

Barbados Clean Tech Industry Report 2022

Published by the BLOOM Clean Tech Cluster Barbados



Definitions and abbreviations

Definitions

\$	US dollars, unless otherwise stated
BAU	Business As Usual
BIDC	Barbados Investment and Development Corporation (re-branded Export Barbados)
BL&P	Barbados Light & Power Company Ltd.
BLOOM	Cleantech Cluster Barbados
CDB	Caribbean Development Bank
COP	Conference of Parties
EV	Electric Vehicle
FIT	Feed In Tariff
FTC	Fair Trading Commission
GCFB	Green Climate Finance Bank
GEF	Global Facility Fund
GHG	Green House Gas
GOB	Government of Barbados
IDB	Inter-American Development Bank
INDC	Intended Nationally Determined Contribution
MIBI	Ministry of International Business and Industry
PV	Photo Voltaic
SME	Small and Medium Size Enterprises
R&D	Research and Development
RE	Renewable Energy
UNIDO	United Nations Industrial Development Organization

Table of contents

Executive Summary 1 Page 4	Objectives and Scope of Project 2 Page 9	Methodology and Approach 3 Page 11	Clean Tech Tracking ... 4 Page 19
Clean Tech Industry Assessment 5 Page 23	Response to select indicators in the ... 6 Page 42	Conclusion 7 Page 44	Annex 1 – Summary listing ... 8 Page 47
Annex 2 – Corporate profil ... 9 Page 50	Annex 3 – Synthetic scoring 10 Page 70		



1 Executive Summary

Key highlights

Background and objectives

- ▶ Barbados' aim is to become the most environmentally advanced green country in Latin America as set out in its National Strategic Plan 2006-2025. To facilitate the achievement of this aim, the United Nations Industrial Development Organization (“UNIDO”), the Ministry of International Business and Industry (“MIBI”), the Barbados Investment & Development Corporation (“BIDC”) [now Export Barbados] and the Cleantech Cluster Barbados (“BLOOM”) are jointly implementing a Global Facility Fund (“GEF”) funded project (the “Project”) to support the implementation of the strategic plan.
- ▶ The project aims to strengthen the local supply side of green quality products and services and the creation of an enabling environment for clean tech entrepreneurship and innovation.
- ▶ This Barbados Clean Tech Industry Report (the “Report”) is directed towards potential industry and public clients and serves as a knowledge product of the industry.

See p. 10.

Conceptual Approach

- ▶ New paradigms have highlighted the importance of five distinct stakeholder groups for the sustainable growth of tech innovation ecosystems, especially emerging ones; those stakeholder groups are:
 - ▶ Entrepreneurs (SMEs)
 - ▶ Capital (finance)
 - ▶ Corporates (established businesses)
 - ▶ Government
 - ▶ Academia (schools, colleges, universities, etc.)
- ▶ These should be supported by a favorable, enabling government policy framework that provides adequate incentives and guarantees stability, thus attracting and fostering entrepreneurial activity. This is particularly relevant for energy transitions, as they usually require a mix of public and private forces.
- ▶ Specific entities within each of the five shareholder groups were identified and engaged to gather their insights and views on how the development of the clean tech sector is being supported, the key challenges experienced and which sub-sectors areas should be prioritized for the overall clean tech sector to grow.
- ▶ Profile data was collected from a representative sample of the SMEs and corporates to assist in developing and understanding the characteristics of the industry.
- ▶ A tracking framework was developed, under a separate phase of this work, a summary of the current state of Barbados' development, as assessed within the framework and against select benchmark countries, is presented in this Report.

See p. 12.

Key highlights (cont'd)

National focus

- ▶ Barbados is committed to the broad aims of the Paris Agreement of pursuing climate mitigation actions to limit global warming to 1.5°C and it has set as an economy-wide goal – to reduce Green House Gas (“GHG”) emissions by 44% compared to its Business As Usual (“BAU”) scenario by 2030 when compared to 2008 (baseline year).
- ▶ A total of 88% of its GHG emissions are produced from energy and power generation, transport and waste. Therefore, the sustainability mainstreaming in the national context documents reviewed are focused on those three areas albeit, there are policies, strategies and initiatives in place regarding other areas such water and the blue economy, etc.

See p. 24.

Clean tech universe and industry profile

- ▶ A range of sources were identified, researched and reviewed for firms whose principal business activity (or significant divisions) were operating in one or more clean tech segments within Barbados. Based on that exercise, there are approximately 60 clean tech SMEs and corporates operating within Barbados.
- ▶ Approximately one-third of the clean tech companies provided their corporate profile but not all responded to each request for specific datapoints. Based on the information provided, the median corporate age of the clean tech companies was 12 years (i.e. established in 2010);
- ▶ Approximately 444 individuals are employed at the 18 companies that provided details on their work-force; of those that provided details on their gender ratio, approximately 69% are males and the remaining 31% are female.
- ▶ A total of 47% of all 60 clean tech companies operate in energy and power; together with circular economy, water and the blue economy as well as agriculture and food, that represents 83% of the clean tech companies.

See p. 13, 27

Clean tech cluster

- ▶ Of those 60 clean tech companies, only 9 startups are members of the Bloom Barbados Clean Tech Cluster (“BLOOM”).
- ▶ BLOOM was operational from 2020; and it offers a range of services to its membership including matchmaking, business intelligence, capacity building and makerspace.
- ▶ It offer business incubation and accelerator programs for potential startups; the programs are arranged across three phases and in total spans 2-1/2 to 3 years.
- ▶ BLOOM also has a network of partnerships with international research and innovation agencies, universities, research centers, accelerators and science parks

See p. 28

Key highlights (cont'd)

Initiatives

- ▶ To support the National policy goals on sustainability and climate mitigation effects, there are a number of initiatives to assist in creating an enabling environment which is conducive to the development of the clean tech sector.
- ▶ One of the significant initiatives in the energy and power sub sector, which is supply-side focused is the Feed In Tariff (“FIT”). The FIT guarantees an investor a range of fixed rates over a fixed duration for 100% of its energy output. However, the slow and cumbersome permit and licensing process remains one of the bottlenecks which investors need to navigate.
- ▶ There are also a number of incentives relating to the transport sector which are intended to drive demand for EVs but will also influence the growth of charging networks across the island,

See p. 25-26, 29-31

Key challenge – availability of finance

- ▶ Notwithstanding the policies and initiatives in place, one of the major challenges, as cited by the stakeholders, relate to the availability of financing including access to grants and concessional loans.
- ▶ Notwithstanding, the identification of the challenge relating to finance, there are a range of financing options either currently available or imminent and which are outside the traditional commercial banks.
 - ▶ Inter-American Development Bank (“IDB”) through its private sector arm (IDB Invest) offers finance to companies to advance clean tech; one of the recent beneficiaries of a revolving credit facility was one of the clean tech companies operating in the mobility and transport segment. IDB is a donor to Compete Caribbean which offers matching grants up to US\$500,000 to firms and/or clusters under the Enterprise Innovation Challenge Fund (“EICF”).
 - ▶ Caribbean Development Bank (“CDB”) which offers finance to a cohort of firms pursuant to applications made by a representative agency or Ministry provided the project meets certain criteria in relation to its technical feasibility, social impact, etc.
 - ▶ Green Climate Finance Bank (“GCFB”) which is soon to come on stream will act as an investment bank where it will be searching for assets of “investible size” which have an impact on climate mitigation and/or adaptation.

See pp. 34-38

Key highlights (cont'd)

Areas requiring focus

- ▶ The results of the stakeholder engagement shows that among the areas identified as key priorities on which Barbados should focus to further develop the clean tech sector are:
 - ▶ Agriculture and food;
 - ▶ Water and the blue economy; and
 - ▶ Mobility and transport
- ▶ In relation to the first two segments (Water and the blue economy and Mobility and transport), the main reasons these were highlighted were due to the need for food security, diversification of crops with higher yields, the island's categorization as a water scarce island, the increasing frequency and duration of droughts and the high level of non-revenue water pumped by the Barbados Water Authority ("BWA").
- ▶ Based on a numerical count, these areas jointly represent the third largest segment where clean tech companies are concentrated.

See pp. 32-33.

Status of the development of the clean tech ecosystem in Barbados

- ▶ Based on an assessment of the policy indicators which include National policies, strategies and dedicated research, Barbados ranks 2.7 out of a possible 5 on the synthetic scoring scale.
- ▶ Based on an assessment of the innovation outcome indicators which comprise six measures including density ratio, investing ratio and number of clean tech jobs, Barbados ranks 0.8 out of a possible 5 on the synthetic scoring scale. However, this is based on the limited data provided by the clean tech companies in relation to their corporate profiles.
- ▶ As a consequence, Barbados is considered an "early-mover" with favourable conditions for growth and development of a sustainable clean tech ecosystem given its strategies and policy-oriented efforts.

See pp. 20-22.

2

Objectives and Scope of Project



Background and Objectives

The United Nations Industrial Development Organization (“UNIDO”), The Ministry of International Business and Industry (“MIBI”), the Barbados Investment & Development Corporation (“BIDC”) [now Export Barbados] and the Cleantech Cluster Barbados (“BLOOM”) are jointly implementing a Global Environment Facility (“GEF”) funded project to support the implementation of the National Strategic Plan 2006-2025, which aims to make Barbados the **“most environmentally advanced green country in Latin America and the Caribbean”**

The project aims to bolster the local supply side of green quality products and services and the creation of an enabling environment for clean tech entrepreneurship and innovation where, clean tech represents, the technologies and business model innovations that enable the transformation to a more resource efficient and low carbon economy.

This industry report forms part of the project by acting as a knowledge product of the industry. In doing so it:

- ▶ Presents an assessment of the development of Barbados’ clean tech ecosystem and its positioning relative to international and regional benchmarks;
- ▶ Provides national context and a view of the degree to which the Barbados environment enables the development of the clean tech sector by outlining key goals, strategies and initiatives in a subset of relevant policy documents. It also shows how government is leading the way with initiatives and demonstrating its commitment to climate mitigation and adaptation resilience;
- ▶ Provides individual profiles on a subset of the clean tech companies operating in Barbados;
- ▶ Presents an overview of the clean tech cluster and how it aims to support the development of the sector;
- ▶ Summarizes the key results of the stakeholder consultations particularly with reference to key challenges and their sentiment on key areas on which Barbados should focus for the clean tech industry to grow;
- ▶ Presents an awareness overview of what is being done, in the highest ranked challenge areas, at a local level; and
- ▶ Provides responses to select indicators as set out in the GEF CEO Endorsement document.



Barbados aims to be the **“most environmentally advanced green country in Latin America and the Caribbean”**

3

Methodology and Approach



Conceptual Approach

In recent years there has been a shift in paradigm from the Triple Helix Framework, as an approach to explain and support the development of entrepreneurial ecosystems, to what is now known as the Five-Point or “Pentagon Model”. The Pentagon Model highlights the importance of the following stakeholders for the sustainable growth of tech innovation ecosystems, especially emerging ones: (1) Entrepreneurs (2) Capital (3) Corporates (4) Government (5) Academia.

Research and existing reports suggest that the existence of a high concentration of startups is the first proxy to measure the “innovation economy”; hence they are drivers of future growth. It is important to understand their profiles and where they are in the process of development and their experience.



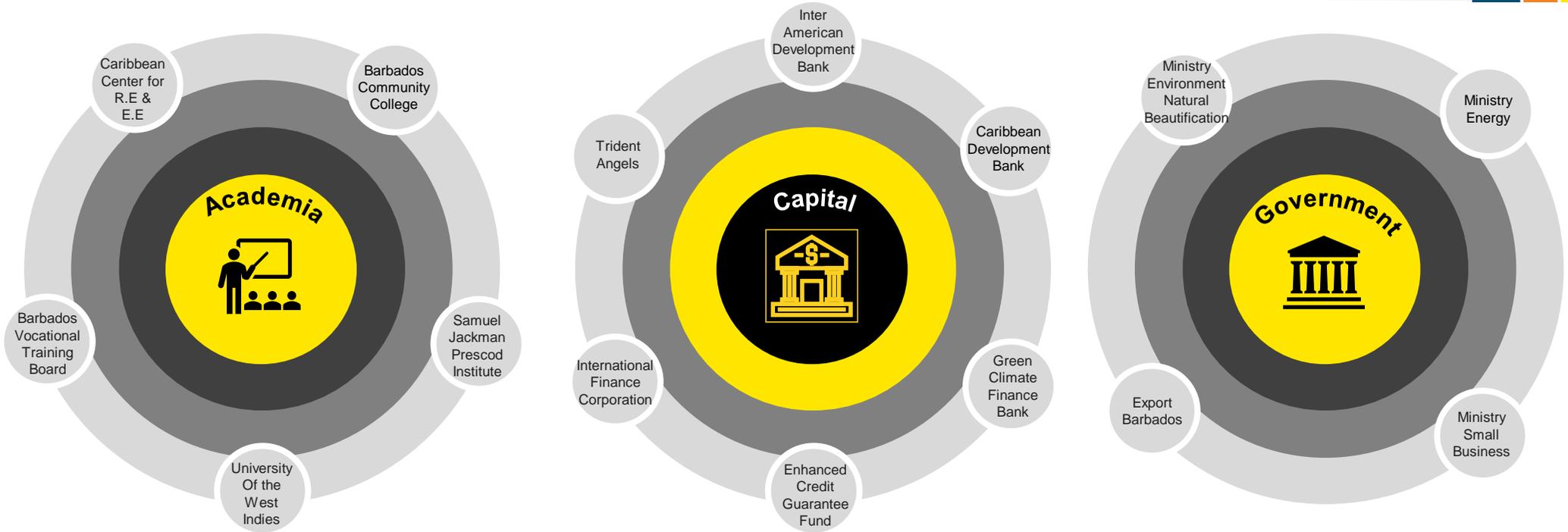
Educational institutions, particularly at the post-secondary level, have a critical role to play in the sustainable growth of the clean tech sector by building knowledge capacity to support the future workforce needs of the sector and by extension the country.

Access to capital in several forms and from different sources is vital to support R&D, the transition from incubator to accelerator, business growth and creating opportunities for future generations within the ecosystems.

Government support, whether active (visionary) and/or passive support (grants, taxes, etc.), and its interplay with industry are critical for the development of ecosystems.
An enabling government policy framework that provides adequate incentives and guarantees stability is important for attracting and fostering entrepreneurial activity.

Larger corporations serve as innovation and economic catalyst and provide an effective way of measuring the enablement of an ecosystem; they provide a solid view of the proven capacities of an ecosystem to generate scalable, successful ventures.

Stakeholder Maps – other key stakeholders for the sustainable growth of clean tech innovation ecosystems



To understand how the local tertiary and other educational institutions are supporting the sector development via delivery of bespoke knowledge; the following five institutions were identified for engagement:

- ▶ Barbados Community College (“BCC”)
- ▶ University of the West Indies (“UWI”)
- ▶ Samuel Jackman Prescod Institute of Technology (“SJPI”)
- ▶ Caribbean Center of Renewable Energy and Energy Efficiency (“CCREEE”)
- ▶ Barbados Vocational Training Board (“BVTB”)

BCC and UWI were the only institutions that participated.

To gather insights, views and details regarding funding initiatives and programs available to the clean tech sector for business and product development as well as commercialization, the following institutions were identified for engagement:

- ▶ Inter-American Development Bank (“IDB”)
- ▶ Caribbean Development Bank (“CDB”)
- ▶ Green Climate Finance Bank (“GCFB”)
- ▶ International Finance Corporation (“IFC”)
- ▶ Trident Angels

The IFC did not participate.

To understand the views regarding overarching trends and public policy actions related to the development of the clean tech industry, the following stakeholders were identified for engagement.

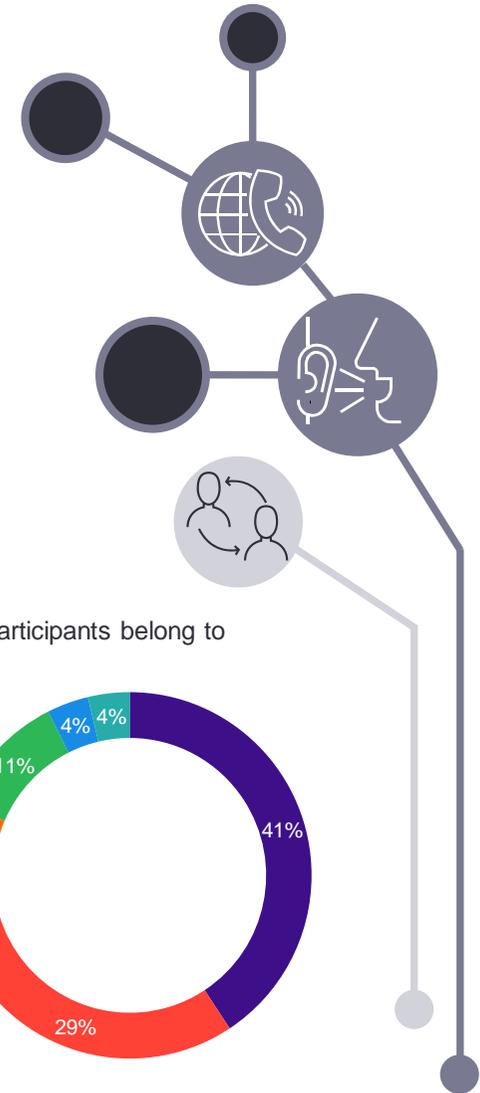
- ▶ Ministry of Energy
- ▶ Ministry of Small Business
- ▶ Ministry of the Environment and Natural Beautification
- ▶ Export Barbados (formerly Barbados Industrial Development Corporation – BIDC)

It was recognized that the general community and members of Chambers and Associations are also stakeholders impacted by clean tech and therefore, those groups were also selected for engagement.

Engaging Methods: interviews and workshops

Once the specific stakeholder entities were identified, engagement was achieved via one-on-one interviews, virtual workshops and/or online surveys.

Beyond the engagement with the government ministries (Energy, Small Business, Environment and Natural Beautification), state-owned enterprise (BIDC/Export Barbados) and NGO (BREA); approximately 50% of the SMEs and corporates which constitute the clean tech industry were either interviewed and/or participated in one of three workshops. As a result of the restrictions on movement and meetings (location, number of attendees, etc.) due to the COVID-19 pandemic, both the workshops and the interviews were facilitated virtually.



Workshops

The following provides the format of the workshops held. Following each break-out session, the web-link(s) to online surveys were distributed to each participant.

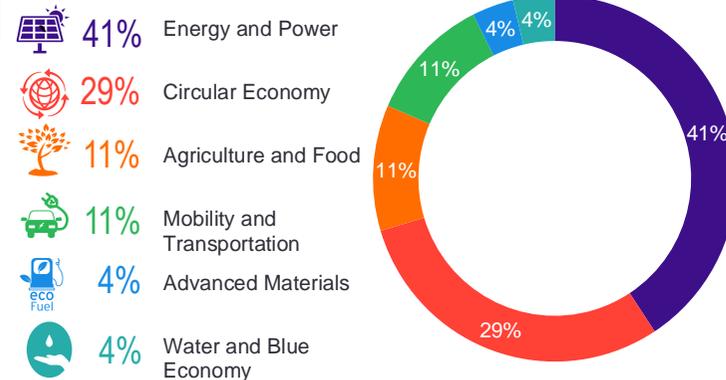


Interviews

A pre-determined array of questions were prepared to facilitate the discussion and to ensure consistency across the interviewees. The intent was to assist in developing a baseline for clean tech in Barbados.

Participation

A total of 27 SME and corporates participated in the workshops and interviews; the chart to the right shows the participant profile. Since the participants (%) composition match the industry composition (%) (page 27), it can be concluded that a representative sample of each industry (sub-sector) participated; and their views and insights are representative of the clean tech sector.

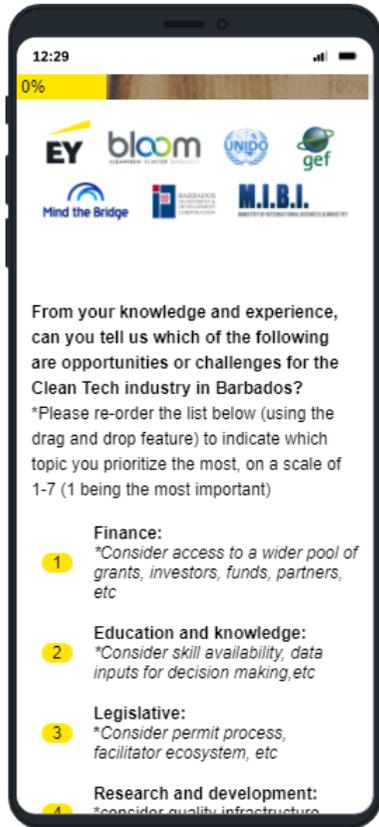
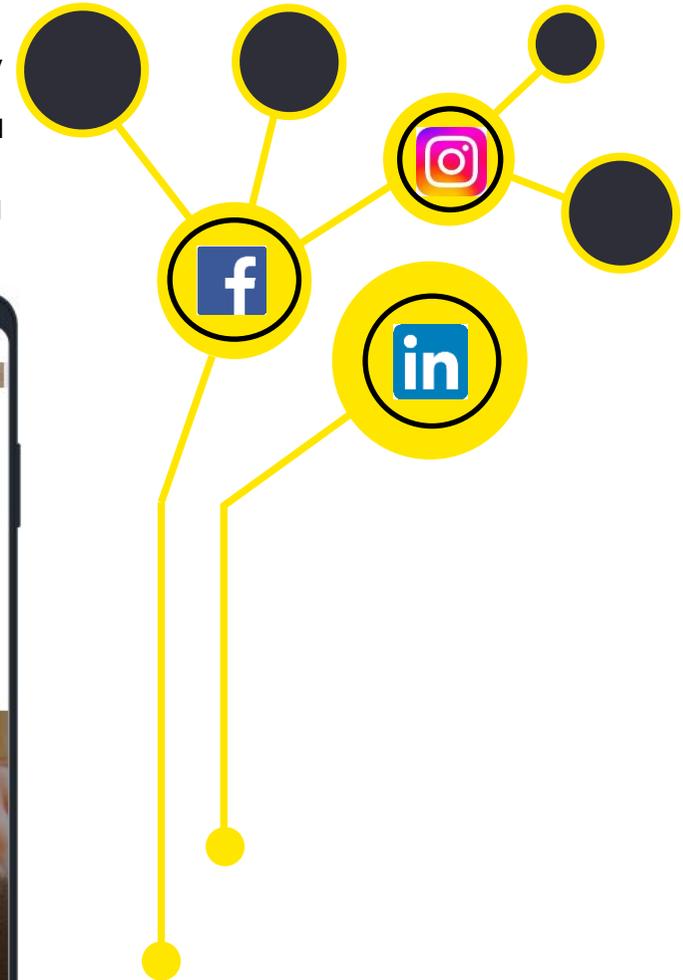


Engaging Methods: surveys

The stakeholders engaged via the survey were the Academia (tertiary institutions), Chambers and Associations and the Community.

