

Barbados Clean Tech Industry Report 2022 - summary

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Barbados



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Introduction and context

Background and broad aim

- ▶ Supporting 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 strengthen the local supply side of green quality products and services and the creation of an enabling environment for clean tech entrepreneurship and innovation

Industry report acts as a knowledge product and in doing so it:

- ▶ Provides National context;
- ▶ Assesses the development of Barbados' clean tech ecosystem;
- ▶ Characterizes the profile of the clean tech industry;
- ▶ Provides an overview of the local, regional and global clusters;
- ▶ Summarizes the key results of the stakeholder consultations;
- ▶ Creates 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”

Limitations

- ▶ Challenges collecting relevant up-to-date data to provide conclusive statically relevant reporting. Hence the findings are more qualitative in nature.
- ▶ Participation rate with some stakeholder groups ranged between 31% - 45%.
- ▶ Profile data provided by 33% and of that some opted not to respond to questions requesting confidential data.
 - ▶ Some industry characteristic are inconclusive (eg. annual revenue)

Introduction and context

Clean Tech

Represents the technologies and business model innovations that enable the transformation to a more **resource efficient and low carbon economy.**

Industrial Technologies



Advanced Materials

- ▶ Biofuels
- ▶ Biochemicals
- ▶ Bio-based Polymers
- ▶ Materials and Chemicals Discovery
- ▶ Composites



Mobility and Transportation

- ▶ 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



Water Management

- ▶ Recycling
- ▶ e-Waste
- ▶ Wastewater



Circular Economy

- ▶ Circular Design
- ▶ Reuse
- ▶ Secondary Material Markets,
- ▶ Biomass Supply
- ▶ Waste-to-energy



Agriculture and Food

- ▶ 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
- ▶ Fertilizers
- ▶ Agritech Robotics
- ▶ Agricultural Genomics,
- ▶ Aquaculture



Logistics and supply chain

- ▶ Delivery Tech
- ▶ Safe Transport and
- ▶ Circular Supply Chains



Energy and Power

- ▶ 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



Construction and Proptech

- ▶ 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

Environmental Technologies



GHG Capture and Storage

- ▶ GHG Removal
- ▶ GHG Storage
- ▶ Carbon Footprint Monitoring
- ▶ Carbon Capture
- ▶ CCUS
- ▶ Carbon Sequestration



Water and Blue Economy

- ▶ Desalination
- ▶ Water Purification
- ▶ Water Distribution
- ▶ Wastewater Treatment
- ▶ Leak Prevention
- ▶ Water Management Systems
- ▶ Ocean technologies

