and executed by IAM with guidance from a UWI St. Augustine Campus graduate team, control sites were established for compost application to trees. Champions recorded substantial higher growth and greater leaf and fruit development for trees that received compost in terms of height and stem thickness.

![Map Showing Locations of Rehabilitated Sites completed under the GEF-IWEco Project](image)

Participants aimed to achieve ‘maximum diversity enrichment’. *Acacia mangium* trees were regenerating naturally on cleared and degraded land and provided shade and nutrients for other plants. Fatpork (*Chrysobalanus icaco*) trees spread broadly at ground level, providing food to enrich the habitat for wild animals. Planted vetiver showed it was resistant to takeover by other species and provides quick ground cover. There was an unkept site of Mandarins, (Portugals), (*Citrus deliciosa*) converted into an agro-forestry experiment where cassava, pimento, scorpion peppers, pumpkins, watermelons, and dasheen were planted and produced substantial harvests.
Dr Carlton Roberts, retired Deputy Conservator of Forests seized the opportunity to work side by side with the Quarries Rehabilitation Champions as an instructor and contribute in his area of passion. He said the energy level and rate of progress in the project was high from the beginning. It has “proven that these community people, ordinary people, were able to be retooled and empowered and are ready to solve this major environmental problem”

The height growth of all the species planted in site 1 was phenomenal, with the tallest trees being over ten metres. Canopy closure is evident; this is an important indicator of successful forest restoration with the return of ecosystem services to this site. The forest trees were chosen for their food and medicinal value and for their role in supporting biodiversity. Quicksticks (*G*il*iricidia sepium*) provides feed for livestock and rich nectar for bees; leaves of the Bois canot (Trumpet) tree (*Cecropia peltate*) possess medicinal qualities, and Immortelle trees (*Erythrina pallida*) provide attractive habitat for iguanas and store water for other plants.

**At Site 2** “The Beach”, was a flat area of bare sand connected to a sloping upland which illustrated severe gullying and erosion. The pilot interventions focused on soil nutrification by adding organic matter to the sandy site. Project staff obtained organic materials from other sources which would otherwise have gone to landfill. This included waste beer hops from a local brewery (Carib Brewery Trinidad and Tobago Limited), tree and grass cuttings from highway road-side maintenance contractors (the state-managed Community-Based Environmental Protection and Enhancement Programme (CEPEP)), and sargassum from beach clean-up activities. Rehab techniques adopted included spacing of vetiver hedgerows and living check dams to slow down run-off and increase absorption. Vegetation growth rates at planting locations which received organic amendments were much higher. Staff recorded the growth rates for different types of organic material. The information was recorded and documented as part of EMA’s topsoil study.

**Waste beer hops being spread as mulch, May 2018**

At **Site 3**, efforts focused on planting of a variety of tree types for forest species enrichment. Individual small plots were planted with different combinations of tree varieties to monitor increases in the amount of tree growth, undergrowth, and diversity of plants and wildlife and effects on soil composition and slope stabilization. The Champions also examined reuse potential for cuttings of fast growth species such as
*Gliricidia sepium*, ideal as timber for check dams. Data on growth of different tree species and beneficial impacts on the environment was recorded and documented for identifying best species for quarry rehabilitation.

In May 2019, a community plant nursery was constructed near site 2 using timber from a nearby forest and covering the frame with a 50% saran netting. Seedling production activities commenced with filling polythene pots with a mixture of mineral soil, compost, manure and sawdust. Young seedlings of chosen species were lifted from the forest floor and planted in these pots. The nursery plants were watered and tended until they were large enough to be exposed to full sunlight, in preparation for out-planting in the field. As an additional supply of native plants for the site, staff arranged for delivery of plants from the Forestry Division’s area nursery.

With the onset of the Covid-19 pandemic and resulting restrictions, the NQCL demonstration site was shut down from April to July 2020. Watering of the community nursery stopped and of the 9,000 seedlings, approximately 90% died. In response to this significant project setback, Champions, and EMA and NGO staff who had backyard gardens established emergency/back-up nurseries at their homes to provide plants during this period and in case of future lockdowns. In addition, upon re-starting the plant nursery in July, the Champions planted shortgrow organic crops as a livelihoods activity in order to quickly produce food for consumption and sale.