Survey weblinks were also sent to over 100 senior officers and business leaders associated with approximately 70 entities including leaders of Chambers and Associations (Chamber of Commerce & Industry, International Business Association, Manufacturers Association, Tourism Authority and Tourism Marketing Inc.). The targeted senior officers and business leaders represented a subset of an EY professional contacts mailing list.

The survey was also posted on the EY accounts of leading social media applications – LinkedIn, Facebook and Instagram.

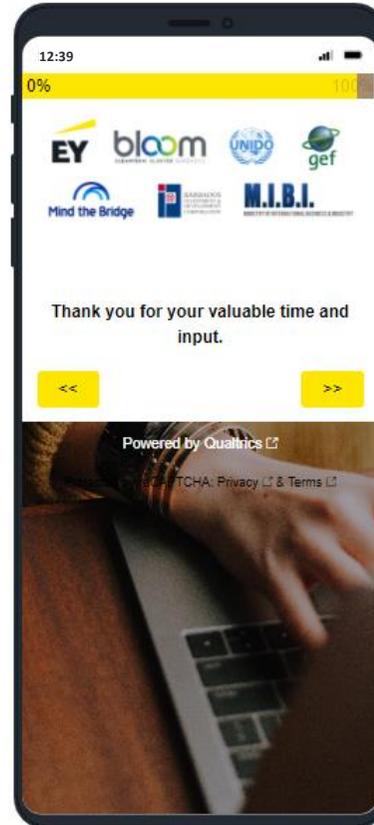


Questions
12

Completion time
10-min

Survey views
58

Surveys completed
18



National policy documents reviewed

Desk-top research of a number of national policy documents was performed to understand goals, strategies and initiatives for clean tech to enable Barbados to be the most environmentally advanced green country in Latin America and the Caribbean.

The documents reviewed are presented below along with their overarching aims. The following page provides detailed outlines of the goals, strategies and initiatives.



3. Methodology and Approach

Limitations

In completing this work, a number of methods were employed (desk research, workshops, interviews, surveys, etc.) and for some methods there were difficulties in collecting relevant and up-to-date data to provide conclusive statistically relevant reporting. Therefore, the report is a presentation of more qualitative information.

The participation rate with some stakeholder groups (academia, SMEs, corporates, community) ranged between 31% - 45% despite efforts to increase the rate.

Notwithstanding multiple intense efforts to obtain primary profile data from the companies operating in the clean tech industry, only one-third of the businesses shared data and of that 33%, some opted not to respond to all questions of the survey as they viewed the data as confidential. As a result, it is difficult to conclude on some of the characteristics of the industry (such as its size in terms of annual revenue, etc.).



4

Clean Tech Tracking Framework

H₂

Hydrogen

H₂

BUS

Summary of Clean Tech Tracking Framework

The development of the clean tech tracking framework took a multi-phased approach; a summary of which is presented below. Ultimately, the tracking framework was designed to provide an internationally comparable synthetic scoring mechanism of the ecosystem which considers all the specific indicators for public policy and innovation outcome.

Data gathering

This phase included a literature review by leveraging:

- ▶ Academic research portals
- ▶ Research reports
- ▶ Publications by clean tech (and related sub-sectors) stakeholders

Stakeholder consultation

- ▶ Stakeholder consultation with local and international public and private industry stakeholders via:
 - ▶ Workshops
 - ▶ Interviews
 - ▶ Surveys

Terminology

- ▶ Review approaches to the evolution of clean tech
- ▶ Derive definition of clean tech
- ▶ Distinguish clean tech taxonomies (environmental, industrial)
- ▶ Approaches of corporate sustainability to be applied to the clean tech ecosystem at a National level
 - ▶ Dow Jones Sustainability Index
 - ▶ Sustainability Accounting Standards Board

Assessment

- ▶ Analysis of the top 25 scaleups based on funding size to understand the success factors behind top performing international clean tech scaleups
- ▶ Systemization of key points from the stakeholder consultation

Benchmarking

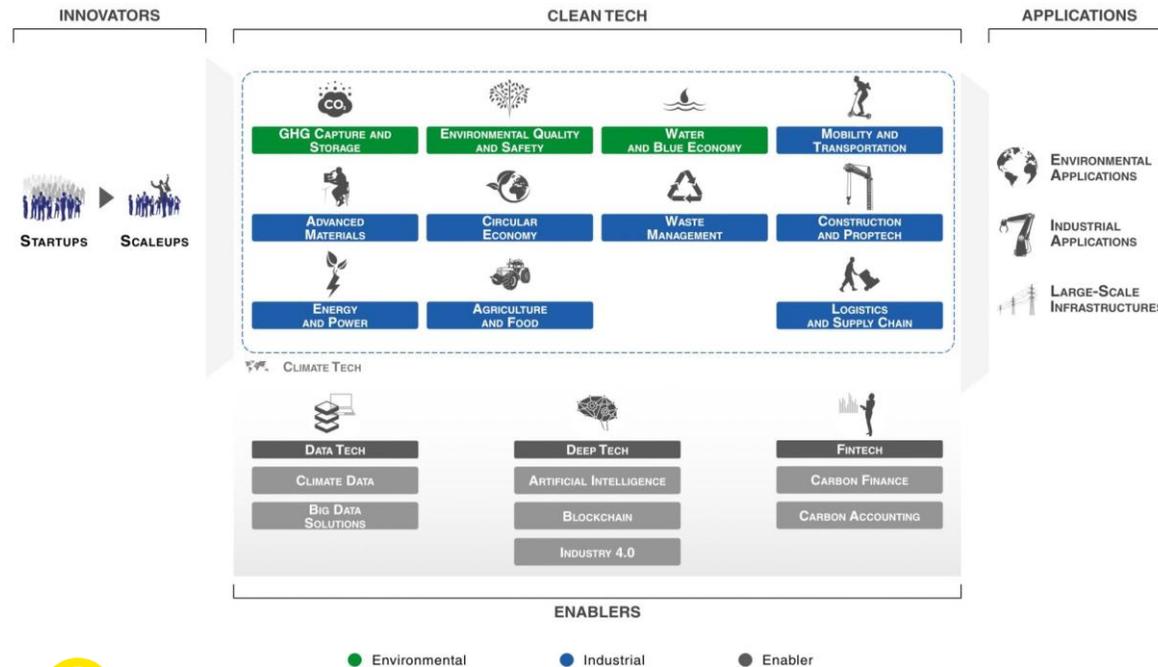
Developed countries selected based on their prominent, benchmarking positioning among global innovation ecosystems. Caribbean countries selected according to the relevance of their energy transition policies and physical proximity to Barbados.

- ▶ Innovation Public Policy Indicators
 - ▶ Dedicated strategy
 - ▶ Dedicated incentives
 - ▶ Research investments
- ▶ Innovation Outcome Indicators
 - ▶ Number of scaleups
 - ▶ Number of scalars
 - ▶ Capital raised
 - ▶ Density ratio
 - ▶ Investing ratio
 - ▶ Number of clean tech jobs

Clean tech taxonomy and technologies

Clean tech represents the technologies and business model innovations that enable the transformation to a more resource efficient and low carbon economy.

The diagram below shows the various clean technology innovations generated by startup and scaleup ecosystems and their multiple environmental and industrial applications.



Environmental Technologies

- GHG Removal, GHG Storage, Carbon Footprint Monitoring, Carbon Capture, CCUS, Carbon Sequestration
- Desalination, Water Purification, Water Distribution, Wastewater Treatment, Leak Prevention, Water Management Systems, and Ocean technologies
- Environmental Management Systems, Environmental and Natural Resource Management, Environment, Health and Safety (EHS), Reforestation, Afforestation, Land Resource Management, Deforestation Prevention

Industrial Technologies

Sub-technologies/sub-verticals associated with the technology applications

- Biofuels, Biochemicals, Bio-based Polymers, Materials and Chemicals Discovery, Composites
- Engine Efficiency, Engine Design, Engine Materials, Electric Vehicles, Micro Mobility, e-Mobility Infrastructure, Ride Sharing, Charging Points, Transport Efficiency, Autonomous Vehicles, Sensor Technologies, Predictive Maintenance and Repair, Low GHG Heavy Duty Road Transport
- Circular Design, Reuse, Secondary Material Markets, Biomass Supply, Waste-to-energy
- Recycling, e-Waste, Wastewater
- Urban Planning, Urban Design, Smart Building, Building Management, Thermal Storage, Innovative Construction Methods, Lighting, Fixtures, Fittings, Heating, Cooling, Energy Consumption, Smart Metering, Efficient Construction, Modular Construction, 3D Printing, Additive Manufacturing, Imagery Computing, BIM
- Alternative Fuels, Renewable Energy, Energy Storage, Supply-demand Balancing Mechanisms, Energy Efficiency, Oil and Gas Efficiency, Fossil Fuel Energy Generation Efficiency, Wind Energy, Solar Energy, Nuclear Generation, Battery Technology
- Food Production Methods, Carbon Intensive Food Production Replacement, Synthetic Proteins, Insect Proteins, Low GHG Farming, Precision Farming, Vertical Farming, Aeroponics,, Soil Carbon Emission Reduction, Food Supply Chain Management, Fertilisers, Agritech Robotics, Agricultural Genomics, Aquaculture
- Delivery Tech, Safe Transport and Circular Supply Chains

Barbados' positioning in the tracking framework



The Tracking Framework provides an internationally comparable synthetic scoring mechanism to the ecosystem. Represented as a two-axis matrix (at left), with four profiles (Legacy, Early-Mover, Mature and Advanced); the framework will act as a tool for ecosystem benchmarking and identification of effective actions for status improvement over time including clear measurement metrics.

Barbados was benchmarked against the EU27, US and Israel given their prominence and benchmarking positioning among global ecosystems; while Costa Rica and the Dominican Republic were selected given the relevance of their energy transition policies and their geographic proximity to Barbados.

Both axes were evaluated using a scoring mechanism that employs a 1-5 Likert-type scale. Qualitative analyses and evaluations on the scale are based on available information, stakeholders' perspectives (if applicable), and the researcher's own perspective and professional judgement. The individual scores of each indicator are averaged to produce a synthetic score ranging from 1 to 5, to precisely position each ecosystem on the matrix.

Barbados is considered an Early-Mover with favourable conditions for growth and development of a sustainable clean tech ecosystem given its structured strategies and policy-oriented efforts.

Policy Indicators Comparison

Country Area	Strategy Score	Incentives Score	Research Score	Average
Barbados	3/5	4/5	1/5	2.7
Dominican Republic	3/5	2/5	1/5	2.0
Costa Rica	5/5	3/5	2/5	3.3
Israel	3/5	4/5	4/5	3.7
EU27	5/5	5/5	5/5	5.0
United States	3/5	3/5	4/5	3.3

Innovation Outcome Indicators Comparison

Country Area	Scaleup Score	Scalers Score	Capital Raised Score	Density Ratio	Investing Ratio	Cleantech Jobs	Average
Barbados	0/5	0/1	0/5	2/5	1/5	1/5	0.7
Dominican Republic	0/5	0/1	0/5	0/5	0/5	0/5	0.0
Costa Rica	0/5	0/1	1/5	1/5	1/5	1/5	0.7
Israel	1/5	1/5	1/5	5/5	5/5	4/5	2.8
EU27	4/5	2/5	2/5	2/5	2/5	2/5	2.3
United States	5/5	5/5	5/5	3/5	4/5	5/5	4.5

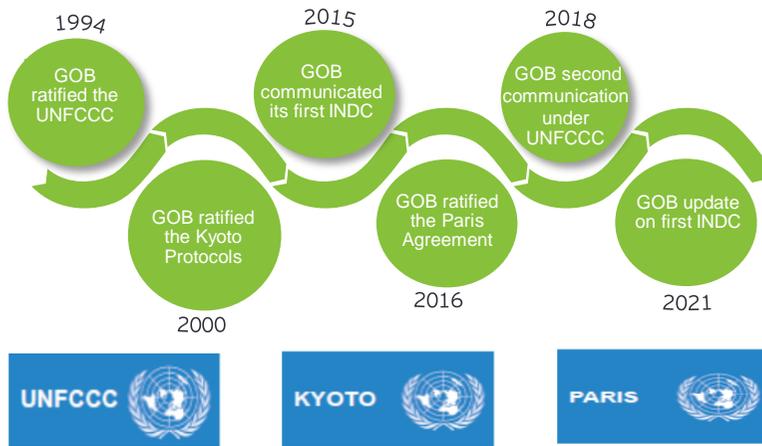


5

Clean Tech Industry Assessment

Barbados commits to climate adaptation and mitigation

Barbados commits to climate adaptation and mitigation actions



Barbados recognizes its susceptibility to extreme weather events and natural disasters which are amplified by climate change(s) and can significantly and adversely undermine the island’s sustainable development gains. Hence, it ratified the United Nations Framework Convention on Climate Change (“UNFCCC”) and the Kyoto Protocols in 1994 and 2000 respectively and has been an active participant at the Conference of Parties (“COP”) since that time.

Barbados prepared a National Climate Change Policy Framework (“NCCPF”) – country’s overarching approach to adaptation and mitigation which is inline with the Barbados Sustainable Development Policy (2004): Primary Goal is establishing a national process for adapting to climate change effects and minimizing GHG emissions over the short, medium and longer terms.

Barbados’ Sustainable Development Policy goal is “to ensure the optimization of the quality of life for every person by ensuring that economic growth and development does not occur to the detriment of our ecological capital.”



Main Contributors to Green House Gasses (2008 – base year)



ENERGY



72% of the GHG emissions in Barbados were generated from energy consumption with energy generation accounting to **67%** of that amount and transport accounting for the remaining **33%**



WASTE



16% of the GHG emissions in Barbados are generated from waste.

Given its size, and the nature of economic activity on the island, etc., Barbados contributes in a negligible way to GHG emissions nevertheless, it is committed to the broad aims of the Paris Agreement to pursuing climate mitigation actions to limit global warming to 1.5°C and it has set as an economy-wide goal – to reduce GHG emissions by 44% compared to its BAU scenario by 2030 when compared to 2008 (baseline year).

Given the major contributors to GHG emissions in Barbados are from energy consumption, mobility and transport and waste, the island has focused on climate mitigation actions in these key areas. This is evident in the National policy documents discussed later and it is expected that the most prevalent clean tech development will be in those areas.

National goals, strategies and initiatives



Barbados Sustainable Development Policy
Goals / Strategies / Initiatives

Goals

- ✓ Facilitate achievement of visionary goals 1, and 6 -10 of the BNEP related to the energy sector

Strategies / Initiatives

- ✓ Develop internationally accepted minimum standards for atmospheric pollutants.
- ✓ Develop appropriate economic incentives, legislation and regulations towards ensuring the achievement of policy objectives for energy efficiency in the transport sector and improved air quality
- ✓ Promote energy efficiency in the transport sector (EVs; LPG/CNG and hydrogen powered vehicles)
- ✓ Develop legislation to support the use of alternative RE sources (including penalties for non-compliance with energy conservation standards). Support IPP.
- ✓ Encourage research and development of environmental management practices and/or "clean technologies" that are appropriate for introduction to the industrial, manufacturing and/or any other sector in Barbados
- ✓ Promote and provide education and training opportunities in the RE sector for postgraduate students as well as those in employed in the sector
- ✓ Encourage large-scale use of RE sources via the establishment of guidelines to govern the contribution of RE sources to domestic power generation (incl. requirement for electric companies to purchase energy generated from renewable sources; allowing IPPs to access the distribution system)



Barbados 2021 Update of the First Nationally Determined Contribution
Goals / Strategies / Initiatives

Goals

- ✓ Reduce Barbados' dependency on fossil fuels through increased use of energy efficiency and renewable energy technologies.
 - ▶ Deployment of Cleaner Fuels and Renewable Energy project, financed by an IDB loan to the National Petroleum Corporation (NPC) and the Barbados National Oil Company Limited (BNOCL), supports the diversification of the energy mix, energy efficiency measures and the use of renewable energy and storage technology within the premises of the NPC and the BNOCL
- ✓ Decrease cost of energy to the population; increase energy security, reduce CO2 and other GHG
 - ▶ 35% emissions reduction relative to its Business As Usual ("BAU") scenario conditional on international support by 2025; (30% without support)
 - ▶ 70% emissions reduction relative to its BAU scenario conditional on international support by 2030; (35% without support)

- ✓ Recover approximately 8 - 15MW of energy from waste

Strategies / Initiatives

- ✓ Increase in decentralized solar PV installations
- ✓ Government procurement policy to prioritize the purchase of electric or hybrid vehicles; to fully operationalize the fleet by 2030
- ✓ R&D support for RE and energy storage technologies appropriate for SIDS; deliberate focus on using distributed generation (e.g. household solar photovoltaics) to provide modern energy access and build resilience for low-income households with an initial target of retrofitting 3,000 low-income homes with solar PV by 2030

National goals, strategies and initiatives (cont'd)



Barbados National Strategic Plan 2006-2025

Goals / Strategies / Initiatives

Goals

- ✓ Build a green economy
- ✓ Develop an efficient transport system and infrastructure
- ✓ Substantially increase Barbados' annual sustainable growth rate
- ✓ Create an entrepreneurial society
- ✓ Boost productivity and competitiveness

Strategies / Initiatives

- ✓ Develop programmes to expand the supply of renewable energy from wind, sun and biomass in particular
- ✓ Diversify the energy mix to reduce the impact world oil prices and vulnerabilities associated with supply
- ✓ Liberalize the production of electricity
- ✓ Increase innovation and develop a new entrepreneurial culture
- ✓ Facilitate a mindset change among all Barbadians towards entrepreneurship
- ✓ Enhance investment opportunities through the development of financial facilities
- ✓ Strengthen entrepreneurship education and training at primary, secondary and tertiary levels
- ✓ Facilitate and promote the development of small and medium sized enterprises
- ✓ Reduce the costs of doing business in Barbados, inter alia, by reducing the costs of energy



Barbados National Energy Policy

Goals / Strategies / Initiatives

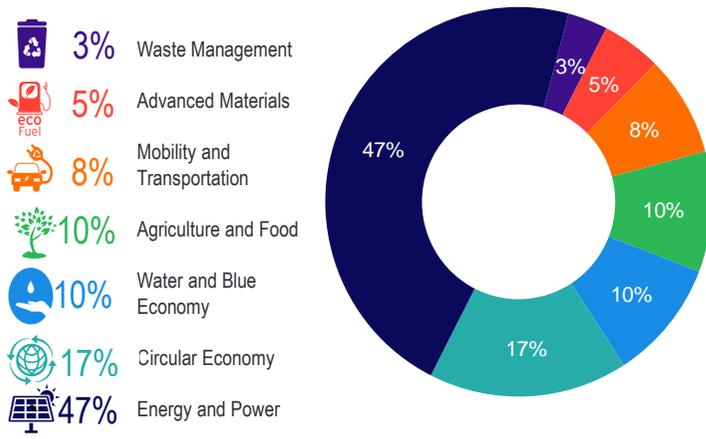
Goals

- ✓ Eliminate the use of diesel and gasoline transport; Full electrification of or use of biofuels by passenger vehicle fleet by 2030
- ✓ An energy sector that:
 - ▶ Offers diversity of sustainable energy options, with a trajectory to achieve 100% Renewable Energy by 2030
 - ▶ Where consumption and production of energy resources occur with the maximum level of efficiency feasible
 - ▶ Offers basic energy products and services that are affordable to local citizens
 - ▶ Offers continuous and reliable supply of energy
 - ▶ Offers opportunities for development of human capacity and collaboration
 - ▶ Offers significant opportunities for local entrepreneurship and international investment
 - ▶ Minimizes the environmental impacts and contribution to global climate change
 - ▶ Is governed by sound management and clear legal regulatory frameworks
 - ▶ Positions Barbados as a center of excellence for innovation, research and development in renewable energy
 - ▶ Provides opportunities for all Barbadians (including the most vulnerable to the impacts of climate change) to participate in and benefit from the transformation to 100% RE

Barbados Clean tech industry profile

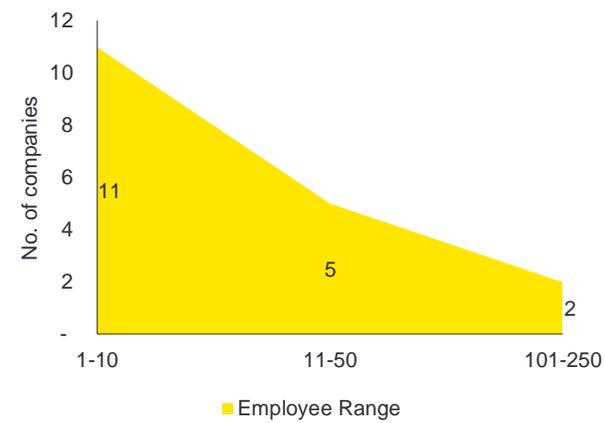
During the stakeholder engagement process, we sought to obtain profiles from each of the companies to facilitate an understanding of the characteristics of the industry and also as a means of obtaining data points for measurement within the tracking framework described earlier. Below is a snapshot of the industry.

Clean Tech Industry Area Concentration (Barbados)



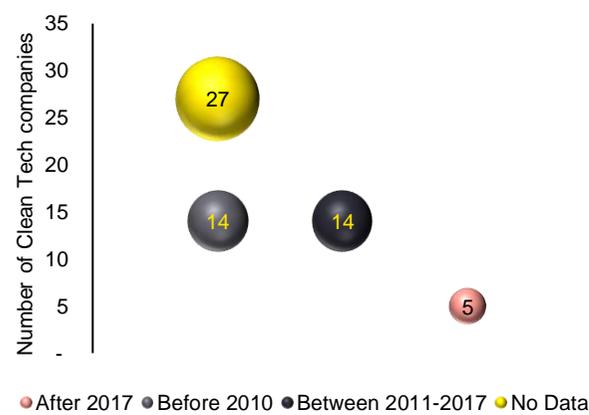
Energy & Power is the largest concentration of companies in the Clean Tech sector. Together with Circular Economy, Water & Blue Economy and Agriculture & Food, they represent **83%** of companies in the industry.

Number of Clean Tech Jobs Per Employee Range

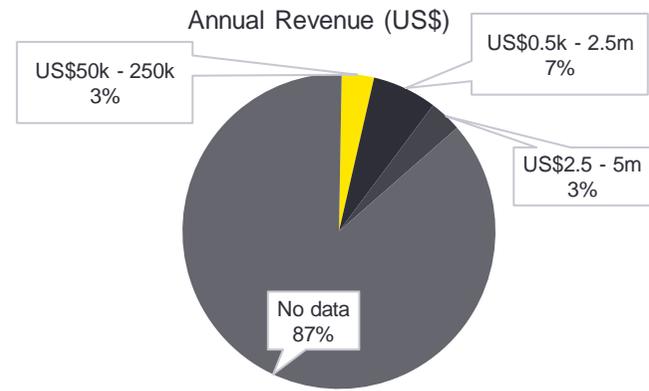


Approximately **444** individuals are employed at the 18 companies that provided details on their work-force, the gender ratio is approximately **69% males** to **31% females**.

