

OFFICIAL DRAFT

# Caribbean Climate Innovation Center Business Plan

Building competitive clean technology  
industries in the Caribbean



THE WORLD BANK



Canada

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## **About infoDev**

infoDev ([www.infodev.org](http://www.infodev.org)) is a global partnership program within the World Bank Group which works at the intersection of innovation, technology, and entrepreneurship to create opportunities for inclusive growth, job creation and poverty reduction. infoDev is a thought leader in technology-enabled small business incubation, assisting governments and technology-focused entrepreneurs and new ventures to grow jobs, improve capacity and skills, increase access to finance and markets, ensure the appropriate enabling policy and regulatory environment for business to flourish, and test out innovative solutions in developing country markets. *infoDev* works in partnership with other development programs, with World Bank/IFC colleagues, and with stakeholders from the public, private and civil society sectors in the developing world.

*infoDev's* Climate Technology Program (CTP) empowers developing countries to proactively and profitably adapt, develop and deploy climate smart (clean tech) technologies and business models. The CTP is creating a global network of Climate Innovation Centers (CICs) that provide a country-driven approach to climate change and allow countries to achieve their green growth objectives. It targets the early stages of innovation, including the key role of entrepreneurs and growth-oriented startups. CICs are currently being developed in eight countries: Kenya, Ethiopia, India, South Africa, Vietnam, Morocco, the Caribbean and Ghana.

# Canada

## **About Canada's development activities in the Caribbean**

In 2009, as part of Canada's new aid effectiveness agenda, the Caribbean was selected as a region of focus. Canada supports the development agenda established by CARICOM to achieve regional integration. While CARICOM promotes greater regional cooperation and harmonization, there is not yet a comprehensive regional development plan for the member countries. Canada's long-term goal in the Caribbean region is to help build a more prosperous and integrated Caribbean community, one that is able to generate sustainable economic growth, and eventually provide opportunity and security to its citizens.

Canada's support will be directed at creating an enabling and predictable environment for economic growth through the increased capacity and accountability of public institutions and by fostering a more competitive private sector. Canada will also continue to advance the rule of law and strengthen legal institutions to counter rising crime and to maintain law, order, and personal security. The Canadian Government's objectives for the Caribbean region include assistance for improving the capacities of the governments to manage and respond to natural disasters and to strengthen regional disaster coordination mechanisms.

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# 1.0 Executive Summary

**Name of Program** Caribbean Climate Innovation Center (CCIC)

**Program Objective** The objective of the Caribbean Climate Innovation Center (CCIC) is to establish regional institutional capacity that will support Caribbean entrepreneurs and new ventures involved in developing locally-appropriate solutions to climate change mitigation and adaptation. Through its programs, activities and financing, the Caribbean CIC and its network of partners and stakeholders will provide a regionally-driven approach to solving climate, energy and resource challenges and support economic development through job creation. The USD 10M program will provide targeted support, mentoring, training and funding facilitation to up to 80 companies in the region over 6 years.

**Program Context and Rationale** The Caribbean region faces disproportionate negative impacts from changing climates contrasted with its small global greenhouse gas (GHG) footprint. The region's Small Island Developing States, share a high degree of vulnerability to sea level rises, degradation to natural ecosystems, extreme weather events, and water supply constraints as a result of climate change. Moreover, the Caribbean is particularly susceptible given the reliance on expensive imported fossil fuels and other resources that contribute further to the region's environmental and economic difficulties.

As a result, key industries such as tourism, fishing, agriculture, energy and water supply will need to adopt new innovative approaches and solutions to mitigate and adapt to climate change, ensure energy and resource security and contribute to the green growth and economic development of the region. Such innovation in climate or clean technology areas should be driven by local entrepreneurs, innovators and new ventures that transfer, develop and adapt locally-relevant solutions.

The commercialization of technology locally ensures solutions are designed for the environments in which they operate, capacity is built locally for maintenance and servicing, local content builds domestic supply chains and economic value is captured locally through the creation of jobs and an enhanced entrepreneurial ecosystem.

Gaps however remain in the capacity for local innovation to excel in the Caribbean region. Entrepreneurs are faced with multiple small individual and fragmented markets that increase the transaction costs of doing business. Moreover the support system and associated institutions for innovation in the region remain limited. Trust, access to finance, market awareness, technical capacity and supportive government policies are all cited as barriers to climate innovation in the region.

However opportunities exist for the region to be proactive in its green growth objectives and curate an entrepreneurial class that contributes to the emergence of new domestic climate and clean energy industries. The Caribbean benefits from proximity to the large markets of North, Central and South America. In addition, there is a vibrant entrepreneurial culture and significant diaspora community, an asset for potential investment, mentoring and partnership networks. The region has some of the highest electricity prices in the world providing e significant opportunities for cost-competitive renewable energy and energy efficiency technologies, particularly significant for the large tourism market. There are also many highly educated individuals throughout the region working in institutions that can be a ready resource to support an innovation ecosystem for climate and clean energy technologies.

The Caribbean's next phase of growth is critically dependent upon its ability to develop, adapt and adopt innovative climate-related technologies and systems. Such locally-applicable solutions will enable the region to combat climate change and provide energy, resource and food security resulting in shared prosperity for the region.

### **Design Process**

The Center's business model and associated services are dependent on, and tailored to, the local market. To identify market needs, opportunities and challenges from a local perspective, *infoDev* developed the CCIC business plan through a detailed analysis and an extensive in-country, multi-stakeholder engagement process. Over 150 stakeholders from the region were convened for a series of workshops, focus groups, surveys, and interviews to explore the key barriers to climate technology innovation and entrepreneurship in the Caribbean and the design of appropriate solutions to these barriers in the form of the CCIC's programs, services and support.

### **CCIC Model**

Based on the design process the CCIC model was developed to offer targeted programs and services in three main areas; Technology Commercialization, Market Development and Venture Acceleration (including a Financial Accelerator for investment facilitation). As such, the CCIC will:

- ✦ Build a pipeline of high-impact new ventures through the provision of Proof of Concept funding
- ✦ Support the iterative testing and prototyping through access to facilities and information.
- ✦ Accelerate access to early growth-stage capital through the provision of targeted pre-investment advisory services and investment facilitation and syndication, including online platforms.
- ✦ Support entrepreneurial capacity through technology-enabled business development services, networking, mentoring and training.
- ✦ Identify and developing local, regional and international market



opportunities through sectoral and market information.

- ✦ Influence and advocating for policy coordination
- ✦ Promote internationalization opportunities through raising awareness and facilitating trade and export opportunities.

#### Countries

The Caribbean Community (CARICOM) including: Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago (excluding Haiti)

#### Sector(s)/focus

- ✦ **Resource use efficiency:** Waste-to-energy, materials recovery, reuse and recycling
- ✦ **Water management:** Potable water, rainwater harvesting, efficient irrigation, waste water treatment and recycling, water use efficiency, desalination,
- ✦ **Sustainable agribusiness:** Water/energy efficient irrigation systems; waste management; high-value agribusiness; sustainable land use practices; waste-to-energy; and wind and solar energy for farms.
- ✦ **Solar energy:** Residential and commercial self-generation, residential and commercial water heating, solar-powered air-conditioning
- ✦ **Energy efficiency:** Lighting, household appliances, air-conditioning, commercial cooling and ventilation systems, consumer behavior, building energy management systems, building design and materials.

#### Implementation approach

To ensure sustainability and the development of local capacity, *infoDev* has partnered with local organizations including Jamaica's Scientific Research Council (SRC) and Trinidad and Tobago's Caribbean Industrial Research Institute to implement the activities of the CCIC and serve as the host for the Center and its associated network. *infoDev* will provide a series of grants to the partners to implement, establish and operate the CCIC over 6 years. The project implementation will consist of two phases:

- ✦ Launch Phase – Establish regional Climate Innovation Center and associated network: Build regional linkages across Caribbean markets by identifying talent, facility providers and business support organizations in CARICOM countries. Begin identifying a pipeline of Caribbean clean technology companies for participation in the CCIC in the next phase. Officially launch CCIC through series of media events and outreach.
- ✦ Scale up Phase – Scale CCIC Core Activities: Once regional linkages and initial programs have been launched, begin implementing and scaling core services and programs which are outlined in the business plan.

**Complementing regional initiatives**

The final CCIC business model was developed after both comprehensive research and stakeholder engagement processes were completed. As a result of those processes, the final model has been designed to complement and build upon a number of other on-going initiatives within the Caribbean. Of particular relevance are programs that assist aspiring entrepreneurs to further develop their concepts. Examples include the regional 'Compete Caribbean' IDEAS competition and the 'i2i' competition in Trinidad and Tobago. In addition, the CCIC provides a vehicle for both aspiring entrepreneurs to grow and be eligible for much larger regional and extra-regional initiatives such as the USAID PFAN project funding network and a range of larger scale CDB, IDB, IFC and World Bank funded initiatives.

**A component of EPIC**

*infoDev's* Entrepreneurship Program for Innovation in the Caribbean (EPIC) is a seven year \$20M program funded by the Government of Canada to build an enabling ecosystem to foster high-growth and sustainable enterprises throughout the Caribbean. EPIC has three core activity pillars: mobile innovation, climate technology, and women-led entrepreneurship. These pillars are complemented by an access to finance facility for Caribbean entrepreneurs, and a skills upgrading and capacity development program for all ecosystem stakeholders. The component of EPIC targeted at supporting climate technology innovation will fund the scale-up phase of the CCIC.

**Current donors**

Canadian Government, World Bank's Development Grant Facility

**Investment required**

USD 10,000,000 (USD 3.5M secured)

**Impacts and Results**

The CCIC and *infoDev* will actively track results of the Center's operations under a Performance Measurement Framework. Through modeling the CCIC's deal flow using benchmarks from company data in the region, it is projected that after 6 years, revenues of up to 80 CCIC-assisted companies will generate the equivalent of approximately USD 11 million in economic impact. This will assist over 35,000 people increase their resiliency to climate change through providing increased access to cleaner sources of energy and better and more efficient sources of water and agricultural resources. In the long term (over 10 years), assuming continued financial support, it is projected that CCIC-supported ventures will generate close to 4,000 cumulative jobs and mitigate over 90,000 tons of CO<sub>2</sub>e.

**Period**

2014-2019

## 2.0 Climate Innovation Centers

Over an six-month period, through an extensive stakeholder engagement process, *infoDev* assessed the feasibility of establishing a locally owned and operated Climate Innovation Center (CIC) in the Caribbean. The engagement process concluded in May 2013 with approximately 150 stakeholders from varied backgrounds and experiences providing input into the conceptualization, design and development of a CIC in the Caribbean.

### 2.1 *infoDev* Goals

The following are the goals of *infoDev* in designing, implementing and operating a CIC in the Caribbean:

- ✎ Assess the feasibility of establishing a CIC in the Caribbean and develop a full business plan that addresses market failures preventing domestic innovation in climate technologies.
- ✎ Based on the business plan, mobilize investment to implement the CIC to execute the Center's programs, services and financing via suitable in-country partner institutions/consortia.
- ✎ Network the Caribbean CIC (CCIC) regionally and internationally to promote technology collaboration, business linkages and to support local and international trade opportunities for the Caribbean's climate technology sector.

### 2.2 The Climate Innovation Challenge

New technologies are essential to reduce the long-term cost of climate change and achieve green growth. Developing countries want to build their own capacity to innovate to (i) ensure energy security and increased energy access, (ii) address climate change mitigation and adaptation and (iii) create competitive domestic industries in clean tech for job creation and other benefits.

However, barriers to innovation in climate sectors are especially high and even more pronounced in developing countries. These barriers often include gaps in appropriate financing, lagging technical and business capabilities, entrepreneurial and human capacity constraints and uncertain regulatory environments. Moreover, many developing countries lack the public and private sector bodies that support innovation, and as a result support for locally appropriate climate innovation is often weak or absent.

### 2.3 Gaps in Existing Initiatives and Institutions

*infoDev* commissioned a report by Bloomberg New Energy Finance that surveyed and analyzed hundreds of government, private and public-private initiatives that support climate and clean energy innovation. These included centers of excellence, seed funds, technology accelerators, business incubators, advisory centers and other programs. Of the 500 that were analyzed, 70 were mostly focused on climate technologies and only 25 dedicated all of their operations to

climate – a small number relative to the gravity of the challenges and immense market opportunities.

The report found gaps in the existing institutions, which prevented them from addressing the broad range of barriers, associated with climate innovation. Some focused only on financing or business advisory while others concentrated efforts solely on technical development – few advocated policy reform or standards. Only a few institutions addressed most barriers including China's Baoding New & High Tech Industrial Development Zone, China, The UK's Carbon Trust and Brazil's CIETEC at the University of Sao Paulo. Geographic coverage was also sporadic with a majority of centers located either in developed or highly industrialized developing countries.



Locations of institutions supporting climate innovation

## 2.4 Incubators, Accelerators and Innovation Centers

*infoDev* supports innovation in developing countries through facilitating a global network of almost 250 business incubators. These incubators act as hubs to aggregate financing and shared services to accelerate innovative companies, helping them overcome market barriers that are particularly high in developing countries. Experience has shown that these centers dramatically increase the survival rate of new enterprises with over 75% being operational after 3 years of exiting the incubator.

As a policy tool, incubators are a highly effective form of public spending, resulting in lower long-term employment costs when compared with infrastructure projects.<sup>1</sup> Incubation experience also has shown that for every USD 1 of government subsidy, a Return on Investment (ROI) of USD 30 tax revenue can be generated in the long-term through corporate and income taxes from the spun out companies.<sup>2</sup> With *infoDev*'s business incubator network expanding to almost 250 centers in more than 75 developing countries, supporting over 16,000 enterprises and creating 200,000 jobs, such programs form an important component of developing country economic growth and employment strategies.

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<sup>1</sup> Grant Thornton Report on Incubation: Source: Economic Development Administration (EDA)

<sup>2</sup> NBIA (National Business Incubation Association) data

## Brazil's CIETEC

CIETEC, or Centro de Inovacao, Empreendedorismo e Tecnologia, is the largest incubator in Latin America and one of the most successful in Brazil. Although it covers a range of sectors, CIETEC's focus has shifted recently, and now hosts some 20 climate technology companies, more than any other incubator in Latin America. With many renewable energy success stories in its portfolio - including wind, hydro, solar hot water and fuel cells - CIETEC offers valuable insights for the Climate Innovation Center in the Caribbean.

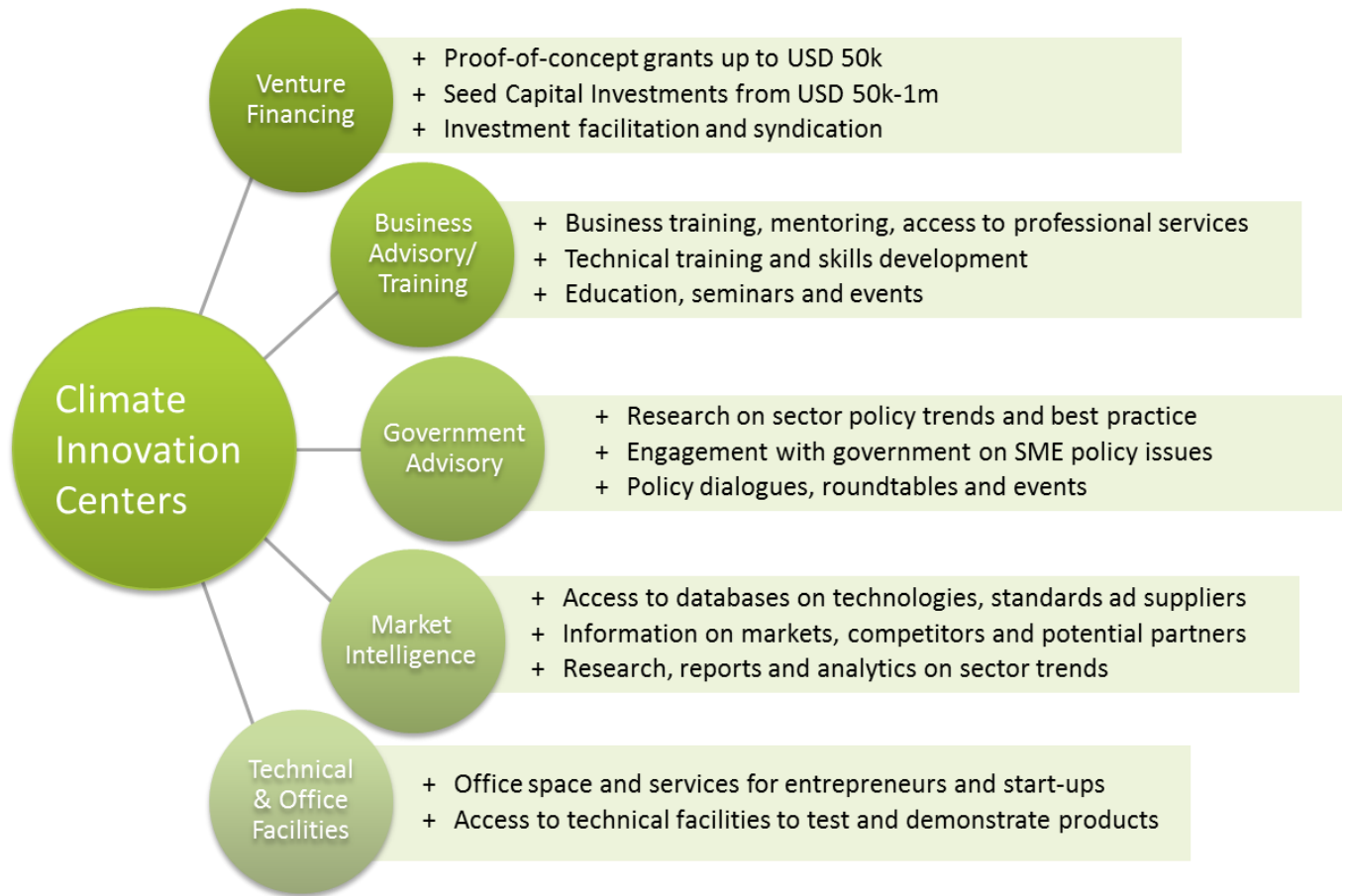
Founded in 1998 with funding from government microfinance program SEBRAE, CIETEC is a 'full-service' incubator that provides assistance to companies at all stages of innovation - from R&D through demonstration and deployment to diffusion and transfer. The center provides companies with office space, laboratory use, and consultancy services at heavily discounted prices. It also helps to arrange financing from public and private sources, and is thinking about creating its own investment fund.

The CIETEC model is proving successful on a wide range of measures. In its first decade, the number of companies under incubation has grown from 15 to 140. CIETEC also helps its companies secure private sector equity investment – rising to USD5M in the past few years. CIETEC's success rate is also impressive: while 75% of Brazilian start-ups fail within three years, for CIETEC companies, that rate is just 30%. The center's work also represents value for money: according to its 2008 annual report, for every USD 1 the government furnished CIETEC companies, it received USD 3.40 in taxes. A total of 90 innovative companies have already graduated from CIETEC, of which some 30 continue to be associated with the center, achieving revenues of USD12M per year and creating thousands of jobs.

## 2.5 Climate Innovation Centers

As multilateral, national and local solutions are being structured to address the issue of climate technologies, *infoDev's* Climate Technology Program is rolling out Climate Innovation Centers (CICs) in 8 regions including Kenya, Ethiopia, India, South Africa, Ghana, Morocco, Vietnam and the Caribbean. While the Kenya CIC has been operational since mid-2012, other CICs are expected to launch or commence implementation in 2013 and 2014. The CICs support innovation by offering a full suite of financing and capacity building services to technologists, entrepreneurs, and new ventures that address challenges to starting and scaling their clean tech businesses. In addition to incubating promising start-ups, CICs provide dedicated proof-of-concept and seed capital funding to entrepreneurs to bridge local funding gaps.

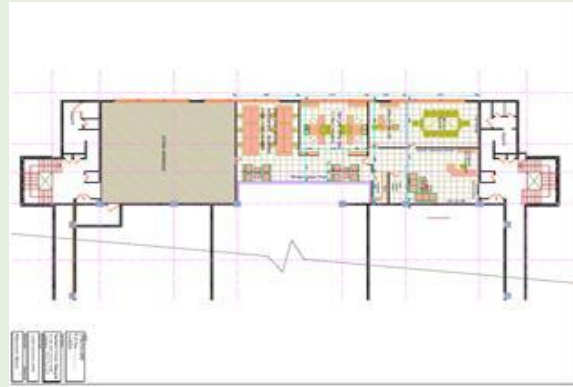
In parallel to investments, CICs also provide business advisory and training services, market intelligence products, access to product testing facilities, and government engagement on policy. In this way, a CIC acts as a national focal point, coordinating efforts in promoting the growth of locally relevant climate sectors. CICs also provide a platform to create international business-to-business linkages, enhance knowledge sharing and facilitate trade.



General services provided by Climate Innovation Centers

## The Kenya Climate Innovation Center (CIC)

The Kenya Climate Innovation Center (CIC) was launched in September 2012 with support from the Governments of Denmark and the United Kingdom. The CIC is hosted of a consortium comprising four main partners, Pricewaterhousecoopers (PWC), Strathmore University, Global Village Energy Partnership (GVEP) International and Kenya Industrial Research and Development Institute (KIRDI). The Center provides an integrated set of services, activities and programs that leverage and expand existing innovation capacity and support the accelerated scale and deployment of climate technology solutions.



In the first five years, the CIC is expected to create more than 70 sustainable climate technology businesses, generating some 4,600 direct and indirect jobs. Over the next decade, it is estimated that over 24,000 jobs will be created in Kenya and 1.74m tCO<sub>2</sub> will be mitigated from CIC supported technologies.

The Kenya CIC has already secured 32 clean technology entrepreneurs from over 180 applications in the following sectors; renewable energy ventures, agribusiness and water and sanitation ventures. The majority are renewable energy ventures including clean and energy efficient cookstoves, biogas, biofuels, briquettes and solar technologies. Others include water purification systems and mushroom farming to produce fertilizer.

For more information please visit <http://kenyacic.org>



### 2.5.1 Complementarity with Ongoing and Future Programs

Each CIC is being designed and developed, leveraging the experiences and expertise of hundreds of local stakeholders representing R&D, academia, entrepreneurs, NGOs, private sectors and host government ministries such as water and energy, environment, commerce, finance and science and technology. This is to ensure that existing local initiatives are complemented and coordinated without duplication. It is also to secure local participation and ownership that will increase the success of the CIC's implementation and operations. *infoDev* is also coordinating efforts at the global level including existing and future programs designed to support climate technology development and deployment. This includes ongoing efforts at the UNFCCC with the Climate Technology Center and Network (CTC&N), international organizations such as the Global Green Growth Institute (GGGI) multilaterals such as the Inter-American Development Bank (IDB), The World Bank and IFC and bi-lateral organizations including development partners and donors.

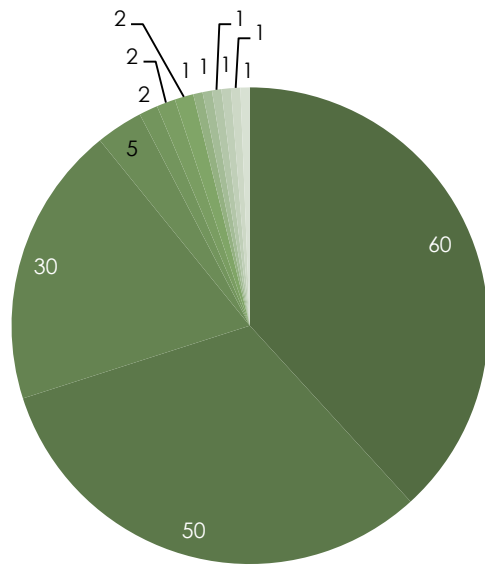
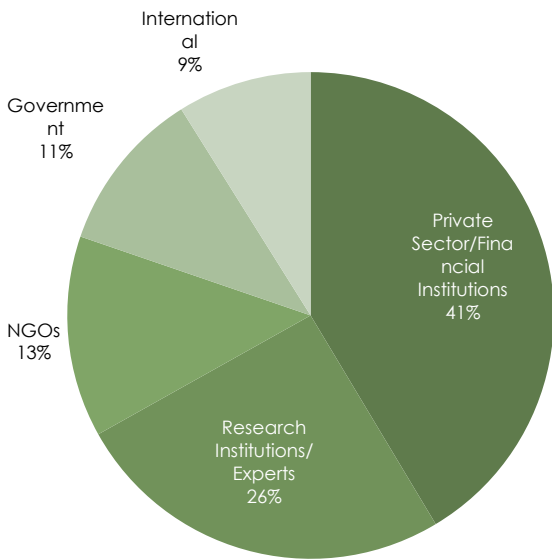
### 2.5.2 Stakeholder Engagement Process

The Center's business model and associated services are dependent on, and tailored to, the local market. To identify market needs, opportunities and challenges from a local perspective, *infoDev* developed a business plan via detailed analysis and an extensive in-country, multi-stakeholder engagement process. Over 150 stakeholders from the Caribbean region were convened for a series of workshops, focus groups, surveys, and interviews to explore the key barriers to climate technology commercialization and assist in the development and design of appropriate solutions to overcome barriers. This gaps-needs analysis formed the basis for the CCIC business model.