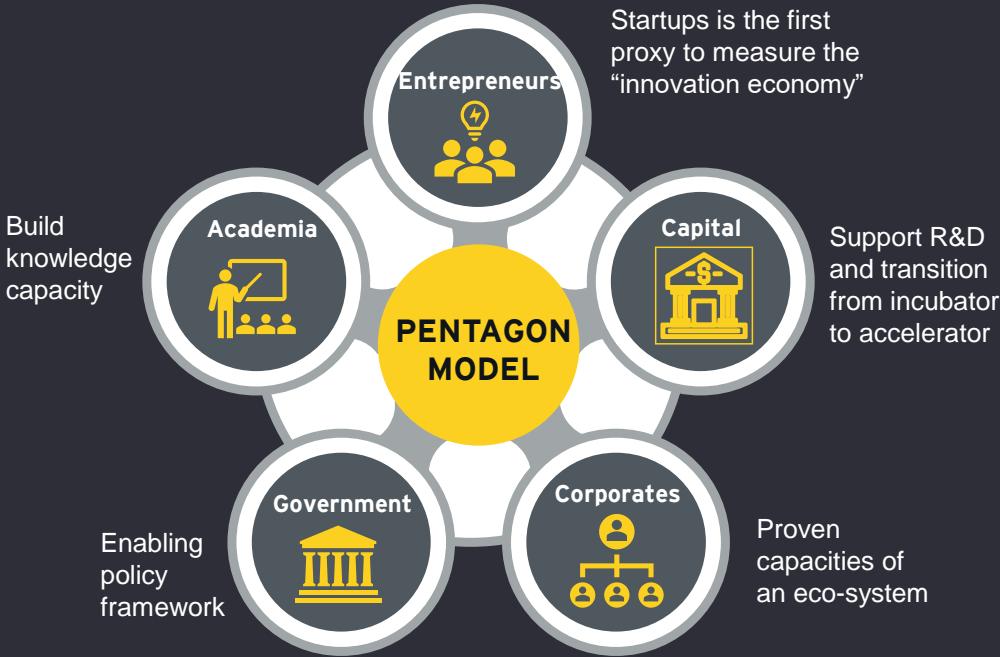


Environmental Quality and Safety

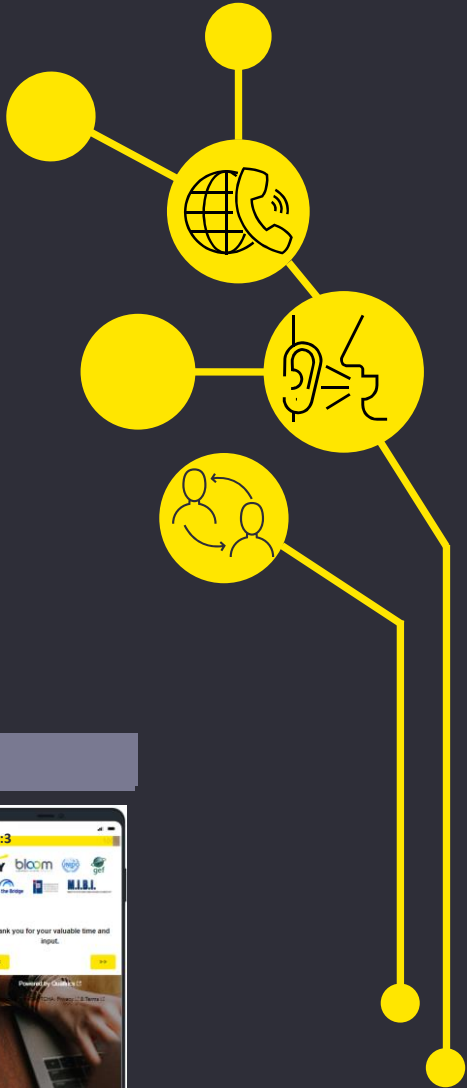
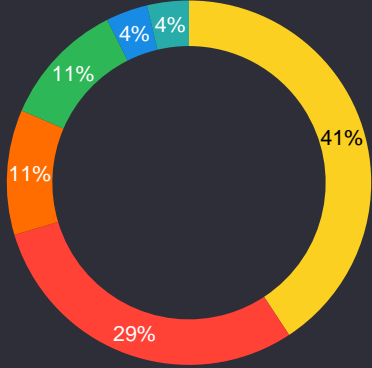
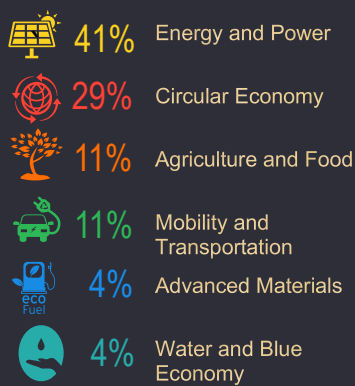
- ▶ Environmental Management Systems
- ▶ Environmental and Natural Resource Management
- ▶ Environment
- ▶ Health and Safety (EHS)
- ▶ Reforestation
- ▶ Afforestation
- ▶ Land Resource Management
- ▶ Deforestation Prevention

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

Conceptual approach



Interview and workshop participants belong to



Workshops

3	2	2
Workshops conducted	Hours in duration for each workshop	Break-outs for focus group discussion



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.