Number of Clean Tech Companies Established in a Given Year/Period



Approximately **85%** of the respondents – for which data was available – were operating in the Clean Tech sector before **2017** with the median corporate age being **12** years (i.e. established in 2010).



US\$13.8m is the average annual turnover of the 13% of the clean tech firms which provided responses to the survey question on their annual turnover. One-half of the firms earn annual revenues between US\$0.5m - \$2.5.

Clean tech cluster membership, partnerships and services

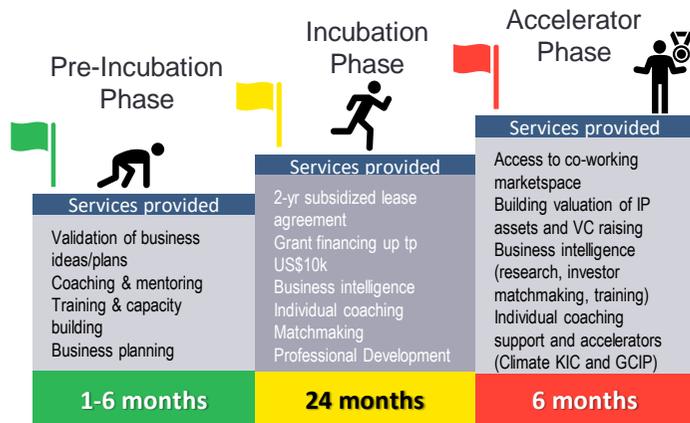
16
Startups
& SMEs

A total of 16 startups and SMEs have been onboarded in the incubation and acceleration programs of the Bloom Barbados Cleantech Cluster (“BLOOM”). BLOOM became operational in 2020 and forms part of UNIDO’s Regional Cleantech Cluster Program; it aims “...to increase the participation of Barbadian businesses in the expanding global value chains of sustainable energy manufacturing and servicing.”

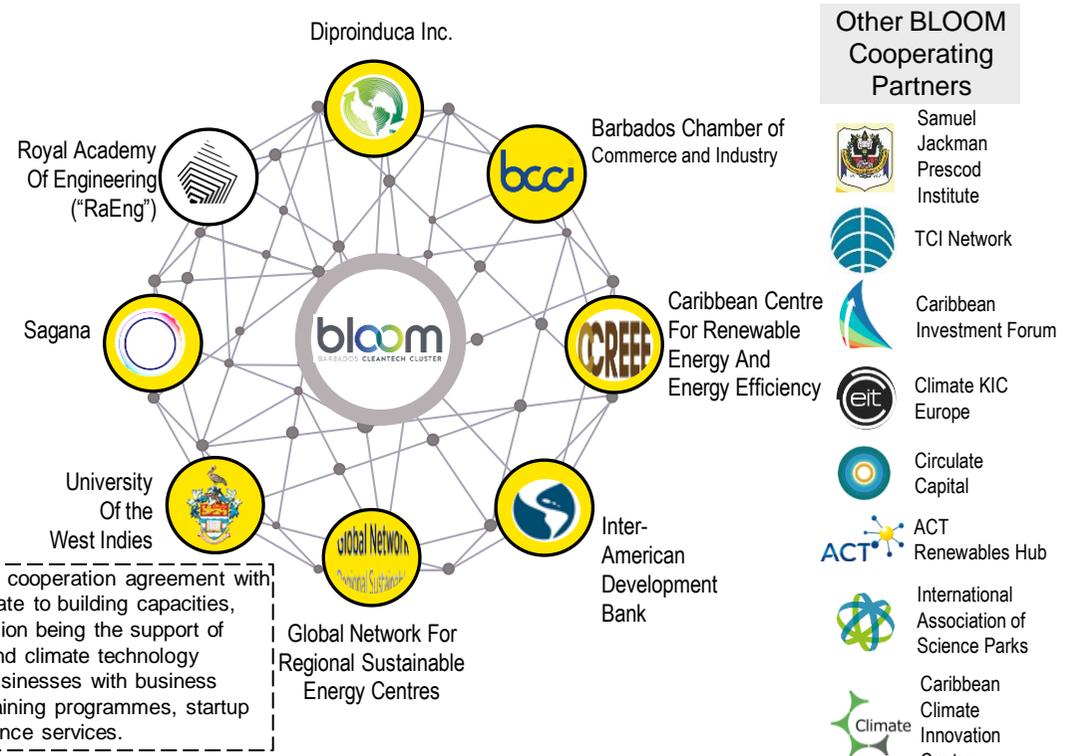
BLOOM offers the following services



BLOOM provides business incubation and accelerator programs for potential startups seeking to create new economic activity in the fields of clean tech in Barbados. The incubator program is arranged in three phases:



BLOOM has a network of partnerships with international research and innovation agencies, financiers, universities, research centers, accelerators and science parks. Its partners are presented below.



Other BLOOM Cooperating Partners

- Samuel Jackman Prescod Institute
- TCI Network
- Caribbean Investment Forum
- Climate KIC Europe
- Circulate Capital
- ACT Renewables Hub
- International Association of Science Parks
- Caribbean Climate Innovation Centre

BLOOM has a signed cooperation agreement with UWI aimed to cooperate to building capacities, with the ultimate mission being the support of sustainable energy and climate technology entrepreneurs and businesses with business incubator facilities, training programmes, startup and business intelligence services.

Barbados Chamber of Commerce & Industry support to BLOOM

- Provided management support for evaluation of incubate pitch-decks;
- Member of evaluation panel in the BLOOM incubation program;
- Member of the interview panel for recruitment of the cluster staff;
- Provided complimentary BCCI membership for 11 incubatees of the BLOOM cluster;
- Participated in the two grant award ceremonies as an invited speaker in Pelican Village in 2021-22;
- Participated in the study tour in Europe in September 2022;
- Disseminated information about the global LIF 2022 acceleration program in association with RaEng;
- Participated in the clean tech webinars as a speaker organized by BLOOM and Atom Solutions in 2021.



Clean tech cluster membership, partnerships and services

Local Regional Global Perspective During the period 2020-2022, the BLOOM cluster program which operates on the local level, partnered with SAGANA, IDB and Circulate Capital in the launch of Caribbean Circular Economy Accelerator – which is a Regional Cluster Program – and it partnered with Royal Academy of Engineering, UK to launch the Leaders in Innovation Fellowship (“LIF”) – which is a Global Cluster Program. Summary profiles of both programs are presented below.

Caribbean Circular Economy Accelerator (REGIONAL CLUSTER)



The aim of this program is to make participants investment ready for pre-seed and pre-series A investments where IDB is working as an anchor investor.



Joint Partners with BLOOM	<p>IDB Lab is the innovation laboratory of the Inter-American Development Bank Group. The leading source of financing for improving lives in Latin America and the Caribbean.</p>	<p>Circulate Capital is an investment management firm dedicated to financing innovation, companies and infrastructure that prevent the flow of plastic waste into the world's ocean while advancing the circular economy.</p>	<p>Sagana work with foundations, development finance institutions and companies on investing in companies and funds that are solving the world's biggest social and environmental challenges.</p>
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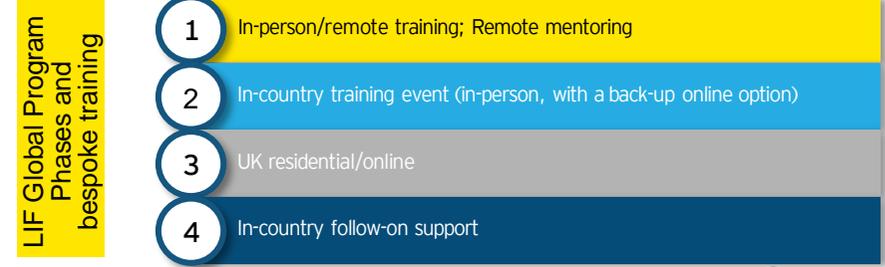
Leaders in Innovation Fellowship (GLOBAL CLUSTER)



The aim of the LIF Global is to connect global startups with UK business ecosystem including international network of peer innovators and mentors, leading business schools, investors and innovation funds.



Joint Partners with BLOOM	<p>RaEng is a charity that delivers public benefit from engineering excellence and technology innovation. Its overarching goal is to harness the power of engineering to build a sustainable society and an inclusive economy that works for everyone.</p>	BLOOM's role	<p>BLOOM is responsible for communications; marketing and selection and onboarding of the new LIF applicants.</p>
	<p>LIF is one of its programs in which it helps engineers worldwide to commercialize their innovations.</p>		



National Context Diagnosis: Energy and power

With energy generation being the largest contributor to the island’s GHG emissions, followed by transport and waste, it is instructive to examine the goals, strategies and initiatives in place to minimize environmental impacts in these areas while simultaneously propelling the island to achieving its 2030 overarching goal.



KEY GOALS



Diversity of sustainable energy options with a trajectory to achieve 100% renewable energy by 2030



Offers significant opportunities for local entrepreneurship and international investment



Increase in decentralized solar PV installations



Encourage large-scale use of RE sources



Decrease the costs of energy to the population



Liberalize the production of electricity

Barbados’ economy-wide contribution goal is to reduce the GHG emissions by 44% compared to its Business-As-Usual (“BAU”) scenario by 2030 which equates to a 23% reduction when compared to 2008 (baseline year).



STRATEGIES / INITIATIVES

SMART fund II launched in 2022 with the aim to increase the use of viable RE and EE technologies in Barbados. Funded by IDB (US\$45m) it is structured in three main components:

- ▶ Promoting RE & Energy Efficiency in SMEs;
- ▶ Promoting Energy Efficiency and RE in the Public Sector;
- ▶ Capacity Building and Institutional Support.

Import duty exemptions on RE systems & energy conservation apparatus/machinery; VAT exemptions on building materials dedicated to RE generation and zero rating of VAT on RE systems and products produced in Barbados.



SMART Fund 1 provided by IDB had six facilities:

- ▶ \$1m grant for feasibility studies;
- ▶ \$12m in subsidized loans for implementing viable RE projects;
- ▶ \$1m interest rate rebates for corporates offering RE or EE products;
- ▶ \$2m in free compact fluorescent lamps to BL&P residential customers;
- ▶ \$3m in 50% rebate to replace older A/Cs with more EE models;
- ▶ \$2m grant for education and awareness programs

In 2019 the Fair Trading Commission established Feed-in-Tariffs (“FITs”) for RE technologies up to 1MW and in 2020 the FITs were established to 10MW to replace the temporary tariff arrangement with BL&P. For smaller RE systems, the FIT rate ranges from BDS\$36.25 cents/kWh to BDS\$52.25 cents/kWh depending on type of technology (solar, wind, biomass) and size (from up to 10kW to 1MW). For larger systems (1MW-10MW) the FIT rate ranges between BDS\$20.25 cents/kWh to BDS\$23.25 cents/kWh). All domestic customers with RE systems from 1kW to 10kW are billed under a “Buy All/Sell All” arrangement where, they are billed for all the energy consumed at their regular electricity rate and then receive a credit on their energy bill for all the electricity generated from their RE system at the appropriate FIT credit rate(s).

National Context Diagnosis: Mobility and transport

700+

Barbados is a leader in the region with over 700 electric vehicles on the road. This represents less than 1% of the approximately 120,000 vehicles on the island. However, the Government of Barbados via its BNEP and its communication on the INDCs have outlined key goals and is pursuing a number of strategies and initiatives intended to further support the creation of an environment to increase the number of electrified or alternately fueled vehicles on island.



KEY GOALS



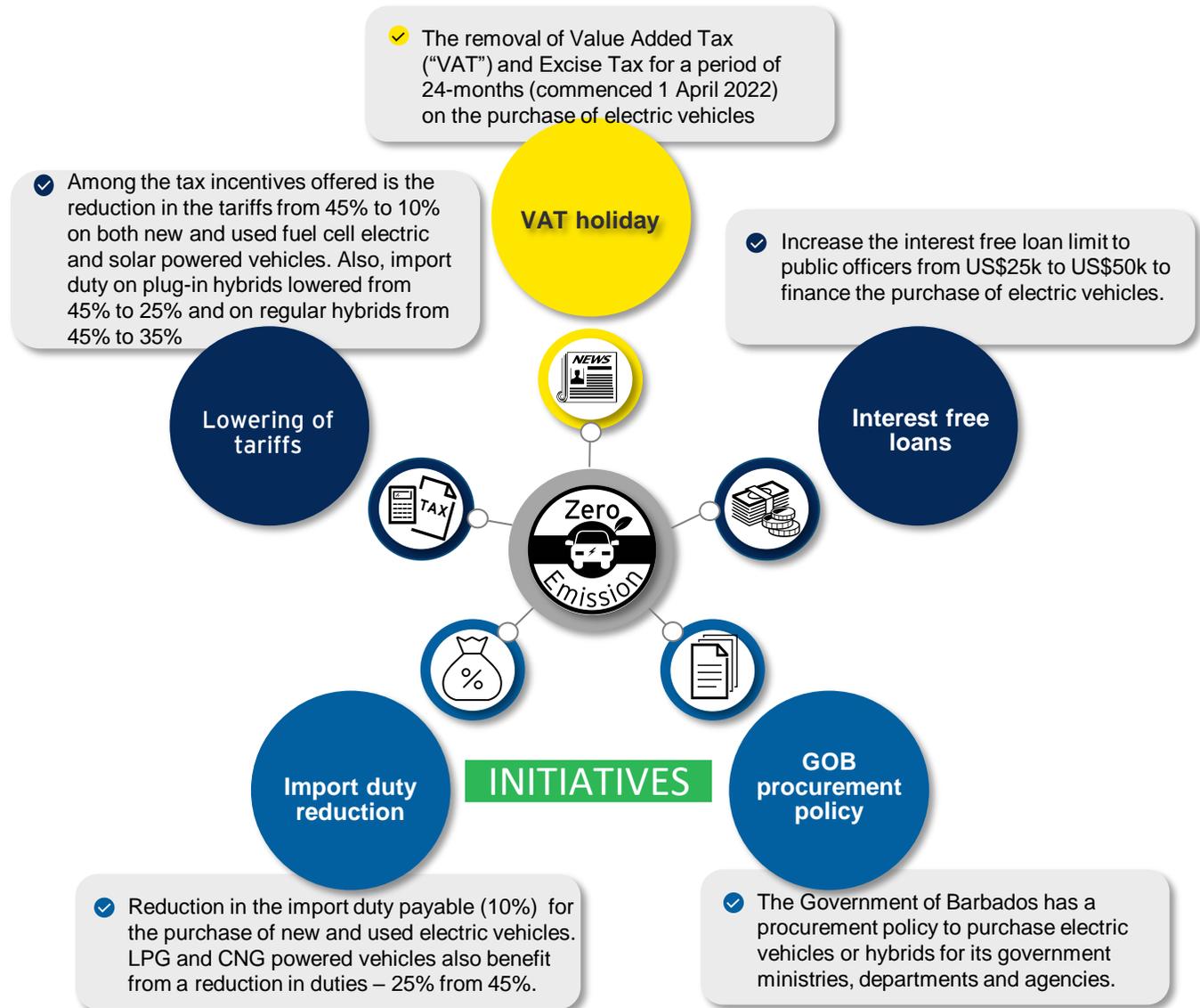
To eliminate the use of diesel and gasoline transport by 2030 (Barbados National Energy Policy ((BNEP), 2019 – 2030)



GOB procurement policy to prioritize the purchase of electric or hybrid vehicles. The aim is to operate a full fleet of electric public transport buses by 2030.



A reduction of 29% in non-electric energy consumption including transport, compared to Business as Usual (“BAU”) scenario in 2029. (INDC, 2015)



National Context Diagnosis: Waste management

WASTE GENERATED

1000 Tonnes

On average, approximately 1,000 tonnes of garbage is generated in Barbados on a daily basis. (Barbados Solid Waste Management Programme)

DIVERSION RATE

69%

Barbados landfill diversion rate is 69% which is among the highest in the region despite the lack of scale for recycling industries. (July 2021 update to IDNC)

POLLUTION

TOP 30

Barbados is 1 of 10 Caribbean islands which are in the top 30 global polluters per capita (Forbes, 2019)

SEWAGE CONNECTIONS

3%

Barbados has amount lowest level of sewerage connections in Caribbean at 3% (IDB Caribbean Water Study, October 2021)

To build a more circular economy, inter alia, Barbados in seeking to ease the pressure on the landfill and recover energy from waste has developed a number of goals.



KEY GOALS / OBJECTIVES



Achieve an energy mix-target by 2030 from which 15MW installed capacity will be from Biomass and Waste-To-Energy ((BNEP), 2019 – 2030)



Achieve 20% decrease in waste emissions (July 2021 update to IDNC)



Phase out natural gas and LPG by 2030; natural gas to be replaced by bio-methane produced from renewable biogas sources (BNEP 2019-2030)

As a demonstration of the Government of Barbados in achieving its goals, meeting its commitments to the Paris Agreement under its National Determined Contributions; and taking the lead in facilitating the development of Clean Tech, it has a number of strategies.



STRATEGIES / INITIATIVES

Construct and operate an Energy from Waste (“EFW”) facility by 2025; US\$160m waste to energy and biomass plant to be constructed in Vaucluse, St. Thomas (July 2021 update to IDNC; Min. Of Small Business, Entrepreneurship and Business, Barbados Today 8 July 2020)

The Sanitation Service Authority (“SSA”) Residential Waste Collection Improvement Project was launched in September 2021. The Project is a collaboration between the SSA and Prosource Limited to distribute a 65-gallon roll-out cart and an 18-gallon bin for recycling is intended to ease the workload of sanitation workers

Barbados Agricultural Management Company (“BAMC”), Barbados Sugar Industry Limited (“BSIL”), and private sugar farmers to establish “Grow Energy” - a company to produce biomass energy (molasses and syrup) at Bulkeley Sugar factory (Appropriation Bill 2021)

Stakeholders' views on key priorities for the clean tech industry to develop

Identification of key priorities

Each of the stakeholders who were engaged were presented with a listing of the multiple environmental and industrial applications under the clean technology taxonomy and asked to rank what they considered to be the key areas in which Barbados should focus for the industry to grow. Stakeholders were also asked to provide the rationales for their priority ranking.

The majority believed that priority should be given to Agriculture and Food, followed closely by Mobility and Transport and then Water and Blue Economy. The full results are presented in the graph to the right.

Distribution of key priorities

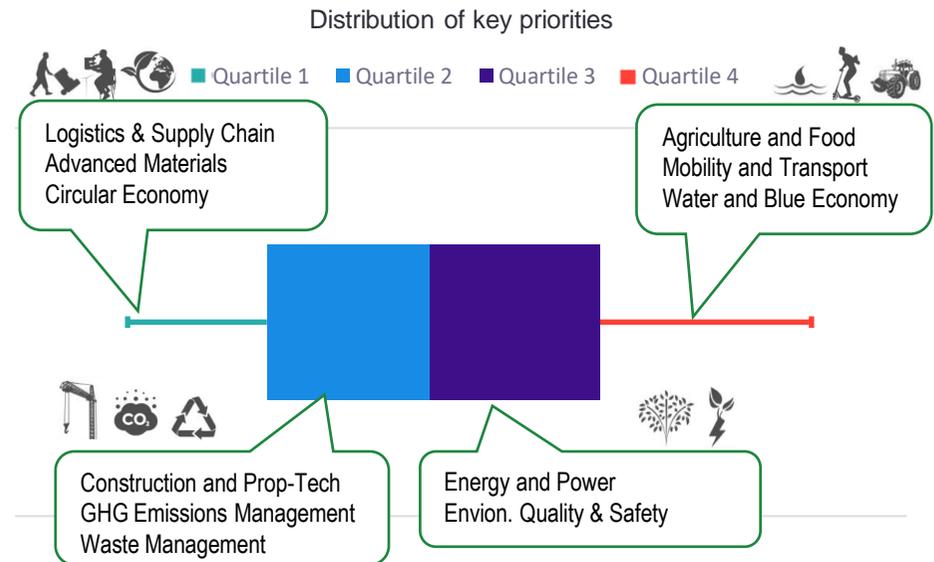
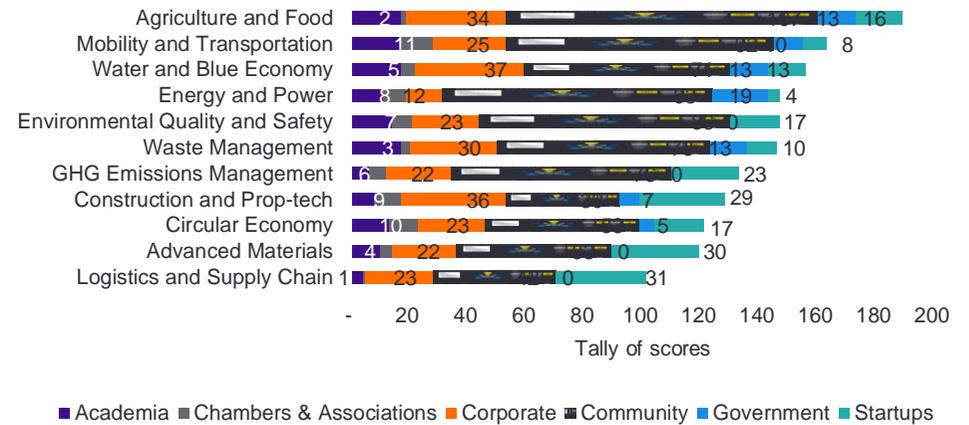
In further systemizing the responses of the stakeholders, the results were analyzed by plotting the data in a box and whiskers graph to identify where the quartiles were distributed.

The box and whiskers graph presented to the right shows that within the fourth quartile (i.e. those clean technologies which assigned with the greatest priority) are Agriculture and Food, Mobility and Transport and Water and Blue Economy

Interestingly, Energy and Power which features high in the National context documents and is the area most heavily served by SMEs and corporations is not featured here. It may be inferred that this area is well underway and other areas should now be prioritized.

The recurring themes and insights emerging from the stakeholders' rationales for prioritizing these three areas which fall in the fourth quartile are presented on the following page.

Stakeholder views on key priorities for clean tech industry to grow



Stakeholders' views on key priorities for the clean tech industry to develop (cont'd)

Among the areas identified as key priorities on which Barbados should focus to further develop the clean tech sector, in order of priority were Agriculture and Food, Mobility and Transport and Water and Blue Economy. Some key themes emerged under each category which are presented below.



Agriculture and Food

- ▶ **High cost of food** should give rise to exploring options such as **containerized agriculture**.
- ▶ **Reliance on imports** and drive towards food security.
- ▶ Provide **sustainable** food options
- ▶ Diversification of food crops with **higher yields**.



Mobility and Transport

- ▶ Contributes towards the **reduction of emissions and fuel import bill** (particularly at this time given the high and rising fuel prices)
- ▶ The existence and prevalence of alternative energy sources would allow for a **cost effective** and **cleaner** system of private and public transport



Water and Blue Economy

- ▶ Barbados is a **water scarce island** and its supply in some regions of the island is (at times) unreliable; however, the low price of water does not reflect its **scarcity** and there's little incentive to develop clean tech in this area
- ▶ Obvious need for systems to **catch and filter** rain-water; currently
- ▶ Wastewater treatment is an option but is energy intensive therefore, **solar and biomass** can facilitate balance
- ▶ Approximately **(41%) of non-revenue water** is pumped by BWA.