The flow chart shows the process of the business plan development





- Trinidad & Tobago
- Jamaica
- Barbados
- Grenada
- Antigua & Barbuda
- St Vincent & The Grenadines
- USA
- Dominica
- Netherlands
- Panama
- Puerto Rico
- St Lucia
- UK/Barbados

Breakdown of stakeholder groups engaged during design process by profession (%) and by country (#)



Photos from stakeholder workshops and focus groups

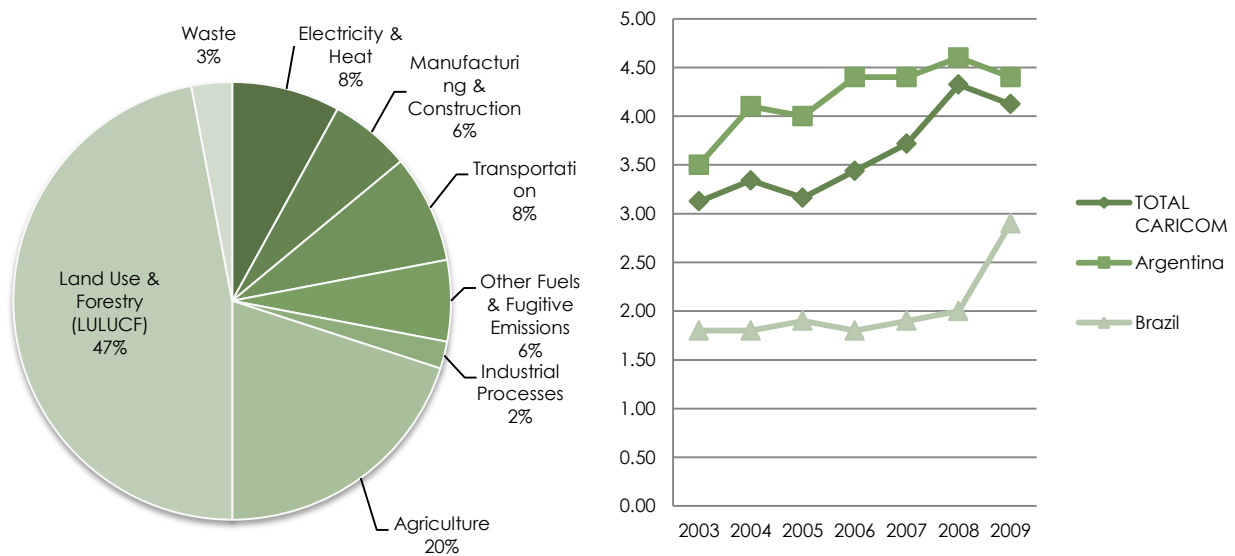
## 3.0 The Climate Technology Market Landscape

### 3.1 Climate Change in the Caribbean Context

Climate change is recognized as being a global problem with local consequences. In the Caribbean context, two observations about climate change are striking. The first is how small the Caribbean's contribution to the problem has been; it is estimated that the Caribbean's total greenhouse gas inventory accounts for less than 1% of the global total. The second is how vulnerable the region is to the problem.

Greenhouse gas data from the Latin American and Caribbean (LAC) region shown below,<sup>3</sup> indicate that the majority of greenhouse gas (GHG) emissions in LAC arise from activity in primarily two sectors: land use,<sup>4</sup> which accounts for 47% of emissions in LAC, compared with 19% globally, and agriculture (20% in LAC versus 14% globally).

Specific data for GHG emissions from land use and agricultural practice in the Caribbean region are not available, however it can be expected that the proportion of land use and forestry emissions would be smaller than in LAC overall. In the Caribbean the electricity and transportation sectors play a larger role in the overall mix of emissions. In the Caribbean Community (CARICOM) region, per capita GHG emissions have also risen over the past decade, outside of a brief downturn during the global financial crisis.



**GHG emissions by sector as a % of total emissions, Latin America and Caribbean. GHG emissions per capita in Metric Tonnes**

<sup>3</sup> Inter-American Development Bank 2010, *Analytical Framework for climate change Action*, Washington DC, <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=35443870>

<sup>4</sup> Defined as Land Use, Land Use Change and Forestry: LULUCF

Despite the relatively modest emissions, the region bears the brunt of climate challenges caused by emissions generated largely from the rest of the world. The region's nations are categorized by the United Nations as Small Island Developing States,<sup>5</sup> which share a high degree of vulnerability to sea level rises of the magnitudes envisioned in even the most optimistic of climate change scenarios. Overall, it is now clear that the elements of Caribbean economic growth and, indeed, the basic elements of life – access to water, food, safe lands and healthy environments – are under threat from climate change.

**Tourism:** The World Travel and Tourism Council (WTTC) ranks the Caribbean<sup>6</sup> as “the most travel & tourism intensive region of the world, where the industry's total contribution amounts to 14% of GDP, 13% of employment, 12% of investment and 17% of exports.” The World Bank<sup>7</sup> estimates that more than half of the Caribbean's population resides within 2 km of the coast and notes that resources critical to island and coastal populations -including beaches, wetlands, fresh water, fisheries, coral reefs and atolls, and wildlife habitat - are all at risk. These characteristics, coupled with the current and projected impacts of climate change, translate into a huge vulnerability primarily due to:

- ✧ Sea level rise, causing inundation of coastal areas, increased geographical impact of storm surges, coastal erosion and other coastal hazards.
- ✧ Coral reef degradation, which the World Bank (2009) estimates could cause more than 15,000 km of shoreline to suffer a 10-20 percent reduction in protection from waves and storms by 2050.

**Fisheries:** Research cited by the World Bank indicates the dramatic disappearance of Caribbean coral reefs, largely due to increasingly frequent and intense periods of warm sea temperatures and increasing ocean acidification caused by rises in atmospheric CO<sub>2</sub>. It notes that these changes have negative and long-term implications for productivity of the tropical seas and fisheries.

**Agriculture, Food Production and Food Security:** Although agriculture has been declining as a contributor to most Caribbean economies, its link to food security is now of growing importance. As a result of recent record-breaking global food price crises, agriculture as a sector is receiving renewed attention. The UNFCCC notes that subsistence agriculture, as well as commercial agriculture, is vital to SIDS economies and the nutritional status and social well-being of their populations. Extreme weather events, such as floods and drought, will put increasing pressure on agricultural systems and water supplies.

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<sup>5</sup> Somewhat misleadingly, since not all of them are islands

<sup>6</sup> WTTC 2011. *Travel & Tourism's Economic Impact 2011*. World Travel & Tourism Council, Caribbean Hotel and Tourism Association and Caribbean Tourism Organization.

<sup>7</sup> The World Bank 2009. *Convenient Solutions to an Inconvenient Truth: Ecosystem based Approaches to Climate Change*. Environment Department, International Bank for Reconstruction and Development, Washington, DC

*Water Supply:* The implications for water supply in the region are grave. The World Bank estimates that by 2050 climate change is expected to reduce water resources in many small islands, for example in the Caribbean and Pacific, to the point where they become insufficient to meet demand during low-rainfall periods.<sup>7</sup> Furthermore, according to research by the UNFCCC,<sup>8</sup> climate model simulations of seasonal temperature and rainfall changes projected to occur by the 2050s indicate that the largest decline in seasonal rainfall is projected for the SIDS in the Caribbean area.<sup>5</sup>

*Energy Security:* With the exception of Trinidad & Tobago, which is an oil and gas producing country and a net energy exporter, the Caribbean is heavily dependent on imported fossil fuels. Although Suriname also produces oil, on net it is still an oil importing nation. The CARICOM Secretariat in 2007 estimated that 95% of the CARICOM group of countries' energy supply was based on fossil fuels. Since then, no significant developments have taken place to materially change that percentage and it is now widely accepted, at both a technical and policy level that the region must urgently transition away from carbon-based energy supplies towards indigenous, low-carbon alternatives.

To the extent that climate change harms economic growth and prospects for growth, energy security is itself endangered. If countries are not growing, energy supplies of any type become more expensive to procure, the demand for energy services is unmet and economic output is constrained, further reinforcing a negative cycle.

It is clear from the abundance of research conducted in the Caribbean that the region is highly vulnerable to the impacts of climate change and as such, prospects for growth in Caribbean economies will depend on the ability of the region to respond accordingly. Taylor (2012) suggests that the region's vulnerability to climate change will become more severe<sup>9</sup> and calls for urgent action to support the development of climate resilience: how to design, develop and create systems that will allow the region to manage, cope with, and adapt to the impacts of climate change.

According to the *infoDev* report<sup>10</sup> on Climate Innovation Centers, the UNFCCC notes that although developing countries will eventually have to mitigate their emissions, in the near term, "adaptation will be more important for these countries since they host the world's most vulnerable populations and societies and, for the most part, lack adequate financial resources with which to respond." Climate adaptation therefore assumes a major role in the focus of this business plan.

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<sup>8</sup> Climate Change Secretariat, UNFCCC 2005. Climate change, small island developing states. UNFCCC, Bonn, Germany.

<sup>9</sup> Taylor, Michael A. 2012. 'Summing' up the Challenge of Climate Change. Presented at infoDev Climate Innovation Workshop, Kingston Jamaica December 2012. Climate Studies Group, Department of Physics, University of the West Indies, Mona, Jamaica.

<sup>10</sup> Sagar, Ambuj and Bloomberg New Energy Finance 2010. *Climate Innovation Centres: A new way to foster Climate Technologies in the Developing World?* infoDev in collaboration with UNIDO and DFID. The International Bank for Reconstruction and Development/The World Bank. Washington, DC

This imperative to adapt is made even more urgent by the fact that Lord Stern, the author of the 2006 report on the economics of climate change indicating a 75% chance of a 2-3 degree Celsius rise in global temperatures, has apparently underestimated the risks: Lord Stern now believes the world is "on track for something like four" [degrees of increase].<sup>11</sup>

Under any scenario, the future cost to the Caribbean of inaction on climate change will be high. A Tufts University study<sup>12</sup> estimates that based on tourism losses and damage to infrastructure due to sea-level rise (exclusive of hurricane damage), the Caribbean's annual cost of inaction is likely to be \$11 billion annually by 2025, or 5% of the region's 2004 GDP.

In the face of this environmental, social and economic vulnerability, resilience and growth can only be achieved through the proactive use of enabling policies, behaviors, infrastructure and investment, all underpinned by innovative technologies.

The Caribbean's next phase of growth is critically dependent upon its ability to develop, adapt and adopt innovative climate-related technologies and systems. Such locally-applicable climate technologies will enable the region to adapt to climate change, mitigate emissions, provide energy, resource and food security with reduced dependence on fossil fuel imports, and remain competitive in the global economy.

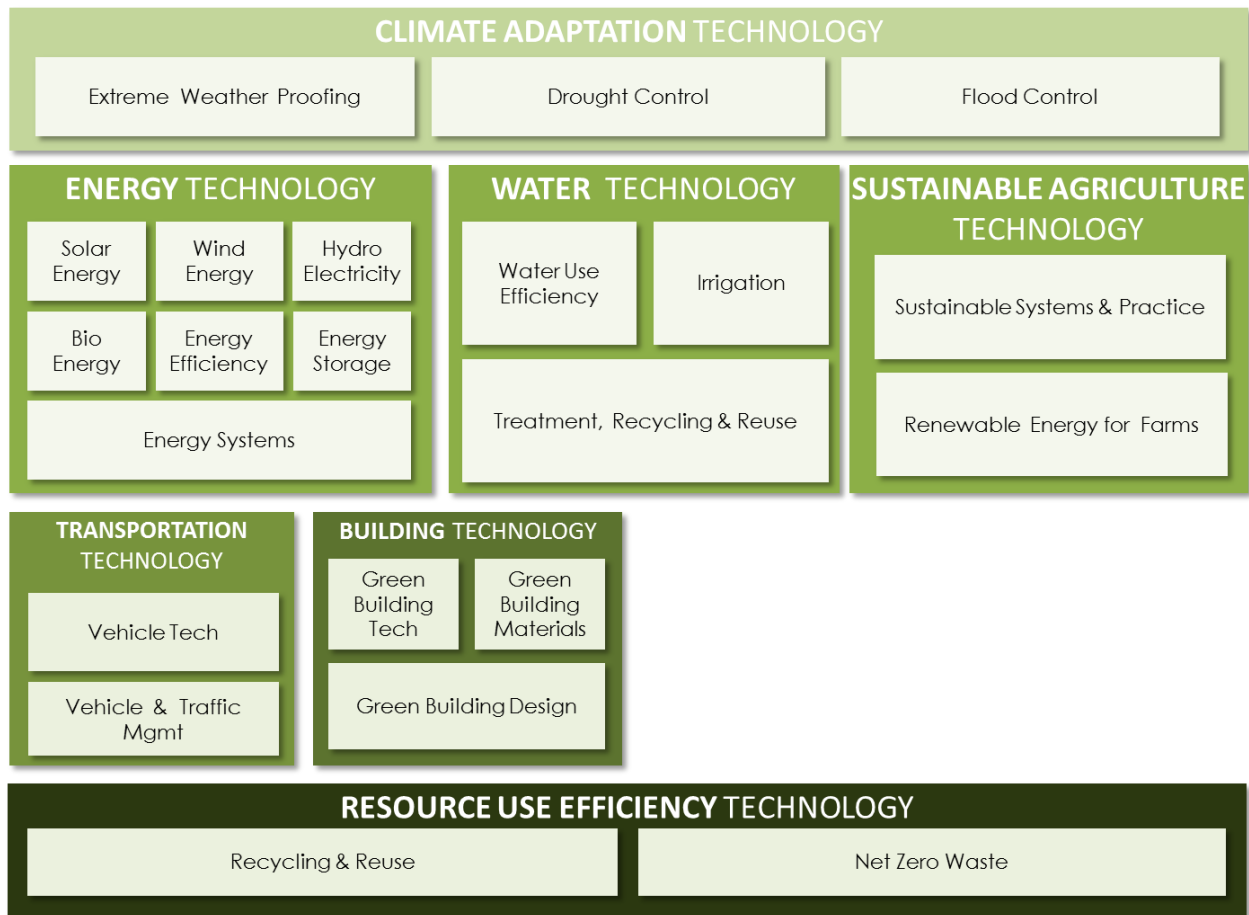
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<sup>11</sup> The Guardian, 26 January 2013. *Nicholas Stern: 'I got it wrong on Climate Change – it's far, far worse'*. <http://www.guardian.co.uk/environment/2013/jan/27/nicholas-stern-climate-change-davos?CMP=SOCKETXT6966>

<sup>12</sup> Bueno, Herzfeld, Stanton and Ackerman 2008. *The Caribbean and climate change: The costs of inaction*. Stockholm Environment Institute – US Center and Global Development and Environment Institute, Tufts University

### 3.2 Defining Climate Innovation Technologies in the Caribbean

Several climate or 'clean technologies' are already important to the region and others are emerging as viable options upon which to develop innovative business-driven solutions to the energy and climate issues facing the region. In order to gain an overview of climate change on specific sectors in the region, seven activity areas were initially examined, and consideration given to Caribbean-relevant applications within each area. These seven areas include climate adaptation, energy, water, agriculture, transportation, buildings and resource use efficiency. The conceptual landscape of the market for these is shown in Figure 3.1



The Climate Technology Market Landscape

In terms of climate impact, energy, water and agricultural technologies are interconnected areas and all relate directly to the objectives associated with climate adaptation (as well as mitigation). Transportation technologies relate directly to energy use, whereas building technologies relate to energy and water use. Finally, resource use efficiency potentially impacts across all of the areas and technologies applicable to climate innovation. Further detailed background information on these areas is provided in Annex 1.

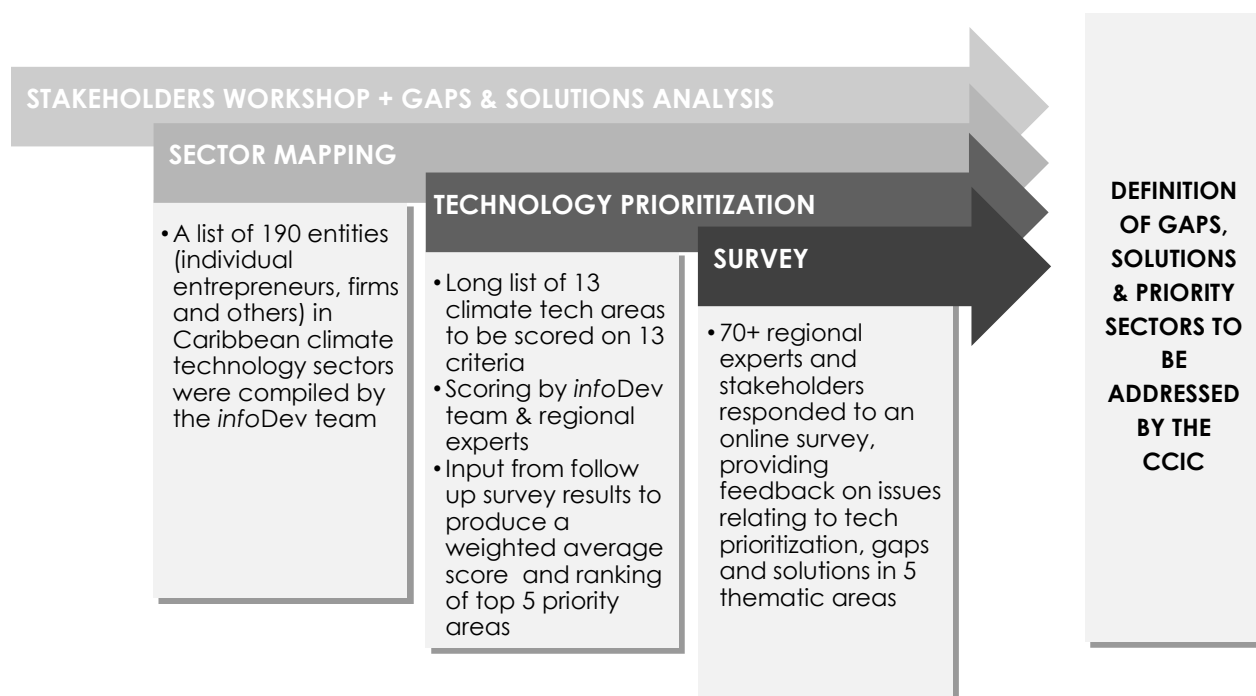
## 3.3 Technology priorities for the Caribbean

### 3.3.1 Introduction and background

Identifying priority sectors for the CCIC is important to ensure that limited resources are effectively utilized, duplication of existing activities and investment are avoided and the Center's efforts are focused to develop core expertise. While the CCIC will primarily target funding and support to the identified priority sectors, it will not exclude other promising and potentially high-impact individuals and companies operating in other areas, particularly in the Center's start-up phase. The CCIC must remain receptive to a diverse range of climate technology solutions to ensure a robust deal-flow and ultimate success.

### 3.3.2 Process for determination of priorities

A consultative and analytical process was developed and implemented by the *infoDev* team to generate and gather input and feedback with regard to the design of the CCIC in general and the prioritization of technology sectors in particular. This process is illustrated below.



Process for determination of the priority climate technology sectors

#### 1. Workshops for initial engagement and input

Three workshops were held for climate technology stakeholders from across the region in the private sector, academia and the public sector. These workshops were held in Trinidad &

Tobago, Barbados and Jamaica<sup>13</sup> and included 150 participants from eight Caribbean countries.<sup>14</sup> During these workshops, expert panels and working groups identified and examined gaps, barriers, and proposed solutions to scaling climate-related businesses in the Caribbean. Gaps, barriers and solutions were considered in relation to five thematic areas, namely:

- ↳ Technology Development
- ↳ Access to Finance
- ↳ Company growth & entrepreneurship
- ↳ Market Transformation
- ↳ Policy and regulation

## 2. *Sector mapping*

A climate technology sector map, comprising an initial list of 190 existing individuals, companies and entities in the climate technology market, was developed and refined over time.

## 3. *Technology prioritization*

The process of technology prioritization involved three key components.

- ↳ Based on the conceptualization of the climate innovation technology market landscape, a long-list of 13 relevant climate sectors (further disaggregated into subsectors) was identified for evaluation against 13 assessment criteria including technology readiness, market demand, business model viability, entrepreneurial and workforce resource capacity and availability, policy landscape and potential impact. Each technology sector and sub-sector was to be scored (using scores of low, medium or high) against the 13 criteria.
- ↳ The *infoDev* team, in consultation with regional experts, scored the sectors and derived a weighted average ranking of the sectors, and
- ↳ A follow up survey provided scoring input from survey respondents, which was incorporated to the experts' scores to provide a final score and ranking of the importance of the climate technology sectors.

The ranking for all thirteen areas is shown in below, including the detailed evaluation criteria. The full analysis is available in the annexes.

## 4. *Follow-up survey*

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<sup>13</sup> The dates of the workshops were: Trinidad & Tobago October 19<sup>th</sup>; Barbados October 22<sup>nd</sup> and Jamaica December 10<sup>th</sup>, 2013.

<sup>14</sup> Antigua & Barbuda, Barbados, Dominica, Grenada, Jamaica, Saint Lucia, St Vincent & The Grenadines and Trinidad & Tobago

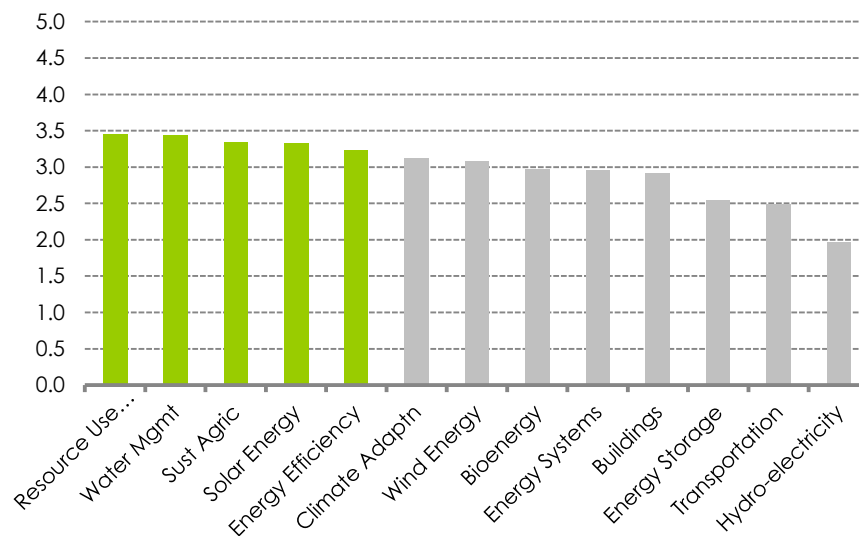


More than 70 regional stakeholders (some of whom had previously participated in the workshops) responded to an online survey<sup>15</sup> to provide feedback regarding the technology prioritization, in addition to other issues relating to gaps and solutions of the five thematic areas discussed in the working groups at the workshop. Respondents included entrepreneurs (one third of the respondents), individuals from government organizations, research centers, industry, finance, NGOs and other organizations.

### 3.3.3 Definition of priority climate technology sectors

As a result of the stakeholder engagement processes, five technology priority areas were identified as being those which will be the primary focus of the CCIC. Of the original thirteen climate technology sectors identified, the final five sector priority areas selected are the following, in order of importance:

1. Resource use efficiency / Recycling
2. Water management
3. Sustainable agribusiness
4. Solar energy
5. Energy efficiency



**Ranking of Caribbean Climate Technology Sector Long List**

Other technology areas among the 13 that were also considered to be important included climate adaptation technologies, wind energy, bioenergy and green buildings. However, these

<sup>15</sup> A total of 253 prospective respondents were sent the online survey via email in January 2013. Seventy-two responses were received. Full details are shown in the annexes.

will not be included as priority areas for the CCIC (though if a particular entrepreneur or business has a compelling proposition in any of these areas, it will not be excluded from consideration). Other areas such as transportation and hydroelectricity were identified as being already on track, meaning that these sectors were either already attracting sufficient private/public investment, or considered to be of a low priority, that is, areas where the CCIC would not be able to effectively compete with other initiatives and entities.

### 3.3.4 Scoring of prioritized sectors

In this section the basis for scoring each of the five priority sectors is described. The combined score for each has been derived as a combination of the scores resulting from both the expert evaluation and the stakeholder surveys. The score measures the importance (low, medium or high) of each criterion associated with each of the technology sub-sectors.