**Results and Impact on Champions**

By the end of December 2018, the main physical rehabilitation work had been completed and in January 2019 a Graduation ceremony was held for the Champions with project partners. Members reflected on their journey of progress and the fact that before, many participants had no connection to the land and their view had been transformed in how they see the land’s environmental and livelihoods value. They expressed how they were able to influence the attitudes and practices of others in their communities to protect and plant more trees.
In July 2019, EMA conducted a mapping exercise using GPS and recording drone footage for the three sites. It found that a total area of 7.05 hectares had been rehabilitated. This exceeded the May 2018 estimate of what could be achieved in this period by 4.35 ha (IWEco Quarterly Newsletter, September 2019). The Champions acknowledged that their feelings of ownership and confidence had increased at each project stage and were proud to have become a tight-knit group. EMA had had only limited drone software at beginning of the project. After access to new software and training, they were able to accurately measure distances, tree heights and types to share as part of documenting vegetation regrowth.

A more in-depth trialing of individual rehab techniques and specific livelihoods training activities began in September 2019. CANARI led a workshop for the Champions on using the Local Green-Blue Enterprise Radar Tool which they had developed to assess environmental, social and economic aspects of their activities and determine the best way forward for SME development.

In August 2020, rehab activities at the NQCL sites continued. Biodiversity in the plots increased as birds, butterflies, and small mammals returned to the site. By 2021, the Champions, having benefitted from the sustainable livelihoods training by CANARI, expressed a desire to register as an NGO to broaden their expertise and experience, assist and share skills with the wider community, and create new sources of income. New activities would potentially include landscaping for area communities, businesses, and government departments and expanding the community nursery. The Champions also intended to develop and submit a proposal to the SGP and other donors for a small-scale livelihoods project to include training from CANARI on how to register themselves as handicraft makers and better market their products.

In early 2021, the Champions embraced a new opportunity to apply their rehabilitation expertise through a small agro-forestry initiative called the Taungya experimental site at NQCL. This system allowed individual participants to plant short-term food crops among the trees and have a quick harvest to boost their incomes. The purpose of the group experiment was to determine the most resilient, low maintenance, highest yielding crops to plant under the full Taungya system. The activity continued through 2022 and generated some income for the Champions. In addition, a 3 Ha Taungya site has been planted with approximately 500 dasheen, cassava and sorrel suckers. The Taungya demonstration site has also produced vegetables, fruit and income for this local community group which previously received training in land rehab and restoration.

Two (2)-day in-person workshops on nature-based livelihoods for the Champions were held in partnership with CANARI in November 2021. In addition, four mentorship sessions were arranged to take place at a later date on topics such as registering an NGO; developing a management structure and defining roles and responsibilities in an NGO; marketing strategies; and product pricing.

Further to the signing of the MOA in May 2022 with SUSTRUST to manage the execution of the livelihoods proposal, the proposed initiatives such as the production of vetiver handicraft for sale and the establishment of ‘grow-boxes’ were executed under their mentorship.

Led by them, project livelihoods training activities began for the Champions and other community residents for handicrafts and vegetable grow-boxes. Trainees included enthusiastic persons whose physical limitations did not allow them to perform physical work outdoors. The Vetiver component of the project served to directly support the development of livelihoods handicrafts using vetiver and other...
natural materials. Several Champions took grow-boxes home to plant and shared advice with each other for getting best results. In this way the Champions learned how to monetize their skills and experience.

By the end of 2022, the total NQCL rehabilitated area covered over 16 Ha and by early 2023 some of the planted trees had reached a height of 6 metres. Leveraging the success of the demonstration project, the IDB announced that, in partnership with IAM and NQCL, it would launch a project to upscale rehab at NQCL to 60 Ha to include NQCL co-funding. This would include replicating best practices from the completed ‘Building on Vetiver Project’ funded by the IAB and implemented by IAM. More vetiver hedgerows were installed, plants and trees planted between them, and different compost and mulch applications applied. Of trees planted without soil amendments many were lost compared to those with amendments and mulching. Soil testing included acidity levels to determine best amendments. Participants observed how vetiver drops roots to create more sprouts. In early 2020, in collaboration with the Pan American Development Foundation a number of members of migrant communities joined project rehab activities. Rehabilitation and maintenance works at the demonstration sites continue to be sustained by NQCL via co-financing from the IDB ‘Building on Vetiver’ project executed by the IAM, specifically the topsoil amelioration study and vetiver management.