Stakeholders' views on key challenges

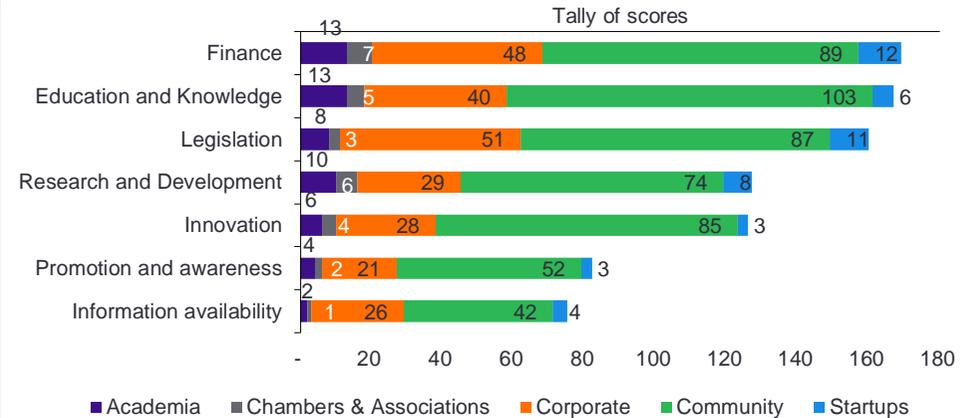
Different groups of stakeholders were presented with the same listing of factors and asked to rate each according to their priority in a sequential manner with the number one being the lowest priority. The ratings presented in the graphs show the aggregate of the individual ratings provided by each respondent at a group level and on an overall basis.

Based on the ratings, the following three factors were listed as those which presented the greatest challenges experienced and should therefore, be prioritized and addressed to support growth in the sector.

1. Finance
2. Education & Knowledge
3. Legislation

Key points on each are provided on the following page.

Key Challenges identified by all stakeholders



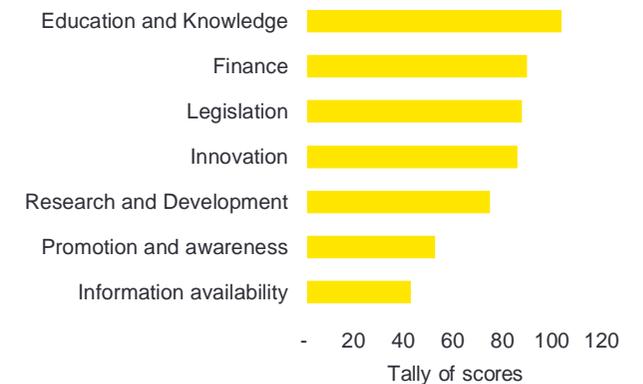
Key Challenges identified by Academia



Key Challenges identified by Start-ups and Corporates in the Clean Tech Industries



Key Challenges identified by the Community



Stakeholders' views on key challenges (cont'd)

Among the areas identified as challenges to the development of the clean tech sector, in order of priority were Finance, Education and Knowledge and Legislation. Some key themes emerged under each category which are presented below.



Finance

- ▶ **Limited financing options** available including access to blended finance given Barbados' rating as a high-income country;
- ▶ **Lack of seed financing** to facilitate transition to next level where businesses may attract venture capital or other series of funding;
- ▶ **Conservative** lending practices by commercial lenders stifling the execution of new and innovative ideas
- ▶ **High cost** of replacing existing infrastructure;
- ▶ **Paucity of grants and concessional loans** available.



Education and knowledge

- ▶ **Unawareness** of the public about clean tech and the attendant opportunities particularly beyond RE;
- ▶ Education is needed from the **basics of mainstreaming sustainability**, in STEM and training on **how to move an idea through to commercialization**;
- ▶ **Lack of revolutionary training that is bespoke**, timely and targeted towards the needs of the learner - at the place where they are in their journey of innovation.
- ▶ Low priority given to science and technology; education is restricted to availability of **limited courses**. Hence Barbados are tech adapters of its imports rather than creating technology specifically suited for its particular circumstances (e.g. salt air, temperate climate, etc.)



Legislation

Legislation – focused on the energy and power sector where the **legal and regulatory processes have been described as slow particularly for approving RE applications**. The general views are that improvements can be targeted to areas such as

- ▶ Government and FTC providing **enhanced clarity** about the approval procedure for new RE projects;
- ▶ **Centralizing the approval process** while determining and publishing parameters for application processing times;
- ▶ Providing **certainty** of the impact of unbundling of BL&P's licence and the PPA that will govern large scale projects – while the PPA framework is being developed investors need to understand how they will be impacted;
- ▶ **Communication** between the Ministry of Energy and BL&P and **enhanced logistics** to reduce time between RE application approvals and completion of connections to the grid.

Financing options: Green Climate Finance Bank

Finance was raised as a key challenge and given it is one of the key pillars to the development of a clean tech ecosystem coupled with the plausibility that a subset of stakeholders may not be aware of some imminent and current options; it is instructive to outline some of the available options in this section.



Green Climate Finance Bank

Barbados will soon be developing a Green Climate Finance Bank (“GCFB”) which is expected to kick-off with US\$30m-US\$50m in capital of which approximately 50% will be pledged by the Green Climate Fund (“GCF”). With this capital, they expect to borrow US\$250m

Investment Institution

GFCB will act as an investment (or wholesale) institution where it will be searching for “good assets”; determining how it can package the projects together to have a sufficiently sizeable investment opportunity that it can securitize and market. Hence its role is that of a catalyst in mobilizing private and public capital to support low-emission climate-resilient development.

Investing Focus

GCFB will be investing in businesses that have an impact on climate mitigation and adaptation; they will start “conservatively” with an immediate focus on:

- ▶ **Housing:** Home Ownership Providing Energy (“HOPE”) project on climate mitigation side to effect a transformation on the lives of those in the low-income bracket
- ▶ **Renewable energy:** HOPE project via solar power and an attractive FIT is an agency for social transformation and re-distribution
- ▶ **Food security:** Projects supporting (transportation) networks from Caribbean locations of high agricultural output to Barbados to reduce carbon miles and mitigate potential supply chain disruptions.
- ▶ **Water management:** Funding pipelines to help reduce the (approximately 41%) of non-revenue water pumped by BWA.

Influencing Policies

A number of national policies including – the INDC, water management policy and housing policy together with BNEP and its goal to achieve 100% renewable energy target by 2030 – are guiding the development of the GCFB. Another guiding force is the understanding from experience of the hesitancy of traditional finance to invest in novelty pursuits without substantial collateralization of the loan hence, the need for a financing entity which would be more comfortable operating in the clean tech space.

Good Assets

Anticipated challenge will be to find “good assets” which on a fundamental level should meet two criteria:

- ▶ **Size:** Should be of “investible size” meaning not too small and able to deliver a commercial rate of return.
- ▶ **Standard:** Should provide understanding from a clean tech point of view what is the impact on GHG emissions and what is the problem to be solved.

Financing options – Donor finance: Inter-American Development Bank



The Inter-American Development Bank (“IDB”) provides financing to governments and at the moment, IDB has committed that 30% of its financing towards climate financing (i.e. activities that help countries mitigate or adapt to climate change). Commencing 2023, all IDB projects will have to be aligned to the Paris Agreement, as it is making an increased commitment to help mitigate the production of greenhouse gases and reach the agreed targets under the Paris Agreement. It has a private sector arm - IDB Invest – which provides finance, inter alia, to advance clean tech. In 2020 it provided a credit facility to Caribbean LED Lighting of up to US\$2m to facilitate expansion and finance working capital.

IDB is one of three donors to the Compete Caribbean Program (“CCP”) which has, as its ultimate goal, to foster sustainable economic growth and enhance competitiveness in the Caribbean with gender equality, women’s economic empowerment and environmental sustainability as key components in program delivery and it is targeted towards innovative private sector projects. One of its pillars is the Enterprise Innovation Challenge Fund (“EICF”); the diagram shows how it operates in practice.

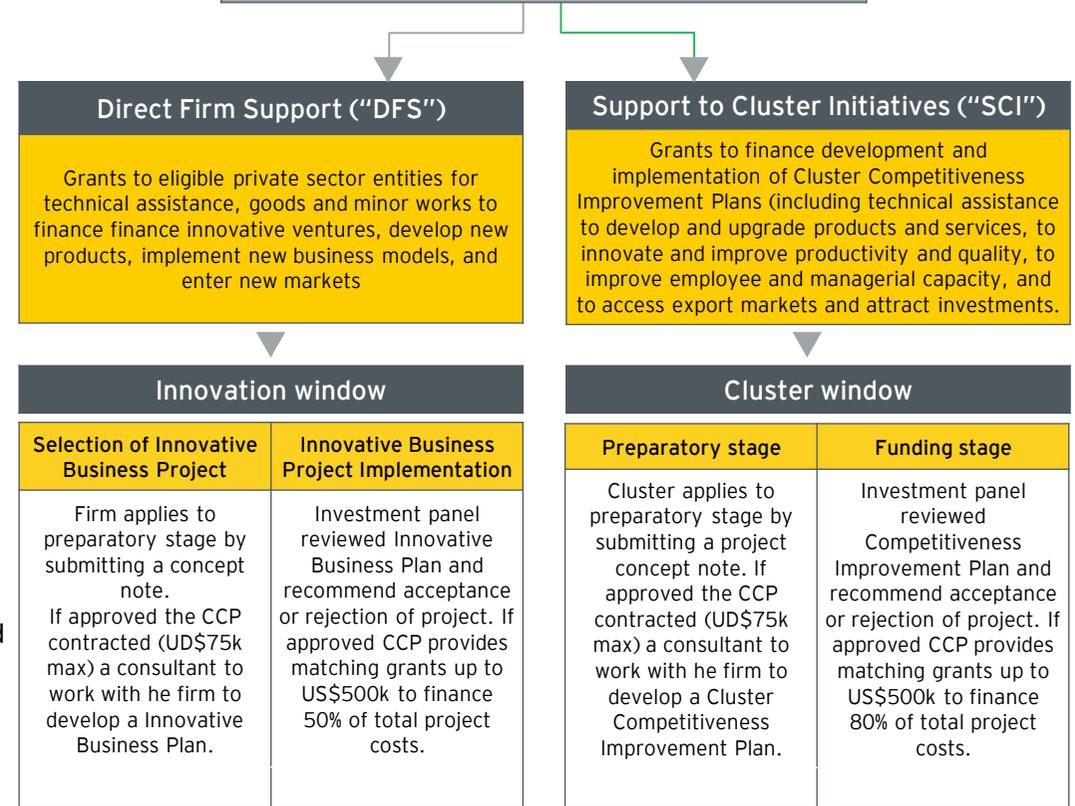
The schedule below shows the number of Project Concept Notes (“PCNs”) submitted compared to those funded. Some factors for the low selection rate related to **Eligibility** (failure to submit project budget, failure to submit evidence of legal status, financial statements, etc.) and **Project Strength** (validity of business model, managerial experience, impact on income / employment / environment / women).

Summary of applications of Project Concept Notes and outcomes

Window	# of PCN submitted	Eligible PCNs (total and %)	Eligible PCNs and of adequate project strength	Funded PCNs (total and %)
Innovation	592	Total 360 (60% of submitted PCNs)	Total 66 (11% of submitted; 18% of eligible)	Total 14 (2.4% of submitted, 3.9% of eligible)
Cluster	71	2/5	Total 27 (38% of submitted)	Total 9 (12% of submitted, 33% of eligible)

Source: Hutchinson (2015) as cited in Final Evaluation of the Compete Caribbean Program (2016), Technopolis Group

Enterprise Innovation Challenge Fund (“EICF”)



Source: Adaptation from Final Evaluation of the Compete Caribbean Program (2016), Technopolis Group

Based on the results of the Final Evaluation of the CCP (2016), noteworthy is that 83% of firms which received support for the development of their Innovative Business Plan, proceeded to implementation without CCP funding. 50% implemented their plan as fully developed while 50% reduced the scope of their plan and implemented.



Financing options – Donor finance: Caribbean Development Bank and lessons from Trident Angels Investor Network

The Caribbean Development Bank (“CDB”) is a regional financial institution which provides support to the social and economic development to its 19 Borrowing Countries (“BMC”) of which Barbados is a member.

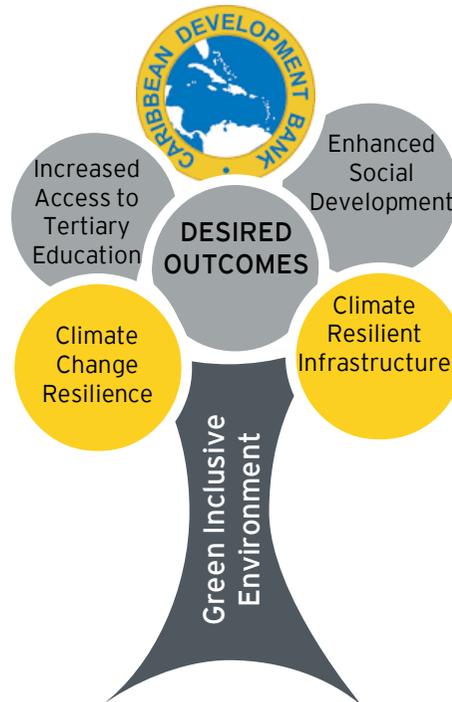
CDB provides support in areas of key priorities for the BMCs and with specific reference to Barbados, one of the key priorities is environmental sustainability.

Its funding programs are determined based on a “Country Strategy Paper” which is prepared on a quadrennial basis and outlines the strategic direction for the collaboration between CDB and Barbados over the four-year horizon while defining the parameters for its support.

In its Barbados Strategy Paper (2015-2018) one of its interventions was in promoting green, inclusive development which was focused on achieving the outcomes presented in the following figure.

While CDB provides different types of financing to Governments generally, it also provides support (technical and financial) through applications from a cohort of businesses made via a representative agency or Ministry.

Projects are appraised on the basis of their technical feasibility, environmental and social impact, gender analysis, climate vulnerability, etc.



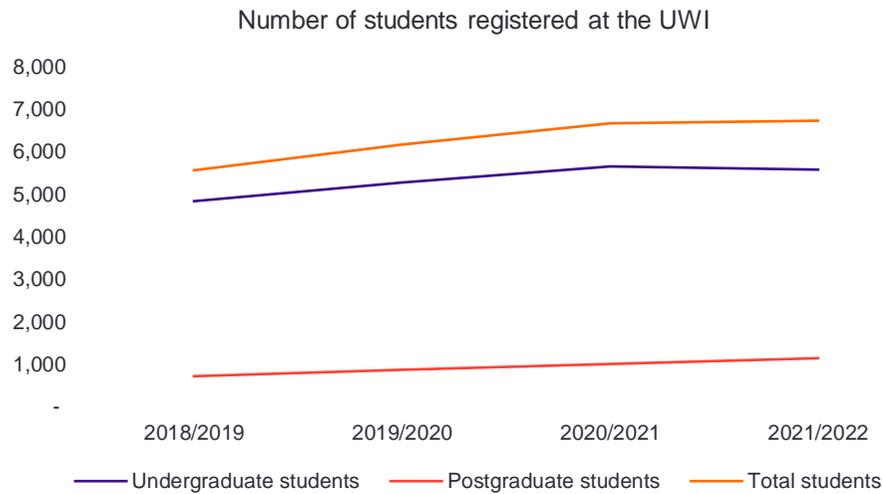
The Trident Angels Investor Network was an initiative of the Barbados Entrepreneurship Foundation to allow for equity financing of new companies in Barbados.

It consisted of 30+ members and provided a forum where entrepreneurs would pitch their business ideas. In terms of investment size, it invested equity in amounts of US\$50k and up to US\$750k.

While it concluded operations in and around 2018, based on comments from the then Network Manager, there were key challenges to equity financing and entrepreneurship which are noteworthy and if addressed, could be helpful to those in the industry seeking financing options from future investors.



Education identified as a key challenge: Capacity building opportunities in relation to clean tech at tertiary institutions

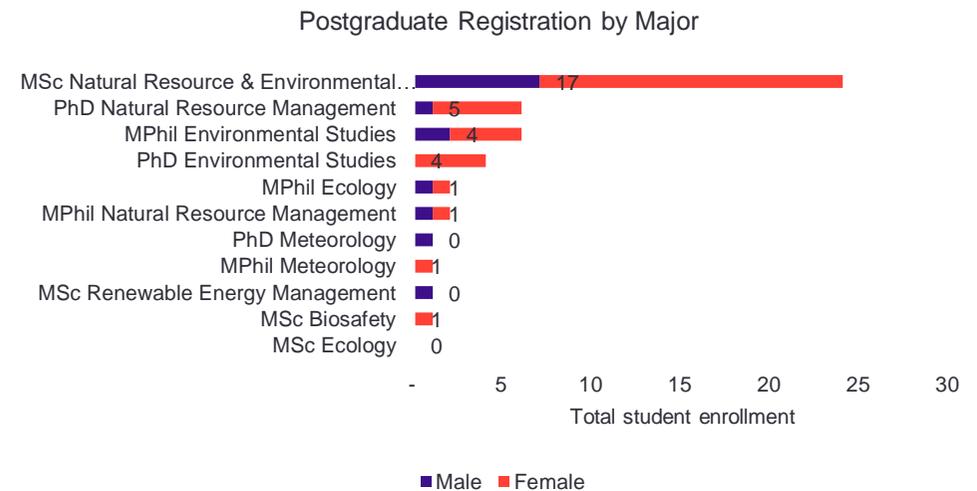
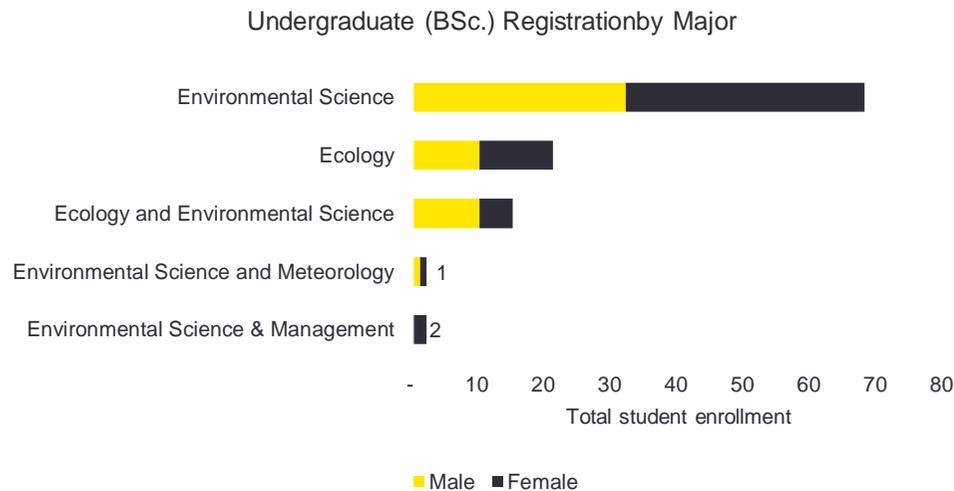



THE UNIVERSITY OF THE WEST INDIES
AT CAVE HILL, BARBADOS

Barbados is the home of one of the Universities of the West Indies (“UWI”) which is ranked in the top 1.5% (top 25) of the 1,668 elite universities in the world and the leading University in the Caribbean by the Times Higher Education ranking system. In terms of capacity building in clean tech and to the extent that education was cited as a key challenge in the development of clean tech, coupled with the fact that academics is one of the pillars of the Pentagon Model, it is useful to examine to what degree UWI and other local tertiary institutions are supporting the sector development via delivery of bespoke knowledge.

Based on the student registration data provided by UWI, the institution had a student enrollment of over 6,000 students from the academic school years 2019/2020 to 2021/2022 and at January 2022, the total enrollment was recorded at 6,735. At the same period, the total number of students enrolled in programs focused on clean tech at both undergraduate and graduate levels was 156 which represents 2% of the student enrollment.

There are 108 students enrolled at the undergraduate level of which 51% are female; at the graduate level, 71% of those enrolled in areas which focus on clean tech are of the female gender.



Education identified as a key challenge: Capacity building opportunities in relation to clean tech at tertiary institutions (cont'd)



The Barbados Community College (“BCC”) offers a range of programs at the tertiary level with Professional Qualification Award along with Certificates, Diplomas, Associate Degrees and Bachelor Degrees across its 12 divisions. There are approximately 76 course programs offered. Specifically in the area of clean tech, it offers two 4-month Professional Certificate courses [Photovoltaic Design and Practice (PVDP) and Photovoltaic Installation-Electrical Technician (PVIET) Level 3 NVQ] in addition to a two-year Associate Degree program in Environmental Science (ENVS).

The total combined student capacity for the cohorts in the Professional Certificate courses is 116 and the student enrollment rate is 92% on average with an average of 96% being males and the remaining 4% being females. The capacity for the Associate Degree program is 40 students per cohort and the enrollment rate is 100% with 23% being males and 77% being female.

Only 3% of the full course offerings by the BCC are in the area of clean tech.



**Ministry of Education,
Science, Technology &
Innovation - Barbados**

The GoB via its Ministry of Education, Science, Technology & Innovation offers National Development Scholarship (annually to suitably qualified individuals) to provide training in scarce specialist areas and in areas identified as priorities in the socio-economic development of the country.

Over the years, there has been a notable increase in the offerings of studies relating to sustainability; for instance, in 2017 there were two programs of a total offering of 25 in the area of clean tech and sustainability – Conservation Studies and Renewable Energy. In 2018, five of the 25 programs offered were in clean tech and sustainability which related to agricultural engineering, botanical biotechnology, sustainable waste management. In 2022, eight of the 34 programs offered were in clean tech and sustainability which related to climate change/environmental science, ocean/maritime energy, renewable energy engineering, blue economy, hydrology - water management and water conservation



To further support the development of the island's capacity building, Barbadians have access to low interest educational funding with delayed repayment terms via the Student Revolving Loan Fund.

Eligible applicants can qualify for educational loans up to a maximum of BDS\$125,000 (the equivalent of approximately US\$62,500).

Through this facility, there are on average 420 loan approvals per year with an average of US\$5.6m in loans distributed annually.

6
Response to select indicators in the
GEF CEO Endorsement document



Key Indicators

There are a number of higher-level progress indicators set out in the GEF CEO Endorsement document.

Each indicator has a quantifiable target which allows for the measurement and tracking of the indicators.

In preparing this report we identified select indicators for which an assessment could be made and these are displayed to the right of this page.