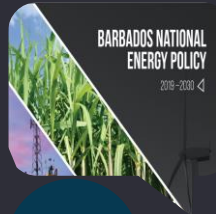
Surveys

	Questions 12	
	Completion time 10-min	
	Survey views 58	
	Surveys completed 18	

National policy documents

Barbados National Energy Policy 2019-2030

"To provide clear direction to the government in the short, medium and long term, for the development of renewable and non-renewable aspects of energy"



National Sustainable Development Policy

An approach to sustainable development "...which aims to deal with individual issues from an integrated and holistic perspective"

National Strategic Plan of Barbados 2006-2025

Provides the "...blueprint for the realization of Barbados' vision of becoming a fully developed society that is prosperous, socially just and globally competitive by the end of the first quarter of this century."



Intended Nationally Determined Contributions

To implement policies "...to seek to be, by 2030, the first 100% green and fossil-fuel free island-states in the world"



ENERGY

72%

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%

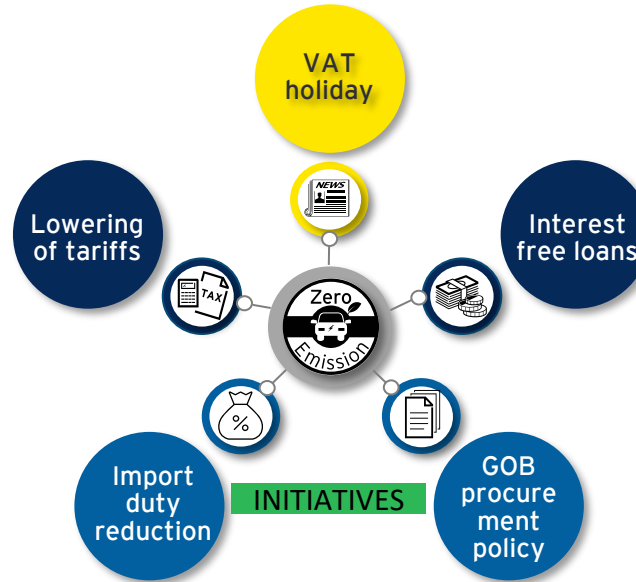
16% of the GHG emissions in Barbados are generated from waste.

National Context Diagnosis

ENERGY AND POWER



MOBILITY AND TRANSPORT



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)

Key goals and/or objectives

ENERGY AND POWER

- ▶ 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

MOBILITY AND TRANSPORT

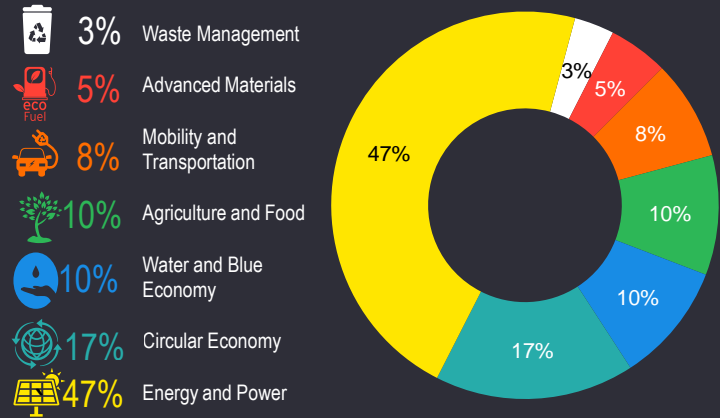
- ▶ To eliminate the use of diesel and gasoline transport by 2030 (Barbados National Energy Policy)
- ▶ GOB procurement policy to prioritize the purchase of electric or hybrid vehicles. The aim is to operate a full fleet of electricpublic transport buses by 2030.
- ▶ A reduction of 29% in non-electric energy consumption including transport, compared to Business as Usual ("BAU") scenario in 2029.