Quarries Rehabilitation Champion Liz Monroe

Ms. Munroe helped form the established Community Livelihoods Champions group. She learned a lot about building and managing soil and used her earnings from her QRC work to invest in growing. Liz raises chickens and lettuce and sells her produce on the street and via social media. She entered a competition for longest vetiver roots and won achieving 9'4" using a PVC pipe as a holder. Other Champions also purchase produce from her.
Ms. Johnson, with her new skills from Handicrafts training grows vetiver and vegetables at home and has made and sold vetiver woven products such as baskets and earrings. As a stay-at-home mom with a large family these activities have been very beneficial however she needs more promotion of her handicrafts. Vetiver, as a very strong plant requires a lot of time from to prepare for weaving but she has become faster at this and shared her techniques with other Champions.

Rehabilitation Activities Undertaken at Privately-owned Quarry Sites

**Carib Glassworks**

In November 2019, after receiving strong interest from Carib Glassworks Limited, IWEco.TT and the company established the first quarry rehabilitation public-private partnership to employ the Quarry Rehabilitation Champions to rehabilitate one hectare of the Matura Sand Quarry. In consultation with the Carib Glassworks’ experienced project manager, it was agreed that the intervention would include a mix of interventions which were successfully used at NQCL (IWEco Quarterly Newsletter December 2019). A proposal was added in 2020 for the rehab to be expanded to a second one-hectare area. Vetiver was planted on the quarry steep slopes, however frequent unprecedented rainfall events resulted in severe erosion causing the plantings to fail before they became established. Where the Vetiver was planted on areas with bench terraces the roots were able to stabilize the soil and significantly reduce incidences of erosion.

**Trinidad Cement Limited**

In 2019, Trinidad Cement Limited (TCL) agreed to a project partnership for rehabilitation at their Mayo quarry site through contracting of the Quarry Rehabilitation Champions. The intervention included planting of different types of trees for species enrichment and vetiver grass for soil and slope rehabilitation, and installation of live check dams to reduce soil erosion. The rehab progressed steadily and in April 2022 TCL signed a MOA to expand the intervention area by 1 hectare as part of the company’s sustainability strategy. Monitoring activities continue periodically. Sites maintenance has been funded by TCL and SUSTRUST. An assessment of the plantings revealed an average survival rate of 66%. A lack of a consistent irrigation system is contributing to increased mortality. Some of the trees are growing well with the tallest survivors were 2.25 m and the average height was 0.6 m.

**Activities for Increasing Public Awareness and Improving Quarry Management**

**Development of Comprehensive Quarry Rehabilitation Guidelines**

Development of a user-friendly set of Comprehensive Quarry Rehabilitation Guidelines for stakeholders was led by the EMA and conducted through a working team with quarries expertise from the public, private and non-profit sectors. In developing the Guidelines, the team aimed to illustrate in a practical way for each lifecycle stage of quarries, the main environmental risks, roles of stakeholders, and benefits to operators and the environment of proper quarry operation. The Guidelines would provide an easy-
reference explanation of the regulatory framework for quarries - including the requirement for a Certificate of Environmental Clearance (CEC) and an Environmental Impact Assessment (EIA) - to obtain a quarry license, operators would be required to include in a rehabilitation plan.

The Guidelines were finalized and incorporated into a Guidebook for Quarry Rehabilitation Plans which was published in March 2023. A two-day workshop for quarry operators was conducted by EMA staff in April 2023. Staff collected participants’ suggestions for subjects which should be included in future workshops.

Supporting complementary activities led by EMA include production of a Quarry Rehabilitation Training Manual and Curriculum which was published and distributed in April 2023. Training for stakeholders on the manual was planned to include field visits to rehab sites and technical exchange visits. In addition, EMA has encouraged operators to conduct drone surveys of their operations with video and photos for sharing in future training workshops on the Guidelines and the Manual. Training for EMA staff included visits to the NQCL demonstration sites to sensitize Permit and Compliance Officers.