Indicator	Target	Comment
% annual increase of the turn-over of the SEC technology industry in Barbados (e.g. through increased sales, contracts) over a period of five (5) years	5% annual increase of the turn-over of the SEC technology industry in Barbados (e.g. through increased sales, contracts) over a period of five (5) years	US\$13.8m is the average annual turnover of the 13% of the clean tech firms which provided responses to the survey question on their annual turnover
Number of additional primary and secondary jobs (full time equivalents (FTE) in the SE industry created over a period of five (5) years (overall 400 jobs (FTE) in the sector after five years) (at least % occupied by women is envisaged)	200 additional primary and secondary jobs (full time equivalents (FTE) in the SE industry created over a period of five (5) years (overall 400 jobs (FTE) in the sector after five years) (at least 40% occupied by women is envisaged)	There are approximately 444 individuals employed in the local clean tech sector at the 18 companies that provided details on their work-force, the gender ratio is approximately Approximately 31% of the employed in the sector are females
A vision statement and strategy to promote the country as a hub for SEC technologies and services is developed and promoted abroad through various means	Vision statement and strategy developed (a gender dimension will be included)	Vision statement (inclusive of a gender element) developed (and attached to this report) as part of and will represent a national vision of Barbados regarding clean tech and be mainstreamed in future marketing efforts
Number of experts from various sectors are trained in priority technology and skill areas (at least % women participation is envisaged)	At least 300 experts from various sectors are trained in priority technology and skill areas (at least 40% women participation is envisaged)	The BCC short-term professional courses in PV design and installaton with a total cohort capacity of 116; at April 2022, there were 107 students enrolled with 96% males and 4% females. The UWI offers approximately 16 under-graduate and post-graduate programs in clean tech areas (priority technology) and based on the registrants for the 2021/2022 academic year, 156 students were enrolled and obtaining training in those areas.



Conclusion



Conclusion

Barbados aims to be the most environmentally advanced green country in Latin America and the Caribbean and the first 100% green and fossil-fuel free island-states in the world. While its contribution to the worldwide GHG emissions is relatively low, in its commitment to the Paris Agreement it has pledged in its Intended Nationally Determined Contributions an economy-wide goal to reduce GHG emissions by 44% compared to its BAU scenario by 2030 when compared to 2008 (baseline year). A total of 88% of its GHG emissions are from energy generation, transport and waste and hence a number of its policies, with reference to climate mitigation (and by extension – clean tech), are focused on those three areas. The sustainability mainstreaming should provide bolstering support for development of clean tech businesses and increase the effectiveness of reducing the climate change impact – thus thrusting Barbados to meet its 2030 goals.

Policies / strategies and incentives

Beyond the policies, the GOB has a number of strategies and initiatives in place to facilitate the creation of an enabling environment for the development and growth of clean tech, particularly in those areas identified as the major contributors to GHG emissions. Additionally, the GOB has further demonstrated its commitment to achieving its goal by leading the way in terms of its approach towards the procurement of EVs for its departments, ministries and agencies.

While some of the initiatives are focused on the demand-side (e.g. several of the tax incentives relating to EVs; ability of homeowners to install PV systems up to 10kW bypassing the application and permit process); some initiatives cater to the supply-side of green quality products and services (e.g. the “buy all/sell all” FIT program with differentiating rates for solar, wind, biomass and anaerobic digestion sources of RE generation). However, a key concern remains the permit and licensing process (i.e. connection impact assessment, Town and Country Planning Office permission, Government Electrical Engineering Department approval, etc.) with which an applicant/investor has to contend, and which involves a range of institutions operating with limited coordination among each other.

While there are a significant number of initiatives in energy and transportation, there is room for further incentives in other clean tech areas such as water particularly given Barbados is a water scarce island, a significant percentage (41%) of water pumped by the water utility is lost due to leaks and the changing climate conditions resulting in more frequent and longer periods of droughts.

Key challenges experienced

Among the key challenges experienced by SMEs and corporations operating in the sector are access to finance and the availability of bespoke training and education. While traditional commercial banks tend to require significant collateral (often real property / tangible assets) to be pledged to support loan application, which may be beyond the capability of some SMEs and corporations, there exists some financial options available which facilitate the development of supply-side of green quality products and services. Institutions such as IDB, via the Compete Caribbean Program, and the CDB which not only funds the governments, of its BMCs at a macro level, but also cohorts of businesses, provided they meet appraisal criteria, are feasible options. Other options include IDB invest (private sector arm of IDB) and the imminent GCFB which will act as an investment institution which will be investing in businesses that have an impact on climate mitigation and adaptation.

It is important to note that these institutions generally have similar evaluation criteria which includes size and scalability of the project(s), its impact on the environment, technical feasibility and gender analysis.

In terms of education, Barbados has a near 100% literacy rate and boast of having a university ranked among the highest in the world (by Times Higher Education); the enrollment for academic year 2021/2022 was approximately 6,700 students and less than 2% of the students were enrolled in area related to clean tech. At the BCC which offers approximately 76 programmes across all divisions at the institutions, there are only two short terms courses and one two-year Associate Degree program in areas related to clean tech.

Conclusion (cont'd)

Key challenges experienced (cont'd)

One of the major limitations to implementation and delivery of the curriculum of (some) clean tech programmes is financing given the high costs of the type of equipment required.

To fill the gap, the GOB has offered National Development Scholarships annually (2020 and 2021 were excluded – likely due to COVID) for undergraduate and postgraduate studies (abroad) in areas identified as priorities in the socio-economic development of the country and the number of scholarships offered in areas of clean tech have been increasing.

Notwithstanding the availability of concessionary loan and grant funding, the clean tech sector could benefit from a national budget for R&D in clean tech innovation.

Barbados Clean tech industry profile

There are approximately 60 SMEs and corporations operating within the clean tech sector of Barbados with almost one-half operating within the energy and power industry. Approximately one-third of the Barbados clean tech universe provided profile data and based on a review of that data, the median age of the companies is 12-years. There are approximately 444 individuals employed in the local clean tech sector at the 18 companies that provided details on their work-force, the gender ratio is approximately 69% males and the remaining 31% females.

Status of development of the Barbados clean tech ecosystem

Status of development of the Barbados clean tech ecosystem

Based on an assessment of Barbados' policy indicators (strategy, incentives and research) Barbados ranks 2.7 out of a maximum of 5 with research being the lowest indicator score at 1 out of 5. In relation to the innovation outcome indicators, Barbados ranks 0.8 out of a possible 5 however, this must be taken in context and with consideration given to the level of participation of SMEs and corporations providing profile data (specifically, figures relating to capital raised, employees, etc.). Based on an assessment of the information available, Barbados is considered an "early-mover" with favourable conditions for growth and development of a sustainable clean tech ecosystem.

An aerial photograph of a vibrant turquoise lake surrounded by a dense, lush green forest. The water is clear and bright, reflecting the sky. The forest is thick and covers the surrounding land, with some small islands or peninsulas extending into the water. The overall scene is serene and natural.

Annex 1 – Summary listing of clean tech SMEs and corporations



Clean tech companies listing

Company Name	Clean Tech Industry	Clean Tech Area	BLOOM Member
ACE Recycling	Circular Economy	Circular Economy	N
Adams Aquafarm	Agriculture and Food	Aqua Farm	N
Amelot Oil Barbados	Advanced Materials	Biofuels	N
Baird's Village Aquaponics Association - Damian Hinkson	Agriculture and Food	Aquaponics	N
Barbados National Oil Company Limited	Energy and Power	Renewable Energy	N
BIMEV	Mobility and Transportation	E-Transportation	Y
Bioresin project / EcoMyco	Circular Economy	Circular Economy	Y
Blue Circle Energy	Energy and Power	Renewable Energy	N
B's Recycling	Circular Economy	Circular Economy	N
Caribbean E-Waste Management Inc	Circular Economy	Circular Economy	N
Caribbean LED Lighting	Energy and Power	Energy Efficiency	N
CEMBI / BitEgreen	Circular Economy	Circular Economy	Y
CloudSolar	Energy and Power	Green technology company / Solar	N
DAJJ Water Solutions	Water and Blue Economy	Wastewater Treatment	N
Dee's Enterprises/ Green Collective 246	Circular Economy	Circular Economy	Y
Diceabed	Circular Economy	Circular Economy	N
EcoEnergy Inc.	Energy and Power	Solar Energy	N
Ecohesion Group	Water and Blue Economy	Wastewater Treatment	N
Ecolab	Water and Blue Economy	Water Purification	N
Emera Caribbean Renewables	Energy and Power	Renewable Energy	N

Company Name	Clean Tech Industry	Clean Tech Area	BLOOM Member
Endless Electric Ltd	Mobility and Transportation	E-Transportation	N
Ensmart Inc	Energy and Power	Renewable Energy	N
Future Energy Caribbean Inc.	Energy and Power	Solar Energy	N
Goldfield Solar	Energy and Power	Solar Energy	N
GoodRidge Power	Energy and Power	Solar Energy	Y
Green Technologies Barbados	Energy and Power	Energy Efficiency	N
HDF Energy (Renewstable Project)	Energy and Power	Renewable Energy	N
Healing Grove Container Farm	Agriculture and Food	Aquaponics	Y
Innogen Technologies	Energy and Power	Solar Energy	N
Ino-Gro Inc.	Agriculture and Food	Vertical Farming	N
Ionics	Water and Blue Economy	Wastewater Treatment	N
Iron Charging Solutions	Mobility and Transportation	E-Transportation	Y
Kayamo Pads	Circular Economy	Circular Economy	N
Machinery & Allied Engineering Services	Advanced Materials	Biofuels	N
Megapower	Mobility and Transportation	E-Transportation	N
Megawatt Energy Services Inc.	Energy and Power	Solar Energy	N
MPC Caribbean Clean Energy	Energy and Power	Renewable Energy	N
National Petroleum Corporation	Energy and Power	Renewable Energy & Biofuels	N
OnSolar	Energy and Power	Renewable Energy	Y
Paradise Green Energy	Waste Management	Recycling	N

Clean tech companies listing (cont'd)

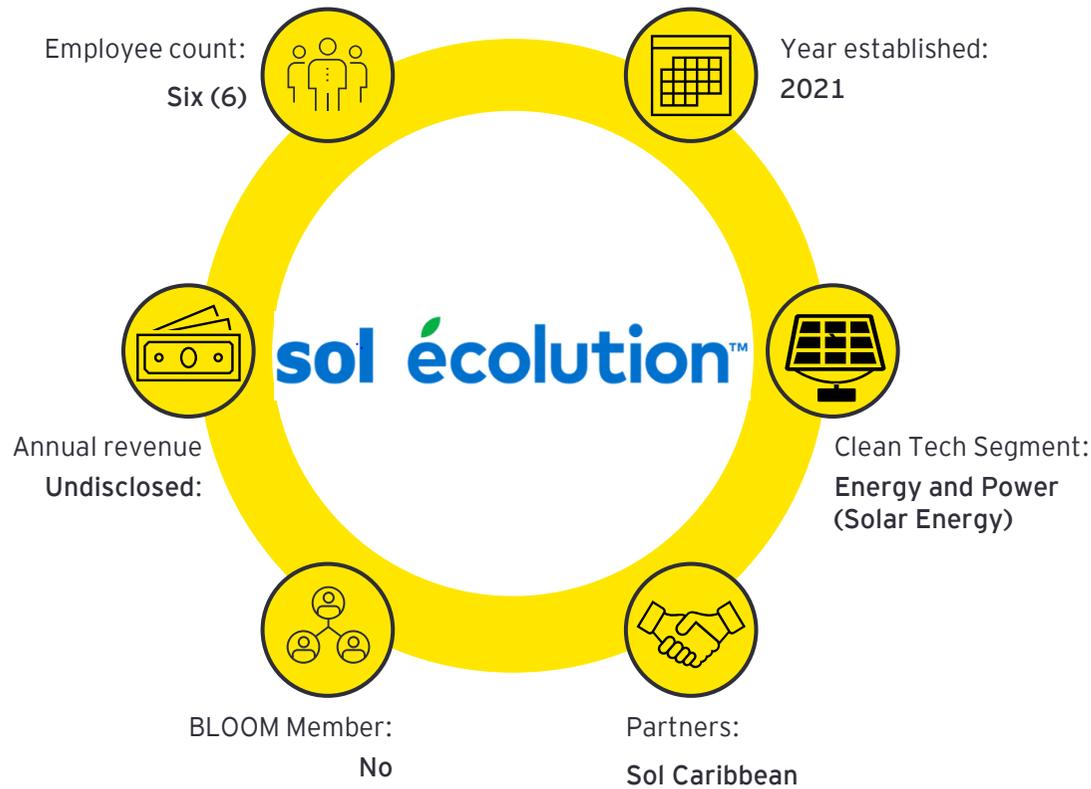
Company Name	Clean Tech Industry	Clean Tech Area	BLOOM Member
ProSolar 246	Energy and Power	Renewable Energy	Y
Recycling Preparation Inc.	Circular Economy	Circular Economy	N
Red Diamond Compost	Agriculture and Food	Fertilizers	Y
RUBIS	Energy and Power	Renewable Energy	N
Rum and Sargassum Inc	Advanced Materials	Biofuels	N
S.I.R Water Management Limited	Water and Blue Economy	Wastewater Treatment	N
SBRC (Sustainable Barbados Recycling Centre) - owned by Williams Industries	Circular Economy	Circular Economy	N
Scrapman Recycling	Waste Management	Recycling	N
SOL Ecolution	Energy and Power	Solar Energy	N
SolaGrow	Agriculture and Food	Food Production	N
Solar Apex	Energy and Power	Solar Energy	N
Solar Creativity Caribbean	Mobility and Transportation	E-Transportation	N
Solar Dynamics	Energy and Power	Solar Water	N
Solar Energy Innovations Inc.	Energy and Power	Solar Energy	N
Solar Genesis Inc	Energy and Power	Renewable Energy	N
Solar Watt	Energy and Power	Solar Energy	N
Sun Power	Energy and Power	Solar Water	N
Superior Solar Power Solutions	Energy and Power	Solar Energy	N
Total Water Solutions	Water and Blue Economy	Wastewater Treatment	N
Williams Solar	Energy and Power	Solar Energy	N





Annex 2 – Corporate profiles of select clean companies

Sol Ecolution



Website: <https://solpetroleum.com/sol-ecolution-barbados/>

Country: Cayman Islands

HQ location: Cayman Islands

Year of establishment: 2021

Status: Active

Management team: General Manager {Dami Adesegha}

Vision: Undisclosed

Mission: Great people working together to be the partner of choice for our customers and suppliers.

Employees: 6

Gender distribution: Confidential

Number of projects: 60

Number of investments: Undisclosed

Annual turnover (BDS\$): Undisclosed

Competitive advantage: Undisclosed

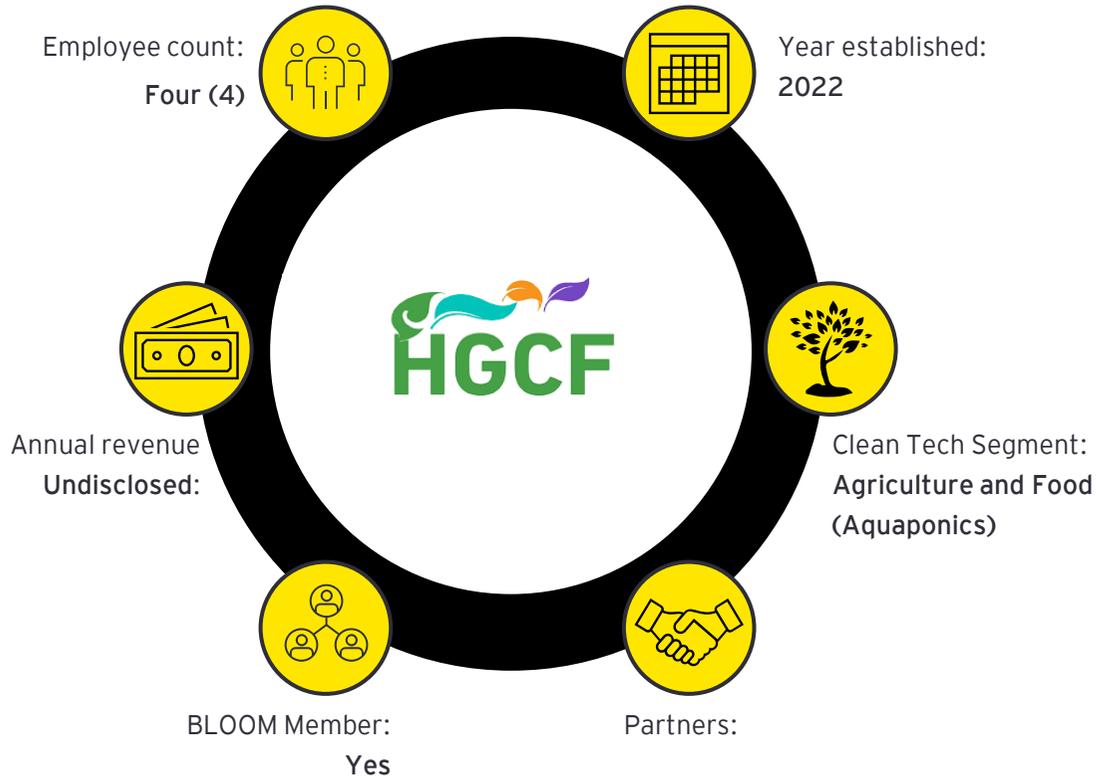
Promotion strategy: Undisclosed

Key partners: Sol Caribbean Limited

Funding raised to date: Confidential

Product(s) and service(s): Provides high quality, reliable and safe energy solutions with Solar energy being a key pillar of Sol Ecolution’s renewable energy offering. The full-service offering includes: project financing, site selection and assessment, project scoping and design, pre-feasibility and feasibility studies, contract negotiation, engineering procurement and construction services – provided through local partnerships

Healing Grove Container Farms



Website: www.healinggrove.com

Country: Barbados

HQ location: Barbados

Year of establishment: 2022

Status: Pending

Management team: Leiska Evanson (Founder)

Vision: Undisclosed

Mission: Undisclosed

Employees: 4

Gender distribution: 25% male: 75% female

Number of projects: 1

Number of investments: 1

Annual turnover (BDS\$): Provided in survey but asked to be kept confidential

Competitive advantage: Provided in survey but asked to be kept confidential

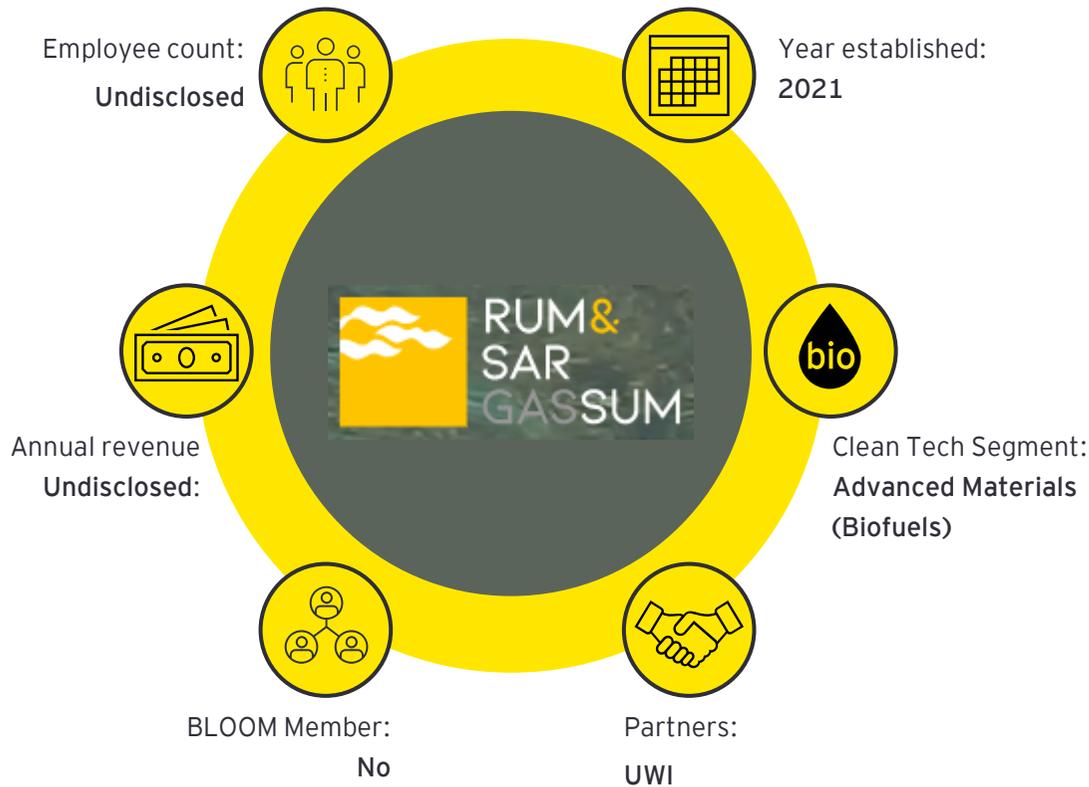
Promotion strategy: Provided in survey but asked to be kept confidential

Key partners: Provided in survey but asked to be kept confidential

Funding raised to date: Undisclosed

Product(s) and service(s): Solar PV powered Greenhouse, Shade house, Freight Container Farming, Water recycling, hydroponics, aquaponics

Rum and Sargassum



Website: <https://rumandsargassum.com/>

Country: Barbados

HQ location: 28 Dairy Meadows, Holders Hill, St. James, Barbados

Year of establishment: 2021

Status: Active

Management team: Dr. Legina Henry

Vision: Undisclosed

Mission: Undisclosed

Employees: Confidential

Gender distribution: 25% male: 75% female

Number of projects: Confidential

Number of investments: Blue Chip Foundation - \$100K USD, IDB - \$1600 USD

Annual turnover (BDS\$): Confidential

Competitive advantage: All substrates for fuel are local

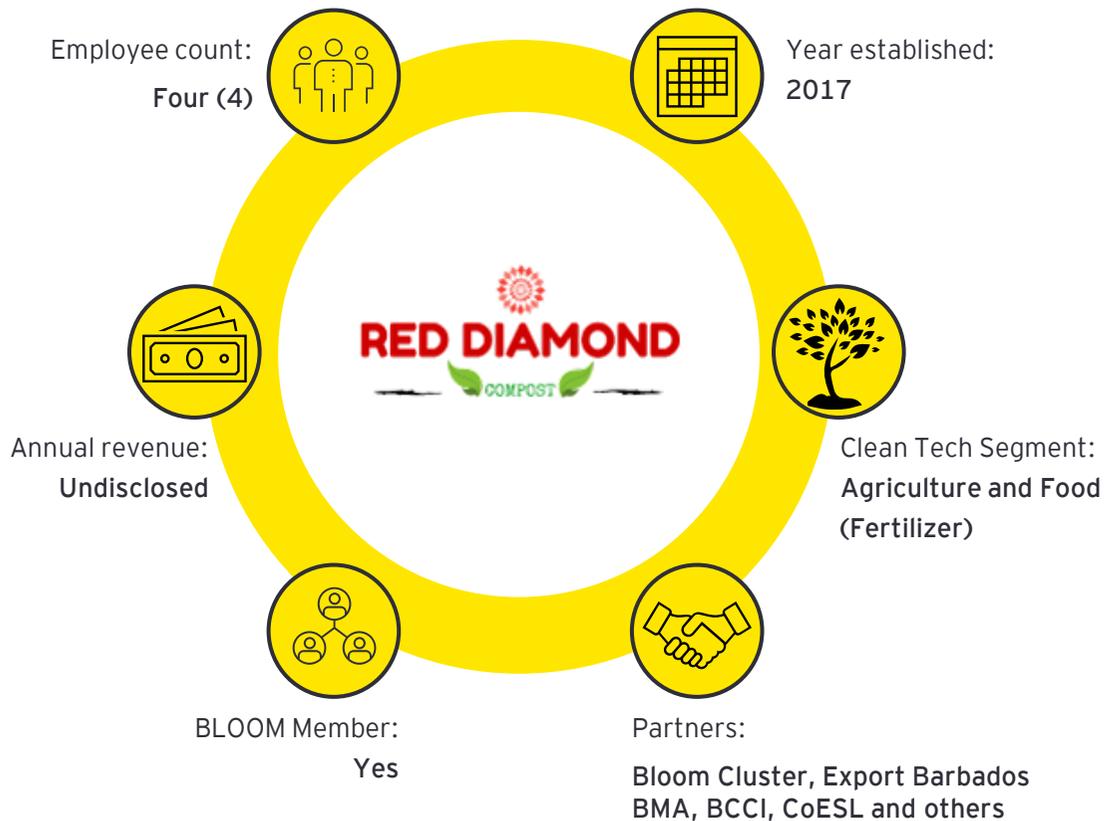
Promotion strategy: Promoted Via UWI Cave Hill connections

Key partners: University of the West Indies, Cave Hill Campus

Funding raised to date: Undisclosed

Product(s) and service(s): Renewable fuel for all cars via rum distillery wastewater and sargassum seaweed biogas CNG kit

Red Diamond Compost



Key partners: Bloom Cleantech Cluster, Export Barbados, CoESL (Caribbean Centre of Excellence for Sustainable Livelihoods), GEN Caribbean, Organic Growers and Consumers Association, Radicle Global, Barbados Manufacturers Association, Barbados Chamber of Commerce and Industry

Funding raised to date: Undisclosed

Product(s) and service(s): Create fertilizers and bio-stimulants designed to support the fragile microbes responsible for building soil structure, storing organic soil carbon, cycling nutrients to plants, and are safe for wildlife.