WASTE MANAGEMENT

- ▶ Achieve an energy mix-target by 2030 from which 15MW installed capacity will be from Biomass and Waste-To-Energy
- ▶ Achieve 20% decrease in waste emissions
- ▶ Phase out natural gas and LPG by 2030; natural gas to be replaced by bio-methane produced from renewable biogas sources

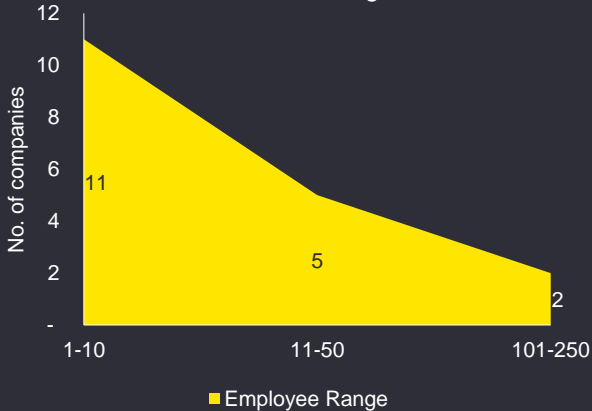
Barbados Clean tech industry profile

Clean Tech Industry Area Concentration (Barbados)



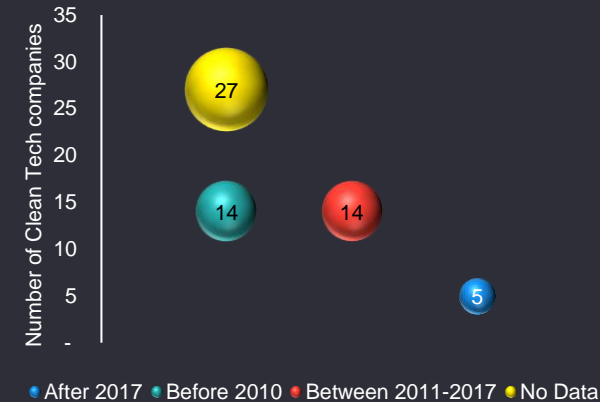
Energy & Power is the largest concentration of companies in the Clean Tech sector. Together with Circular Economy, Water & Blue Economy and Agriculture & Food, they represent **83%** of companies in the industry.

Number of Clean Tech Jobs Per Employee Range

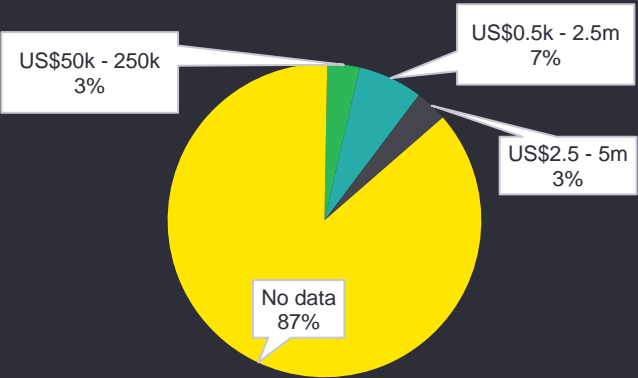


Approximately 444 individuals are employed at the 18 companies that provided details on their work-force, the gender ratio is approximately **69%** males to **31%** females.

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 memberships, partnerships and services

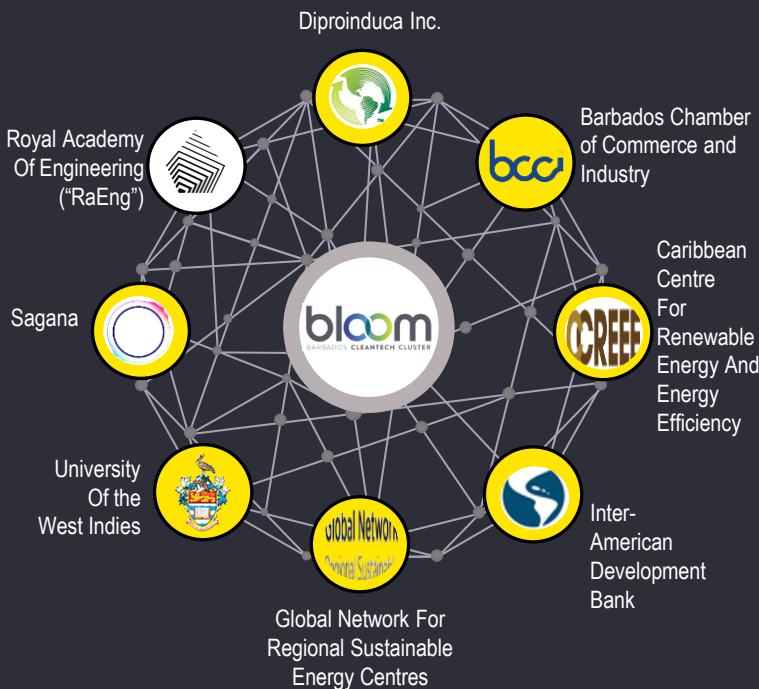
16
Startups
& SMEs
Onboarded

BLOOM offers the following services



BLOOM has a network of partnerships

16
Cooperating
Partners



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

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

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.