Support to Ministries in Monitoring, Regulation and Enforcement of Quarry Operations

The EMA has partnered with various Ministries involved in quarry operations to provide support for monitoring, regulation and enforcement. In collaboration with the Ministry of Planning and Development (MPD), a monitoring protocol for periodic assessment of identified environmental indicators such as vegetation was produced, and with the Ministry of Energy and Energy Industries (MEEI) and the Minerals Advisory Committee, strategies for improving enforcement for legislative compliance were developed. To support national efforts for strengthening enforcement against illegal quarrying led by the Commissioner of State Lands and a Multi-Agency Task Force, including ground-level support of the National Police Service, EMA identified locations throughout the northeast with high rates of violation and high environmental risk for installation of “No Trespassing” signs. These activities are also aimed at producing more regular monitoring in accordance with the requirements of UNCCC.

Activities for Creating Broad Public Awareness

As part of the project launch in April 2018 at the NQCL demonstration site, 300 volunteers participated in tree planting. This was broadcast on national television and social media and followed by a ceremony. SUSTRUST and IAM Movement conducted environmental awareness pilot sessions in a number of schools. The Champions accepted invitations to visit schools including the National Centre for Persons with Disabilities to explain their work, learn about the lives and aspirations of students, and explore ideas for partnering in future local environmental activities. A number of school groups visited the site and these learning experiences were subsequently incorporated into, and discussed, in classroom lessons. UWI environmental and agricultural studies students at the undergraduate, graduate and post-doctoral level periodically made visits to the site for practical field experiences and some of these students returned to perform research on different aspects of the intervention.
**Videos and a podcast** for creating public awareness and interest in the project were produced by EMA, UNEP and CANARI and uploaded to IWEco TT, EMA, CANARI, IAM and SUSTRUST websites and You Tube highlighting the story of the Champions path to empowerment and success as well as key support from participating organizations. The videos attracted a substantial number of viewers, ‘likes’ and positive comments.

Trinidad & Tobago Television (TTT), seeing the success of the project and podcast, produced television spots, including interviews with EMA staff on successful technical aspects of the rehabilitation activities and the practical value of the findings for future replication. The EMA Managing Director, opened a national television spot by announcing that the IWEco project is leading the way for quarry rehabilitation in Trinidad & Tobago, emphasizing the essential project role of NQCL in providing rehab demonstration sites, and inviting operators of more private quarries to partner with them to build on project success.

IWEcoTT promoted its achievements in the 20th edition of the Trinidad & Tobago Energy Guide Magazine targeting the extractive sector (TTEG e-Directory_20th Anniversary (energyguidett.com)). A documentary film on the project was commissioned by the EMA promoting the benefits of restoration and conservation in the energy sector by capturing interviews with key stakeholders.

**Establishment of a National Stakeholder Focus Group for Strengthening Legal Instruments and Institutional Capacity Building**

A national stakeholder focus group was established for supporting the strengthening of legal instruments and institutional capacity building for quarries regulation. It was meant to identify existing gaps and make recommendations.

**Research Studies at Project Demonstration Sites**

A number of research studies have been undertaken at the NQCL demonstration sites. Research was conducted by The Vetiver Network International (TVNI) on the ability of vetiver grass to stabilize slopes and promote tree growth on degraded quarry lands while regenerating topsoil and subsurface soil. UWI faculty and graduate students performed data collection and analysis on the ability of waste material (organic mulch) to rehabilitate topsoil at degraded quarry lands and a quantitative assessment of the carbon sequestration capabilities of vetiver grass and organic mulch. Next, UWI staff began research on the extent to which vetiver can pull water upward to benefit other plants and trees.

**Presentations to International Professional Associations**

At IWEco’s 17th Partners’ Webinar in January 2022, Mr. Jonathan Barcant, Caribbean Coordinator of TVNI, introduced participants to "The Vetiver Education & Empowerment Project (VEEP) model and the Vetiver System (VS) in the Caribbean." He shared the Trinidad quarries project experience with vetiver as bioengineering tool including cross-sectional diagrams and photos illustrating the extent of natural terracing which developed. EMA Environmental Officer Mr. Arnott Jones delivered a presentation "Rehabilitation of Quarries" based on the activities undertaken at the demonstration sites and key findings at the at 7th Conference of Geological Society in Trinidad & Tobago in July 2022. As part of this presentation, Mr. Jones directed attendees to the location of relevant key documents on the IWEco and EMA websites and encouraged stakeholders potentially interested in collaborating with EMA in this sector to contact the Department.
c. Project Documentation, Recording, and Information Sharing

Several videos of the project were made showing on-site rehabilitation and livelihoods activities and telling the personal stories of the Champions. Academic and research papers produced by University of the West Indies, St. Augustine Campus and other agencies would be published and uploaded to websites for environmental research and presented at conferences.

iii. Key Findings & Lessons Learned

a. Overall Project Goals

• IWEco TT achieved its goal of successfully demonstrating approaches for integrated environmental management and protection in Trinidad & Tobago using nature-based solutions to restore vegetation, reduce sedimentation and restore ecological function to exhausted or abandoned quarries.