## 3.4 Evaluation of priority sectors

Evaluation Criterion	Code	Description
Technology Readiness	<b>TR</b>	Potential of the technologies to enter the market in the near future
Market Demand	<b>MD</b>	Subsidies, consumer orientation, competing technologies, affordability, etc.
Availability of Funding	<b>AF</b>	Near-term fund for R&D, commercialization and expansion
Clear, Ready Stakeholders	<b>RS</b>	Stakeholders able to affect the likelihood of adoption of a given technology
Business Model	<b>BM</b>	How viable is the business model today? Includes supply-chain, distribution, consumer access, etc.
Leverage of Indigenous Resources	<b>IR</b>	Ability to utilize and/or leverage the region's natural resources
Entrepreneurial Capacity	<b>EC</b>	Existence of talent or ability to develop/recruit talent to make the company a success
Workforce	<b>WF</b>	Current or potential workforce capabilities necessary to commercialize given technology
Policy	<b>PO</b>	Regulations, incentives and policies impacting on a given technology
Economic Impact	<b>EI</b>	Potential impact of a given technology on local economy
Carbon Impact	<b>CI</b>	Potential impact of a given technology on CO <sub>2</sub> reduction
Social Impact	<b>SI</b>	Ability to impact rural poor and marginalized populations
Already on Track	<b>AT</b>	There is good traction in the market for these technologies

<b>(H) High</b>	<b>(M) Medium</b>	<b>(L) Low</b>
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### 3.4.1 Priority Technology 1: Resource Use Efficiency

Combined Score 3.44/5

RESOURCE USE EFFICIENCY	TR	MD	AF	RS	BM	IR	EC	WF	PO	EI	CI	SI	AT
Recycling / Reuse	H	M	M	H	M	H	H	H	L	H	M	M	L
Net Zero Waste	L	L	L	L	L	H	M	M	L	M	M	M	L

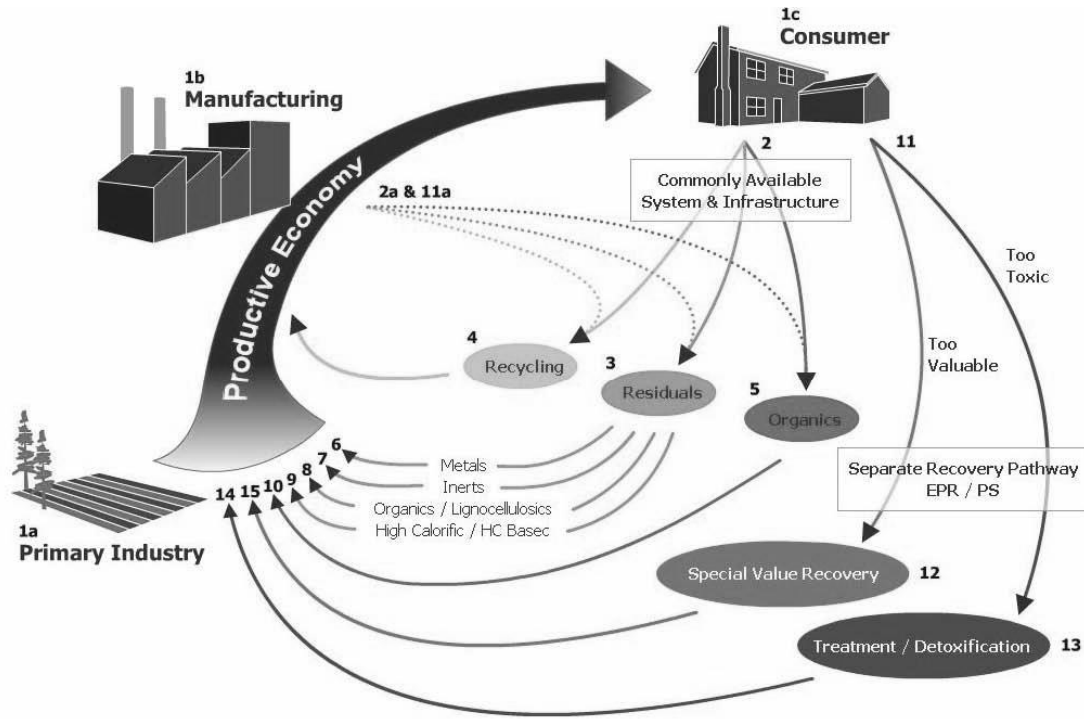
Main applications: Waste-to-energy, materials recovery, reuse and recycling.

Background to Resource Use Efficiency: Current levels of resource use efficiency in the region are low due to lack of awareness of end users on the impacts of resource use (details presented in Annex 1). Resource use efficiency initiatives receive high priority in order to promote the sustainable consumption of resources through the reduction of resources utilized within a process and the reduction of waste produced by a process.

A net zero waste society is illustrated in the graphic below. The aim is for everything to be used within closed cycles and have a net zero impact on the environment. In essence net zero waste embraces the following components:<sup>16</sup>

- ✎ Eliminating the unnecessary use of raw materials
- ✎ Implementing sustainable design
- ✎ Using resources efficiently
- ✎ Waste prevention
- ✎ Reusing products
- ✎ Recovering value from products when they reach the end of their lives through recycling, composting, or energy recovery

<sup>16</sup> <http://www.edinburgh.co.uk>

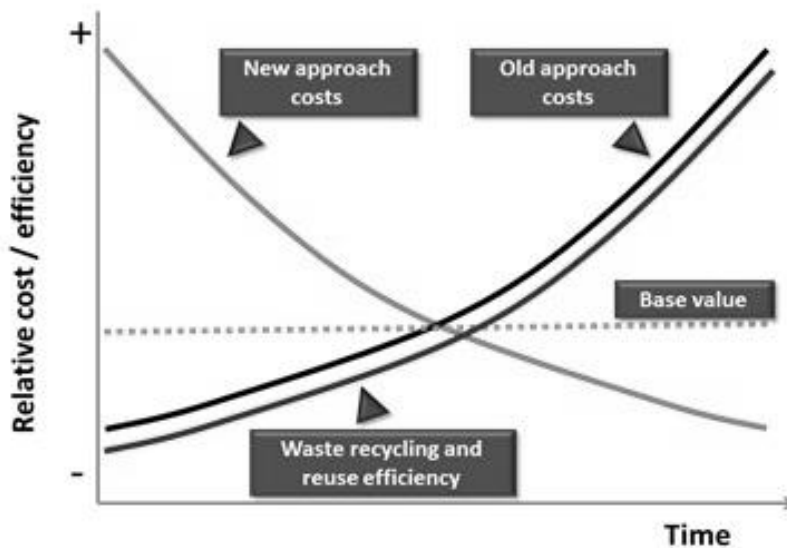


### Overview of the structure of a Net Zero Waste Society<sup>17</sup>

The ultimate objective is to create sustainable resource life cycles so that all products are redesigned or reused for others to use, achieving 100% recycling and net zero waste.<sup>18</sup> The changing economic and efficiency balance between the traditional consumption model and the net zero waste model, is largely driven by technological advances and increasing competition for global resources. It is observed that over time, the cost effectiveness and efficiency of recycling and reuse has improved while the costs of pursuing traditional processes have been increasing, as depicted below.

<sup>17</sup> Total Environment Centre. [www.tec.org.au](http://www.tec.org.au)

<sup>18</sup> Energy, water and waste sector research. Part 3: Waste, Ian Ivey and Gudrun Strohmeier, for Thies Services, 2010



The changing balance between open cycle and closed cycle business models

*Opportunities in Resource Use Efficiency:* Plastic waste is a major component of municipal waste streams in many parts of the Caribbean, in particular Trinidad & Tobago<sup>19</sup> where the government is introducing measures to improve recycling and reuse plastic beverage containers<sup>20</sup> in an effort to improve the country's environment. Initiatives such as 'Plastikeep' were introduced there during 2012 to increase plastic waste recycling.<sup>21</sup> Malikca Cummings is a young entrepreneur in Barbados who has set up the region's first e-waste recycling business in Barbados.<sup>22</sup> In Antigua, recycling has largely been the domain of community groups<sup>23</sup> and private entrepreneurs.

In relation to agricultural and process waste, the Scientific Research Council (SRC) in Jamaica has developed patented bio-digester designs that produce energy from agricultural and process waste streams, and entrepreneurs such as Carol Lue are developing biogas-based businesses serving the tourism industry;<sup>24</sup> Ken Aldonza in Saint Lucia is developing a process to convert banana waste from farms into ethanol for fuel and Elliott Lincoln of Themba Biofuels in Antigua is converting used cooking oil into biodiesel. These are all small steps that are early indicators of the opportunities for innovators and entrepreneurs in the Caribbean region.

### 3.4.2 Priority Technology 2: Water Management

Combined Score 3.44/5

<sup>19</sup> <http://guardian.co.tt/cleaningupthemess/?a=jtbirch101/tt-must-get-serious-about-recycling-waste-plastics>

<sup>20</sup> [http://www.trinidadexpress.com/news/New\\_Bill\\_coming\\_to\\_improve\\_T\\_T\\_s\\_recycling\\_and\\_waste\\_management-192170631.html](http://www.trinidadexpress.com/news/New_Bill_coming_to_improve_T_T_s_recycling_and_waste_management-192170631.html)

<sup>21</sup> <http://v1.tntriver.com/2012/08/05/a-great-service-to-trinidad-recycle-plastics-with-plastikeep/>

<sup>22</sup> [http://www.rienet.net/ri\\_cfm?cat =Champion%20of%20the%20Month&ID=638](http://www.rienet.net/ri_cfm?cat =Champion%20of%20the%20Month&ID=638)

<sup>23</sup> [http://www.rienet.net/ri\\_cfm?cat =Champion%20of%20the%20Month&ID=517](http://www.rienet.net/ri_cfm?cat =Champion%20of%20the%20Month&ID=517)

<sup>24</sup> <http://www.caribsharebiogas.com/>

WATER MANAGEMENT	TR	MD	AF	RS	BM	IR	EC	WF	PO	EI	CI	SI	AT
Water Treatment, Recycling & Reuse	H	M	L	M	M	M	M	M	L	H	M	M	L
Water Use Efficiency	H	M	L	M	M	M	M	M	M	H	M	H	L
Irrigation	H	M	L	M	M	L	M	M	M	H	M	M	L

*Main applications: Potable water, rainwater harvesting, efficient irrigation, waste water treatment and recycling, water use efficiency, desalination.*

*Background:* The current and projected impacts on Caribbean water resources due to climate change are decidedly negative. For example Taylor et al<sup>25</sup> noted some impacts of a drought in Guyana during 2009/2010 stating “Up to 35% of rice fields left uncultivated. US\$1.3 million spent to operate irrigation pumps (US\$ 16,000/day). About 150 acres irrigated with salt water in desperation. In 2010 alone, over 100,000 acres experienced water stress, prompting government investment of over US\$30 million.”

The consensus view, based on the research done with regard to Caribbean climate change impact scenarios, is that the Caribbean will become markedly drier over the long term – rainfall will decline by an annual average of 30% and that that decline will be most significant in the traditional rainy season. Coupled with rising sea levels and higher average temperatures, the projected overall result of these threats is significantly lower levels of water security and an increased need for responsive, innovative water management solutions to provide potable water and water for commercial, industrial and agricultural needs.

*Opportunities in water management:* Rainwater harvesting at the individual residence level is well-established in some countries. However, little emphasis is placed upon the subsequent treatment and recycling of grey water, for example. This presents opportunities for developing integrated harvesting, efficiency and reuse/recycling systems for maximizing the utilization of water in households.

The use of desalination as an option for the provision of potable water in the region is growing. St Georges University in Grenada, for example, produces all of the water consumed on its True Blue campus at its own desalination plant and desalination is a predominant means of water supply in countries like Barbados.<sup>26</sup> While desalination offers a renewable option for water supply to meet growing demands, particularly for island countries, it also has high economic,

<sup>25</sup> Taylor, Stephenson & Rankine, 2011. *Synthesis Paper: Climate Variability and Change and Water Availability in the Caribbean*. Climate Studies Group, Department of Physics Mona Campus, University of the West Indies. Presented at Workshop on climate change Adaptation in Caribbean Agriculture: Enhancing Water Management, 9-11 October 2011, Dominica.

<sup>26</sup> Cashman, A., L. Nurse, and J. Charlery. 2010. Climate change in the Caribbean: The water management implications. *The Journal of Environment & Development*, 19(1): 42-67.

environmental, and energy costs – for example, the extensive use of desalination may increase fossil fuel dependence and GHG emissions.<sup>27</sup> Demonstrating a way to avoid this, a 2011 World Bank Global Environment Facility (GEF) project on Bequia, St Vincent & the Grenadines<sup>28</sup> has installed 75.9 kW<sub>p</sub> of solar photovoltaics to power a 'carbon neutral reverse osmosis desalination plant' that supplies water to the coastal village of Paget Farm. The PV system was installed by Grenada Solar Power Ltd (Grensol) and Juwi Solar Power GmbH of Wörrstadt, Germany.

One of the growing potable water trends in the region – the increasing use of bottled water for personal consumption - is not sustainable in the long-term. Much of the product is imported,<sup>29</sup> the production process is energy and water-intensive<sup>30</sup> and container waste disposal and recycling mechanisms are not in widespread use. This opens up opportunities for innovation to make an impact.

Irrigation is an underutilized practice in the region, but has been identified as a vital part of the climate adaptation response. Therefore, the design and development of irrigation systems that optimize the harvesting and use of ground, surface and rainfall resources, and incorporating recycling and reuse, will be important aspects in providing sustainable water supplies for agriculture. As water resources become scarcer, real opportunities will be presented to innovators and entrepreneurs in the sector.

### 3.4.3 Priority Technology 3: Sustainable Agribusiness

		Combined Score 3.34/5												
SUSTAINABLE AGRIBUSINESS		TR	MD	AF	RS	BM	IR	EC	WF	PO	EI	CI	SI	AT
Sustainable Systems & Practice		M	M	M	M	M	H	M	M	L	H	L	H	L
RE for Farms		H	L	L	M	L	M	M	M	L	M	M	H	L

*Main applications:* Water/energy efficient irrigation systems; waste management; high-value agribusiness; sustainable land use practices; waste-to-energy; and wind and solar energy for farms.

<sup>27</sup> Cooley, H., Gleick, P.H. and Wolff, G. 2006. Desalination, with a grain of salt. A California Perspective: Pacific Institute for Studies in Development, Environment and Security: Oakland, California

<sup>28</sup> The project, "A carbon neutral reverse osmosis desalination plant", was implemented under the World Bank GEF / Caribbean Community climate change Centre's Special Programme for Adaptation to climate change (SPACC) Programme.

<sup>29</sup> The Jamaica Gleaner reports that in 2005, 42 brands of bottled water were on the market in Jamaica, of which 5 were locally produced. ("Imported bottled water drowning local producers. May 29, 2005. <http://jamaica-gleaner.com/gleaner/20050529/business/business1.html> . Accessed 11<sup>th</sup> March 2013.

<sup>30</sup> For example, the Pacific Institute estimates that 2 additional litres of water are required to produce 1 litre of bottled water. [http://www.pacinst.org/topics/water\\_and\\_sustainability/bottled\\_water/bottled\\_water\\_and\\_energy.html](http://www.pacinst.org/topics/water_and_sustainability/bottled_water/bottled_water_and_energy.html)

*Background:* Though its contribution to national economies has dwindled over the past fifteen years, agriculture is of vital importance to the region. In more recent years, the issue of food insecurity, in the context of dramatic escalations in international energy, commodity and food prices coupled with a global economic downturn, has raised the issue of agriculture on national agendas. Caribbean countries are especially vulnerable due to their high reliance on imported food. There is an urgent need to plan for and implement a new approach to agriculture in the region which embraces sustainability, innovation and an entrepreneurial drive.

A review of the food trade balances in the region indicates the scale of the problem. Guyana's Minister of Agriculture noted at a CARICOM/FAO food policy and security workshop<sup>31</sup> in 2010 that two decades ago, the Caribbean region accounted for more than two percent of the world's agricultural trade, with a net agricultural trade surplus of US\$3 billion. By 2010, the situation had reversed with a less than 0.3% share of international agricultural trade and a trade deficit caused by an annual food import bill of over US\$ 3.5 Billion.

*Opportunities in sustainable agriculture:* Agriculture in the Caribbean is still largely a state-influenced activity. Governments play a large role in the operation and management of agricultural activities and enterprises, particularly in relation to crop and stock breeding, fertilizer and pest control inputs and marketing. Accordingly, the United Nations Food and Agriculture Organization (FAO) is currently collaborating with CARICOM governments on an initiative to ensure that all fifteen member states have food and nutrition policies and action plans in place by the end of 2013. This development will set the overall policy stage for allowing entrepreneurs to maximize opportunities in the sector and the CCIC will be in a position to help facilitate an increase in sustainable agriculture technology use in the overall agricultural sector and to increase the involvement of innovators and entrepreneurs in the sector.

There are some excellent examples of potential opportunities for agriculture in the Caribbean that have relevance to the CCIC objectives. One is Market Movers in Trinidad and Tobago. Like most Caribbean countries, T&T imports huge quantities of food - over US\$700 million annually<sup>32</sup> - because the local agricultural sector has declined as a contributor to the nation's economy. However, the cost of many fresh food items tends to be high for two reasons, (i) poor and erratic local availability (due to a lack of modern production systems, low productivity, poor production scheduling, and a lack of effective value chains) and (ii) the high costs of imported fresh products. Market Movers has set up both protected cropping environments and also contract grower relationships to supply high quality, high health, low or no-chemical spray, fresh and processed produce to T&T customers through a combined online portal<sup>33</sup> and home delivery system. This entrepreneurial business is making an impactful contribution toward climate change mitigation because it is increasing locally grown food supplies, improving resource use efficiency and reducing the use of chemical inputs. In addition, by delivering door-to-door using a single delivery driver and vehicle, they have reduced the number of kilometers individual consumers

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<sup>31</sup> CARICOM Secretariat Press Release, Validation Workshop for the Draft CARICOM Regional Policy for Food and Nutrition Security. Georgetown, Guyana. 28 Sep 2010. [http://www.caricom.org/jsp/pressreleases/pres375\\_10.jsp](http://www.caricom.org/jsp/pressreleases/pres375_10.jsp)

<sup>32</sup> <https://www.dropbox.com/s/n64mvs3vkjnpw6/Marketing%20Boards%20Final%20Proofed%20131112%20Corrected.pdf>

<sup>33</sup> <http://www.dmarketmovers.com/>



would have travelled if each had used their own vehicle to purchase from a 'high street' produce retailer, market, or supermarket.

Other examples of entrepreneurs developing business models which have positive benefits in terms of climate change include Goodfellow Farm<sup>34</sup> in The Bahamas (high productivity, 'hurricane proof', improved local food supplies, import substitution, and largely chemical free mini-green production using simple media based hydroponic growing systems); the Bellevue Growers Cooperative in Saint Lucia<sup>35</sup> which has developed a 25-acre organic vegetable production unit that produces more profit than from the entire area cultivated by the cooperative's 200 grower members (improved local food supplies, import substitution, reduced chemical usage, environmental enhancement); The Grenada Chocolate Company which has resurrected a number of abandoned cocoa estates in association with owners in Grenada, gained organic certification for them, developed one of the world's top four award winning organic chocolates, which is also rated as being carbon neutral, and delivers the product to the UK by sailing ship to avoid transport related environmental impacts;<sup>36</sup> and Jamaica Exotic Flavours & Essences Co. Ltd.<sup>37</sup> which is using lower quality 'reject' fruit and vegetables to produce value-added processed products (improved local food supplies, import substitution, improved resource use efficiency, value adding).

### 3.4.4 Priority Technology 4: Solar Energy

Combined Score 3.33/5

SOLAR ENERGY	TR	MD	AF	RS	BM	IR	EC	WF	PO	EI	CI	SI	AT
Solar Electricity	H	L	L	M	M	M	L	M	L	M	M	M	L
Solar Water Heating	H	M	H	H	H	H	H	H	M	H	H	M	M
Solar Cooling	M	M	L	L	M	M	M	M	L	M	M	M	L

*Main applications:* Residential and commercial self-generation, residential and commercial water heating, solar-powered air-conditioning.

*Solar Energy Background:* Data from the GEF-supported Solar and Wind Energy Resource Assessment (SWERA) indicate that the solar irradiation resource in the Caribbean is in the range of 4.5 to 6.5kWh/m<sup>2</sup>/day, which is highly favorable for PV and solar thermal applications. As a comparison, the level of this resource in Germany is in the range of 2.5 to 3.5kWh/m<sup>2</sup>/day. Paradoxically, Germany has the greatest number of solar electricity installations in the world, while the Caribbean's status in solar electricity installations is insignificant.

<sup>34</sup> [http://www.tffi.net/article\\_view/256](http://www.tffi.net/article_view/256)

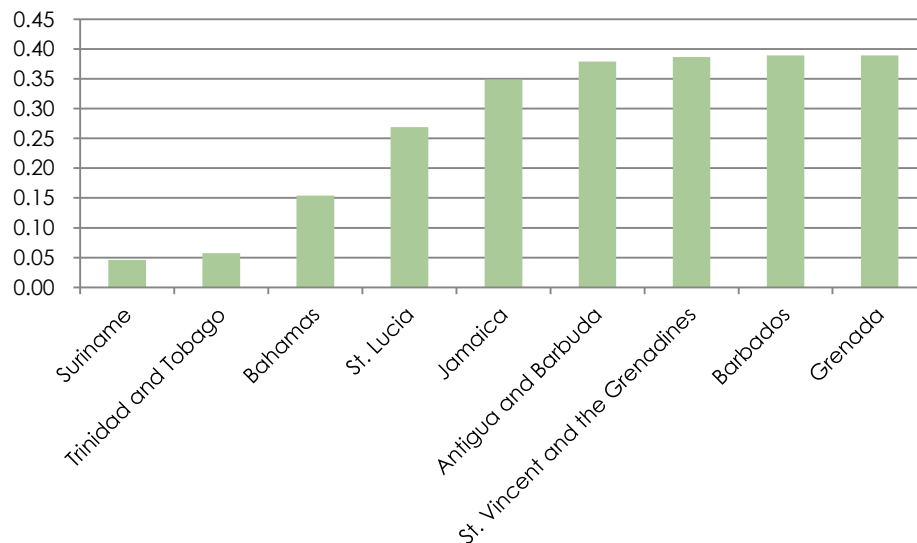
<sup>35</sup> [http://www.tffi.net/article\\_view/318](http://www.tffi.net/article_view/318)

<sup>36</sup> [http://www.springwise.com/eco\\_sustainability/in-uk-carbon-neutral-chocolate-bar-shipped-wooden-sailboat/](http://www.springwise.com/eco_sustainability/in-uk-carbon-neutral-chocolate-bar-shipped-wooden-sailboat/)

<sup>37</sup> <http://www.jaefe.com/>

However, the landscape for the solar market is different when solar thermal application (for water heating) is considered. The Caribbean, based on innovation that began in Barbados<sup>38</sup> in the 1970s, is now a world leader in the development and utilization of solar water heating technology, with an installed capacity across CARICOM of 170 thermal megawatts ( $MW_{th}$ ) – equivalent to more than the peak electricity demand of Barbados and St Lucia combined.

*Opportunities in solar energy:* Apart from its abundance, several factors make solar energy an attractive option for the region. The most important is the high retail price of electricity in the region. Except in Suriname and Trinidad & Tobago, where indigenous resources are used to produce a significant portion of energy and electricity prices are subsidized, prices of electricity in the rest of the Caribbean are among the highest in the world, approaching (and sometimes exceeding) US\$0.40 per kWh.



**Retail electricity prices in selected Caribbean countries, US\$ per kWh<sup>39</sup>**

The very low maintenance requirements associated with solar PV and water heating systems is an advantage in a region where most necessary materials and components must be imported. Conversely, the high initial investment costs associated with PV installations, coupled with unclear or ad-hoc grid interconnection policies, have been a critical barrier to the widespread adoption of PV in the Caribbean. However, the cost of PV modules has fallen from US\$7 per peak Watt ( $W_p$ ) in the early 1980s to less than \$1 per  $W_p$  today, and other associated hardware costs are also falling. Real opportunities now exist for solar entrepreneurs to deliver economically

<sup>38</sup> Husbands, James, 2012. *History and Development of Barbados' solar hot water industry*. Solar Dynamics, St Michael, Barbados. <http://www.sidsenergyforall.org/wp-content/uploads/2012/05/S8.-James-Husbands-Solar-Dynamics-History.pdf>

<sup>39</sup> CARILEC Tariff Survey, authors' calculations

viable, distributed, grid-connected energy supplies to homes and businesses throughout the region.

The market opportunity for solar cooling in the region is just beginning to be recognized and the region's first commercial solar cooling installation was commissioned in 2012 at the Kingston, Jamaica headquarters of mobile phone company Digicel.<sup>40</sup> It was installed by RED, a Jamaican renewable energy development firm.