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.

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.

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

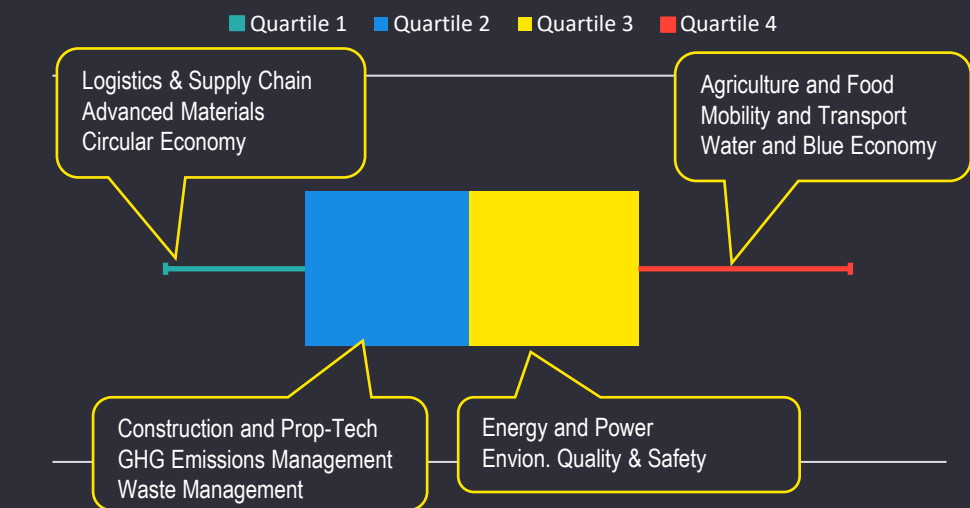
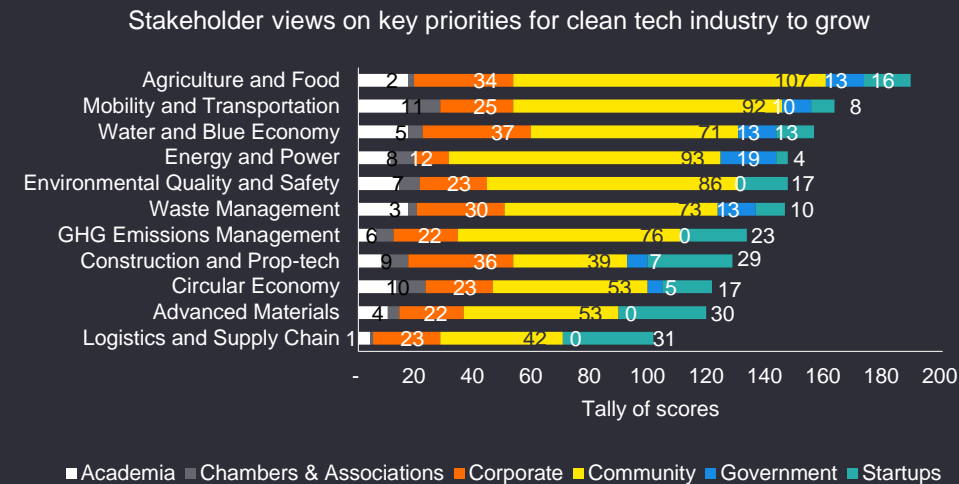
RaEng is a charity that delivers public benefit from engineering excellence and technology innovation. Its overarching goal is to harness the power of engineering to build a sustainable society and an inclusive economy that works for everyone.