Website: <https://reddiamondcompost.com>

Country: Barbados

HQ location: Weston, St. James

Year of establishment: 2017

Status: Active

Management team: Mr. Joshua Forte (Founder); Anne (Agricultural Engineer); Verrol-Ann (Operations Coordinator)

Vision: Undisclosed

Mission: Provide easy access to nutrient rich foods, reconnecting with the spirit of nature and building a reputation of Integrity in product and service quality

Employees: 4

Gender distribution: 50% male: 50% female

Number of projects: 3

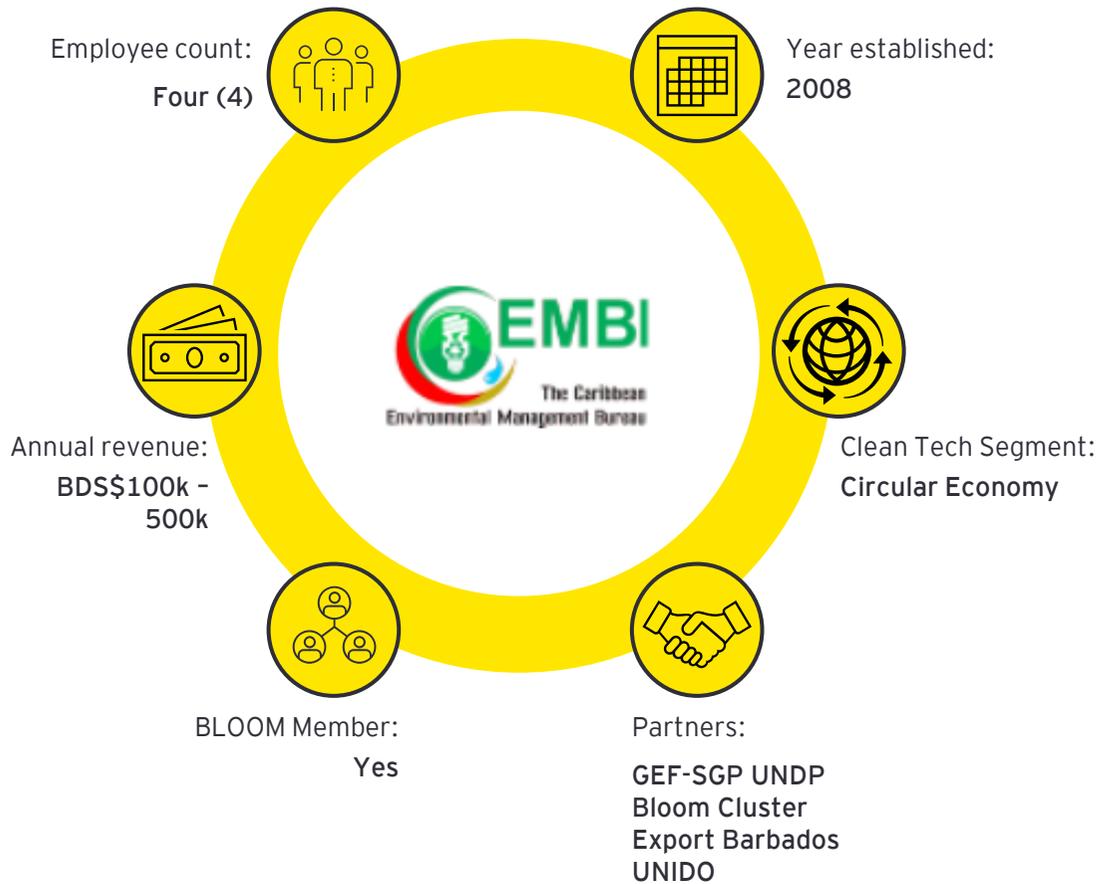
Number of investments: Undisclosed

Annual turnover (BDS\$): Undisclosed

Competitive advantage: Differentiation from the other products in the organics category by providing a product with no synthetically derived ingredients to harm or 'run off' beneficial organisms such as earthworms and fungi. Offer highly concentrated products with a large application coverage area and a manufacturing process that boasts an ecologically positive footprint and provides multiple benefits to the surrounding environs.

Promotion strategy: Primarily social media marketing, various means through our partners (e.g. featured on the cover of Export Barbados Bioland Magazine). Aim at launching an educational initiative with some of their key partners and fellow stakeholders to raise awareness around the theme: People, Planet, Health.

Caribbean Environment Management Bureau



Product(s) and service(s): BitEgreen Market: web platform & app. BitEgreen Market is an innovative environmental initiative that uses technology to assign monetary value to reusable and recyclable material for all citizens and corporations, making it.

Website: www.cembi.org

Country: Barbados

HQ location: "Simbar", Lodge Hill, St. Michael BB12001

Year of establishment: 2008

Status: Active

Management team: Ms. Simera Crawford (Executive Founder); Selwyn Cambridge (Founder); Kadeem Wharton (Founder)

Vision: Using the power of collective Corporate Purpose towards 100% perpetual sustainability on planet Earth.

Mission: Committed to being a driving force towards achieving sustainable development goals through enhancement and innovation of ideas and methods via supportive partnerships, integrity, facilitation, expertise, research & analysis, training, project planning, systems development, implementation and monitoring.

Employees: 4

Gender distribution: 50% male: 50% female

Number of projects: 1

Number of investments: Undisclosed

Annual turnover (BDS\$): Undisclosed

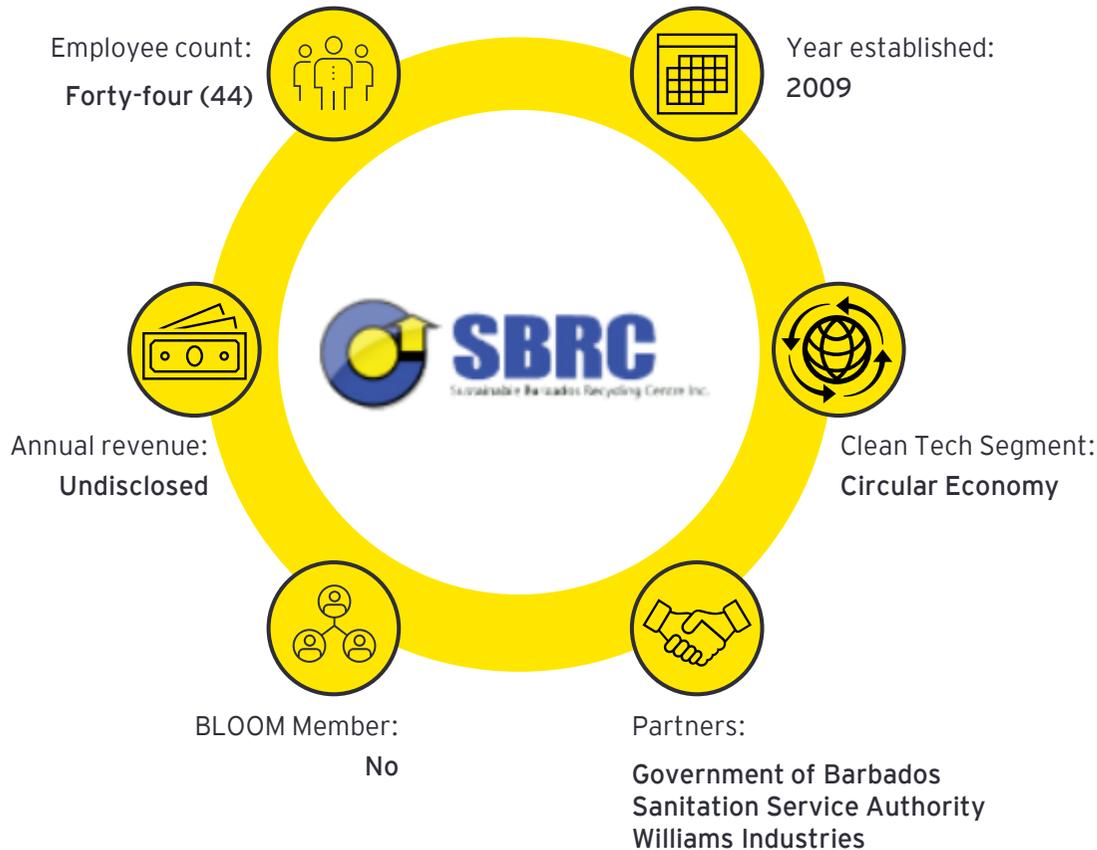
Competitive advantage: Solution/project affects and helps manage all areas of the sustainable development goals.

Promotion strategy: Confidential

Key partners: GEF-SGP UNDP, Bloom Cleantech Cluster (Export Barbados & UNIDO)

Funding raised to date: n/a

SBRC Inc



Website: www.sbrcinc.com

Country: Barbados

HQ location: Vaucluse, St. Thomas

Year of establishment: 2009

Status: Active

Management team: Carol Scantlebury (General Manager), Tony Armstrong (Operations Manager)

Vision: Undisclosed

Mission: Undisclosed

Employees: 44

Gender distribution: 75% male: 25% female

Number of projects: Undisclosed

Number of investments: Undisclosed

Annual turnover (BDS\$): Undisclosed

Competitive advantage: Solution/project affects and helps manage all areas of the sustainable development goals.

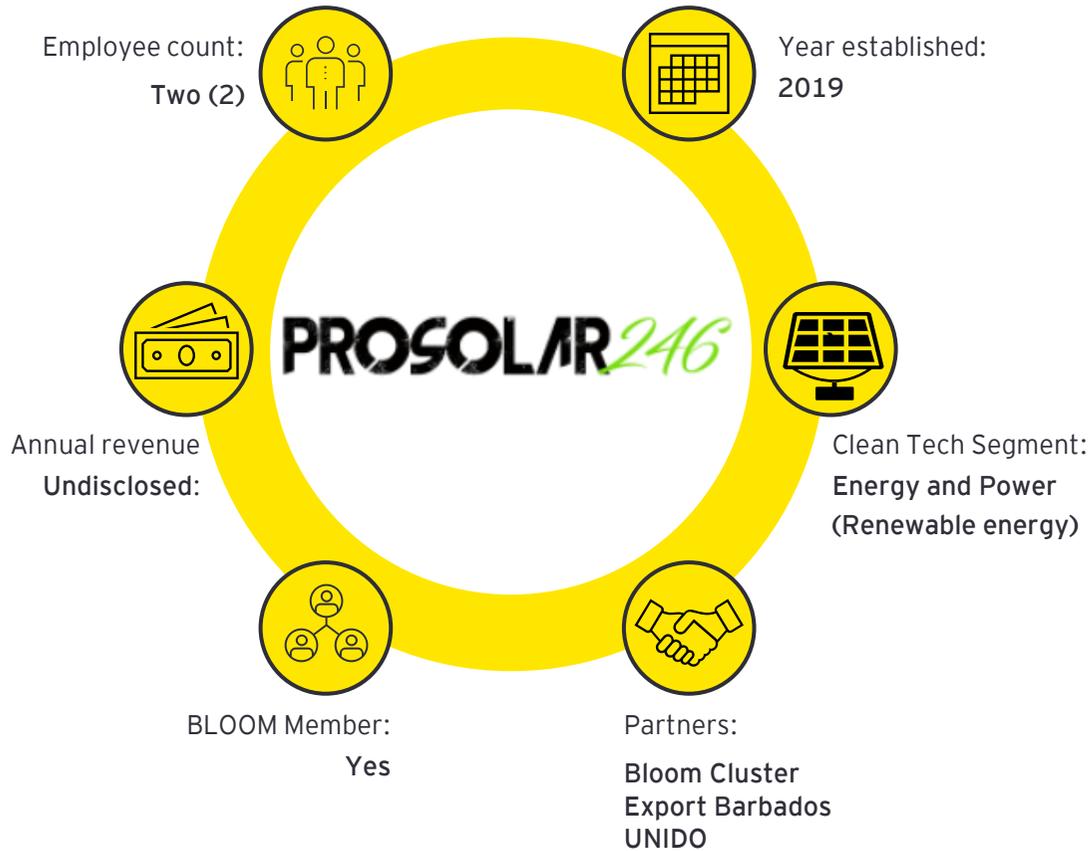
Promotion strategy: Tours, website, social media

Key partners: Sanitation Service Authority, Government, Williams Industries (as the parent company)

Funding raised to date: Undisclosed

Product(s) and service(s): Divert waste to develop products from the organic solid waste stream as it seeks to maximize diversion of recyclable waste from the Sanitary Landfill, reduce the disposal load, conserve the Island's resources, increase the organic content of local soils and contribute to the effort of reducing global warming. Among products produced are bagged organic mulch, animal bedding, compost, top-soil, soil amendment, wood chip and coconut fibre.

ProSolar246 Inc



Product(s) and service(s): Renewable energy – Project management and project development (solar and wind projects), roof and ground mounted panel installation, hybrid grid-tie battery storage systems, off-grid renewable energy solution, solar panel cleaning and replacement of modules/inverters and troubleshooting services for system faults

Website: www.prosolar246.com

Country: Barbados

HQ location: Chapel Place, Culloden Road St. Michael Barbados

Year of establishment: 2019

Status: Active

Management team: Kyle Albert (CEO, Founder); Karen Bishop-Mcclean (Marketing Development)

Vision: ProSolar246 Inc. vision is to be a leader in renewable energy technology in Barbados and throughout the wider Caribbean, by providing quality durable solar and wind power solutions to home and commercial businesses at affordable pricing.

Mission: To exceed our customers' expectations in quality, delivery and cost through continuous improvement and customer interaction. To create green environment by advocating renewable solutions.

Employees: 2

Gender distribution: 50% male: 50% female

Number of projects: 7

Number of investments: 1

Annual turnover (BDS\$): Undisclosed

Competitive advantage: Pricing

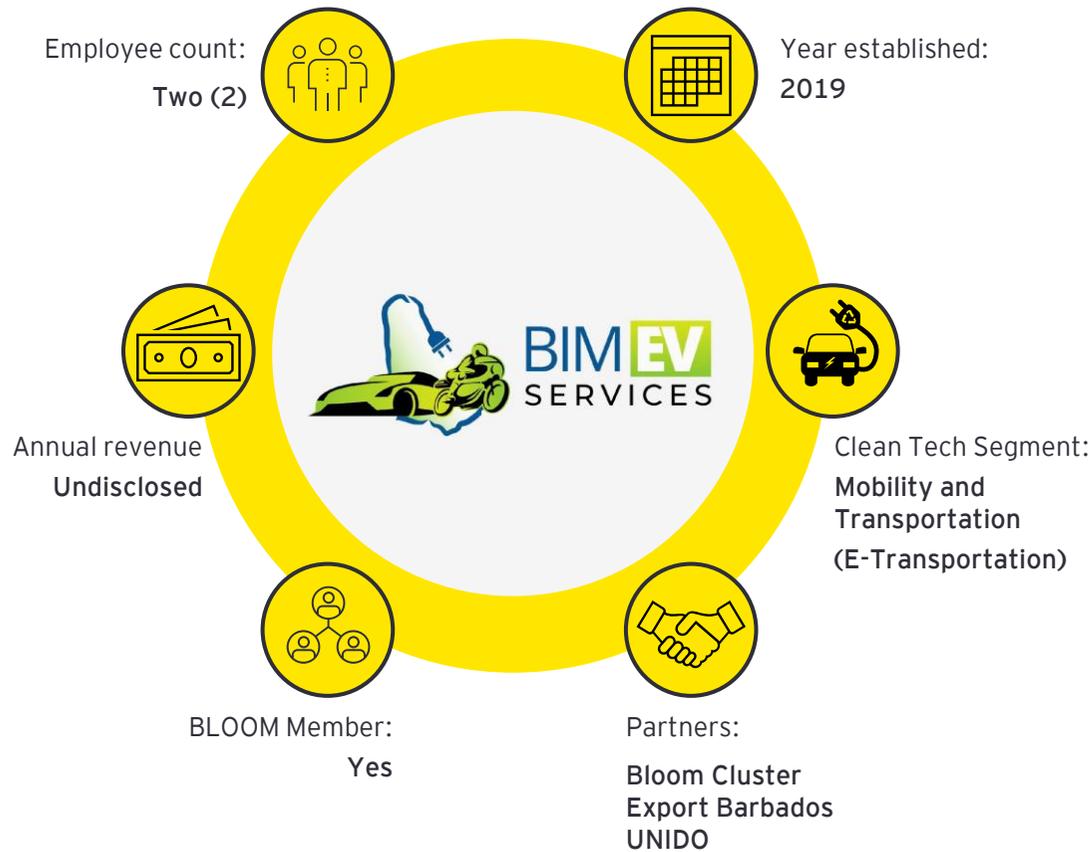
Promotion strategy: Website and word of mouth

Key partners: Bloom Cleantech Cluster (Export Barbados & UNIDO)

Funding raised to date: Undisclosed

Product(s) and service(s): Renewable energy – Project management and project development (solar and wind projects), roof and ground mounted panel installation, hybrid grid-tie battery storage systems, off-grid renewable energy solution, solar panel cleaning and replacement of modules/inverters and troubleshooting services for system faults

BIM EV Services



Website: <https://bimev.business.site>

Country: Barbados

HQ location: Shop Hill, St. Thomas, Barbados

Year of establishment: 2019

Status: Active

Management team: Dario Alleyne (CEO, Founder) Akelia Belgrave (Executive Assistant)

Vision: n/a

Mission: To provide professional transportation services while protecting the environment. BIMEV provides fully electric vehicles to locals, tourists and commercial institutions.

Employees: 2

Gender distribution: 50% male 50% female

Number of projects: Undisclosed

Number of investments: Undisclosed

Annual turnover (BDS\$): Undisclosed

Competitive advantage: Undisclosed

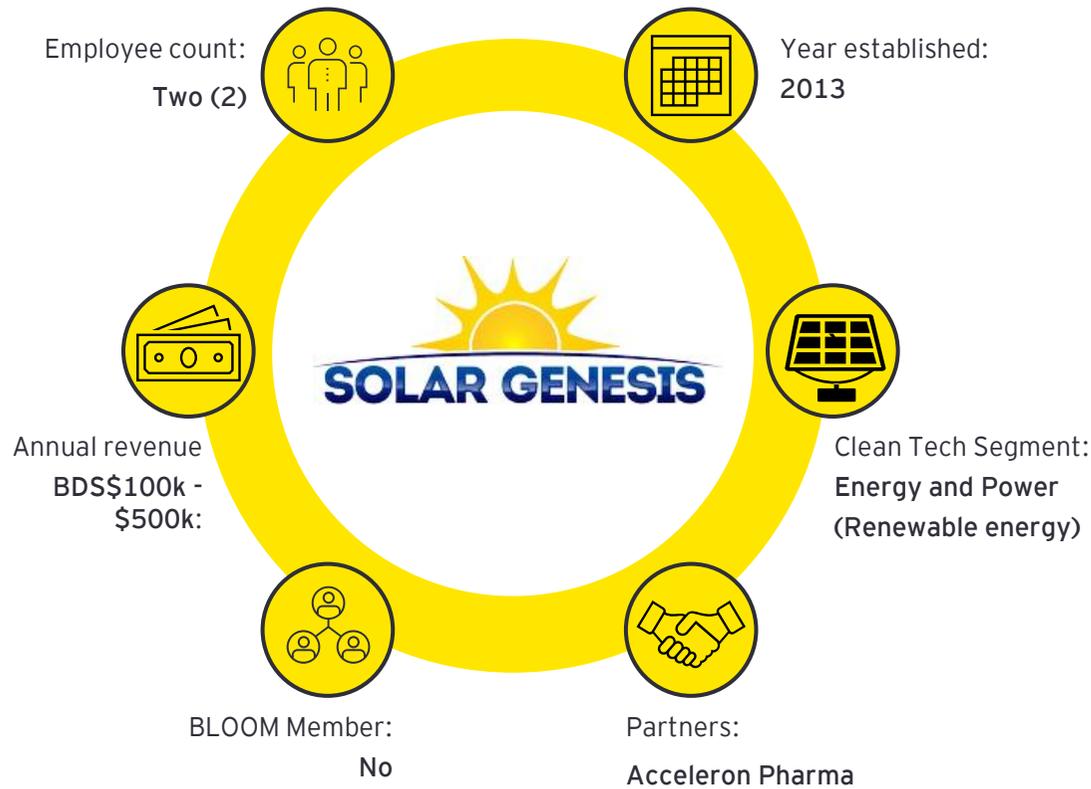
Promotion strategy: Social media and word of mouth

Key partners: Bloom Cleantech Cluster (Export Barbados & UNIDO)

Funding raised to date: n/a

Product(s) and service(s): Fully electric vehicle rental company

Solar Genesis Inc



Website: www.solargenesis.com

Country: Barbados

HQ location: Barbados

Year of establishment: 2013

Status: Active

Management team: Khalid Grant (CEO, Founder)

Vision: Undisclosed

Mission: Undisclosed.