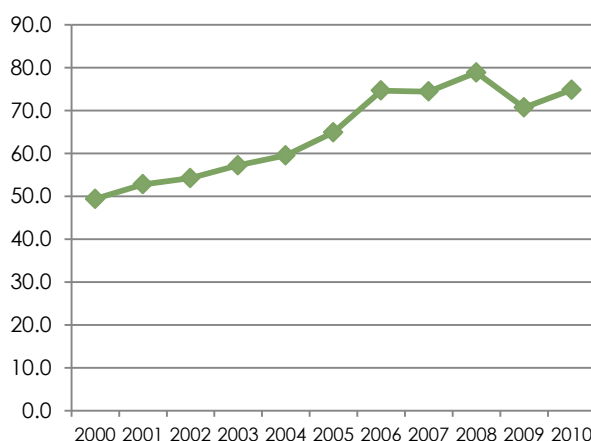
### 3.4.5 Priority Technology 5: Energy Efficiency

Combined Score 3.23/5

ENERGY EFFICIENCY	TR	MD	AF	RS	BM	IR	EC	WF	PO	EI	CI	SI	AT
EE Technology	H	L	L	M	M	M	H	L	L	L	L	L	L
EE Solutions	H	M	L	M	M	M	H	M	L	M	M	L	L
EE Behavior	L	L	L	L	M	M	M	M	L	M	M	L	L

*Main applications:* Lighting, household appliances, air-conditioning, commercial cooling and ventilation systems, consumer behavior, building energy management systems, building design and materials.

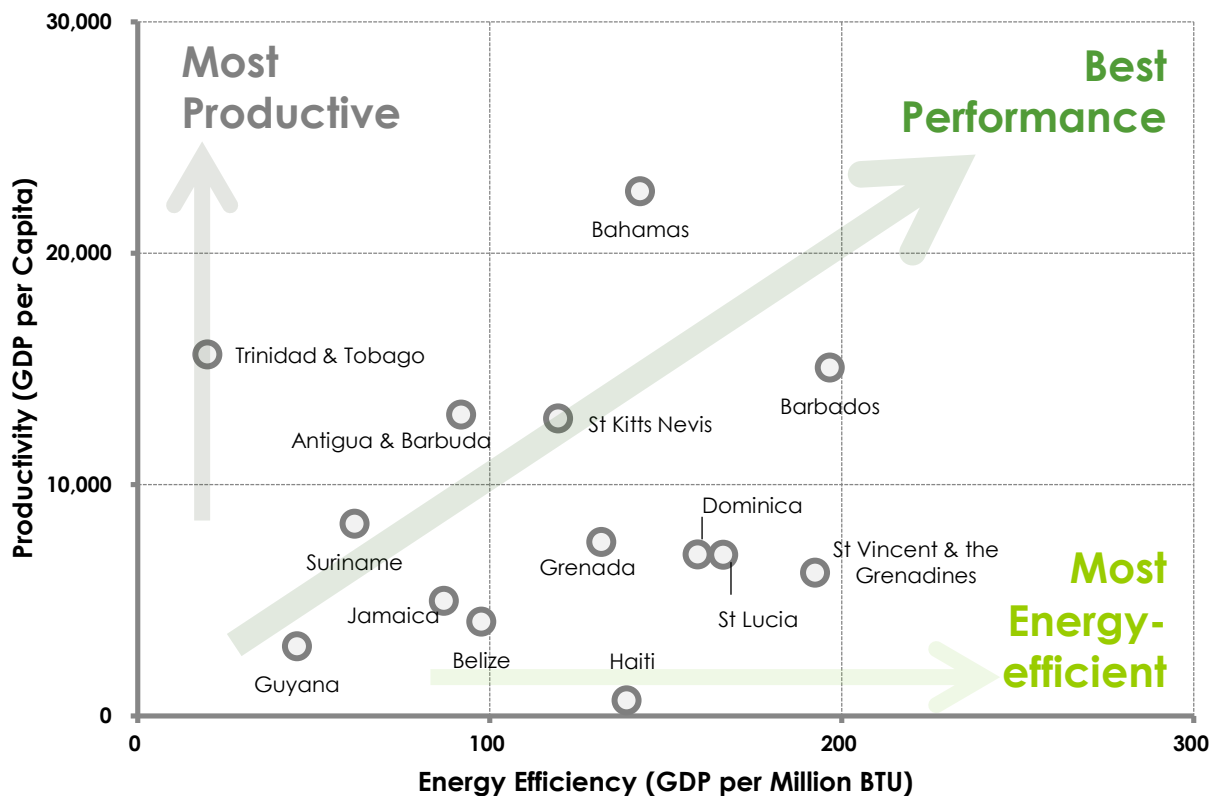
*Energy Efficiency Background:* Over the past decade, primary energy consumption in the CARICOM region has grown. The below graph shows the per capita consumption of primary energy across the CARICOM group of countries between 2000 and 2010.



Primary energy consumption per capita in the CARICOM countries (Million BTU)

<sup>40</sup> Commissioning of SOLID's first solar cooling plant in Jamaica, 2012. [http://www.solid.at/index.php?option=com\\_content&task=view&id=235&Itemid=1&lang=en](http://www.solid.at/index.php?option=com_content&task=view&id=235&Itemid=1&lang=en)

The importance of energy efficiency is highlighted by the below matrix which illustrates a comparison of national economic productivity (GDP per capita) with national energy efficiency (measured by the quantum of GDP that is produced per unit of energy consumption). Countries with the lowest performance in both measures are located in the bottom left of the grid and the highest performers in the top right. The majority of the CARICOM countries are located in the region of mid-to-low energy efficient performance. Two extreme outliers are Haiti with extremely low economic productivity and Trinidad and Tobago with very low energy efficiency.



Economic Productivity and Energy Efficiency (2010)

*Energy Efficiency Opportunities:* Energy efficiency is an area with considerable potential in the region but this opportunity is not being effectively exploited by the public and private sectors. At the policy level, no CARICOM country has yet passed specific energy efficiency legislation and at utility level, there is no legislated requirement to pursue efficiency: the region's electrical generation and distribution utilities are not mandated to optimize their generation heat rates or to reduce their transmission/distribution losses. In addition, utilities are permitted to recover from customers all costs of purchasing imported fuel, regardless of the efficiency of its use.

On the demand side, the situation in the region has been mixed. In Jamaica, a 1994 GEF-funded demand side management (DSM) program produced significant positive outcomes, but

the activity was not continued after the program expired in 1999 and it is unclear what the program's impact has been over a decade later.<sup>41</sup> There are however enterprises that recognized the opportunities and have taken steps to position their businesses to benefit from the region's high energy costs. For example, Solar Buzz Jamaica sells and installs Owl Energy monitors in homes and businesses so consumers can monitor their electricity usage. With electricity prices so high (reaching US\$0.40 per kWh in some countries) technologies promoting energy efficiency can create significant savings for consumers. According to Solar Buzz Jamaica, once the monitors are installed, the average customer reduces their electricity consumption by 20 – 30%.

Elsewhere in the region, consumers are generally unaware of, or are confused by, the available options, costs and benefits of investing in energy efficiency. Part of the reason is a lack of basic information; a consequence of the Caribbean's generally weak attempts in data collection, compilation, analysis and explanation. For example, during the late 2000s, the government of Cuba donated approximately 5 million compact fluorescent light bulbs to replace existing incandescent bulbs in households across the Caribbean – and to date, there has been no analysis or detailed public reporting on the overall outcome of the program. More to the point, there appears to have been no significant effort to complement the replacement program with the appropriate education and awareness activities – so that consumers could understand the significance of the exercise and use that understanding in future appliance purchase decisions. One outcome of this lack of follow-up is that consumer spending on lighting and household appliances is often not based on a consideration of life-cycle energy costs, but almost entirely on purchase price. This increases costs across the board – households spend more of their disposable income on energy costs; utilities and countries spend more to import fuel; more fuel is used; and more GHG emissions are produced.

However, the Trinidadian government has taken steps to engage and educate the public on energy efficiency through the 'My Energy My Responsibility' Campaign. Despite energy costs being substantially lower than in the rest of the Caribbean region, a team at the Ministry of Energy and Energy Affairs led by Mr. Randy Ramadhar Singh (Adviser to the Minister on Renewable Energy Ministry of Energy and Energy Affairs) recently commissioned and delivered the national promotional campaign to encourage citizens to save energy in their everyday lives. This included online resources, national advertisements and educational programs. This is part of a longer-term future-focused strategy to improve resource use efficiency and reduce carbon emissions as part of the country's international commitments to climate change impact reduction. The initiative also is also intended to encourage the country's private sector to become more sustainable and competitive in future global markets.

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<sup>41</sup> Marbek Resource Consultants & Angelhoeve Associates Inc, 2006. *Post-Implementation Impact Assessment, Jamaica Demand-Side Management Demonstration Project*. Global Environment Facility Program, The World Bank, Washington, DC



Poster from Trinidad and Tobago's government run energy efficiency education campaign

This situation presents significant challenges and opportunities for innovation and entrepreneurship in energy efficiency approaches that incorporate technology, systems and behavioral change.

### 3.5 Deal flow analysis: Sample companies

Based upon the CCIC stakeholder engagement process the *infoDev* team identified a number of companies that would be eligible for support from the Center. A sample of these enterprises is presented below with company names removed.


Co.	Sector	Product	Location	Needs
1	<b>Resource Use Efficiency</b>	Bio-fermentation of farm and organic wastes	Regional	<ul style="list-style-type: none"> <li>• Technical support</li> <li>• Operation/maintenance models</li> <li>• Market development</li> <li>• Sales and business</li> </ul>
2	<b>Resource Use Efficiency</b>	Polyethylene terephthalate (PET) recycling	Jamaica, Trinidad & Tobago	<ul style="list-style-type: none"> <li>• Technical support</li> <li>• Finance to move up the supply chain (produce plastic fibers from plastic chips)</li> <li>• Market development</li> <li>• Value chain development</li> </ul>
3	<b>Resource Use Efficiency</b>	Bagasse for medium and high density chip board	Barbados, Belize, Jamaica, Guyana	<ul style="list-style-type: none"> <li>• Machinery to diversify products</li> <li>• Technical support</li> <li>• Access to finance to enable scaling up of operations</li> <li>• Branding and Marketing</li> </ul>
4	<b>Resource Use Efficiency</b>	Refining used cooking oil for use as bio-diesel	Regional except Trinidad & Tobago (due to its low energy costs)	<ul style="list-style-type: none"> <li>• Technical support</li> <li>• Cost benefit analysis</li> <li>• Quality assurance</li> <li>• Security of supply</li> </ul>

				<ul style="list-style-type: none"> <li>• Supply chain development</li> <li>• Financing</li> </ul>
5	<b>Resource Use Efficiency</b>	Energy and water efficient building design and construction	Regional	<ul style="list-style-type: none"> <li>• Technical support</li> <li>• Skills development</li> <li>• Cost benefit studies</li> <li>• Marketing</li> </ul>
6	<b>Resource Use Efficiency</b>	Mobile app for car-pooling arrangements	Regional	<ul style="list-style-type: none"> <li>• Business model</li> <li>• Monetization</li> <li>• Branding and marketing</li> <li>• Mobile operator contract(s)</li> </ul>
7	<b>Resource Use Efficiency</b>	Recycling old tires to make biofuel	Regional	<ul style="list-style-type: none"> <li>• Business model</li> <li>• Cost benefit analysis</li> <li>• Technical support</li> <li>• Financing</li> </ul>
8	<b>Water Management</b>	Rainwater harvesting	Regional	<ul style="list-style-type: none"> <li>• Technical support</li> <li>• Business model</li> <li>• Market development</li> <li>• Operation and maintenance skills training</li> <li>• Financing solution delivery</li> </ul>
9	<b>Water Management</b>	Drip and tape irrigation systems	Regional	<ul style="list-style-type: none"> <li>• Technical and design support</li> <li>• Technology transfer</li> <li>• Operational and maintenance skills training</li> <li>• Cost benefit studies</li> <li>• Productivity improvement</li> <li>• Financing solution delivery</li> </ul>
10	<b>Water management</b>	Low/no water toilets and low flow showerheads	Regional	<ul style="list-style-type: none"> <li>• Technical support</li> <li>• Business model</li> <li>• Financial assistance to support company development</li> <li>• Marketing and sales support</li> </ul>
11	<b>Water Management</b>	Small scale water recycling and purification systems	Regional	<ul style="list-style-type: none"> <li>• Technical support</li> <li>• Operational and maintenance models - safety</li> <li>• Marketing</li> <li>• Support networks</li> <li>• Water reuse policies</li> <li>• Financing</li> </ul>
12	<b>Sustainable Agribusiness</b>	Protected cropping	Regional	<ul style="list-style-type: none"> <li>• Cool house technology</li> <li>• Systems development</li> <li>• Value chain development</li> <li>• Marketing</li> <li>• Financial support</li> <li>• Technical support</li> </ul>
13	<b>Sustainable Agribusiness</b>	Organic vegetables	Regional	<ul style="list-style-type: none"> <li>• Financial assistance/access</li> <li>• Land access</li> <li>• Systems development</li> <li>• Technical support</li> <li>• Value chain development</li> <li>• Brand development</li> </ul>

14	<b>Sustainable Agribusiness</b>	High value teak products from sustainable production forests	Guyana, Trinidad & Tobago	<ul style="list-style-type: none"> <li>• Value proposition development</li> <li>• Value chain development</li> <li>• Skills development</li> <li>• Sustainable resource management</li> <li>• Branding and marketing – regional and international</li> </ul>
15	<b>Sustainable Agriculture</b>	'Hurricane proof' crops and growing techniques	Regional	<ul style="list-style-type: none"> <li>• Technical support</li> <li>• Technology transfer</li> <li>• Systems development</li> <li>• Skills training</li> <li>• Branding and marketing</li> <li>• Financing</li> </ul>
16	<b>Solar Energy</b>	Non-grid solar solutions e.g. solar water heating and solar air conditioning	Regional	<ul style="list-style-type: none"> <li>• Technical support</li> <li>• Technology transfer</li> <li>• Business model (own/lease etc.)</li> <li>• Talent pool of skilled engineers</li> <li>• Branding and marketing</li> </ul>
17	<b>Solar energy</b>	Solar refrigeration	Regional	<ul style="list-style-type: none"> <li>• Technology transfer</li> <li>• Operational and maintenance skills training</li> <li>• Business model (financing)</li> <li>• Branding and marketing</li> </ul>
18	<b>Energy Efficiency</b>	Smart systems	Regional	<ul style="list-style-type: none"> <li>• Technical support</li> <li>• Amortization payback studies</li> <li>• Regional market development</li> <li>• Financial assistance/access</li> </ul>
19	<b>Energy Efficiency</b>	Energy service, Energy auditing	Regional	<ul style="list-style-type: none"> <li>• Financial resources.</li> <li>• Advisory/ capacity building in business skills</li> <li>• Solutions development skills</li> </ul>
20	<b>Energy Efficiency</b>	Home and business energy monitoring systems	Regional	<ul style="list-style-type: none"> <li>• Business model</li> <li>• Monetization of the business</li> <li>• Alliances and partnerships</li> <li>• Marketing</li> <li>• Finance</li> </ul>

### 3.6 Stakeholder Analysis

Through its stakeholder engagement, *infoDev* conducted a landscape analysis across the climate innovation value chain and in the above five priority technology areas. A significant number of stakeholders already working in these sectors were identified. The CCIC will engage collaboratively with a broad range of such stakeholders and build upon existing efforts, knowledge and synergies, and will complement rather than compete with existing activities. The following section outlines in detail the current climate technology stakeholder landscape in The Caribbean, including:

- |  |   |   |
|--|---|---|
|  R&D          |  Business Incubation |  NGOs                |
|  Government   |  Industry – Large    |  International Inst. |
|  Universities |  Industry – Small    |  Financiers          |



### 3.6.1 Sector Mapping Matrix

The below table provides a sample of some key stakeholders operating in prioritized sectors in The Caribbean:

Stakeholder Type	Resource Use Efficiency	Water Management	Sustainable Agribusiness	Solar Energy	Energy Efficiency
<b>R&amp;D Institute</b>	SRC, CARIRI	CARIRI, SRC	CARDI, SRC, CARIRI		
<b>GOI/Policy</b>	MoE, MSTEM, MEEA, PIOJ, EDB/CCI, Government-owned utilities				
<b>Universities</b>	UWI, USC, U-TECH, UTT, NSC, SGU/WINDREF, ALJ GSB				
<b>Incubators</b>	Caribbean YBT Network, U-TECH, CARIRI*, ALJ GSB*, AmCham, CED#, Branson Centre#, Kingston Beta#				
<b>Industry SME</b>	Eco Tec, CaribShare Biogas, Zaref Engineering	Caribbean Water Treatment, New Water Caribbean, H2O Tech Services	Market Movers, Bellevue Growers Coop, Lampkin's Natural Farms	GrenSol, Solaris, Energy Dynamics, Sunpower, Solar Buzz, Smart Energy	Atom Solutions, Energy Dynamics, Caribbean LED, Welectricity
<b>Industry Large</b>	TOSL, Brittenwoods International, Enman	WASA	Grace Kennedy Baron Foods Matouk's	Green RG Caribbean	Siemens
<b>NGO</b>	Energy Chamber, Caribbean Institute of Sustainability, Green Building Institute, Global Water Partnership – Caribbean, Caribbean Farmers Network (CAFAN), Jamaica Solar Energy Association, The Toco Foundation, The Future Centre Trust, Centre of Excellence				
<b>Consulting</b>	Meister Consultants, Zernike, META Group, Emprende, Paul Hay Capital Projects, QM Consulting, Development Synergies, DPM International, Echos Consulting, BPD Associates				
<b>International</b>	World Bank, GIZ, GVEP, USAID, CIDA, DFID, UNDP, UNEP, Friederik Ebert Stiftung, CDE, Caribsava, CTA				
<b>Financiers</b>	NEDCO, Green Fund, Scotia Bank, CFSC, AID Bank, DBJ, First Citizens Bank, Samdor Services, St Kitts & Nevis SIDF, GSB Credit Union, Eastern Credit Union, RMP Group/Keystone Augusta				

\* Currently being developed. # Partial business incubation

### 3.6.2 Business Model Innovation: Importance for the Caribbean

While the CCIC's overall mission is to support the commercialization and scaling-up of emerging technologies, both the small size of markets and the current policy and trading constraints that prevail in the region will influence the support approach. Such an approach will need to address non-technical barriers to deployment of not only new technological concepts, but also existing and adapted technologies.

To achieve the best outcome for participants in the CCIC's services, innovative approaches will be necessary in terms of defining 'best bet' market niches (locally, regionally and internationally). Refinement of collaborative and distribution models, servicing, marketing and business development, cost structures, consumer financing, and production processes and options will be required. There are also a number of economic and social challenges, particularly in underserved rural areas and locations with many low income households that require especially innovative approaches, in terms of both financing and business models. The CCIC will need to be able to provide specialist support and assistance to help businesses achieve success within such economic and social environments.

### **3.6.3 Stakeholder Mapping Matrix**

The graphic on the following page provides an overview of the activities of various existing stakeholders in the Caribbean region and the possible roles they could play as part of the CCIC innovation value chain. The highlighted area designated the 'CIC Business Focus' represents areas where gaps currently exist and where support from the CCIC will best assist business establishment and development. It also indicates areas where partnerships and collaborative alliances will be pursued in order to optimise the outcomes and help encourage the development of a long-term, sustainable, climate change business support ecosystem.

Stakeholder	Commercialization Stages				
	Basic and Applied Research	Development and Demonstration	Scale-up	Commercial	
<b>NGOs</b>		Provide technical assistance			
		Provide financial assistance / microfinancing			
		Policy Advice			
					Promotion of clean energy: Awareness creation
		Capacity building: BDS			
<b>Incubation Centers</b>		Provide equipment	Provide working space & consultancy		
				Provide networking	
			Business Consultancy, Entrepreneurship & Business training		
<b>Financial Institutions</b>			Development of the financial market		
			Microfinance	Equity finance, Debt financing, Venture capital	
				Fund advisory services	
					Financing projects
			Business services		
			Investment advisory		
<b>International Institutions</b>			Funding - Grants		
			Funding - Loans		
	R&D on policy and regulation		Financial sector development		
		Capacity Building			

CIC  
Business  
Focus



Source: Nortec, Adapted by infoDev

The Caribbean CIC Business Plan

Stakeholder	Commercialization Stages				
	Basic and Applied Research	Development and Demonstration	Scale-up	Commercial	
<b>Universities &amp; Academia</b>					
Arthur Lok Jack CSS, University of the West Indies, University of the Southern Caribbean, U-Tech, Northern Caribbean University, University of Trinidad and Tobago, CARIRI, SRC (Jam), NIHERST (T&I), Caribbean Council for Science and Technology (CCST), Caribbean Science Foundation, Centre for Resource Management and Environmental Studies (CERMES - BB), Caribbean Institute for Meteorology and Hydrology (CIMH), International Centre for Energy and Nuclear Science (ICENS), National Council for Science and Technology (Jam), National Council for Science and Technology (BB), Jamaica Young Scientists Forum, Caribbean Agricultural Research and Development Institute (CARDI), Institute for Sustainable Development (JWI Mona), National Science and Technology Council (Grenada), Windward Islands Research and Educational Foundation (WINDREF), Institute of Applied Science and Technology (Guyana), Environmental Research		Provide some facilities			
		Workforce development and capacity building			
	R & D				
	R & D on policies				
<b>Industry</b>					
Atom Solutions (BB), Energy Dynamics (T&I), Solar Dynamics (BB), Caribbean Water Treatment (A&B), Grenada Solar, TOSL (T&I), DPM International (Jam), Applied Renewables Caribbean Inc (St Lucia), Welectricity (SVG), Green Technologies Inc (BB), Clarke Energy Associates (BB), Eco-Tech (Jam), SILEK (T&I), DC Power Systems (T&I), Enman (T&I), Frank Hill Ltd., ACES (T&I), NH Energy Services (T&I), Smart Energy (T&I), EIL (T&I), IYE Electrical (T&I), Omega telecom (T&I), BPD Associates (T&I), Green Ventures Ltd (Dom), WiConnect (BB), Sunpower Ltd (BB), Themba Biofuels (A&B), Ace Recycling (T&I), Solaris Energy (BB), Ecosun Products (St. Lucia), Caribbean LED lighting (BB), North Star Development (SKN), Evergreen (BB), Wigton Windfarm Ltd (Jam), Sol Wind Energy (Jam), Brit&Tenwoods International (Jam), Ballantyne Beswick & Company (Jam), GreenRG Caribbean, ECCO Ltd (Jam), Caribbean ESCO Ltd, Paul Hay Capital Projects (Jam), LeeCorp (Jam), Sun Source Technologies and Services (Jam), Echos Consulting (Jam), Caribbean Solar Energy (Jam), Atlantic Solar (Jam), RED Renewable Energy Developers (Jam), Solar Buzz Jamaica, Development Synergies (Jam), A1 Solutions (Jam), New Leaf (Jam), Caribbean E-Waste Management Inc (BB), Meister Consultants Ltd (Regional), 3 Bows (Jam), Ministry of Labour and Small and Micro Enterprise Development (T&I), Canary Investments Limited, Quality Management Consultancy Company (Jam), CaribShareBiogas (Jam), Zaref Engineering (T&I), New Water Technologies (BB), H2O Technical Services	R & D on product/service		Pilot production, testing and demonstration, new technologies	Integrate new technologies, manufacture / for production expansion	Launching
	Generate IP	Marketing research, IP & SS	Identification of target market, marketing channel development, reaching target and expanding market		Advertising, Product promotion
		Identify sources of finance	Acquire finance and maintain balance sheet	Acquire additional finance	
		CIC Business Focus Influence policy and regulation, advocacy			
		Company formation	Expansion, Human resource development, production efficiency		
<b>Government</b>					
Ministry of Energy and Energy Affairs (T&I), Department of Energy (BB), MSTEM (Jamaica), Ministry of the Environment (Jam, T&I), Council for Competitiveness & Innovation (T&I), Economic Development Board (T&I), PCJ (Jam), ABIA (A&B), Planning Institute of Jamaica, WASA (T&I), TIEC (T&I), Ministry of Planning and Sustainable Development (T&I), Anguilla Renewable Energy Office, Ministry of Industry, Small Business and Rural Development (BB), Nevis Electricity Co., JAMPRO, Water Resources Authority (Jam), Ministry of Water, Land, Environment & Climate Change (Jam), Minister of Industry, Investment and Commerce (Jam), Ministry of Trade and Industry (T&I), St Vincent Electricity Services; Guyana Power & Light; Antigua Public Utilities Authority; St Kitts Electricity Company; Anguilla Electricity Company	Business Development Support	R&D services through agencies			
	Issue IPR				
			Loan, Financing projects, Coordinate international funds		Awareness creation/promotion of environmental products/services
		R & D on policy, sector policy development, implementation and control			

Technology    Company    Finance    Market    Policy

Source: Nortec, Adapted by infoDev

The Caribbean CIC Business Plan

### 3.6.4 Leveraging existing initiatives

Caribbean National Government and CARICOM initiatives that are relevant to the CCIC are summarized in the table below.