• Direct interventions at project demonstration sites provided valuable lessons learned, and stakeholder capacity building activities resulted in an enhanced enabling environment and strengthened institutional capacity for good quarry management practices.

b. Project Design and Preparation

• Completion of a diagnostic environmental analysis of identified project quarry sites prior to commencing rehabilitation activities allowed the total area of demonstration sites’ to be reduced to a manageable size and NbS interventions to be more targeted, resulting in more in-depth trialing of techniques and hands-on learning.

• Selection of quarry sites on property operated by a Government entity (NQCL), with agreement from NQCL’s management in the project design phase, ensured a designated location as well as support for demonstration activities for the project duration.

• The role of the UNDP SGP in facilitating participation of two very different NGOs to work together with the local community and other partners, was key to involving persons from the nearby communities in rehabilitation activities and to the success of these interventions. Each NGO contributed different areas of expertise and strengths to the rehabilitation.

• If the project had been of longer duration, additional private quarry sites and private operator contributions in terms of equipment and materials could have been secured to trial additional nature-based solutions.

c. Stakeholder Engagement and Capacity Building

• Project messaging to local communities was effective in gaining strong project participation and buy-in by focusing on residents needs for employment and skills development, and their connection to their local community.

• The selection of a project team (Government staff, NGOs, and private sector) with proven sector expertise, strong sector working relationships, and a positive reputation in the local community proved invaluable for IWEco TT implementation and achieving stakeholder buy-in. This was seen, for instance in the EMA Managing Director’s past role as head of NQCL, and in Dr. Carlton Roberts’ (SUSTRUST) experience and community connections as a retired Forester.
• Project implementing NGOs’ approach of using common language and consistently emphasizing the importance of achieving small steps for building awareness, learning techniques, and applying learnings with the Quarry Rehabilitation Champions and other community members was essential for maintaining team motivation, especially during challenges such as the pandemic.

• The close proximity of the EMA field office in Valencia and of IAM Movement and SUSTRUST offices to the NQCL demonstration site were important for building project relationships with local residents, responding to urgent site matters, staying in touch and building public awareness.

• Application in training of the Local Green-Blue Enterprise Radar Tool developed by the CANARI was valuable in the mid-project stages as it sensitized the Champions to the need for attention to the social, economic, environmental and governance aspects of their small enterprises in the pursuit of sustainability.

• The initial launch of the project in April 2018 with a public event at the NQCL site which had wide participation, was very successful. Greater public participation, stakeholder education, and business involvement might have been maintained if outreach efforts had been maintained as the project activities progressed; perhaps through the Ministry of Education and the Quarries Association.

d. Means and Frequency of Communication

• Effective communication between the NPC, NPF, PSC was achieved by using face-to-face meetings and different technologies, the latter of which proved invaluable during the Covid-19 pandemic and associated temporary closure of the NQCL demonstration site and EMA offices.

• When meetings and communications were missed, site specific issues took longer to resolve causing some delay in activities.

• Considering the multiple demands on the NPC, more comprehensive reporting on project progress and more efficient financial management and record management in EMA might have been achieved if a designated communication specialist had been included in, or available to, the PMU. This might have reduced some delays in activities implementation. That person could also have assisted with more regular follow-up with partners such as SUSTRUST.

e. Logistics

• Project partners’ successful efforts to secure offsite sources of organic materials from Government Departments, area businesses, and local communities as inputs on rehabilitation sites, provided valuable learning experiences on the impact of different types of recycled waste materials on growth under different conditions and at minimal cost.

• Regular access to the rehabilitation sites was necessary for maintenance and irrigation of plantings, monitoring progress, and – in combination with signage – for preventing vandalism and/or theft. During the period of covid restrictions when access was not possible, the project experienced significant setbacks.
f. Adaptive Management

- The commitment of the NPC and NFP to be flexible for achieving activities implementation and quickly respond to logistical challenges and stakeholder concerns prevented excessive project delays and helped solve problems before they reached the wider community and the media.