LIF is one of its programs in which it helps engineers worldwide to commercialize their innovations.

BLOOM's role

BLOOM is responsible for communications; marketing and selection and onboarding of the new LIF applicants.

Stakeholder' views – key priorities for the clean tech industry to develop



- ▶ **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**.



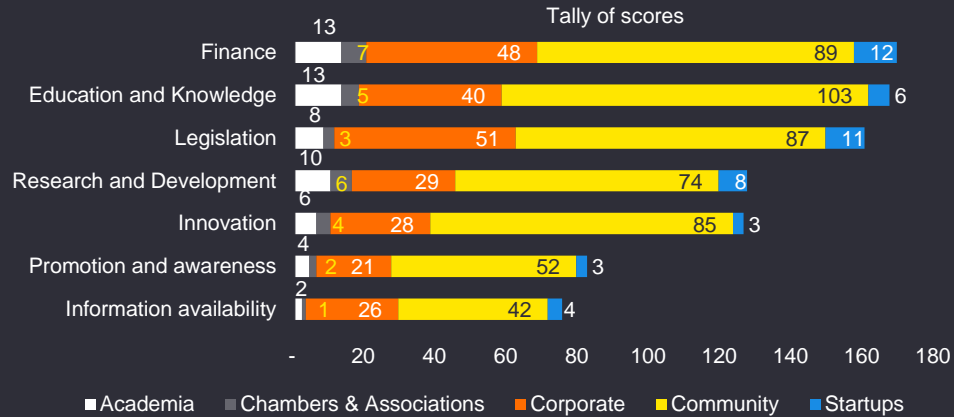
- ▶ Contributes towards the **reduction of emissions and fuel import bill** (particularly at this time given the high and rising fuel prices)
- ▶ The existence and prevalence of alternative energy sources would allow for a **cost effective** and **cleaner** system of private and public transport



- ▶ Barbados is a **water scarce** island
- ▶ 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.

Stakeholder' views – key challenges

Key Challenges identified by all stakeholders



Finance

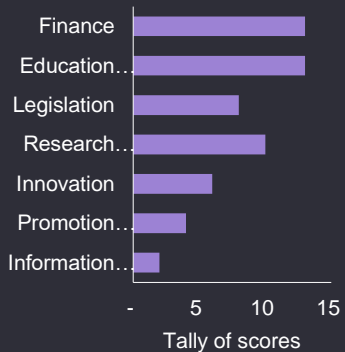
- ▶ Limited financing options available;
- ▶ Lack of seed financing;
- ▶ Conservative lending practices by commercial lenders;
- ▶ Paucity of grants and concessional loans available.



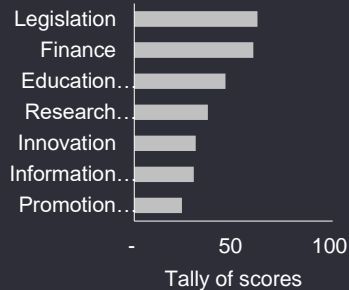
Education and Knowledge

- ▶ Lack of public awareness about clean tech;
- ▶ How to move an idea through to commercialization;
- ▶ Lack of revolutionary training that is bespoke,
- ▶ Low priority given to science and technology;

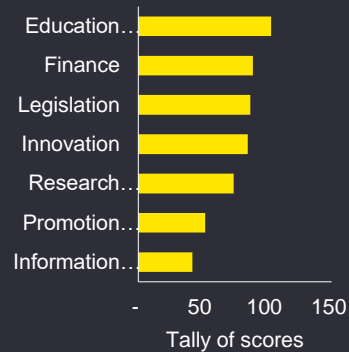
Key Challenges identified by Academia



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



Key Challenges identified by the Community



Legislation

- ▶ Enhanced clarity about approvals for new RE projects;
- ▶ Centralizing the approval process;
- ▶ Certainty of the impact of unbundling of BL&P's licence and the PPA that will govern large scale projects
- ▶ Communication between the Min. of Energy and BL&P and enhanced logistics to reduce time between RE application approvals grid connections

Options Non traditional

There are a range on financing options either currently available or imminent and which are outside the traditional commercial banks.