Initiatives	Description	Agency in charge
<b>Caribbean Agro-Meteorological Initiative (CAMI)</b> Caribbean	A regional project that focuses on applying meteorological data and forecasting to improve agricultural productivity in the region. This includes providing long-range forecasts to help farmers plan their cropping schedules and be better prepared for weather-related pest and disease problems.	Caribbean Institute for Meteorology and Hydrology in association with the CTA (EU)
<b>Caribbean Community Agricultural Policy</b> CARICOM	A work in progress that addresses growing concern about the high dependency on food imports into the region and the poor state of national agricultural sectors. The policy approach now includes sustainability and the environment as key components.	CARICOM
<b>Caribbean Disaster Emergency Management Agency</b> Caribbean	Established in 2009 to replace an earlier organization, CDEMA embraces the principles and practice of Comprehensive Disaster Management (CDM), an integrated and proactive approach to disaster management that seeks to reduce the risk and loss associated with natural and technological hazards and the effects of climate change to enhance regional sustainable development.	Regional Governments
<b>Caribbean Energy Information System (CEIS)</b> Regional	A regional energy information system supported by the governments of all the CARIFORUM countries in the region plus several 'associate member states'. The CEIS provides a range of services including two online portals – CIPORE (Caribbean Information Platform on Renewable Energy) and CEEBIP (Caribbean Environment and Energy Business Platform) – which cover a range of energy and environmental areas of interest.	Scientific Research Council (SRC) with the support of CARIFORUM Government Agencies
<b>Caribbean Energy Program</b> CARICOM	Work commenced in 2008 to develop an energy program with the goals of increasing regional energy security and moving the region's energy sector towards a path of sustainable energy development. The program calls for the establishment of a Caribbean Renewable Energy Centre – which is still a work in progress.	Directorate of Trade and Economic Integration, CARICOM
<b>Centre for Resource Management and Environmental Studies (CERMES)</b> Regional	The Centre promotes and facilitates sustainable development in the Caribbean and beyond through education, applied research, professional training, advisory services to governments, NGOs and the private sector, public awareness outreach.	The Centre for Resource Management and Environmental Studies (CERMES) UWI - Barbados
<b>Climate Change &amp; the Caribbean</b> CARICOM	A regional framework for achieving development resilient to climate change for 2009 – 2015. It seeks to strengthen awareness and build capacity; address specific challenges in water supply, coastal and marine ecosystems and infrastructure, tourism, and health; promote actions to reduce GHG emissions through conservation and greater use of cleaner energy sources; reduce the region's vulnerability to climate change and	Caribbean Community climate change Centre CARICOM

	promote the management of standing forests.	
<b>Energy Use Efficiency Campaign</b> Trinidad & Tobago	A public awareness campaign (using both traditional and new media) to encourage energy-efficient practices by citizens in T&T. The program includes the use of a Toyota Prius hybrid vehicle, to demonstrate the energy savings that can be derived through the use of hybrid and electric vehicle technology.	Ministry of Energy and Energy Affairs (T&T)
<b>Environmental Audits for Sustainable Tourism (EAST)</b> Jamaica	A USAID funded project to introduce environmental management systems into Jamaican hotels with an initial focus on water conservation.	USAID, JHTA
<b>Green Fund</b> Trinidad & Tobago	A grant fund financed by a levy on all businesses in the country, with a current value of around USD 500 million. The original intent was to fund projects by NGOs and associated partners to deliver environmental remediation, reforestation, and conservation outcomes. To date, funding awarded has been about USD 20 million and a review is underway to encourage more productive use of the fund.	Ministry of the Environment and Water Resources, T&T
<b>Green Initiative Barbados: Advancing Barbados as a Green Economy</b> Barbados	An informal public private partnership between the government of Barbados and social and business groups to encourage the adoption of technologies, measures and initiatives that increase the country's green status'	Government of Barbados
<b>Integrated Business Incubation System</b> Trinidad & Tobago	A national initiative to fund the establishment of a network of community and commercial business incubators throughout Trinidad and Tobago. The intent is that the project will run for 5 years ending around 2016. It is still in the early stages of implementation.	Ministry of Labour and Small and Micro Enterprise Development T&T
<b>Integrated Water Resources Management (IWRM)</b> Caribbean	An initiative promoting the coordinated development and management of water, land and related resources, to optimize economic and social welfare without compromising environmental sustainability. Focal areas include community sustainability projects as well as sustainable agriculture.	Global Water Partnership (GWP) – Caribbean Includes many Caribbean state water utilities as partners
<b>International and regional trade agreements</b> CARICOM	The OTN, located in Barbados, is responsible for negotiating trade arrangements that enhance the trading opportunities for Caribbean-based businesses within the context of bilateral and multi-lateral trade agreements, eg: the Economic Partnership Agreement between the EU and the ACP countries.	Office for Trade Negotiations (A CARICOM Agency)
<b>One Caribbean – Tourism</b> Caribbean	A regional public/private partnership body charged with promoting and developing Caribbean tourism. Its support is from government tourism ministries and agencies, private sector groups and tourism sector NGOs. Its goal to 2017 is to be the leader of sustainable tourism development for the region.	Caribbean Tourism Organization (CTO) –a public private partnership
<b>Rainwater Harvesting</b> Trinidad & Tobago	A multi-million dollar project in Trinidad and Tobago to provide more secure and sustainable water supplies by the national water utility to poorly-served or un-served rural communities.	GWP/NIHERST
<b>Renewable energy generation and grid connection in Jamaica</b> Jamaica	The electricity market in Jamaica is in the early stages of being opened up, ultimately to allow independent renewable energy generators to connect to the grid and supply power in competition to the incumbent utility,	Ministry of Science, Technology, Energy and Mining (Jamaica)

	which has monopoly control of power generation and supply.	
<b>Renewable energy generation and grid connection in T&amp;T</b> Trinidad & Tobago	T&T's MEEA is in the process of developing a comprehensive sustainable energy program that will pave the way for the transition to an economy that fully utilizes renewable energy and energy efficiency to provide energy services to its people. The IDB-supported program is in the early stages of development.	Ministry of Energy and Energy Affairs (MEEA)
<b>SME Business Development Support</b> CARICOM	Manages several SME funding programs provided by both the EU's Centre for Development of Enterprise and the Compete Caribbean project (jointly funded by Canada, DFID and the IDB).	Caribbean Export (A CARICOM Agency)
<b>SME development</b> Barbados	The BIDC is state agency charged with assisting the development of selected SMEs through a range of targeted support programs, including a type of business incubation.	The Barbados Investment and Development Corporation

Stakeholders interviewed in the CCIC consultation process indicated that policy frameworks in the Caribbean to encourage climate technology businesses are severely lacking. Small national populations combined with inconsistencies in regulations across the fourteen CARICOM countries covered by the CCIC, is viewed as a major hurdle to the development and growth of viable climate change related businesses. However, the examples provided in the above table demonstrate that both national Caribbean governments and their regional representative body, CARICOM, are beginning to put in place a number of policy frameworks that have a stronger focus on climate change. Within the context of these existing and emerging frameworks, more specific action plans, projects, and initiatives are likely to be implemented, although the pace of such implementation in the region has been slow to date.

The CCIC will need to track such policy developments closely and, where appropriate, coordinate with the relevant government and regional agencies to:

- ↳ Raise awareness among policy makers about the value of private sector involvement in addressing climate change, and any private sector (especially early-stage companies) impacts that may be associated with proposed policies;
- ↳ Create and/or participate in national and regional forums and dialogues to ensure the private sector provides feedback on policy making processes as well as the implementation of specific policies, programs, and initiatives;
- ↳ Advocate for policies and programs that support climate innovation, commercialization, and the market for climate technology adoption;
- ↳ Utilize/channel resources from the above programs to create business opportunities, create market demand for climate enterprises, to prime/facilitate private sector participation and support climate technology innovation;
- ↳ Leverage private sector funding to sustain and multiply the impact of these efforts.

In addition to climate change initiatives, Caribbean governments at the national level, and CARICOM at the regional level, have created a number of mechanisms and agencies to support the development of new ventures, some of which are also listed above. A number of these organizations are relevant to the CCIC's work in The Caribbean and can potentially contribute through collaborative arrangements. The CCIC will work to ensure that the benefits,

resources, and support available from such government entities are captured by climate technology entrepreneurs.

**R&D Institutes and Universities:** Institutes and universities in the region active in climate change research, policy and implementation and adaptation initiatives and activities are listed in the table below. The largest organizations include The University of the West Indies (UWI), the Caribbean Agricultural Research and Development Institute (CARDI) and the Caribbean Institute for Meteorology and Hydrology (CIMH). The region's universities typically also have their own subsidiary specialist institutes, examples of which are included in the list.

Institute / University	Location
The University of The West Indies (UWI)	Jamaica, Trinidad & Tobago, Barbados
University of The Southern Caribbean (USC)	Trinidad & Tobago
St Georges University (SGU)	Grenada
University of Technology (U-Tech)	Jamaica
Northern Caribbean University	Jamaica
College of Science, Technology and Applied Arts T&T (COSTAATT)	Trinidad & Tobago
University of Trinidad and Tobago (UTT)	Trinidad & Tobago
Arthur Lok Jack Graduate School of Business	Trinidad & Tobago
Caribbean Industrial Research Institute (CARIRI)	Trinidad & Tobago
Scientific Research Council (SRC)	Jamaica
National Institute for Higher Education, Science, Research and Technology (NIHERST)	Trinidad & Tobago
The Caribbean Association of Technologists, Technicians, Artisans & Craftsmen (CATTAC)	Trinidad & Tobago
Caribbean Council for Science and Technology (CCST)	Trinidad & Tobago
Caribbean Science Foundation (CSF)	Barbados
Centre for Resource Management and Environmental Studies (CERMES)	Barbados
Caribbean Institute for Meteorology and Hydrology (CIMH)	Barbados
International Centre for Energy and Nuclear Science (ICENS)	Jamaica
National Council for Science and Technology (NCST)	Jamaica
National Council for Science and Technology (NCST)	Barbados
Jamaica Young Scientists' Forum	Jamaica
Caribbean Agricultural Research and Development Institute	Trinidad & Tobago
Institute for Sustainable Development (UWI-Mona)	Jamaica
National Science and Technology Council	Grenada
Windward Islands Research and Educational Foundation (WINDREF)	Grenada



Institute of Applied Science and Technology (IAST), University of Guyana	Guyana
Environmental Research Institute, University of Belize	Belize

Some of the institutions listed are more focused on policy research, such as the National Councils for Science and Technology in Barbados and Jamaica. NIHERST in Trinidad and Tobago also includes national Science and Technology policy development as part of its broader agenda. Specialist staff members at the University of the West Indies tend to be a primary source of advice at both government and regional levels as it pertains to the development of policies related to climate change, resource use, and environmental management.

A specialist Climate Studies Group at UWI Mona, Jamaica, in the Department of Physics, has completed comprehensive studies on the potential impacts of climate change on the region and developed a range of useful scenarios. The UWI Institute for Sustainable Development is also a key body in the region. The Caribbean Institute of Meteorology and Hydrology (CIMH) is a regional organization which has been involved in climate change and adaptation initiatives in collaboration with key international partners.

All universities and institutions listed play an important part in shaping the approach to climate change mitigation and adaptation within the Caribbean region. One of the issues for the CCIC is the vast number of such entities, many of which tend to work in isolation. The Center will need to work with select proactive institutions if it is to contribute towards policy formulation at key national and regional levels. The CCIC can offer practical contributions from the climate tech business sector perspective towards national and regional policy development processes, or provide data and information to support such processes. In the Caribbean in particular, there is a pressing need to selectively integrate a private sector climate technology-focused view early in the policymaking process to ensure that constructive and well-informed policies are developed which advance both economic and social progress.

In terms of research and development, the contributions that different institutions in the region can make range from pure through to applied sciences and technologies. In the latter case institutions such as CARIRI, the SRC, CARDI and the CIMH are of particular note. Such institutes are places where the CCIC can leverage existing infrastructure, laboratories, technological developments and specialist equipment, as well as sources of expertise to assist in the development of CCIC entrepreneurs.

One major concern raised by CCIC stakeholders during the consultation process was the gap between climate change policy development and R&D and its practical application in the commercial world. However, applied research institutions, such as those referenced previously, have experience working in partnerships with private sector businesses to transfer R&D and technologies into value-generating commercial ventures and activities. This is a challenge that the CCIC will need to address, particularly in some of the smaller Caribbean countries, and ensure the Center targets the most promising priority areas.

**NGOs other Civil Society Partnerships:** There are only a few NGOs relevant to the CCIC that have a significant regional base. These include the network of Youth Business Trusts - currently operational in nine Caribbean countries with another seven planned to open in the

region over the next 12 to 24 months.<sup>42</sup> The network is coordinated through a regional 'Centre of Excellence' led by Dr. Marcia Brandon, a leader in business incubation in the region. Other important regional NGOs include the Global Water Partnership; the World Intellectual Property Organization (WIPO) Bureau for Latin America and the Caribbean; and the Caribbean Farmers Network (CAFAN). None of these has a specific climate change focus but it is included in the objectives of each.

The balance of the NGOs are more so nationally-active and most tend to be small, largely voluntary, and have a relatively limited influence, with one or two exceptions, for example, the Toco Foundation in Trinidad and Tobago, the Jamaica Solar Energy Association and the high profile environmental activist group, the Trini Eco-Warriors (with over 14,000 members on Facebook). Carisave, an NGO based in Barbados formed as a partnership initiative between the Caribbean Community Climate Change Centre (CCCCC) and the University of Oxford, is focused exclusively on issues related to climate change and has a number of projects across the region. A number of the national chambers of industry and commerce, and other sector representative bodies, particularly in tourism, are beginning to focus a little more on sustainability and the environment: for example: several years ago, a Green Building Institute was established in Trinidad and Tobago.

There are selected NGOs among those listed in the Caribbean Sector Mapping overview which will certainly prove to be valuable allies and support partners for the CCIC.

*Other infoDev activities in The Caribbean:* infoDev's Entrepreneurship Program for Innovation in the Caribbean (EPIC) includes a number of other activities beyond the establishment of the CCIC, which will work together to provide comprehensive support to entrepreneurs where appropriate. For example, under EPIC a Mobile Innovation Project (MIP) is underway to support entrepreneurship in the mobile space. The MIP aims to nurture these innovative individuals and businesses to bring mobile apps, services and content to the market, and then will support the best growth-oriented start-ups to scale their companies into successful enterprises.

In cases where entrepreneurs are developing mobile apps related to climate technology (such as environmental data collection tools or energy consumption monitoring apps) the opportunity exists to receive coordinated support from both the CCIC and the MIP. Local implementing organizations and partners for EPIC will need to ensure frequent collaboration to better serve entrepreneurs in the region that have technologies or business models that cut across mobile, ICT and climate sectors.

Similarly, EPIC also includes a project to support women entrepreneurs, through the Women Innovators Network in the Caribbean (WINC). Women climate technologists identified through WINC will be connected to the CCIC and the associated regional network, to provide them with the necessary support to scale their enterprise. Likewise, women involved in the CCIC will have the opportunity to participate in activities offered through WINC, such as being part of a network of women entrepreneurs and mentors from the region, including the diaspora.

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<sup>42</sup> Pers. comm. Dr Marcia Brandon, February 26, 2013.

EPIC also includes a component on Innovative Access to Finance, exploring the potential of utilizing online co-investment platforms to match Caribbean entrepreneurs to angel investors in the region and the Caribbean diaspora. The availability of equity financing for enterprises in the Caribbean is extremely limited, both in terms of the amounts readily available, as well as the willingness of investors to take bets on early stage businesses. Local commercial banks are also risk averse and therefore entrepreneurs are often unable to secure loans. Access to finance has been identified as a chronic issue throughout all of EPIC's activities, and new climate technology ventures are no exception. The CCIC will therefore collaborate with the EPIC activities on Access to Finance to ensure that client ventures benefitting from the CCIC's services will also have the opportunity to access the platform being developed under EPIC.

Beyond *infoDev*, the World Bank is also engaging in a number of projects related to private sector development in climate change mitigation and adaptation in the Caribbean. For example, the Jamaica Energy Security and Efficiency Enhancement Project includes a line of credit available for energy efficiency and renewable energy private sector investments through the Development Bank of Jamaica. Financing is available to entrepreneurs developing climate technologies, or to potential end use consumers purchasing technologies from promising startups. There could be linkages between the CCIC and this line of credit to connect entrepreneurs with sources of finance or potential customers.

Another example is the Climate Change Loan Facility being established in St Lucia, which will make loans available to businesses and households to adapt to climate change. This again could provide a source of funds to potential buyers of innovative climate technologies being brought to market using the CCIC services. *infoDev* will continue to explore opportunities for collaboration with other World Bank and donor activities relating to private sector development in climate technologies in the Caribbean, forging synergies where appropriate to benefit entrepreneurs and new ventures.

**International Aid Agencies and Multilaterals:** The table below lists a selection of ongoing or planned programs and initiatives from donors relevant to the CCIC. In recent years international development partners active in the region have programmed significant support specifically for climate change or for related themes such as energy efficiency or disaster management. Many of these initiatives include a component to support the private sector (either directly or indirectly) and these will represent important potential opportunities for the CCIC and its entrepreneurs.

Agency / Program	Description
CREDP-GIZ CARICOM Caribbean Renewable Energy Program (CREDP) - Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)	A joint project of the German GIZ and CARICOM, the current second phase is funded by the GIZ and the Austrian Development Agency with special co-financing from the European Union. The project focuses on renewable energy policy activities and projects, energy efficiency activities including a component on energy standards and labeling, capacity building, information and public awareness activities.

USAID CTI Private Financing Advisory Network (PFAN)	A multi-lateral initiative financed by USAID which has the objective of bringing together clean energy project developers and investors to mitigate climate change. Is intended for larger projects requiring funding of between USD 1 million to USD 50 million
IDB T&T more efficient sustainable and clean energy matrix	A USD 60 million program to improve the policy and regulatory status of the T&T energy sector, to improve the efficiency and rational use of fossil fuels and to facilitate the country's transformation to a sustainable energy economy.
IDB Public Sector Energy Efficiency Improvement Project - Jamaica	A USD 90 million dollar project focusing on improving demand side management, energy efficiency and conservation in public buildings. Lighting and air conditioning are two major focus areas.
IDB / DFID / GVEP International Ideas Energy Innovation Contest (other supporters included GIZ and the Korean Government)	Launched in 2009, this regional energy innovation competition provides grant awards of up to USD 200,000 to assist the development of innovative entrepreneurial business ideas. In 2012 eight awards were made.
DFID Pilot Program on climate change	The Pilot Program on climate change has been allocated around GBP 40 million to develop climate resilience program for Jamaica and five other Caribbean countries.
UNFCCC - Climate Investment Fund	Supports a range of programs throughout the Caribbean: a Clean Technology Fund which finances a shift to using cleaner technologies; the Strategic Climate Fund that aims to support developing countries' efforts to reduce emissions from deforestation and forest degradation by providing scaled-up bridge financing for readiness reforms and public and private investments; The Pilot Program for Climate Resilience which aims to demonstrate ways in which climate risk and resilience may be integrated into core development planning and implementation; and The Program for Scaling-Up Renewable Energy in Low Income Countries.
OAS Caribbean Sustainable Energy Program (CSEP)	Program providing technical assistance for a number of national projects including the development of sustainable energy plans for Dominica and Grenada, the development of draft geothermal resource legislation in St Vincent & the Grenadines, and an electrical interconnection study between St. Kitts & Nevis and Puerto Rico.
USAID - Partners of the Americas Farmer to Farmer Program	Provides technical assistance to local agricultural businesses, producer organizations and agribusinesses in Jamaica, Guyana and Haiti.
CTA, CCST, CIMH, CARDI, CAMI and others – Enhancing climate change and food and nutrition security policies in the Caribbean	A series of initiatives and projects aiming to improve food and nutrition security in the Caribbean within a climate change adaptation context. The project areas include protected cropping and value adding as a tool for improving national food and nutrition security.
GWP – Integrated Water Resources Management (IWRM)	A process which promotes the coordinated development and management of water, land and related resources to optimize economic and social welfare without compromising environmental sustainability. Participating countries include Antigua & Barbuda, The Bahamas, Barbados, Dominica, Grenada, Guyana, Jamaica, St Vincent & the Grenadines and Trinidad & Tobago.
IDB – Caribbean Renewable Energy Centre	Proposed as one of the potential outcomes of the IDB USD 60 million loan facility, and related projects, provided to T&T in 2011.

DFID - Caribbean Renewable Energy and Energy Efficiency Improvement Project	A GBP 4.8 million, 4 year project to support renewable energy and energy efficiency in the Caribbean.
UNDP – Carbon Reduction Emissions and Electrical Power Generation	To develop and elaborate a strategic and policy framework for carbon reduction emissions for the electrical power, industrial and transport sectors in Trinidad and Tobago.
REED+ Norwegian government – Carbon Credits	Norway has committed to pay Guyana USD 250 million from 2010 – 2015 in carbon credits backed by limiting deforestation in Guyana and the pursuit of a Low Carbon Development Strategy. Part of the proceeds will be used as government co-financing, alongside contributions from the IDB and China Development Bank, of a large hydro-electricity project
CDB – Caribbean Technology Consultancy Services	A CDB technical assistance program to support regional private sector capabilities by linking business and technical experts with companies requiring consulting advice and experience. This includes businesses operating in areas related to the CCIC key focus areas.
GVEP International	A UK based non-profit, funded by a wide range of donor sources, which supports the development of small scale renewable energy and energy efficiency businesses in Africa and the Caribbean. Their support includes technical assistance, loan guarantees and they are one of the sponsors of the IDEAS Energy Innovation Contest for the Caribbean.
Compete Caribbean	A private sector development program that provides technical assistance grants and investment funding to support productive development policies, business climate reforms, clustering initiatives and SME development activities in the Caribbean region. The USD 40 million program is jointly funded by the Inter-American Development Bank (IDB), the Canadian Government), and the United Kingdom Department of International Development (DFID) and projects in the OECS countries are implemented in collaboration with the Caribbean Development Bank.
IDB Energy Efficiency Finance Facility	A USD 50 million facility intended to finance investments in energy efficiency and self-supply renewable energy projects in Latin America and the Caribbean. The Facility will be supported by €7 million (USD 8.6 million) from the Nordic Development Fund (NDF) to mitigate risk through the provision of partial guarantees to the IDB-financed sub-loans, which will range in size from USD 500,000 to USD 5 million. An additional €1 million (USD 1.3 million) from the NDF will provide technical assistance grants related to project identification, feasibility and engineering studies.

Given the CCIC will be established as a multi-donor initiative, it will be in an effective position to interface between the donor community and private sector. The CCIC is anticipated to complement donor initiatives in the following manner:

- ✎ Help new ventures and entrepreneurs to tap into the resources offered by a range of donor sources and projects. In many cases this means helping them overcome the final hurdles to become qualified as beneficiaries of donor funding and submit complying applications;
- ✎ Provide data/information on gaps, needs, challenges and opportunities from the climate technology sectors to the donor community – this will provide feedback and insights to donors who are formulating their pipeline projects or reviewing the ongoing implementation of existing projects;

- ✎ Matching funding from donor sources with private sector sources and initiatives to support CCIC entrepreneurs and business ventures.

*Financiers:* Businesses associated with climate technology sectors are a relatively new concept to the traditional financing perspective in the region. To date, the most important financiers for climate technology sectors have been international investors, development banks and business development agencies. With one or two exceptions, the traditional banking sector has generally not been a significant source of capital for establishing such ventures. They have tended to focus on supporting businesses that have proven track records, such as Energy Dynamics in Trinidad and Tobago and Caribbean Water Treatment in Antigua and Barbuda.

The Inter-American Development Bank has a high profile in this regard and their funding for climate technology sector businesses has been provided through two different channels – as a primary financier of approved projects and as a provider of funds to winners of various sector-related regional business competitions and initiatives such as the IDEAS Energy Innovation Contest and the Compete Caribbean initiative.

The Caribbean Development Bank and local development banks such as the Agricultural and Industrial Development Bank in Dominica, the Agricultural Development Bank in Trinidad and Tobago and the EXIM Bank (which is also based in Trinidad and Tobago but operates regionally) operate financing programs for projects that require export financing and those which enhance the development of the agricultural sector. The Development Bank of Jamaica has been charged with playing a lead role in enhancing business incubation and investment into SMEs that have considerable growth potential in that country, but not specifically in the climate technology sector. The OAS and Meister Consulting Group from Boston, USA, have also been investigating the basis for setting up a private sector renewable energy funding group in Jamaica, but this project is still a work in progress.

There are a number of other sources of finance for businesses in a range of sectors, including climate technology, such as Credit Unions (e.g. in Dominica, Jamaica, and Trinidad and Tobago), national business development agencies such as NEDCO in Trinidad and Tobago, and even through some of the region's Youth Business Trusts (which are set up to provide micro-loans to qualified SMEs).

In terms of commercial banks, the situation in the Caribbean varies country by country. For example, in Trinidad and Tobago the state-owned and commercial banks are highly liquid and some, such as Scotiabank and Intercommercial Bank, have developed special lending and support programs for SMEs. Several banks are in discussions regarding becoming key alliance partners in several national T&T Business Incubation projects. In Barbados, the Caribbean Financial Services Corporation has also been examining small business investment opportunities in recent years. In Jamaica, the greatest challenge to new ventures is the high cost of borrowing due to the country's challenging economic circumstances. The Eastern Caribbean countries also have high debt and so lending from most sources tends to be conservative and expensive, unless facilitated by regional or international multilateral sources.

The CCIC will be in a position to encourage greater participation and investment from commercial banks and development banks by aiding the Center's beneficiaries to access appropriate financial services.