- Rehabilitation learnings acquired by stakeholders in activities’ initial and mid-stages provided them with the knowledge and confidence to expand the intervention area size, to initiate additional environmental activities, and to seek additional funding towards the end of the project.

- EMA’s existing relationships with quarry operators, MEEI including the Minerals Division, the Commissioner of State Lands, QATT, CANARI, and UWI allowed for a substantial amount of baseline information to be collected and in turn to be shared with partner NGOs. This resulted in more informed and efficient decision-making, faster implementation, and higher quality outcomes.

- The major threat to the rehabilitation demonstration NQCL project site by the loss of community nursery plants due to site closure in summer of 2020 during the Covid-19 pandemic was overcome by the actions of the Champions and project team to bring plants from their own properties as well as to establish small nurseries on their own properties, thereby ensuring some plants were available when planting could restart.

iv. Sustainability

- Development of policy, legislation and guidelines to require best quarry management practices and the rehabilitation of spent quarry lands is a pre-requisite for wider uptake of the rehabilitation methods promoted by this project.

- Successful replication and adoption of rehabilitation practices across communities in Trinidad and Tobago depends on receptive and supportive quarry operators and landowners, as well as wider uptake by capable, trained community-based organizations and interested NGOs.

- NbS interventions, because they are labour and time intensive, require sustained financial support and active collaborations (including continuity of staff) to achieve long-term benefits. It is notable that NQCL was awarded ‘Best Social Investment Project (Large)’ by the Energy Chamber of Trinidad and Tobago in February 2019, on the basis of rehabilitation work and alternative livelihood opportunities initiated under the IWEco Project. See [https://www.youtube.com/watch?v=FRXXkLJlojY](https://www.youtube.com/watch?v=FRXXkLJlojY). This seems to indicate industry appreciation for such an approach.

- The project aligns with GoTT’s current priorities and the substantial level of technical capacity, collaboration, and confidence developed amongst participating agencies and community stakeholders is sufficient to continue quarry rehabilitation projects using NbS.

- EMA development, modernization, administration, and enforcement of the legal framework for quarries management in Trinidad & Tobago will require sufficient human and financial resources and effective cooperation and coordination amongst jurisdictional Departments.

- Sustainability of the project’s interventions as well as future projects using NbS depends on a range of factors including maintaining the support of policy makers, private operators, and the broader population. Advocates must demonstrate that not only can the NbS interventions sites be maintained
by the local community with moderate amounts of additional resources, but that sites will generate consistent income for property owners and operators, and that NbS will be more cost-effective than traditional hard infrastructure methods over the long term. Also, in selecting privately-owned quarries for project partnerships, operators should be required to provide a formal commitment to maintain rehabilitated areas and not return them to extractive uses.

F. Recommendations

i. Project Replication and Scaling-up

• Outreach efforts to the private sector could include approaching and arranging initial meetings with quarry operators to create concept scenarios for potential rehabilitation and restoration interventions at selected quarries whereby different NbS are applied and trialed. Trials should explore certain aspects/subjects from IWEco TT in greater detail (piggy-backing) and include methods and techniques which use on-site materials as much as possible, potentially bringing donated organic materials, and scientific techniques such as injecting top-soil with microbes to increase fertility. Research activities such as carbon sequestration led by UWI subject experts could also be undertaken. Trials should use an adaptive management approach and involve multiple stakeholders to maximize experiences and learnings. Selected sites should illustrate varying characteristics for example, and not necessarily limited to size, type of operation, geology, and distance to sensitive environments/high value habitats. The trials should use the new EMA Guidebook for Quarry Rehabilitation Plans as a reference framework for selecting trial activities and for monitoring and assessing results. This initiative could also involve new tailored training for the Champions and/or other community groups.

• Standards for measuring reforestation success should be the same for all parties - for example some operators currently count secondary forest as forest cover whereas EMA does not. For quarries certified as ISO14001 and having on-site Environmental Management System (EMS), rehab trials can include measuring improvements in aspects such as emissions to air, releases to water, releases to land, and use of raw materials. Operators can use these results to make changes to EMS for improving environmental performance. Income generation scenarios could include timber, fruit and vegetable production, employment for rehabilitation services, and recreation visitors.