Employees: 2

Gender distribution: 100% male

Number of projects: 50

Number of investments: 5

Annual turnover (BDS\$): BDS\$100,000 - \$500,000

Competitive advantage: Canadian experience and network to service providers and manufacturers

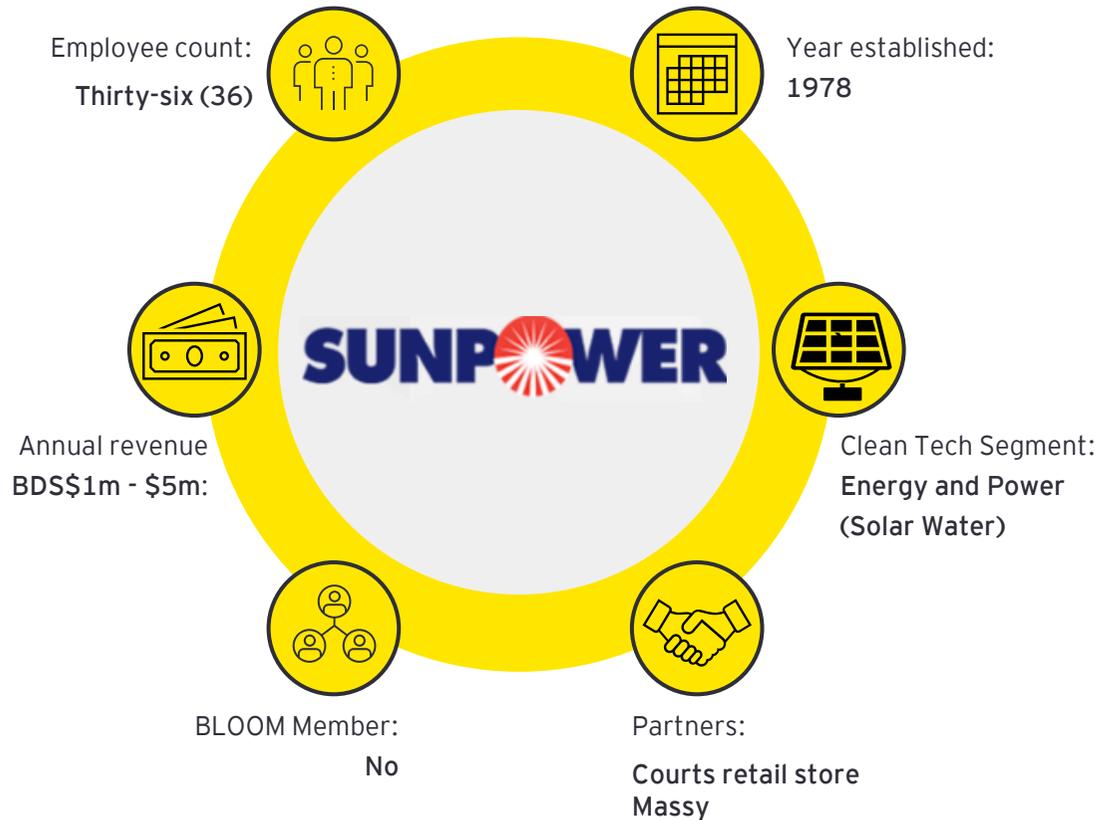
Promotion strategy: Online and word of mouth

Key partners: Undisclosed

Funding raised to date: Undisclosed

Product(s) and service(s): Renewable energy company providing consulting, project management and solar development services for the Caribbean solar photovoltaic (PV) market.

Sunpower



Product(s) and service(s): Manufacture and sell solar water heating systems, tanks, panels, water storage systems and pressure release valves. All products, with the exception of modular tanks, are produced locally

Website: www.sunpower.com

Country: Barbados

HQ location: Factory Yard, Christ Church

Year of establishment: 1978

Status: Active, private

Management team: Henry Jordan (Sales Director); Susan Jordan (Office Manager)

Vision: To be the leading manufacturer and supplier of solar heated water systems in the Caribbean Region and to be continually innovative in the production of products that utilize solar energy

Mission: Sunpower manufactures high quality, cost effective and cost-efficient solar water systems that contain recyclable materials. Our systems have been designed by experienced engineers and are built by skilled craftsmen and supported by a knowledgeable and efficient staff, such that the customer requirements are always achieved and customer satisfaction maximized.

Employees: 36

Gender distribution: 70% men: 30% women

Number of projects: current projects – 2 small hotels and the prison

Number of investments: n/a

Annual turnover (BDS\$): BDS\$1 – BDS\$5m

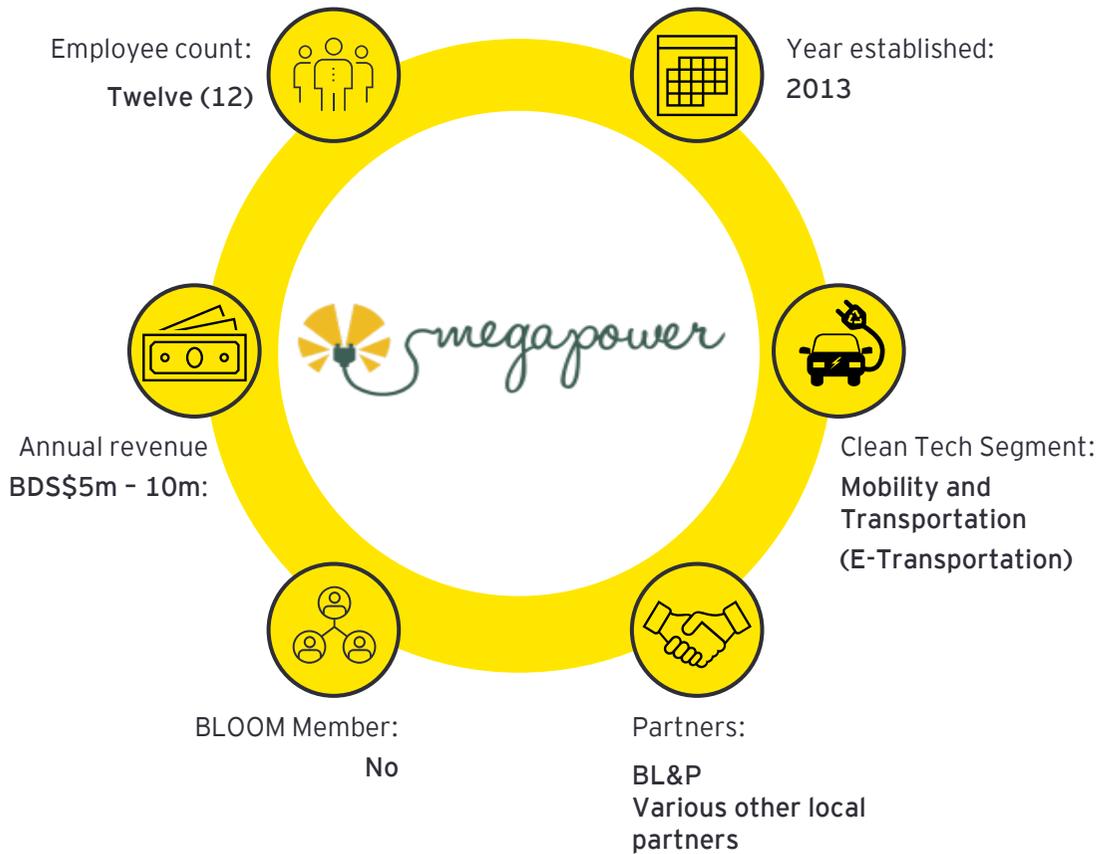
Competitive advantage: differentiation of product and service

Promotion strategy: Printed press and social media

Key partners: Key building contractors; Courts and Massy are retail partners for purchase of the systems via hire purchase agreements

Funding raised to date: n/a

MegaPower Ltd



Funding raised to date: n/a

Product(s) and service(s): Sale of EVs, reuse and upcycle old EV batteries for new projects (from golf carts to streetlights); design solar carparks, charging networks

Website: www.megapower365.com

Country: Barbados

HQ location: Wildey Business Park, Wildey, St. Michael

Year of establishment: 2013

Status: Active

Management team: Simon Richards (Co-Founder and CTO); Joanne Edghill (CO-Founder and Business Director); Ana Herrera (BYD Country Manager); Sheron Waithe (Operations Manager); Philip Best (Master Technician) Melinda Belle (Financial Controller)

Vision: To promote the uptake of EVs powered by renewable energy

Mission: n/a

Employees: 12

Gender distribution: 58% men: 42% women

Number of projects: n/a

Number of investments: BDS\$4m

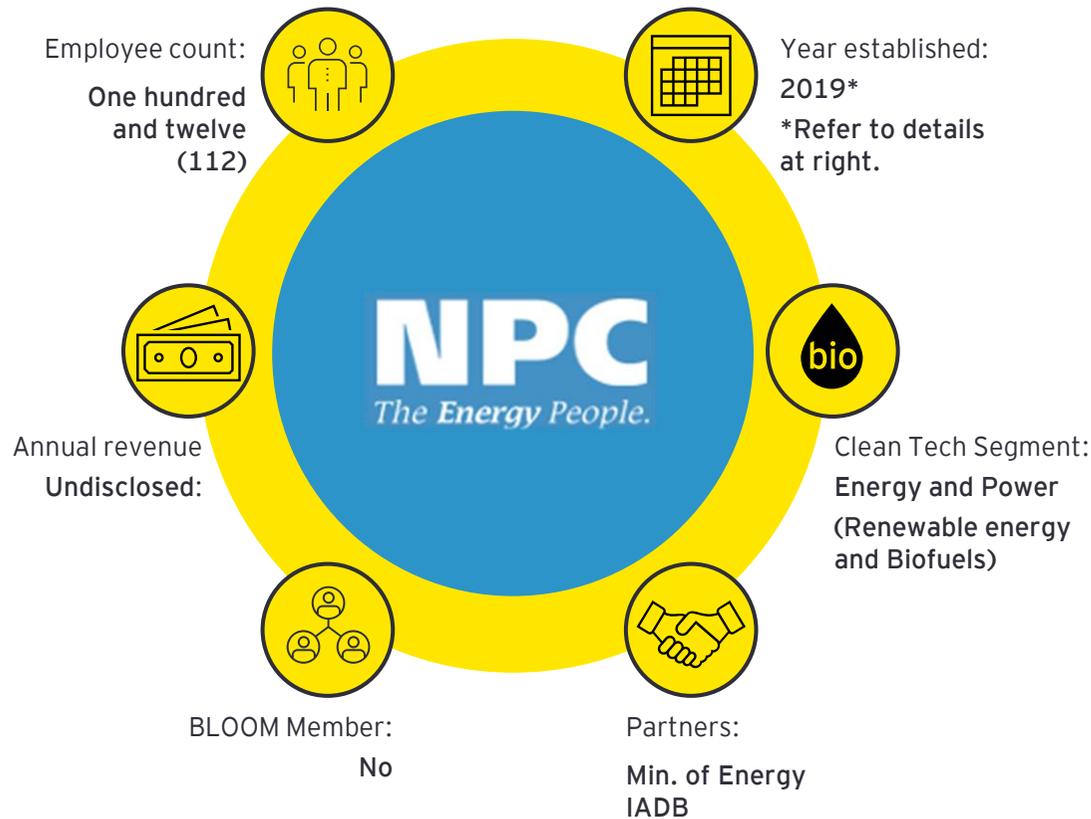
Annual turnover (BDS\$): BDS\$5 – BDS\$10m

Competitive advantage: Specialist EV Garage which was the first to the Barbados market; highly trained staff; provide full support for vehicles sold by MegaPower, strong brand recognition

Promotion strategy: Finance promotions (Ansa Bank); strong Face Book and social media presence; returning customers and customer referrals based on past (good) customer experience

Key partners: BL&P, Partner sites at various locations across Barbados where the use of the charging stations requires a MegaPower RFID card – locations/partners are Little Good Harbour Hotel and Fish Pot Restaurant, LimeGrove Lifestyle Center, The Walk in Welches, Caribbean LED Lighting, BICO Ice Cream, Southern Palms Beach Hotel, Atlantis Hotel

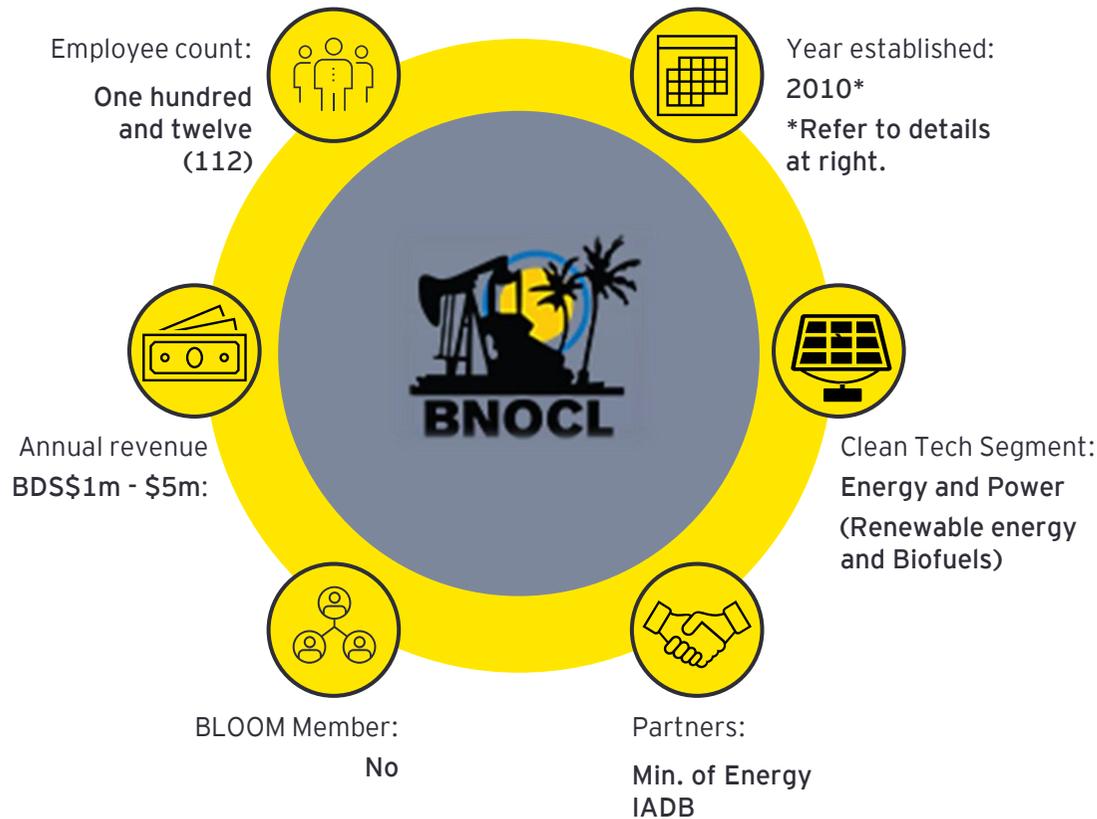
National Petroleum Corporation



Key partners: Ministry of Energy and Business and IADB
Funding raised to date: n/a
Product(s) and service(s): Distribution of natural gas supply. Refueling of CNG Vehicles

Website: www.npc.bb
Country: Barbados
HQ location: Wildey Main Road, St. Michael
Year of establishment: 1982 however Natural Gas Vehicles first started in 2008 in conjunction with Courtesy Garage, and NPC had commissioned its first fast-fill natural gas station in 2011. Concentrated research and activities around biomethane would have started in 2018 with BoD approval on a pilot project in 2019.
Status: Active
Management team: Mechelle Smith (General Manager Ag.); Francine Forde (Manager, Human Resources and Administration Ag.); Ian Bradshaw (Manager., Finance Ag.); Roger Martindale (Manager, Technical Operations); Andrea Burnett-Edward (Technical Officer)
Vision: n/a. Strategic planning currently being conducted
Mission: Strategic planning currently being conducted however the current mission of the Corporation is to provide and maintain a safe, reliable, efficient and competitive gas service to consumers and be instrumental in carrying out Government’s energy policy to improve the quality of life in the community which it serves.
Employees: 112
Gender distribution: 72% men: 28% women
Number of projects: Undisclosed
Number of investments: US\$34,000,000 – IADB, Deployment of Cleaner Fuels and Renewable Energies in Barbados
Annual turnover (BDS\$): Undisclosed
Competitive advantage: Only entity with a subservice network in Barbados to distribute energy in the form of fuels
Promotion strategy: Strategic planning currently being conducted

Barbados National Oil Company Limited



Product(s) and service(s): Solar PV systems (residential, commercial and utility scale), sell battery-based solutions

Website: <https://bnocl.com>

Country: Barbados

HQ location: Woodbourne, St. Philip

Year of establishment: 1982; Renewable Energy Department established in 2010

Status: Active

Management team: James Browne (CEO); Ashley Bignall (CFO); Ronnie Gittens (Group HR Manager); Pedro Bushelle (Group IT Manager); Damien Catlyn (Group HSSE Manager); Terrance Straughn (COO); Carolyn Forde-Bryan (Internal Auditor); Wesley Carter (Commercial Manager)

Vision: n/a. Strategic planning currently being conducted

Mission: To efficiently and economically identify and produce hydro-carbon resources and utilize the petroleum value chain and emerging solar technologies to contribute to energy production in Barbados

Employees: 139

Gender distribution: Undisclosed

Number of projects: Residential :>150 either installed or in process; commercial: approximately 10; Utility scale: 4-5

Number of investments: Undisclosed

Annual turnover (BDS\$): BDS\$1m – BDS\$5m

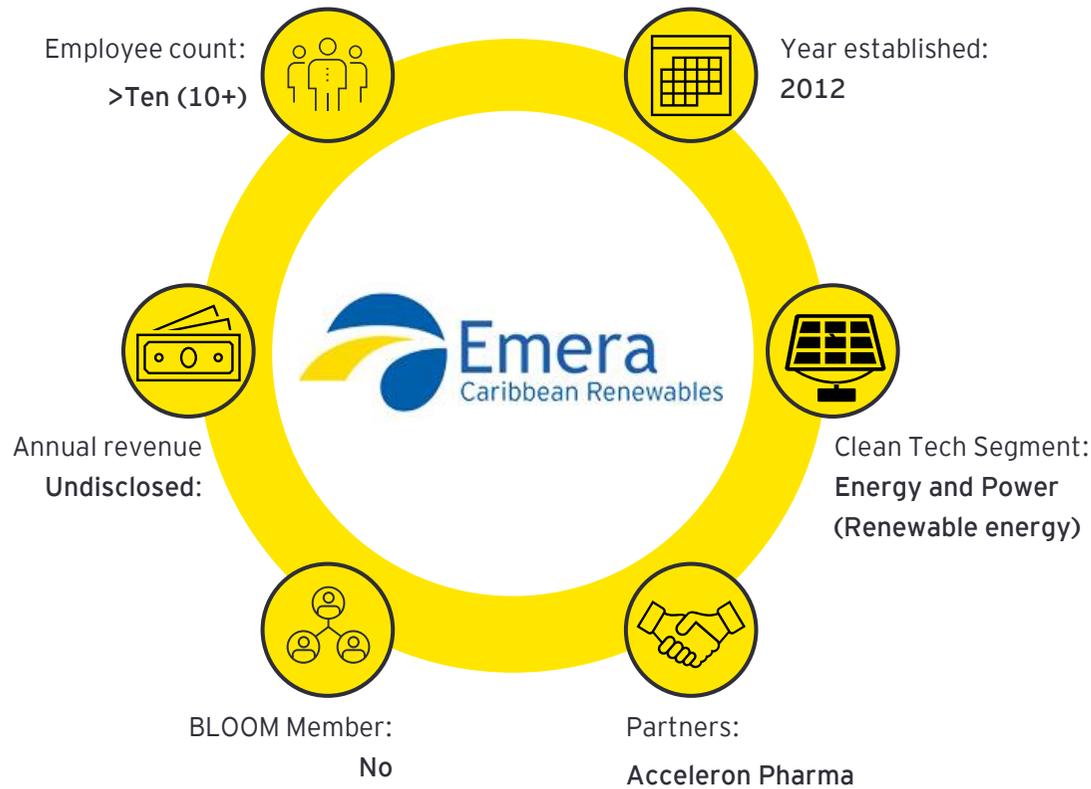
Competitive advantage: High quality products at competitive price

Promotion strategy: Print and social media and attended business expos to showcase products

Key partners: Undisclosed

Funding raised to date: Undisclosed

Emera Caribbean Renewables Inc



Website: <https://www.emeracaribbeanrenewables.com>

Country: Barbados

HQ location: Garrison Hill, St. Michael, Barbados

Year of establishment: 2012

Status: Active

Management team: Neilsen Beneby – Renewable Energy Manager

Vision: To lead the transition of our Caribbean communities to a sustainable energy future by facilitating the development of viable renewable energy projects.

Mission: Undisclosed

Employees: >10

Gender distribution: 3:1

Number of projects: Not disclosed

Number of investments: Not disclosed

Annual turnover (BDS\$): Not disclosed

Competitive advantage: Economies of scale, leveraging expertise within group of companies locally and internationally, years of expertise

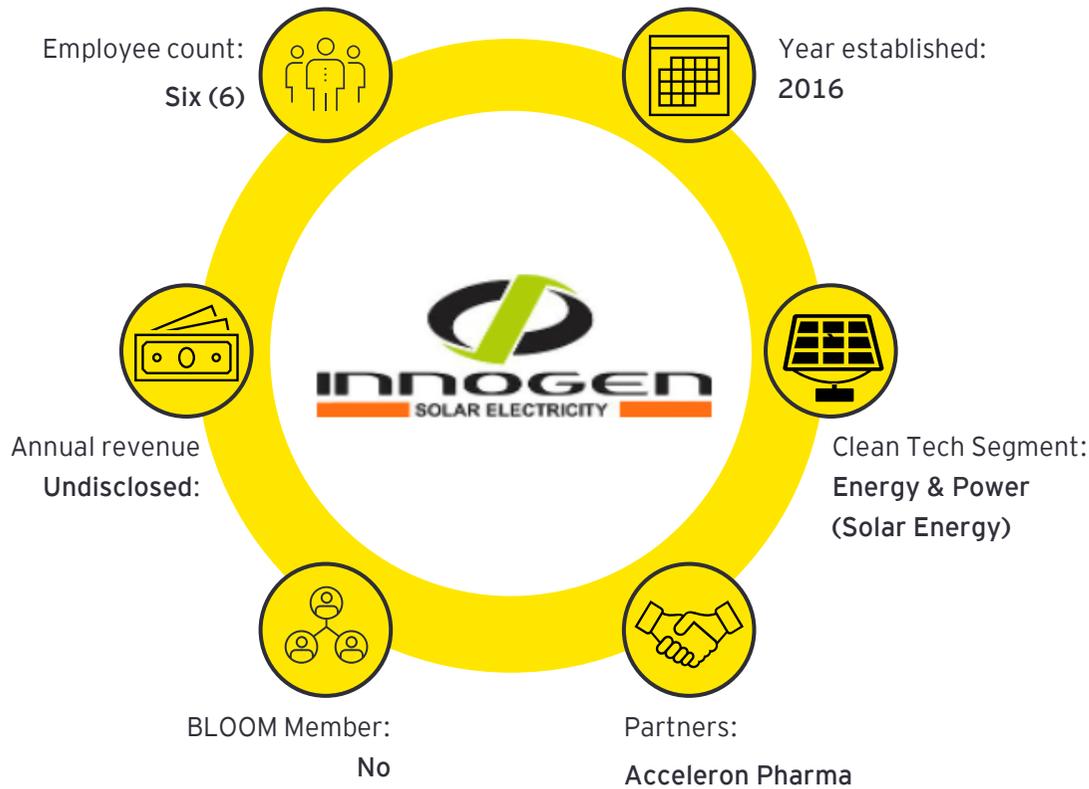
Promotion strategy: Social media presence

Key partners: Emera Inc. is the parent company which is an international energy and services company headquartered in Halifax, Nova Scotia

Funding raised to date: Not disclosed

Product(s) and service(s): Provides custom engineering design, procurement, construction, project management, and after sales operations and maintenance support of renewable solutions inclusive of photovoltaic, wind, energy storage, as well as energy management services for commercial and industrial scale applications.