As noted previously, there are programs (such as PFAN) available in the Caribbean to support investment in clean energy projects, but those investments would typically be larger than those needed by CCIC-backed businesses. This financing gap can potentially be addressed by private equity from individuals and groups interested in investing in innovative and future-focused businesses, provided that the appropriate support infrastructure and risk management frameworks are in place. Outside of Trinidad and Tobago, one of the biggest concerns of private investors is the uncertain economic state of many of the Caribbean economies. Many investors in such countries are therefore looking for more secure investments outside the region. Notwithstanding such concerns, if the right investment opportunities and support models are in place, there are a number of possible private equity investment channels, which include:

- ✧ Samdor Services – a private investment fund management group that has expressed an interest in examining business investment opportunities emerging from business incubation programs in the region;
- ✧ The Enterprise Hub – a business development group led by a former employee of the T&T-based NEDCO which has access to investors interested in investing in SMEs
- ✧ Keystone Augusta – an equity investment group based in the USA but managed by a high-profile, successful Jamaican businessman. This group has expressed an interest in investing in Caribbean businesses with good potential provided certain criteria are met;
- ✧ Cave Shepherd – a successful family business group in Barbados which has expressed an interest in new businesses, including clean-tech;
- ✧ Natural Gas Company – a large state corporation in Trinidad and Tobago which has expressed an interest in investing into high potential new businesses that will help diversify the T&T economy;
- ✧ A T&T private investor group – successful business persons who are looking for new innovative equity investment opportunities with a particular emphasis on agriculture;

In addition to the above potential private sector funding sources, moves are underway to set up a unit trust investment fund in Trinidad and Tobago that will focus solely on emerging businesses. The initiative is being driven by the ex-CEO of a major international banking group based in T&T.

The *infoDev* team has met informally with a number of the above investors to discuss their interest in becoming involved as equity participants in businesses that are supported by business incubation initiatives, including the CCIC. The funds that such investors are prepared to invest are likely to provide follow-on rather than start-up financing in most instances. However, there may also be a possibility for private sector co-investment into CCIC ventures if the prospects are attractive.

The CCIC can present deal flows to these individual investors and equity funds in a more effectively risk-managed and informed way than has traditionally been the case. Provided that normal investor conditions and expectations are met, it is envisaged that funding of CCIC supported businesses will be through a combination of traditional commercial banking channels, development banks and donor funded programs, complemented by venture capital,

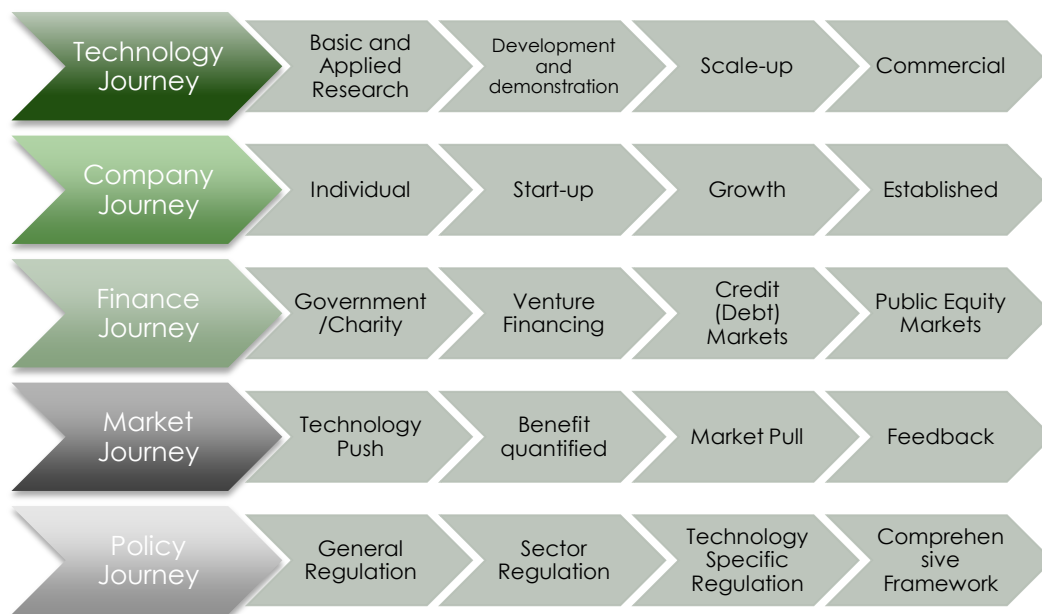
angel investors, and potentially innovative funding options such as the emergent crowdfunding investment industry.



## 4.0 Climate Innovation Analysis: Caribbean

### 4.1 Gaps along the Value Chain

The Caribbean countries must progress through five core areas<sup>43</sup> in order to successfully develop and deploy local innovation:



#### Five core areas of innovation development where gaps were

- ✎ **Technology:** Supporting local and adapted technology and business model innovation.
- ✎ **Company:** Building existing private sector capacity and creating a pipeline of high-impact new ventures.
- ✎ **Finance:** Facilitating access to flexible sources of finance for product development and early company growth.
- ✎ **Market:** Creating new and expanding local, regional, and global markets.
- ✎ **Policy:** Informing, inter-linking and influencing innovative policy mechanisms at both national and regional levels.

Over a 6-month process, *infoDev* engaged with over 150 climate technology stakeholders throughout the Caribbean region to identify the gaps in each core area that hinders climate and clean energy technology innovation. Participants at three workshops held in Trinidad & Tobago, Barbados and Jamaica were divided into working groups, where they identified the relevant gaps in each of the above five core areas, then proposed solutions to these challenges. Based on the outcomes of the workshops, and to better quantify stakeholder feedback, an online survey was used to collect a number of data points. *infoDev* received a 50% response rate to the survey which was completed by over 70 stakeholders.

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<sup>43</sup> Adapted by *infoDev*: Carbon Trust

For each of the five core areas (technology, company growth/ entrepreneurship, access to finance, market transformation and policy), the survey listed the main gaps discussed in the workshops and asked respondents to prioritize each gap.



Programs and services of the CCIC are formulated as solutions to stakeholder's needs.

Their responses enabled the CCIC team to develop some empirical measures relating to the importance of issues associated with specific innovation challenges.<sup>44</sup>

Reviewing workshop outcomes, survey data, and follow-on interview materials led to the development of a comprehensive overview of the interventions needed in the Caribbean, which translated into the design of CCIC activities, programs, and services. The case study examples included in this business plan have been derived from several sources, including studies undertaken by members of the project team over recent years complemented by input from individual entrepreneurs in specific cases.

#### 4.2 Technology Gaps: Supporting local and adapted technology and business model innovation

The largest perceived barrier to the development of suitable climate technologies in the Caribbean is the lack of a formal system to support moving from ideas through to commercial implementation. 92% of survey respondents affirmed this, with over half strongly agreeing that this was a major issue. A lack of regional information for designing technology products and solutions was also seen as a major hurdle by 85% of those surveyed (with about 30% strongly agreeing) as were poor links between Caribbean university researchers and the private sector. 82% rated this as a major issue with over 40% of the total strongly agreeing. The other two significant gaps related to technology training and capacity building as well as a lack of in-country technical expertise.

Gaps	% Agree	Needs
Lack of a formal system to support moving from ideas to implementation	92%	Improved structures for R&D commercialization
Lack of regional data to use toward the design of clean tech products and services	85%	Centralized market information for the region that is easily accessible
Poor links between Caribbean universities (research) and industry	82%	Linkages, through programs, between educational institutions with the private sector

<sup>44</sup> The tables in Sections 4.2-4.6 rank these gaps by the total percentage of respondents who answered "Agree" and "Strongly Agree". For more detailed survey results, see Annex 3

Technology training not up to date to build necessary capacity	69%	Support from governments, private sector and research institutions.
Lack of in-country technical knowledge and expertise	52%	Investment in training, professional development and accreditation

## Case Study: Technology Gap

### Jervis Rowe: Jamaica

Jervis Rowe leads a consulting group involved in developing protected cropping systems and agricultural investment packages in Jamaica. The economics of such protected production systems are very attractive with grower returns as much as 1200% higher per unit area compared to field production. For example, research by Dr Janet Lawrence of CARDI, in conjunction with commercial growers in Jamaica, has shown tomato productivity can increase as much as 1000% over open field production using relatively simple protected cropping structures. In addition to higher yields, other benefits include; total pest exclusion (removing the need to use pesticides); improved disease management (through ICT-managed environmental control); and far more efficient use of resources.

The technology issue is the need is to develop commercially viable 'cool houses', rather than 'hot houses', that provide an optimum protected growing environment for crops in tropical Caribbean climates. A breakthrough in cool-house protected growing environments would enhance national food and nutrition security, increase resource use efficiency, reduce food imports and provide sustainable financial returns to both growers and investors.

### 4.3 Company Gaps: *Building existing private sector capacity and creating a pipeline of high-impact new ventures*

The greatest constraint for developing CCIC businesses is one which is common throughout the region in almost every area – a lack of collaborative networks. 89% of those surveyed rated this as a major issue with over 40% of those strongly agreeing. Trailing slightly was the view that both individuals and businesses have a poor understanding of the value of climate technology related products and services. 84% of those surveyed rated this highly with 45% strongly agreeing. Other gaps considered to be constraints included access to information (as was the case in the previous section) and the limited availability of advice and expertise. Just under half of the survey respondents felt that finding skilled labor and experienced people was a significant gap that needs addressing.

Gaps	% Agree	Needs
Lack of access to a network of supportive collaborators (mentors, investors, joint venture partners etc.)	89%	Educational and training programs to change regional networking mindset. Mentorship networks and relationship

Individuals and businesses have a poor understanding of the value of climate technology goods and services	84%	Training and education (including philosophies) Initiatives informed by consultants and customized to local situations
Limited access to market and sector trends, new technology information and partnership opportunities	78%	Access to market research being done along with a database repository of information
Limited availability of advice and expertise on business development, accessing financing and intellectual property rights laws	76%	Provide comprehensive training at all levels including entrepreneurship and information sourcing. Case studies and Caribbean success stories Legal advice (on IP) Business valuation and investment training
Difficulty in finding skilled and experienced people	49%	Scholarships, sponsorship, mentoring and internships Comprehensive training at all levels using the appropriate content

## Case Study: Company Growth & Entrepreneurship Gap

### Energy Dynamics – Trinidad & Tobago: Founded 2002

Energy Dynamics has achieved a great deal of success in the fields of energy solutions, energy efficiency enhancement and renewable energy. They believe that Combined Cooling Heating & Power (CCHP) technology has the potential to offer substantial savings in the Caribbean by increasing the energy efficiency conversion rates of generation systems from 30 – 40% to 85% . However, the company requires significant capital in order to be able to set up a pilot project that demonstrates the benefits of CCHP installations in the Caribbean and the level of savings and return on investment that would attract customers. They estimate an initial USD 250,000 – 500,000 would generate an additional USD 1 million of revenue annually. They also require a better source of skilled practitioners. To date they have had to invest heavily in staff expertise training and capacity building, because the majority of graduates from institutions in the region are not being equipped with international leading edge technical knowledge.

### 4.4 Finance Gaps: *Facilitating access to flexible sources of finance for product development and early company growth*

Almost all (94%) of the stakeholders surveyed agree that the major finance gap in the region relates to the issue of collateral and guarantees – more than two thirds of those strongly agreed that this was a major issue. 92% also pointed out that access to working capital is also a real problem for Caribbean businesses, over 40% strongly agreeing this is the case. The majority also strongly agreed that financial institutions in the region lack expertise in evaluating climate tech projects (89% with well over half strongly agreeing) and are risk averse (88% with two thirds strongly agreeing). Two other gaps that also were seen to be of significant importance include a lack of equity investors in the Caribbean and entrepreneurs not being well-versed in pitching their propositions to potential investors.

Gaps	% Agree	Needs
Lack of access to seed capital	94%	Access to grant financing followed by loans.
Lack of working capital for business operations	92%	Facilitation of access to mentorship and financing opportunities with larger established companies
Financial institutions lack technical expertise and knowledge for evaluating climate technology projects	89%	Facilitation of bank financing through the use of an independent expert to work with financial institutions
Risk aversion for the financing of early-stage technology ventures	88%	Risk assessment, controlled exposure, and business development support infrastructure
Scarcity of equity for investors in the Caribbean	79%	Additional support institutions for clean tech projects in the Caribbean through the development of a non-profit or Green Fund that offers grants and other financing options
Entrepreneurs and innovators not versed in pitching to potential investors	77%	Provision of a suite of training modules to build capacity in pitching. Development of business support and incubation services. Skills development for entrepreneurs in market identification and research

In terms of the magnitude of funding gaps, 55% of the survey respondents identified the USD 50 to 250,000 funding gap range to be most critical and the same percentage also identified the USD 250 to 750,000 range as being critical. So the most critical funding gap spans a range from a relatively modest USD 50,000 up to a more substantial USD 750,000.

## Case Study: Finance Gap

### Atom Energy - Barbados: Founded 1998

Founder of Atom Energy, Erwin Edwards, is a dynamic businessman who has worked hard to develop a niche in the renewable energy and energy efficiency market. He has plans to supply a specialist energy rating and solutions delivery service, particularly for larger commercial and institutional clients and commercial properties. However, because he has had to reinvest much of the revenue he has earned into developing the business outside his home country of Barbados, a market which is too small to sustain his business on its own (offshore business now generates 90% of his revenues), he does not have the financial resources to invest in the final development of the energy rating service which he believes he can sell regionally and internationally based upon his market research. It is estimated that a 300% gross return on the initial seed investment of several hundred thousand USD could be realized within several years if funding was accessible.

## 4.5 Market Gaps: *Creating new and expanding local, regional, and global markets*

Eighty five percent of those surveyed agreed (40% strongly agreed) that the prices of climate and clean energy technologies in the Caribbean region were too high, especially for lower

income earners, and this was a significant market constraint. Another important issue was a lack of consumer awareness about clean tech products and services with 81% of those surveyed agreeing it was a major gap. A further significant issue was the small size of individual national markets and the associated challenges this creates when scaling up businesses. This is exacerbated by the lack of progress towards a single Caribbean market.<sup>45</sup> Seventy one percent also felt that a lack of quality and performance standards in the region leads to consumer distrust. Cost and market size are two major issues that both the CCIC and new entrepreneurial businesses will need to address in a proactive and innovative way.

Gaps	% Agree	Needs
The price of climate technologies is high, especially for low income users	85%	Fiscal and financial/monetary incentives Market segmentation
Lack of consumer awareness, information and knowledge of products and services	81%	New media to raise awareness National awareness programs, school competitions, and demonstration projects
Individual country markets too small to develop scale and not enough being done to consolidate them	76%	Enhancement of technology transfer A new mechanism for improving the ease of doing business (regionally)
Lack of quality and performance standards creates uncertainty and a lack of trust	71%	Adoption and enforcement of labeling standards and systems (e.g.: Energy Star, EnergyGuide labels) Independent product testing entities
Lack of trained personnel to sell, deliver and install products and services	55%	Training and employee development opportunities Training and capacity building

## Case Study: Market Gap

### Smart Energy – Trinidad and Tobago: Began trading in 2008

Smart Energy is a renewable energy and energy efficiency company based in Trinidad & Tobago. The venture was registered in 2008 by Ian Smart, a T&T based entrepreneur. The venture specializes in the provision of solar power for homes and commercial buildings. Smart Energy also offers cost saving energy audits for commercial buildings, renewable energy consulting and training.

One of the major obstacles for Smart Energy is positioning renewable energy solutions in a country that provides cheap subsidized energy sources. In addition there exist regulatory constraints, such as the lack of renewable energy wiring standards, which are currently being formulated. An additional obstacle is growing and marketing the business outside of T&T to the Caribbean and beyond.

<sup>45</sup> The CARICOM heads of government first proposed the establishment of the CARICOM Single Market Economy (CSME) in 1989. Twenty-three years later, it has not been established, as noted by Stoneman et al, 2012.

## 4.6 Policy Gaps: Informing, inter-linking and influencing innovative policy mechanisms at both national and regional levels

Stakeholder feedback revealed that limited and uncoordinated policy development in the Caribbean inhibits the creation and adoption of new technologies and businesses. There are issues at both the national and regional levels within and between government agencies as well as regional bodies such as CARICOM. There exists a lack of progress in developing common regional clean tech policies, resulting in regional market access barriers, which is an impediment to the growth and expansion of many entrepreneurial and innovative businesses. There is a need to engage, at both the national and regional levels, with climate industry practitioners and the international community in order to develop a policy framework favorable to innovation and entrepreneurial business development.

Another significant issue is the monopoly power of the utility companies in the Caribbean countries, which often works to constrain the transition to clean tech energy sources. Surprisingly, only about half of those surveyed rated intellectual property and patent protection as being a significant gap that needs addressing. It should be noted that the CCIC will have a limited ability to influence a number of key national and regional policy gaps. Its main contribution will be to act in an advisory role and as a champion where appropriate, for the development of climate technology sectors in the region.

Gaps	% Agree	Needs
Limited coordination across ministries within the government on climate technologies. Difficult for entrepreneurs to navigate	89%	Cross governing bodies (including private, public, government and societal stakeholders)
Government policies and incentives not rationalized to grow the markets for climate tech goods and services	85%	Short, medium and long-term policy reviews needed. Cross-sectional consumer approach needed
Lack of a regional clean-tech policy	81%	CDB and CARICOM to help with the harmonization of policies.
Government policy favors large incumbents (utility companies) in the climate tech sector	77%	An entity/individual to keep 'pertinent issues' on the front burner. The State should take a lead in creating the environment for public private partnerships
Limited support for intellectual property rights and patents	52%	Tax incentives and a resource center to support climate change innovators with regard to IP rights and patents

## Case Study: Policy Gap

### **Grenada Solar Ltd: Founded 2005**

Grenada Solar (Grensol) pioneered the introduction of photovoltaic systems into the island of Grenada. After establishing a significant local presence, they have recently faced challenges relating to the interconnection arrangement with the local utility company GRENLEC (which is a privately-owned company since 1994). The utility in 2012 changed the interconnection arrangement from a net metering arrangement (which pays the retail value for each surplus kWh of electricity consumed or produced) to a net billing arrangement (which pays the PV producer less than the retail value of the kWh). This, Grensol contends, has reduced the financial incentive for potential customers to invest in self-generation and therefore has affected their market prospects. This example highlights that one of the greatest challenges for renewable energy businesses in the Caribbean region is the lack of well-developed regulatory frameworks and often a lack of commitment to national renewable energy strategies that will drive the transition from carbon-intensive to clean energy sources.



## 5.0 Climate Innovation Center Model

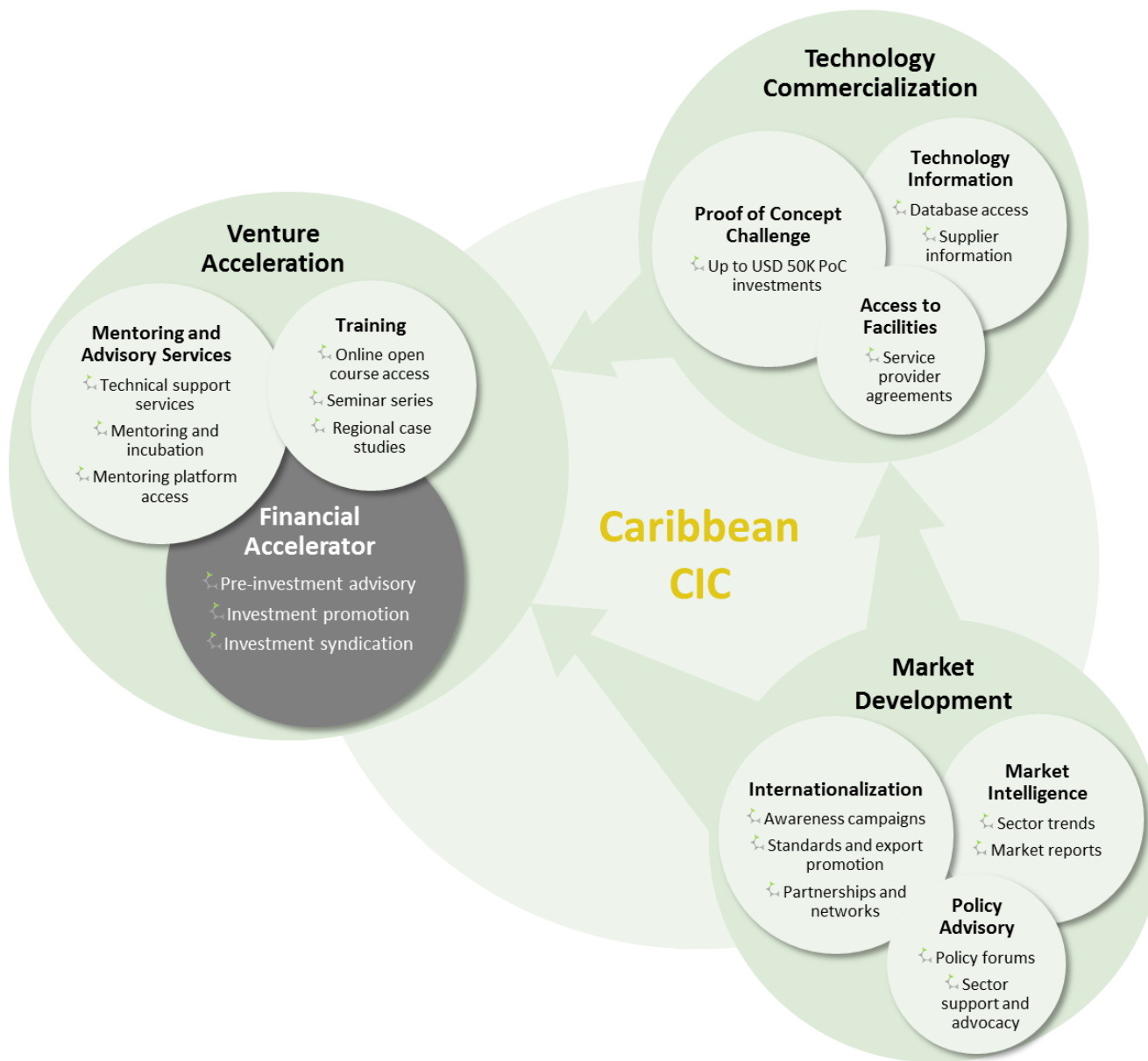
### 5.1 Overview of CIC services

The custom-designed CIC model for the Caribbean is based on the gaps and challenges identified through the stakeholder engagement process. The model was developed in collaboration with local stakeholders to specifically address the identified gaps across the five priority sectors through the following initiatives:

- ✦ Building a pipeline of high-impact new ventures through the provision of Proof of Concept funding to test the commercial viability of select climate solutions.
- ✦ Support the iterative testing and prototyping of these solutions through access to technical facilities and technology information.
- ✦ Accelerating access to early growth-stage capital to local climate technology companies through the provision of targeted pre-investment advisory services and investment facilitation and syndication, including via online platforms.
- ✦ Supporting the accelerated growth of climate-tech businesses and entrepreneurial capacity through providing technology-enabled business development services, networking, mentoring and training programs.
- ✦ Identifying and developing local, regional and international market opportunities for innovative climate solutions through the provision of needed sectoral and market information.
- ✦ Influencing and advocating for policy coordination and change through creating better dialogue and linkages between the public and private sectors.
- ✦ Promoting internationalization opportunities of supported projects and companies through creating and managing a network of regional and international partners, raising awareness and facilitating trade and export opportunities.

The CCIC model has been developed in consideration of the above objectives and aligned with areas of need. The vision for the CCIC is to provide a holistic range of programs and support services that ensure local challenges to climate innovation are addressed, while also coordinating and leveraging related activities in The Caribbean at the regional and international levels.

Based on these objectives, the model for the CCIC is built around three main components, each of which will support the delivery of various programs that stakeholders have identified as being essential for successfully developing climate-tech businesses. The model diagram below illustrates the core activities and business lines.