• Future efforts to expand quarry rehabilitation in the northeast region should also consider work previously conducted by EMA and CANARI for the update of Management Plans for the Aripo Savannas as well as Integrated Aripo Savannas Environmentally Sensitive Area Plans. This should include reviewing the list of stakeholders who participated in the planning process for the Aripo Savannas as many of these persons are likely to possess valuable ground- and community-level knowledge for siting and designing rehab projects. NGOs and CBOs with quarry sector experience should also be considered.

• EMA, NQCL and Trinidad Cement Limited should establish a way forward for on-going maintenance and monitoring of the rehabilitation demonstration sites to be led by the quarry operators. Consideration could be given to the provision of labour by quarry operators and depending on availability of qualified workers and/or could be contracted with a qualified service provider such as the Champions. Monitoring should include erosion and sedimentation, plant and tree growth and vegetable and fruit production, and plant and animal species abundance and diversity which could
also employ camera traps. Reference resources for these efforts should include the EMA Quarry Rehabilitation Training Manual and the SUSTRUST Training Manual.

- Livelihoods activities promotion should consider marketing and selling fresh produce, saplings and natural handicrafts. Marketing could also explore opportunities for ‘green’ branding emphasizing the uniqueness of community-based rehabilitation projects. CANARI or another NGO with this area of expertise could possibly assist with this initiative and provide training. Tools could include the Green-Blue Enterprise Radar as well as other resources developed by CANARI as part of the regional sustainable livelihoods activities also conducted under IWEco.

- Future efforts for monitoring of quarry operations should include monitoring of the extent of use of the EMA Guidebook for Quarry Rehabilitation Plans as well as extent of application of methods and results. Review should examine the extent to which the operation followed the steps and best practices listed in the Guidebook. This could include surveys with quarry operators on how easy they find the Guidebook instructions to follow and to implement. This information would be used to make improvements to the Guidebook in order to maximize its usefulness to operators and for achieving better environmental outcomes.

- Future project design should incorporate learnings from IWEcoTT as well as the overall IWEco project. This includes selecting adaptive management (small frequent project cycles with continuous monitoring and learning and making timely adjustments to overcome obstacles and take advantage of opportunities as they arise), targeting sites with high potential restoration value, ensuring maximum public exposure, project leaders with a strong local familiarity, proven effectiveness, and positive community relationships, siting the PMU and/or its branch offices close to project sites and implementing partners, setting aside time for design review in the project planning stages, holding a national kick-off meeting and/or public event with strong community-friendly theme. Key Findings from IWEco’s Terminal Evaluation should eventually also be addressed.

- Project future design for integrated environmental management with NbS should align with and support the goals of other Multilateral Environmental Agreements (MEAs) which address water quality and quantity, biodiversity and habitat, and climate change such as, and not necessarily limited to, the Cartagena Convention Protocol for Pollutants from Land Based Sources (LBS), Convention on Biological Diversity (CBD), and Ramsar Convention on Wetlands.

ii. Future Legislative and Policy Review

- EMA should consider conducting monitoring and data collection activities in 2024 to assess the level of quarry operator compliance with the set of comprehensive Quarry Rehabilitation Guidelines. This could include a voluntary survey to operators and analysis of data on licensing, operator reporting, and enforcement activities. The survey should also invite feedback on ways to improve compliance through outreach and training and using incentives and disincentives.

- Review of national level environmental laws, policies, regulations should be undertaken every few years to determine whether changes can be made to improve the regulation and operation of quarries. Research should include review of best practices employed in other counties and industrial sectors to promote voluntary compliance such as for example waiving of annual licensing fees or tax credits for operators undertaking implementing improvements in site design and operational and
management practices. Review of best practices should include the Minerals Sector Study completed under the IWEco St Kitts and Nevis National sub-Project.

iii. Outreach and Education in Integrated Environmental Management and NbS

- Existing partnerships in environmental outreach and education with the Ministry of Education, UWI St. Augustine Campus, and other research agencies should be reviewed for identifying opportunities for more targeted messaging to key stakeholders and specialist agencies as well as for reaching a wider audience such as mainstreaming in schools. Graduate and post-doctoral students could be encouraged to do research including hands-on trials of NbS approaches in rehabilitation and restoration. Research undertaken at specific sites could be used for future project development.

- Develop and improve existing initiatives for collaborative data sharing including knowledge products, formatting, storage, analysis, and presentation for producing effective public messages and awareness campaigns, and advocacy for Government departments, community stakeholders, and the public.
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