Innogen Technologies



Website: <https://www.innogenonline.com>

Country: Barbados

HQ location: Harold Hoyte and Fred Gollop Media Complex, Fontabelle, St. Michael,

Year of establishment: 2016

Status: Active

Management team: Karl Nhembard (Engineering Manager), Noel Wood (Group CEO), Vancourt Rouse (Director)

Vision: Undisclosed

Mission: To assist both the average household and small and large businesses in minimizing their carbon footprint; reducing operation/ living expenses and contributing to saving foreign exchange at a macro level

Employees: 6

Gender distribution: 16% female, 84% male

Number of projects: >10

Number of investments: Undisclosed

Annual turnover (BDS\$): Undisclosed

Competitive advantage: Customer service and response

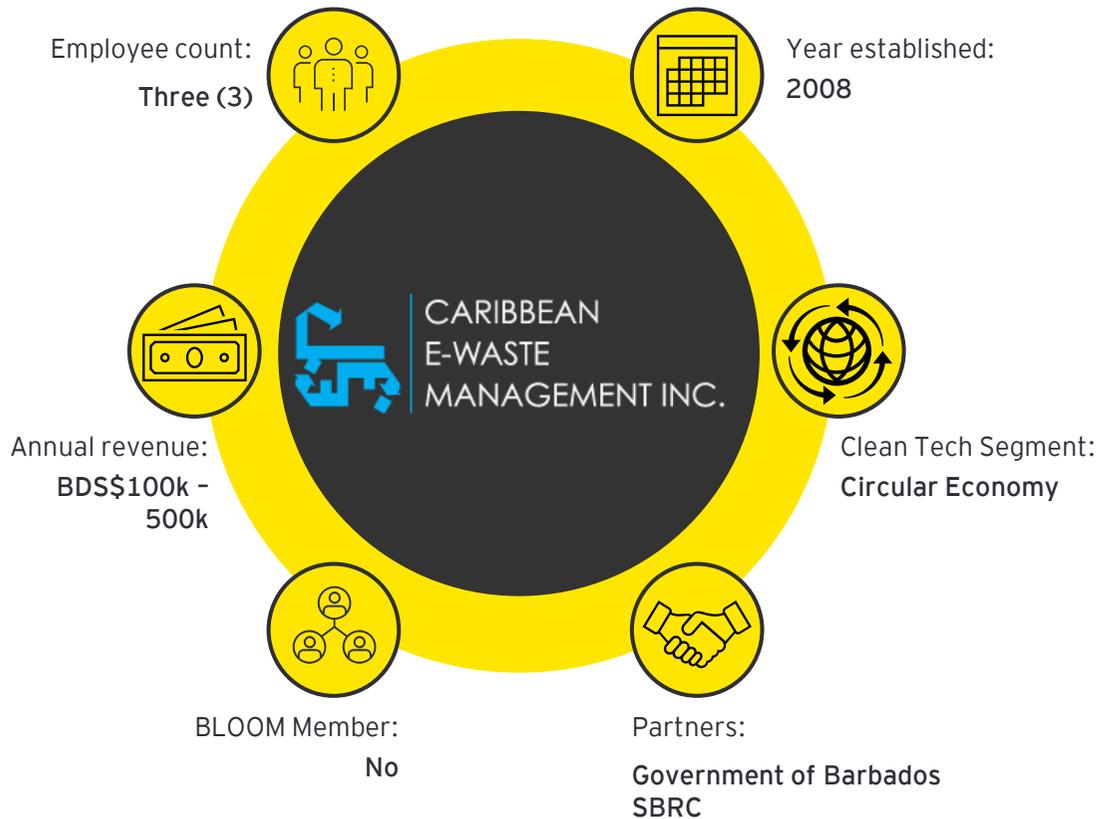
Promotion strategy: Radio, digital and print media

Key partners: Acceleron Pharma (parent company)

Funding raised to date: Undisclosed

Product(s) and service(s): Commercial and residential off grid and grid connected services including energy storage

Caribbean E-Waste Management Inc



Promotion strategy: Social media, word of mouth and referrals

Key partners: Government, SBRC

Funding raised to date: USD\$250k - \$500k

Product(s) and service(s): Disassemble and recover recyclable materials from electronic equipment that cannot be repaired, refurbished or upgraded which are then shipped to e-Stewards or R2 certified International recyclers to undergo further processing

Website: <http://cewmi.com/>

Country: Barbados

HQ location: Herberts Land, Codrington Hill, St. Michael

Year of establishment: 2008

Status: Active

Management team: Nadaline Malikca Cummings – Managing Director, Kevin Singh – Operations Supervisor, Ian Brewster – Board of Advisors, Kendi Brewster – Board of Advisors, Claudia James – Board of Advisors, David Beckles – Board of Advisors

Vision: We will be the leader and first choice in electronic recycling and waste management in the Caribbean

Mission: To provide environmentally sustainable electronic waste recycling services to public sector, private sector and residential consumers; to provide needs-based waste management solutions to our clients across the Caribbean; to increase public awareness of e-waste hazards and promote a zero-landfill objective; to achieve regional expansion through strategic alliances with partners and affiliates in selected countries; to create a safe, results oriented workplace that recognizes and appreciates the contributions of employees and promotes their continuous development; and to build shareholder value by earning consistently robust financial results

Employees: 3

Gender distribution: 67% male, 33% female

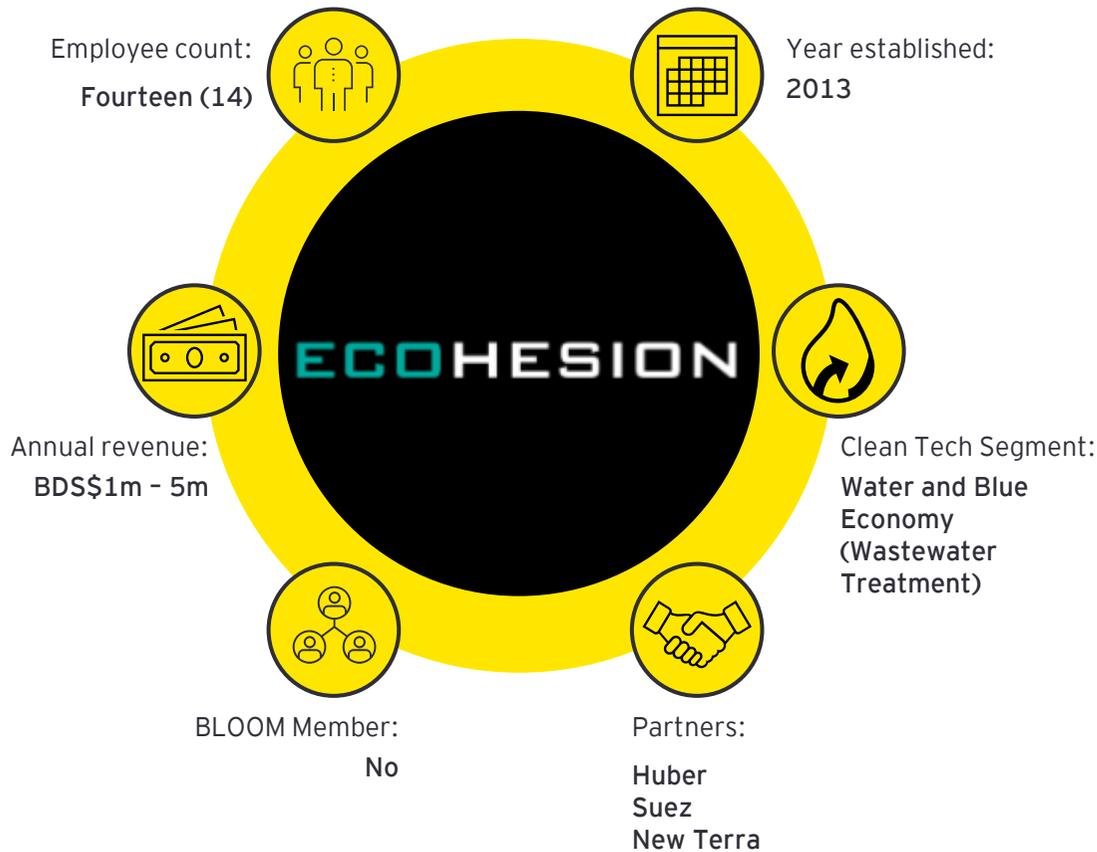
Number of projects: 1

Number of investments: Undisclosed

Annual turnover (BDS\$): BDS\$ 100k – 500k

Competitive advantage: Knowledge of e-waste industry and years of experience

Ecohesion Group



Funding raised to date: BDS\$40,000 from UNDP

Product(s) and service(s): Design and build water and wastewater treatment assets. Remote control and monitoring wastewater treatment assets as well as maintenance

Website: <https://ecohesion.bb/>

Country: Barbados

HQ location: Building 1, Town Centre, Villages at Coverley, Christ Church

Year of establishment: 2013

Status: Active

Management team: Andre Quesnel (Director Caribbean Operations & Business Development); Corey Jackman (Director Barbados Operations); Sam Neilands (Director Business Development)

Vision: Ecohesion is the premier provider of potable and reclaimed water management systems in Barbados and the Caribbean

Mission: Ecohesion is committed to protecting the environment and building a sustainable future by providing safe, secure, innovative and reliable water and wastewater services which exceed the expectations of our customers and communities.

Employees: 14

Gender distribution: 70% men: 30% women

Number of projects: Undisclosed

Number of investments: 20 local / 10 foreign

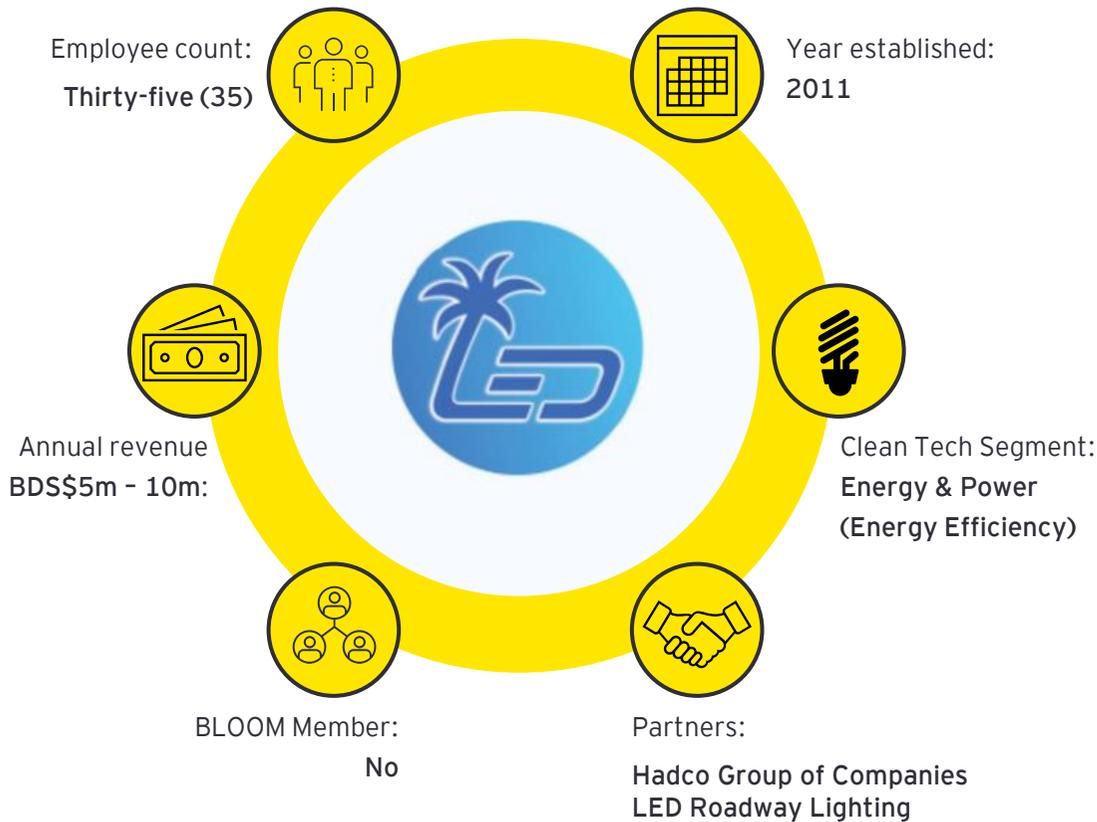
Annual turnover (BDS\$): BDS\$1m – BDS\$5m

Competitive advantage: Specialised niche with trained personnel and leadership with years of experience. Caribbean based company familiar with challenges readily able to provide local and regional after sales support.

Promotion strategy: References from prior projects, networking with stakeholders in MEP, civil and structural design, architecture, project

Key partners: Huber, Suez, New Terra

Caribbean LED Lighting



Website: www.caribbeanledlighting.com

Country: Barbados

HQ location: Unit 1, Dega Complex, Lower Estate, St. Michael

Year of establishment: 2011

Status: Active

Management team: John Hadad – Chairman, Gerard Borely – Chief Executive Officer, David Tindale – Chief Operating Officer, Shelly-ann Harding – Sales & Marketing Manager, Heidi Charles – Office Manager & Accountant, T'Amor Skeete – Business Development Manager, Raymond Griffith – Production & Warehouse Manager, Derniea Serieux-Ellis – Country Manager (St. Lucia)

Vision: Undisclosed

Mission: Enriching our customer's lives by creating a sustainable environment through the provision of innovative and diverse energy efficient solutions, delivered with superior service

Employees: 35

Gender distribution: 53% male, 47% female

Number of projects: Undisclosed

Number of investments: Undisclosed

Annual turnover (BDS\$): BDS\$5 -10m

Competitive advantage: Undisclosed

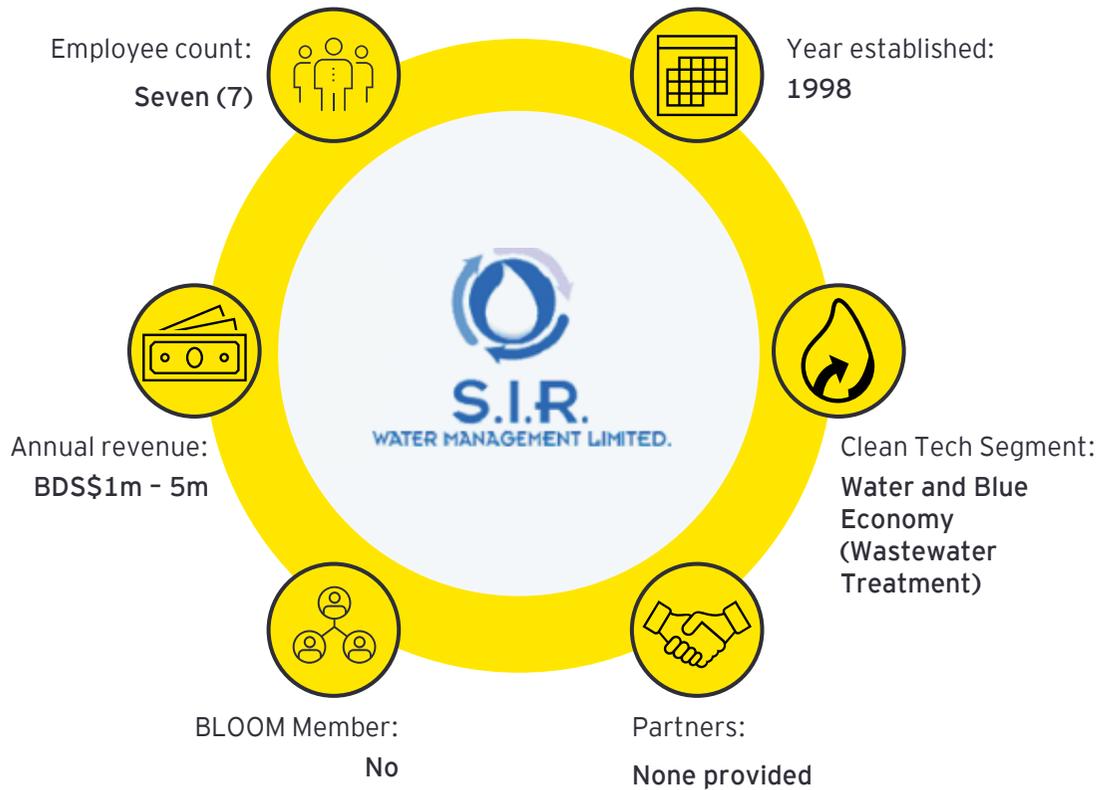
Promotion strategy: N/A

Key partners: Hadco Group of Companies & LED Roadway Lighting

Funding raised to date: Circa BDS\$4m

Product(s) and service(s): Bulb disposal, energy lighting audits, lighting level measurements, payback analysis, energy efficient lighting products

S.I.R Water Management Limited



Website: www.sirwatermgmt.com

Country: Barbados

HQ location: Bloomsbury, St. Thomas

Year of establishment: 1998

Status: Active

Management team: Ian Bayne (Managing Director). Nicolette Campbell (Office Manager), Kevin Oakley (Project Manager)

Vision: Positioning our group of companies to meet the present and expected regulatory requirements while satisfying our customer needs and future expectations of their water and wastewater resources in an environmentally safe, cost effective and timely manner.

Mission: Our mission is to provide the most efficient and reliable water and wastewater services that will always safeguard our employees and customers in an eco-friendly way.

Employees: 7

Gender distribution: 33% female, 67% male

Number of projects/investments: >20

Annual turnover (BDS\$): BDS\$1 – 5m

Competitive advantage: Service differentiation – design, engineer, build, ship, install, service, maintain and commission and competitive pricing

Promotion strategy: Social media, email blasts, direct mail, word of mouth, referrals, presentations

Key partners: n/a

Funding raised to date: BDS\$1m (approx.)

Product(s) and service(s): Hydra jetting, leak detection, grease removal systems, wastewater treatment, water disinfection systems, pumps, water conditioning & storage, water saving devices, micro bacterial aids and water storage tanks

The background of the slide is an aerial photograph of a large solar farm. The solar panels are arranged in neat, curved rows across a hillside. The sun is low on the horizon, creating a warm, golden glow over the landscape. In the distance, there are layers of mountains under a clear sky. The overall scene is peaceful and highlights renewable energy.

10

Annex 3 – Synthetic scoring

Synthetic scoring: Policy Indicators

Policy Indicators

Score	Strategy: Existence of a dedicated, coherent national Clean Tech strategy (if any, or generalist approaches)	Incentives: Existence of explicitly dedicated Clean Tech-related incentives including tax benefits	Research: Existence of Clean Tech investments in research infrastructure, grants, loans, and subsidies and the presence of Top Academic Institutions based on the QS World University Rankings 2021
1	Preliminary or exploratory strategic approaches (eg. agendas, ongoing policy discussions, studies)	Limited presence of generalist industrial incentive programs, lack of a structured approach	Limited presence of generalist industry RDIs, low average score of ecosystem's higher education institutions (1000-2000 QS World Ranking)
2	Progressing or advanced generalist innovation support strategy	Presence of progressing or advanced generalist industrial incentive programs	Adequate presence of generalist industry RDIs, medium average score of ecosystem's higher education institutions (500-1000 QS World Ranking)
3	Existence of a generalist innovation support strategy. Progressing discussions about a dedicated Clean Tech strategy in place (eg. approved agendas, establishment of think tanks)	Presence of generalist industrial incentive programs, and preliminary discussions about dedicated Clean Tech incentives	Adequate presence of generalist industry RDIs and preliminary discussions or strategies related to dedicated Clean Tech RDIs, medium average score of ecosystem's higher education institutions (500-1000 QS World Ranking)
4	Existence of a dedicated Clean Tech strategy, currently without a dedicated budget	Presence of generalist industrial incentive programs and some dedicated incentive programs for Clean Tech	Adequate presence of generalist industry RDIs and minimal or limited dedicated Clean Tech RDIs, medium-high average score of ecosystem's higher education institutions (100-1000 QS World Ranking)
5	Existence of a dedicated Clean Tech strategy, with allocated budget	Presence of multiple dedicated incentive programs for Clean Tech	Adequate presence of generalist industry RDIs and significant dedicated Clean Tech RDIs, high average score of ecosystem's higher education institutions (1-500 QS World Ranking)

Synthetic scoring: Innovation Outcome Indicators

Innovation Outcome Indicators

Score	Clean Tech (Innovation Ecosystem): Absolute number of Clean Tech scaleups in each ecosystem	Number of Clean Tech scalers and superscalers in each ecosystem (Score: 0-1 where 5 is the current benchmark)	Capital Raised by Clean Tech scaleups, scalers, and superscalers in each ecosystem (Score: 1-5 where 5 is the current benchmark)	Clean Tech Scaleup Density Ratio (i.e. total number of scaleups, scalers, and superscalers in each ecosystem compared with its population) (Score: 1-5 where 5 is the current benchmark)	Clean Tech Investing Ratio (i.e. total capital raised by scaleups, scalers, and superscalers in each ecosystem compared to the national GDP, PPP) (Score: 1-5 where 5 is the current benchmark)	Cleantech Scaleup Jobs (i.e., estimated amount of employees of Cleantech scaleups, compared to the total country workforce) (Score: 1-5 where 5 is the current benchmark)
1	>0-10% of the current benchmark	>0-10% of the current benchmark	>0-10% of the current benchmark	>0-10% of the current benchmark	>0-10% of the current benchmark	>0-10% of the current benchmark
2	10-30% of the current benchmark	10-30% of the current benchmark	10-30% of the current benchmark	10-30% of the current benchmark	10-30% of the current benchmark	10-30% of the current benchmark
3	30-50% of the current benchmark	30-50% of the current benchmark	30-50% of the current benchmark	30-50% of the current benchmark	30-50% of the current benchmark	30-50% of the current benchmark
4	50-90% of the current benchmark	50-90% of the current benchmark	50-90% of the current benchmark	50-90% of the current benchmark	50-90% of the current benchmark	50-90% of the current benchmark
5	Current benchmark	Current benchmark	Current benchmark	Current benchmark	Current benchmark	Current benchmark