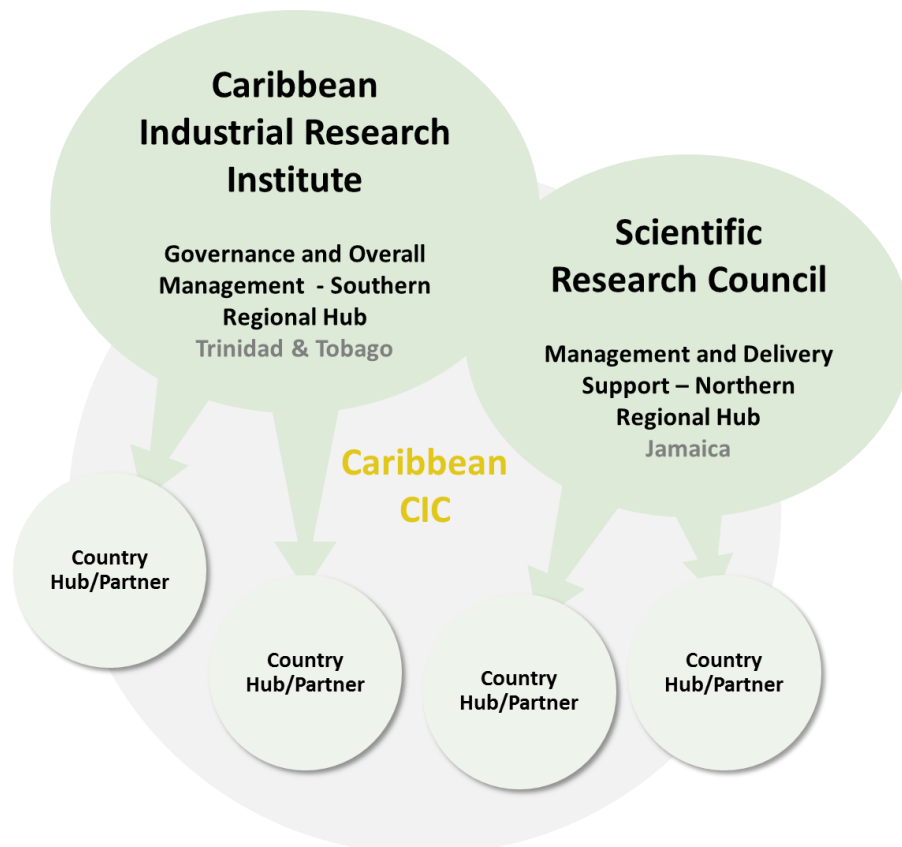
CCIC Model

## 5.2 Local implementing host institutions

Given the CCIC will serve 14 CARICOM countries, developing the overarching regional model sufficient to deliver the program has required considerable research, assessment and selection of groups well placed to operationalize the project. *infoDev* has selected a consortium of two partners to work together to host and establish the CCIC. The selection process followed World Bank selection guidelines, comprising a request for expressions of interest, shortlisting of candidate organizations, and a request for technical proposals. A review team interviewed the shortlisted organizations following the submission of their proposals. The review team selected the Caribbean Industrial and Research Institute (CARIRI) based in Trinidad and the Scientific Research Council based in Jamaica as the implementing host institutions, who submitted a joint proposal.

SRC and CARIRI were selected based on their track record in supporting technology innovation and entrepreneurs, as well as their proposed methodology for delivering the services of the CCIC. Both organizations were considered best positioned to lead and manage the CCIC in a consortium arrangement, drawing on local partners or 'hub coordinators' in the region; SRC will act as a hub for countries in the North of the Caribbean, and CARIRI will do the same in the south. CARIRI has experience in supporting new ventures through its idea 2 innovation Competition, and partnerships with the Caribbean Development Bank to deliver their Caribbean Technology Consulting Services (CTCS). They are also establishing a Center for Enterprise Development as an incubator for technology ventures. SRC supports enterprises by collating market information through its subsidiary Marketech Ltd, and hosts the Caribbean Energy Information System (EIS), a regional information service with eighteen member countries, providing databases and resources relating to energy resources, production, pricing, and market intelligence.

This regional model drawing on coordination hubs contrasts with other CICs being established in single country environments such as in Kenya, Ethiopia and Vietnam where activities are concentrated in one or two cities. A simple overview of the delivery method envisaged for ensuring effective regionalization of the CCIC programs is shown below.



An overview of the proposed CCIC delivery model

The key considerations that led to the development of this delivery method include:

- ✧ The need to have a good geographic spread across CARICOM countries. Through engaging several competent partners located in strategic geographic locations, physical coverage can be assured. Entrepreneurs in the remaining countries will be connected virtually with the CCIC and its network using modern IT and social media platforms.
- ✧ The requirement to address areas that are specific to the Caribbean and the complexities that prevail within the region.
- ✧ The benefit of having partners that understand both the technical and business aspects of the prioritized sectors as they pertain to the local context, culture and environment.
- ✧ The need to have experienced partners with excellent local networks to play key roles in deal identification and the provision of business development services.
- ✧ The necessity to avoid duplication of existing activities through establishing new entities or organizations without leveraging existing resources.
- ✧ The need to function cost efficiently using a combination of in-house and outsourced resources and facility sharing arrangements that ensure the program has the greatest potential to become largely sustainable in the long-term.

### 5.3 Program Tracks












The following section provides further details relating to the programs within each of the three components in the CCIC model. For each of the components an outline of the specific

activities, their functions and the needs they address (as identified in Chapter 4 of the business plan) is provided.

### 5.3.1 Component 1: Technology Commercialization

Program	Activity	Needs Addressed
<b>Proof of Concept</b>	<b>Proof of Concept Challenge</b> (USD 20K - 50K): A competitive process to allocate grant funding for researchers, entrepreneurs and/or new projects within existing organizations, to assist the localization, commercialization, and transfer of technologies for local and regional markets. Such funding is delivered upon the achievement of milestones. Uses include prototype development, product design, demonstration and field testing, measurement, market research, business formation, and related activities.	<ul style="list-style-type: none"> <li>✦ Lack of a formal system to support moving of ideas to implementation.</li> <li>✦ High risk proof of concept testing and market buy-in funding support.</li> <li>✦ Access to commercialization grants to pilot new technologies.</li> <li>✦ Support for collaborative innovation technologies and approaches.</li> </ul>
<b>Technology Information</b>	<p><b>Technology Database:</b> Facilitate access to databases and repositories of information that provide a source of intelligence about current and emerging climate technologies.</p> <p><b>Supplier Information:</b> Access to information on suppliers of technology components, materials and equipment as well as any intellectual property information pertinent to the region.</p>	<ul style="list-style-type: none"> <li>✦ Improved access to comprehensive technology knowledge databases and best practice</li> <li>✦ The need for 'one-stop-shop' point of access to information and contact details of suppliers of climate-tech products and services with special emphasis on those within the Caribbean region.</li> <li>✦ To be able to readily assess the IP status of various climate-tech products and services being developed or available within the region.</li> </ul>
<b>Access to Facilities</b>	<p><b>Service Provider Agreements:</b> Partner with existing facility providers to ensure access to:</p> <ul style="list-style-type: none"> <li>✦ Equipment/suitable environments for technology testing and prototyping.</li> <li>✦ Facilities for first-run production and small-scale manufacturing.</li> <li>✦ Other facility-based support services required by CCIC businesses.</li> </ul>	<ul style="list-style-type: none"> <li>✦ Prototype development, manufacture and testing support systems and facilities.</li> <li>✦ Standards compliance and marketability testing.</li> <li>✦ Environmental impact assessment.</li> <li>✦ Concept development and testing (services).</li> </ul>

### 5.3.2. Component 2: Market Development









Program	Activity	Needs Addressed
<b>Market Intelligence</b>	<p><b>Sector trends and market reports:</b> Conduct, facilitate and contract specialist market research, analytical services and reports relating to specific climate tech sectors and detailed information and data relating to local, regional and global niche market trends and opportunities. The CCIC will also produce and release updates about the lessons learned from other CIC beneficiaries and share their knowledge and experiences with the broader network, including Caribbean 'Success Stories'.</p>	<ul style="list-style-type: none"> <li> Original Caribbean-specific market research.</li> <li> Marketing knowledge and information sharing on par with global best practice.</li> <li> Creating an awareness of the cost benefits of climate-tech products and solutions</li> <li> Support for the development of international market opportunities.</li> </ul>
	<p><b>Awareness Campaigns:</b> Promote the climate tech sector to the widest possible range of stakeholders, including potential end customers. Collaborate with key representative groups and networks to market and communicate CCIC initiatives and broader innovation activities (including the EPIC program) in the Caribbean to encourage greater public awareness and wider stakeholder understanding.</p> <p><b>Standards and Export Promotion:</b> Promote standards for products and services developed, manufactured and assembled in the Caribbean for sale nationally, regionally and internationally. Support understanding of appropriate quality standards to ensure confidence in purchasing 'home grown' versus imported products and services. This requires collaboration with institutions in the region that have responsibilities in these areas.</p> <p><b>Partnerships and Networks:</b> Facilitate and support a range of key partnerships and networks at the local, international and regional level that will maximize the marketing opportunities for the CCIC businesses and affiliates. The Caribbean private sector, including climate and clean energy sectors, is not well connected regionally and internationally. A key focus will be developing local, regional and international relationships that support technology transfer and the development of market opportunities for mutual benefit. This requires the building and facilitation of strong and diverse networks that leverage existing channels.</p>	<ul style="list-style-type: none"> <li> Information on and promotion of climate tech sector market advances with a strong Caribbean relevance.</li> <li> Greater public/stakeholder awareness/interest.</li> <li> Greater collaboration between the government, private sector, institutional sector and regional and international community to encourage commercialization and exports.</li> <li> The adoption of internationally recognized product and service standards to engender customer confidence.</li> <li> Independent accredited testing agencies need to be available to certify regional products and services.</li> <li> Participation in global networks – both real and virtual - in the Caribbean is not highly developed and needs strengthening.</li> <li> Leverage and enhance existing regional networks.</li> </ul>

<p><b>Internationalization</b></p>		<ul style="list-style-type: none"> <li>✦ Greater collaboration throughout the Caribbean region in areas such as standards, legal requirements, import/export requirements, and technology and information transfer as individual country markets are too small to support the development of many innovative tech-based entrepreneurial businesses.</li> <li>✦ Closer linkages between educational institutions, business development agencies and entrepreneurs.</li> </ul>
<p><b>Policy Advisory</b></p>	<p><b>Policy Forums and Advisory:</b> Participate, organize and sponsor regional policy forums and also act in an advisory capacity to key public and private sector stakeholders. Contribute towards dialogue and policy developments that have implications for CCIC supported businesses and affiliates. Such participation will include policy issues related to a number of areas including innovation, R&amp;D, intellectual property rights, private sector development, taxation, environmental, and export policy, with a particular emphasis on regional policy harmonization.</p> <p><b>Sector Support and Advocacy:</b> Promote, and support the climate technology sector as a green growth opportunity for countries in the Caribbean, and advocate for greater support from both government and regional policy-making and implementing agencies. Connect with, support and sponsor business development agencies, educational institutes and schools, private sector interest groups, and consumer groups in the region.</p>	<ul style="list-style-type: none"> <li>✦ There is a need to provide a channel for dialogue between innovators, SMEs and government Ministries and Agencies and align all policy initiatives in one direction.</li> <li>✦ There is a need to support the rationalization of policies and incentives across the region and grow climate-tech markets as there is currently no one Caribbean regional market.</li> <li>✦ There is a need for a new mechanism that improves the ease of doing business regionally as every Caribbean country has different policy positions and interpretations.</li> <li>✦ Keep the relevant pertinent issues on the front burner so that they are not put to one side.</li> <li>✦ Caribbean countries need to pursue policies that encourage a broader-based and fairer market opportunity development approach.</li> </ul>

### 5.3.3 Component 3: Venture Acceleration

Program	Activity	Needs Addressed
<b>Training</b>	<p><b>Online Open Access Courses:</b> Provide access to online open access training and educational programs that enhance the skills and capabilities of Caribbean entrepreneurs who have a desire to develop businesses in the climate technology sector.</p> <p><b>Seminar Series (incl. webinars):</b> Deliver customized seminars and training sessions relating to various aspects of climate technologies that are delivered to CCIC businesses and affiliates both physically and virtually. Provide access to seminars conducted or hosted by other network partners</p> <p><b>Caribbean Success Story Case Studies:</b> Compile collection of Caribbean national and regional climate tech business success stories that can be accessed and updated electronically. These will provide a reference source that has high relevance for regional training and entrepreneur support programs.</p>	<ul style="list-style-type: none"> <li>✦ To align and deliver academic and tertiary institutional educational and outreach programs more closely with the needs of a modern climate-tech sector.</li> <li>✦ Cost-effective access to specialist learning and training in diverse geographic locations on both an on-demand or program basis.</li> <li>✦ Knowing how Caribbean entrepreneurs have developed successful climate-tech businesses in the region and the way they did it instead of learning from 'irrelevant' imported examples.</li> <li>✦ Encouraging greater collaboration and interactive learning, networking and business development.</li> </ul>
<b>Mentoring and Advisory Services</b>	<p><b>Technical Support Services:</b> Provide access to the services of persons and firms with specialist technical advisory skills in areas needed to support the development of CCIC program participants.</p> <ul style="list-style-type: none"> <li>✦ <b>Mentoring and Incubation:</b> Provide business mentoring and incubation support - both in-house and outsourced – to assist with pre-company formation, professionalization and venture acceleration.</li> <li>✦ <b>Mentoring Platform Access:</b> Provide access to a range of integrated services for entrepreneurs, including mentoring via a web-hosted platform to ensure that business support services and processes are time-efficient, cost-effective and available across the region.</li> </ul>	<ul style="list-style-type: none"> <li>✦ The provision of customized technical support for local and regional entrepreneurs delivered by specialists who have a good empathy with and understanding of the region and its complexities.</li> <li>✦ To address the limited availability of advice and expertise on business development, accessing finance, and IP laws.</li> <li>✦ To put in place a comprehensive business incubation ecosystem and support infrastructure that supports the entire business development process from proof of concept through to business acceleration.</li> <li>✦ To improve the global connectedness of Caribbean-based entrepreneurs and businesses and</li> </ul>



		<p>the quality of mentoring support, skills and capacity building available to support successful business development.</p>
<p><b>Financial Accelerator</b></p>	<p><b>Pre-Investment Advisory Role:</b> Assist early growth-stage CCIC businesses (those past PoC funding stages), to become 'investor ready' and prepared to pitch to potential investors, banks and other financial institutions.</p> <p><b>Investment Promotion:</b> Provide a well-managed and facilitated interface that promotes and supports the connection of investors with CCIC investment opportunities in a credible, secure and risk-managed way. This include connecting with and growing local/regional investor networks as well as relationships with high-net-worth individuals, angel investors and existing fund providers, including traditional institutions, to secure co-investment and participate in follow-on financing rounds. This includes hiring of executives-in-residence, angel investors or investment promoters to work directly with CCIC beneficiaries over a significant period of time to secure large amounts of investment (USD 250K up to USD 750K or even higher thresholds of USD3M depending on company size)</p> <p><b>Investment Syndication:</b> Develop a formal alliance with a number innovative and regionally appropriate investment matching platforms and/or partners (for example, crowdfunding or similar online investment platforms). Such platforms will also offer a formal way for many potential individual Caribbean investors to fund CCIC beneficiary companies in a managed and transparent way.</p>	<ul style="list-style-type: none"> <li> Entrepreneurs lack experience in developing investment propositions and pitching them to potential investors.</li> <li> A lack of collateral and guarantors as well as working capital.</li> <li> Facilitation of bank and institutional financing through the provision of appropriate advice and guarantees as well as improved risk management.</li> <li> Stronger connections and expansion of the investment ecosystem (academic, business, government, social private sectors) nationally, regionally and internationally.</li> <li> An enhanced ability to compete for global green growth financing.</li> <li> Providing a formal channel for connecting potential investors 'anywhere anytime' with potential investment opportunities in the Caribbean through a credible and well managed platform.</li> <li> An integrated approach to identifying and accessing both seed capital and acceleration funding from a range of international, regional and national donor agencies, development banks, youth business trusts, business development agencies, NGOs and private sources.</li> <li> Targeted finance instruments are required, in particular for business acceleration.</li> </ul>

# 6.0 Operational Plan

## 6.1 CIC Implementation

To ensure sustainability and the development of local capacity, *infoDev* will partner with local organizations to implement the activities of the CCIC and serve as the host or secretariat for the Center. Prior to full scale-up of the CCIC's services and programs, *infoDev* will begin identifying partners to work to establish the CCIC's network. In a geographically fragmented area such as the Caribbean, it is critical to ensure that the CCIC is established on the foundation of a strong network of partners, experts, institutions and entrepreneurs. It is also important that this network is supported by an appropriate governance and institutional framework, ICT infrastructure, web-enabled services and other capacity building programs. As such, *infoDev* will pursue a two phased approach which will include: 1) establishment of the Climate Innovation Center's regional network to serve as a platform for the CCIC, and 2) operationalize and scale the core services of the CCIC as defined in this business plan. Partner institutions currently identified have been competitively selected according to World Bank processes.

## 6.2 Launch Phase – Year 1

The objective of the first phase is to establish the required infrastructure, partnerships, skills, facilities and pipeline of entrepreneurs and technologies that form a foundation for the CCIC's full implementation and scale up in the second phase. Activities in the launch phase to be funded under Phase 1 include:

- ✦ Selection of a host organization/s as secretariat for the CCIC including setting up of appropriate office space, networking, meeting space, IT infrastructure and conferencing facilities.
- ✦ Identification, selection and funding of partners (organizations and individuals) in various CARICOM countries that will form part of the CCIC's network and serve as focal points across the region to identify deal-flow (researchers, technologists, entrepreneurs, companies), link beneficiaries with relevant service providers (mentors, professional service firms, etc.), and facilitate partnerships (linkages with universities government, donors, private sector other initiatives).
- ✦ Expansion of the infrastructure, resources and skills of the above regional partners over 12 months to ensure the CCIC has sufficient network capacity to scale core programs

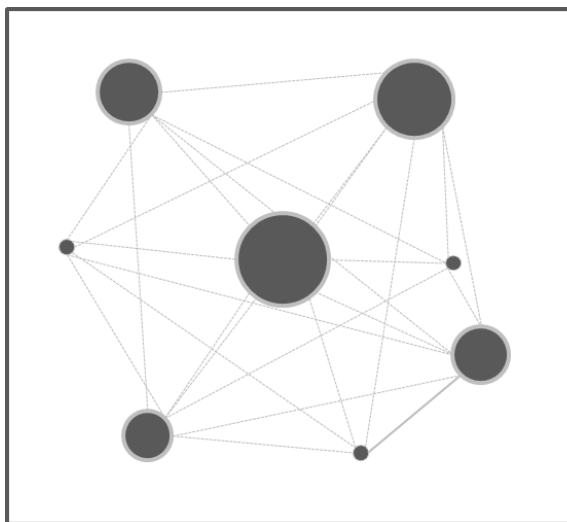
**The Value of a Network**

*infoDev* has leveraged Canadian government funding with USD 1.5M from the World Bank to support the roll out of a Network for the CCIC. The World Bank is financing two similar networks in East Africa and North Africa connected to the Kenya and Morocco CICs. These networks will help build regional capacity and linkages among institutions and stakeholders through a number of programs aimed at facilitating knowledge exchange, investing in networking facilities and software and identifying deal flow. The CCIC Network will build on experiences of the East African Climate Innovation

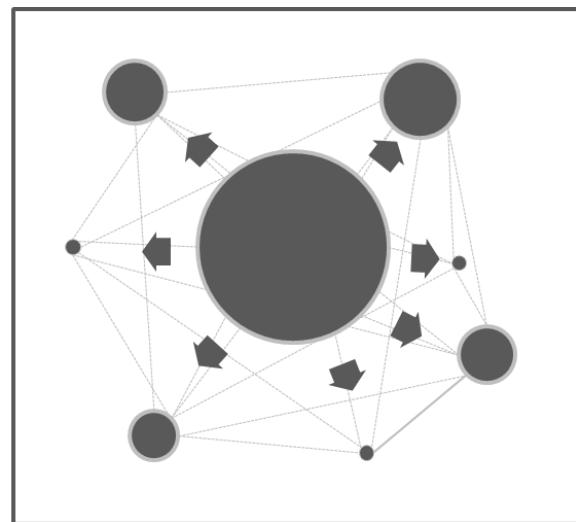
regionally in subsequent years. This includes investment in appropriate ICT software and infrastructure.

- ✦ Begin testing the market by building a pipeline of beneficiary companies through programs such as proof-of-concept, entrepreneur-in-residence or other business accelerator activities. These companies would be eligible for the full range of CCIC services, financing and support when established in Phase 2.
- ✦ The completion of a detailed, business plan to inform core activities of the CCIC to be implemented in phase 2.
- ✦ Ongoing technical assistance, support, training and partnership facilitation from *infoDev's* Climate Technology team.

An important function of the network is to identify existing business support organizations, incubation managers, trainers, and support networks in CARICOM countries. The CCIC will work with identified parties through partnership arrangements to deliver local support to climate technology entrepreneurs across the region. The two phases of the program are depicted below:

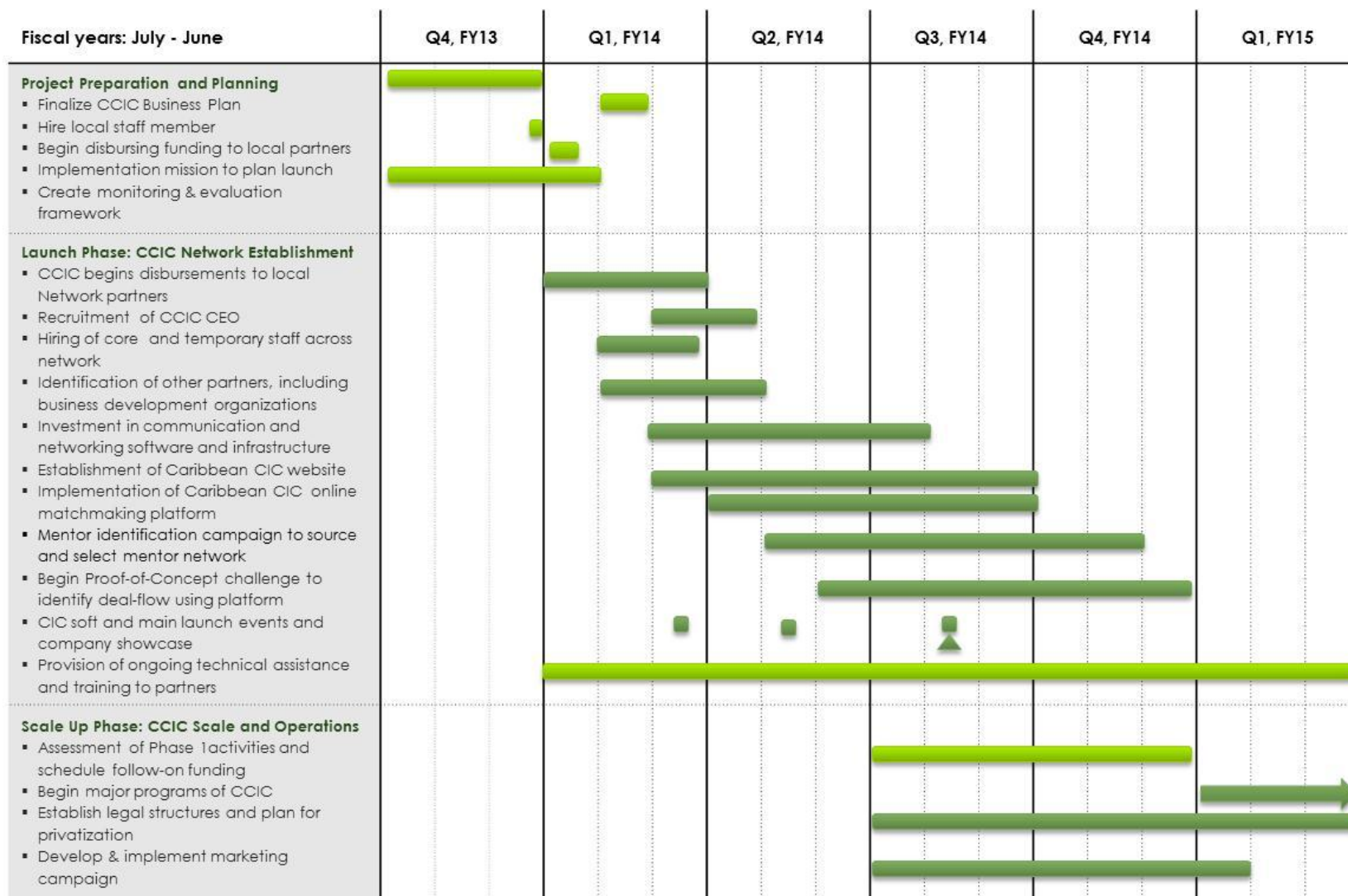


**Phase 1:** Establish CCIC Network including required partnerships, skills, expertise, infrastructure and deal-flow



**Phase 2:** Using CCIC as a platform, scale key CCIC programs and services as defined in the Business Plan

## 6.2.1 Launch phase summary work plan



■ infoDev Responsible   
 ■ Partners Responsible

### 6.3 Scale-up Phase: Year 2-5

It is anticipated that after the launch phase, *infoDev* will assess the progress and success of the activities implemented in the first 12 months. It will then begin the next phase of funding to the CCIC to scale the core CCIC services as outlined in chapter 5. These are centered on three components covering Technology Commercialization, Market Development and Venture Acceleration and include the launch of a dedicated CCIC Financial Accelerator. These programs and services will operate on predominantly annual cycles from years two through six.

Other programs will be phased and prioritized according to their importance. To avoid capacity constraints, the CCIC's host partners should allocate resources and concentrate efforts on the core support programs to entrepreneurs. A full work plan based on experience in the first phase will be developed with partners before funding is allocated to scale-up. In addition to the below activities, *infoDev* will deliver training and other technical assistance on a continual basis, and ensure coordination across all EPIC programs.