Green Climate Finance Bank

- ▶ Investment institution for “good assets” to package
- ▶ Size and standard
- ▶ Catalyst for mobilizing capital
- ▶ Climate mitigation and adaptation focus

Caribbean Development Bank

- ▶ Environmental sustainability
- ▶ Cohort of businesses
- ▶ Projects appraised on the basis of technical feasibility, environmental and social impact, gender analysis, climate vulnerability, etc.

Inter-American Development Bank

- ▶ Private sector arm - IDB Invest
- ▶ IDB is 1 of 3 donors to the Compete Caribbean Program
 - ▶ Direct Firm Support
 - ▶ Support to Cluster initiatives

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

1 “Team of One”

Entrepreneurs operate as “teams of one” rather than as and entrepreneurial team of co-founders

2 Risk Aversion

Investors in Barbados tend to be more risk averse than their counterparts in larger international markets

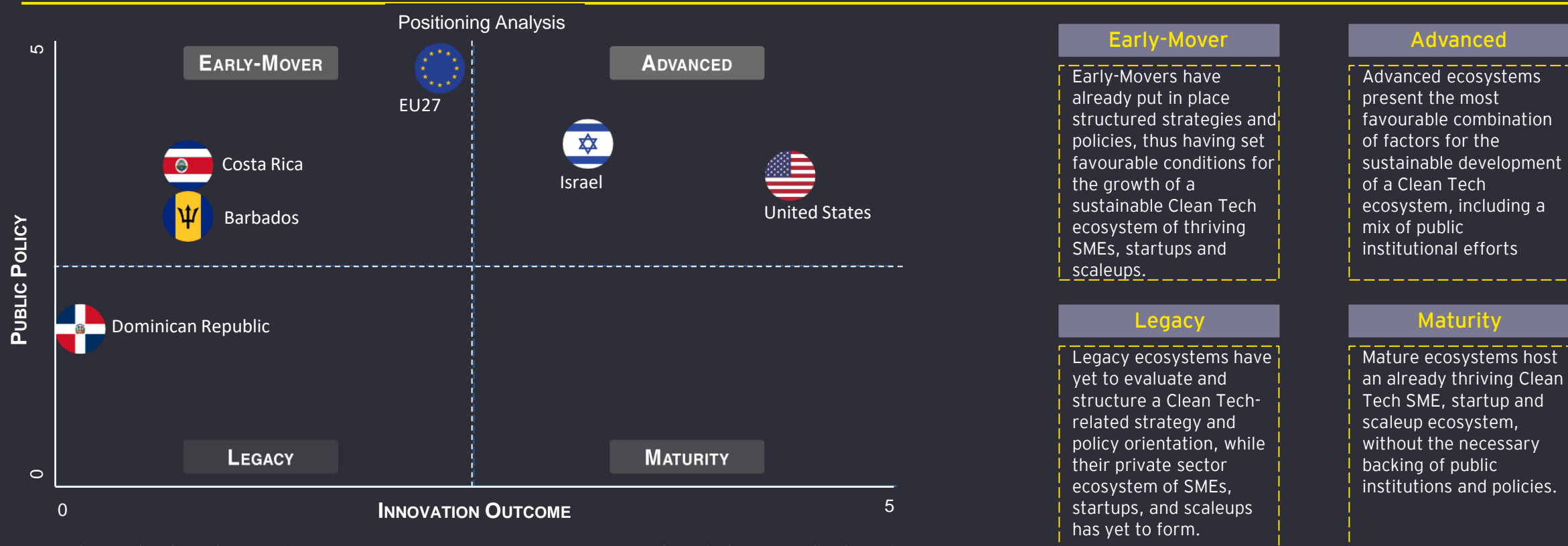
3 Small funnel

The quantum of business plans proposed was relatively small

4 Target market

Entrepreneurs in Barbados targeted small markets (i.e. Barbados) with a view of later expansion to even smaller (regional) markets rather than targeting major world markets (US, UK, Canada, etc.). Therefore, revenue growth is stymied.

Barbados' positioning in the tracking framework



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

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.

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