### 6.4 CIC Network Selection

In late 2012, *infoDev*'s EPIC team began a process to competitively select a group of partners that could begin forming the foundations of the CCIC by establishing the Center's regional network. A number of organizations across the Caribbean were identified and invited to participate in an expression of interest, followed by a full technical proposal in response to a detailed request for proposals. A selection committee was formed to review the proposals and participate in meetings with the various bidding consortiums. Additional partners outside the process were also considered based on ongoing efforts to identify the best geographic mix of skills to implement the first phase of the program.

Important evaluation criteria in identifying and selecting partners for the regional CCIC network included:

- ✦ Capabilities to build and manage complex organizations, including strong internal governance frameworks and a track record of fiduciary responsibility and accountability.
- ✦ Proven ability to attract and build a strong team of individuals including a senior management team for project implementation.
- ✦ Understanding of the needs of climate and clean energy companies in the Caribbean or similar contexts, including experience evaluating clean technologies and incubating early-stage businesses.
- ✦ Strong regional links with potential partners including climate technology firms, investors, technical and business experts, policy experts, and leading research and development organizations.
- ✦ Ability to leverage existing and additional sources of funding, both cash and in-kind, such as space, equipment, and staff.

- Ability to implement and maintain procurement and financial management processes and a comprehensive M&E strategy.

Core partners identified to execute phase one of the program include:

Institution/Organization	Type	Geographic focus
<b>Scientific Research Council (SRC)</b>	Research Institution	Jamaica
<b>Caribbean Industrial Research Institute (CARIRI)</b>	Research Institution (including incubator)	Trinidad and Tobago

## 6.5 Selection for scale-up

*infoDev* will conduct a full review of activities at the conclusion of phase 1 of the program. Based on the success and delivery of results of the CCIC network, the team will either extend further financing to the partners, or alternatively identify a different mix of organizations to execute the scale-up phase. The team will work closely with partners in the first year of the program to identify any constraints and provide training and technical assistance where needed. *infoDev* will also actively engage other regional or international groups to provide complementary skills and expertise to address any capacity constraints of the consortium.

A sample of extended partners and potential affiliates for the CCIC to engage include the following:

Institution/Organization	Type	Geographic focus
<b>Arthur Lok Jack Graduate School of Business</b>	Education	Caribbean Region (partial)
<b>Caribbean Agricultural Research and Development Institute (CARDI)</b>	Applied R&D	Caribbean Region
<b>Caribbean Development Bank</b>	Development Financial	Caribbean Region
<b>Caribbean Farmers Network</b>	NGO	Caribbean Region
<b>Caribbean Institute for Meteorology and Hydrology</b>	Applied R&D	Caribbean Region
<b>Caribbean Water Treatment</b>	Commercial business	Antigua with some regional
<b>Energy Dynamics</b>	Commercial business	T&T with some regional
<b>Global Water Partnership - Caribbean</b>	NGO	Caribbean Region
<b>Jamaica Solar Energy Assn.</b>	NGO	Jamaica
<b>Keystone Augusta (David Mullings)</b>	Investment	Jamaica with some regional
<b>Scotia Bank</b>	Commercial Financial	Caribbean Region
<b>The Energy Chamber</b>	NGO	T&T with some regional

## 6.6 Proof of Concept

The Proof of Concept (POC) funding model is emerging as a promising financing mechanism within accelerators/incubators, universities, research institutions and multinational companies to support and drive early stage technology commercialization. The funding, typically between USD25k and USD100k, is usually granted “pre-company”, at the prototype development stage, over a 12 to 24 month period. The money is administered on a competitive basis and actively paired with advisors, experienced entrepreneurs and/or a committee that sets milestones and meets with the successful applicants over the life of the project. Funding is used in part to pay a small salary to advisors or mentors with the rest is used to support technology development activities such as equipment purchases, prototype development, collection of data, feasibility tests, and other advanced pre-commercial research.

POC funding helps to explain the idea and convince investors the product has commercial applicability, that is, it turns skeptics into believers. Universities in the United States that have employed such programs have witnessed a successful leverage effect on the quality of start-ups, types of licenses, and royalty terms negotiated as a result of POC funding. In exchange for removing the technical risk, universities and other funding organizations have also managed to help raise more capital for start-ups in follow-on funding rounds.

The purpose of the CIC's Proof of Concept funding is to build a pipeline of investable clean technology companies, projects and products that are regionally and internationally scalable and allow unsuccessful concepts to fail inexpensively and quickly. POC recipients will be beneficiaries of the CCIC and are eligible for support through other programs and services offered including the Center's Financial Accelerator's investment promotion and facilitation activities. The CCIC will aim to provide POC financing to up to 8-10 successful applicants each year throughout the life of the program. POC applications will be eligible for:

- ✦ Funding up to USD 50,000 in tranches based on milestones, to develop, launch and/or scale an innovative product or service.
- ✦ Showcasing at official Caribbean CIC, EPIC and affiliate events and promotion through related marketing, communications and media activities.
- ✦ Access to Climate Innovation Center programs including a range of mentorship, partnership and support services including follow-on funding through the Financial Accelerator and EPIC's Access to Finance activities.

### **6.6.1 Repayment**

Successful applicants will be required to sign a memorandum of understanding (MoU) with the CCIC and adhere to a royalty arrangement for the Intellectual Property (IP) developed as a result of POC funding. Royalties will constitute 5% of gross revenues of product sales for up to seven years of sales. It is assumed that only 10-20% of companies will develop high-growth opportunity products and services and therefore most of the POC repayment will be derived from these more successful companies.

### **6.6.2 Eligible applicants**

The CCIC's proof of concept funding will be allocated via a competitive selection process to eligible individuals and private sector entities in the Caribbean including researchers, entrepreneurs, start-up companies and existing companies that are developing new products or new business lines. Individuals applying must be national citizens of a CARICOM country or have resident status while companies must be legally registered entities in CARICOM countries with more than 50% Caribbean ownership. All proposals will be reviewed and judged on:

- ✧ Completeness of proposal including submission of required documentation
- ✧ Level of innovativeness
- ✧ Technology priority and appropriateness for region
- ✧ Competitive advantage
- ✧ Market & growth potential
- ✧ Uniqueness of business model
- ✧ Quantifiable environmental benefits
- ✧ Impact on gender and social inclusion

### **6.6.3 Technology priority and appropriateness for region**

Projects that address the challenges of climate change in the region are encouraged to apply. Additionally, the following sectors have been specifically identified as priority areas where proposals will be highly favored:

1. Resource use efficiency - main applications could include: Waste-to-energy, materials recovery, reuse and recycling.
2. Water management - main applications could include: Potable water, rainwater harvesting, efficient irrigation, waste water treatment and recycling, water use efficiency, desalination.
3. Sustainable agribusiness - Water/energy efficient irrigation systems; waste management; high-value agribusiness; sustainable land use practices; waste-to-energy; and wind and solar energy for farms.
4. Solar energy – main applications could include: Residential and commercial self-generation, residential and commercial water heating, solar-powered air-conditioning.



5. Energy Efficiency – main applications could include: Lighting; household appliances; air-conditioning; commercial cooling and ventilation systems; consumer behavior; building energy management systems; building design and materials.

#### **6.6.4 Stage of development**

The main need and therefore focus of the CCIC has been identified as applied research, development and demonstration with facilitation services offered for later stage growth and deployment activities. Accordingly the Proof of Concept funding will target projects in the applied research and product development phases. This will include funding support for activities including:

- ✦ Product development and design
- ✦ Prototyping
- ✦ Field testing, market research and demonstration
- ✦ Marketing and business development
- ✦ Cost for staff directly involved in the project
- ✦ Other launch costs

#### **6.6.5 Ineligible applicants**

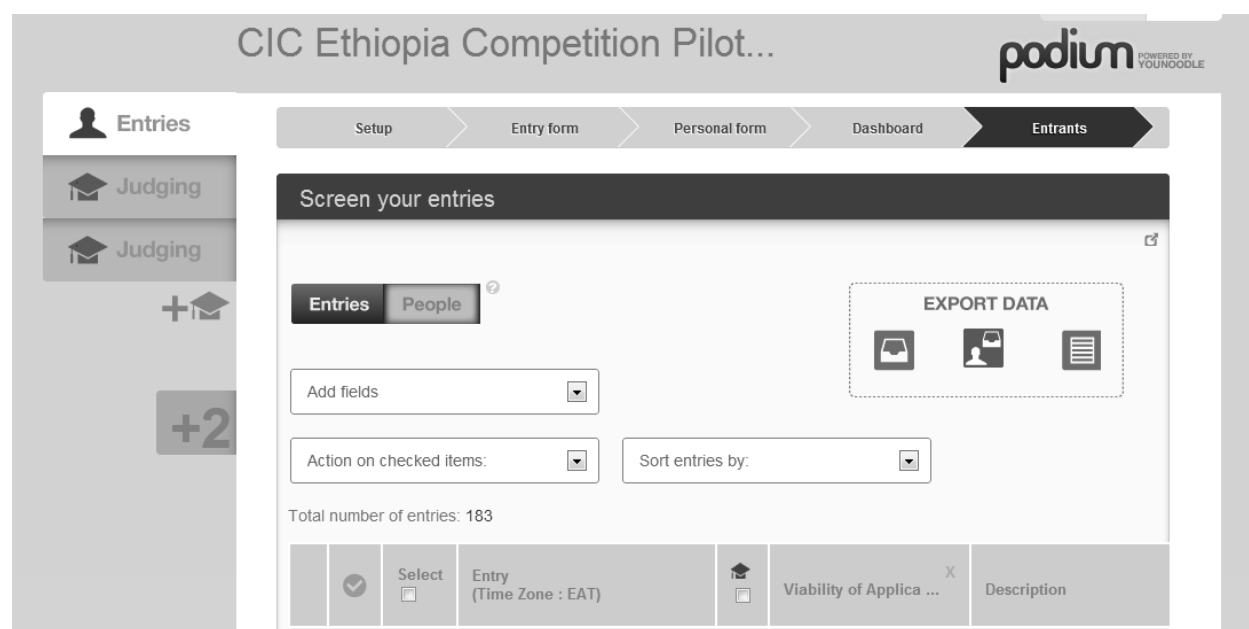
It is important to note that certain projects will not be eligible for funding through Proof of Concept activities. These include:

- ✦ Projects that are not considered relevant climate and clean technology industries
- ✦ Individuals or companies that do not meet local ownership and nationality requirements
- ✦ Proposals from government entities or affiliates, foreign governments and non-governmental organizations, or individuals that cannot be established as a business if successful
- ✦ Projects that do not need funding, i.e. are currently being fully funded by another source, unless the term of funding is nearing termination and without promise of continuation
- ✦ Projects without an identified innovative aspect. This includes direct importation, installation or other activities that support technologies that are already deployed at scale in the region
- ✦ Projects focused on improving energy access without identified benefit to the green economy of Ethiopia, such as implementing one-off projects for individual use; and
- ✦ Projects focused on basic research for a product without a clearly defined market demand or credible commercialization prospects.

#### **6.6.6 Application management**

All applications will be managed via an online platform such as Gust.com, BidX or Podium by Younoodle (currently the platform used by the Ethiopia CIC to manage the POC process). This

increases efficiency, transparency and allows for ease of data collection and comparisons across applications. Judging also takes place via the online platform with judges assigned specific applications to review and rank based on their preference and experience.



Younoodle's Podium platform is currently being used to manage POC processes for the Ethiopia CIC

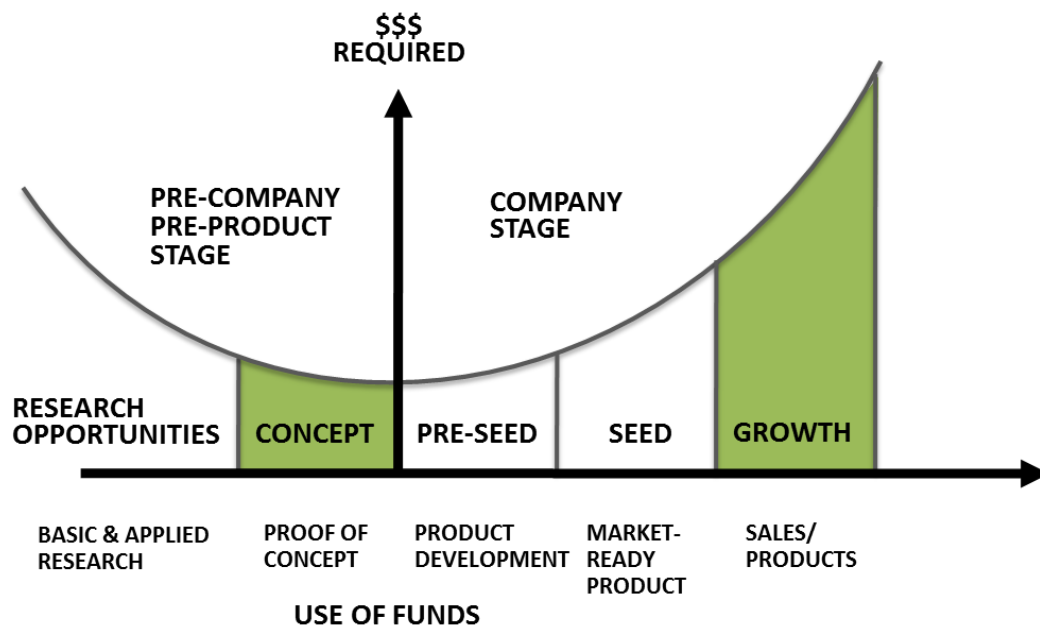
## 6.7 Financial Accelerator

Chapter 3 outlines a number of potential sources, both local and foreign, of investment capital in the Caribbean region. It is envisioned, with the exception of POC funding support, the CCIC will provide indirect financial support via individuals, contract staff and external groups with the appropriate investment and fundraising expertise and networks to facilitate sources of seed and growth-stage funding for CCIC beneficiaries. This Financial Accelerator would support the promotion and syndication of investment including debt, equity and reward-based financing (in the case of crowdfunding), rather than establish a traditional equity fund structure. The main considerations for this approach, and the departure from CIC designs in larger markets, include; i) the expected deal flow associated with CARICOM countries does not warrant the cost of the establishment of a formal fund management structure and ii) the numerous regulatory issues surrounding the operation of a fund and related investment and securities laws in the region are complex. Conversely, the Financial Accelerator is tasked to unlock existing sources of financing in the region for CCIC companies, including via EPIC's Access to Finance activities. As such, it will create a demonstration affect to attract further early-stage funding in the region and in part, improve the landscape for new venture investments in the Caribbean.

### 6.7.1 Investment philosophy and approach

While many companies in the region of various sizes and stages of development have limitations in attracting capital, there is an even more acute sense of fund raising challenges for established small and medium sized businesses with a high-growth potential. These include companies in the Caribbean with a track record of a number of years of solid revenue (e.g. USD 500,000), who have proved successful in their home markets and are now poised for regional and/or international growth. There are a number of reasons that these “growth stage” companies are having difficulties in finding funds, including; i) financial institutions’ limited familiarity with climate and clean energy-related products, (ii) the continuing economic difficulties prevailing in a number of Caribbean nations, and (iii) a historically weak private sector structure as well as fragmented business development support ecosystems.

The Financial Accelerator’s approach is to therefore attract investments that will enable such growth-stage enterprises to leverage their existing experience and talent and assist them to expand into new markets (geographic and product). In this way the CCIC’s Financial Accelerator programs and services will focus primarily on growth-stage enterprises rather than very early stage start-ups. Companies operating at development stages other than concept and growth will be eligible for other services of the CCIC, however the Center will not actively pursue funding, direct or indirect for such entities until the market is more mature. Pre-seed and seed stage investments will be ideally supported by EPIC’s Access to Finance activities which is more focused on targeting angel investors.



The CCIC will primary focus on funding support to concept and growth-stage  
via POC grants and Financial Accelerator services

### 6.7.2 Mechanisms of support

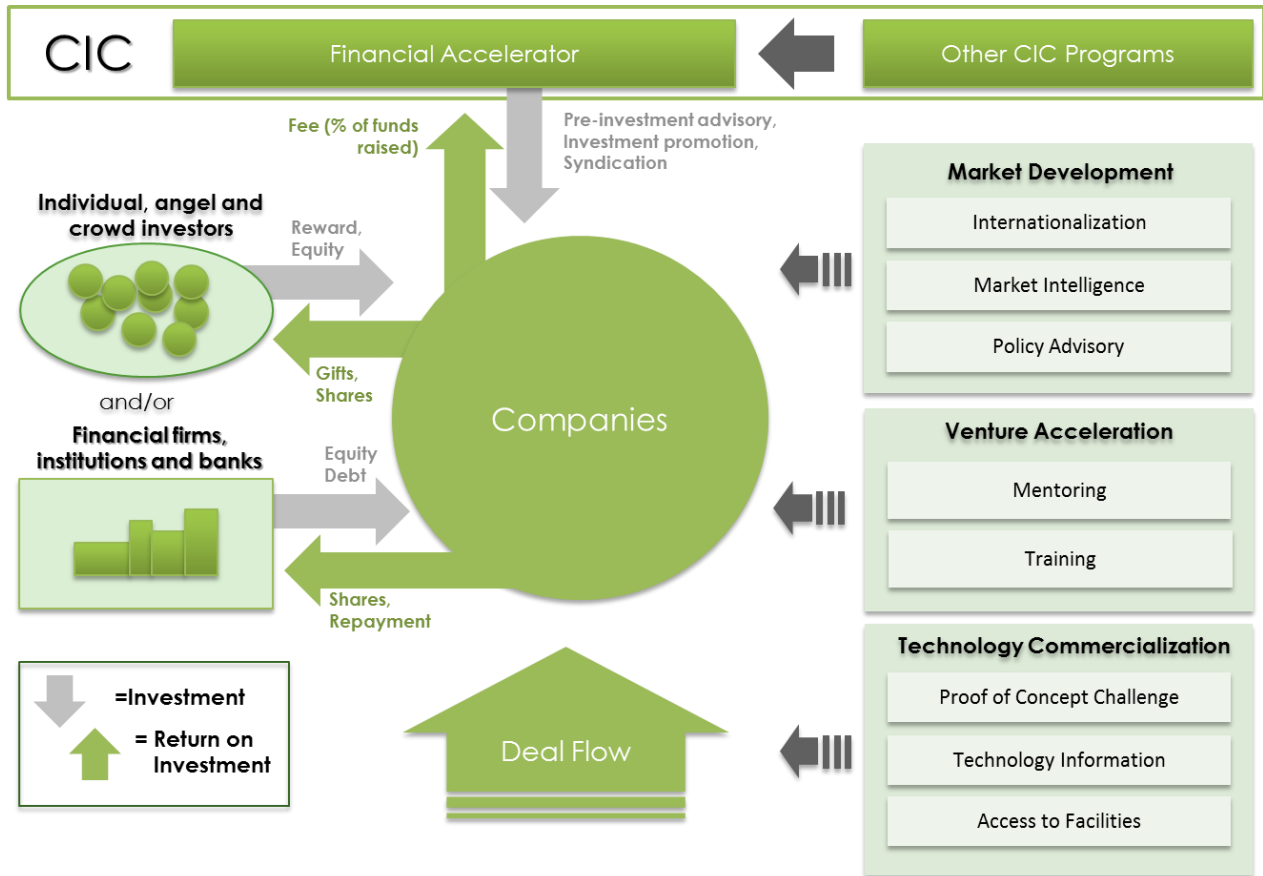
The CCIC's Financial Accelerator will differ from the POC funding mechanism of primarily grant-based financing by instead offering a number of pre-paid services delivered by the Center's staff, contracted individuals and external firms. The CCIC may also decide to fund the companies directly to cover similar costs and will be decided on a case-by-case basis. Support will be offered in three ways:

- ✦ **Pre-Investment Advisory Role:** Assist early growth-stage CCIC businesses (those past POC funding stages), to become 'investor ready' and prepared to pitch to potential investors, banks and other financial institutions.
- ✦ **Investment Promotion:** Provide a well-managed and facilitated interface that promotes and supports the connection of investors with CCIC investment opportunities in a credible, secure and risk-managed way. This includes connecting with and growing local/regional investor networks as well as relationships with high-net-worth individuals, angel investors and existing fund providers, including traditional institutions, to secure co-investment and participate in follow-on financing rounds. It will also include the hiring of Executives-in-Residence, angel investors or investment promoters to work directly with CCIC beneficiaries over a significant period of time to secure large amounts of investment (USD 250K up to USD 750K or even higher thresholds of USD 3M depending on company size).
- ✦ **Investment Syndication:** Develop a formal alliance with a number of innovative and regionally appropriate investment matching platforms and/or partners (for example, crowdfunding or similar online investment platforms). Such platforms will also offer a formal way for many potential individual Caribbean investors to fund CCIC beneficiary companies in a managed and transparent way.

### **6.7.3 Program Structure**

The Financial Accelerator's investment services have been budgeted at USD 50-100K of support per company over a two year period, dedicated to the above mentioned activities. Applicants to the program will apply on a competitive basis via the CCIC's website. The allocation of resources will be determined by an Investment Committee and approved by the Management Committee of CCIC using transparent processes. The Investment Committee will determine the needed package of support for each beneficiary and allocate a budget accordingly. It will also define the terms and conditions for the allocation and guide on an appropriate repayment structure in the form of a success fee on funding raised.

Aside from the internal processes in allocating the level of financial facilitating support needed for each company, all other funding related matters will be negotiated between individual CCIC clients and the investors/investment groups involved in providing funding. All companies accessing support from the Center's Financial Accelerator services will be eligible to participate in other CCIC programs including market development activities, mentoring, training and POC funding (in the case of the development of a new product or product line).



Model of funding flows and programmatic support for the CCIC's Financial Accelerator

#### 6.7.4 Service providers and investors

Investment specialists, promoters (such as ex-executives, investors, entrepreneurs and angels) or service providers contracted by the CCIC (either in-house or outsourced) will deliver the package of pre-investment advisory, investment facilitation and promotion services to each beneficiary. They will play a key role in connecting with and maintaining networks with local, regional and international investors and investment groups. They will also be tasked with screening credentials for all such investors to build trust and maintain a high quality network of investment partners. Investment facilitation service providers will be selected by the CCIC Management Committee competitively based on World Bank procurements policies.

Investors likely to be engaged to form part of the CCIC's network of investment partners include:

- ✦ *Individuals such as high-net worth persons, angel investors, serial entrepreneurs and ex-executives:* There are both locally based and Diaspora based potential investors who have indicated an interest in investing in quality new businesses emerging from the CCIC. To date such expressions of interest have come from international investors based in Singapore, New Zealand, the USA, and the UK as well as a significant number of investors based within the Caribbean, in particular in Barbados, Trinidad and Tobago and Jamaica.

- ✦ *Investment groups:* For example First Citizens Bank, Scotia Bank, Samdor Services, The Enterprise Hub, Vielle Case Credit Union, Caribbean Financial Services Corporation, the National Gas Company, and the RMP/Keystone Augusta Group.
- ✦ *Online platforms:* For example Kickstarter, BidX, GUST, the Caribbean Investment Network, First Push, Kiva, Solar Mosaic and Go Fund Me.

## EPIC's Diaspora Study

The Diaspora Investment Interest Study was conducted by *infoDev* from March-April 2013 to assess the willingness and ability of the diaspora to serve as angel investors and as a response to the access to finance challenge for early stage growth companies. The study surveyed 635 online respondents, interviewed 200 individuals through focus groups and another 20 one-on-one angel investors. Highlights from the study:

- ✦ 85% of the Diaspora is engaged in some form or another back home - although ~50% send remittances, another ~30% donate and ~20% invest in some form or another
- ✦ In regards to investing, ~25% of respondents had invested in a start up in the Caribbean before
- ✦ In regards to sectors of interest, 1% had invested in climate change and green technology but a much larger 40% of respondents are interested in investing in the sector going forward
- ✦ Climate change and green technology had the largest multiplier between investment history and investment interest indicating significant latent potential if investors could access desired deals

*The full study will be published October 2013.*

### 6.7.5 Returns, expectations and sustainability

The focus on growth-stage companies that the CCIC's Financial Accelerator activities will support is driven in part by the sustainability such companies can provide to the ongoing operation of the CCIC in the longer-term. In order to repay the support provided by the Financial Accelerator, beneficiary companies will be required to pay back the cost of the services they have been offered after 3 years at zero interest terms. In addition, companies that successfully raise funds from the CCIC's efforts will be required to contribute up to 10%, as an Accelerator Fee, on all funding raised. This "promoters" fee will be used to fund future CCIC operations. It is anticipated that the Financial Accelerator will provide, on average, the equivalent of USD 50k to 70K of investment syndication, facilitation and promotion services per company.

Funding raised through the Accelerator Fee will be in the range of USD 5k to USD 100K depending on the size of the company and the investment. In later years, the CCIC intends to broker a small number of large deals to secure fees of up to USD 250K. Once the CCIC has built a cadre of successfully funded businesses, it may be possible to enhance the revenue generating basis. However, such activities will need to be 'profit centers' and not distract the CCIC's development mandate.

### 6.7.6 CCIC investment pipeline

The intended host organizations for the CCIC of CARIRI with the SRC, as well as other organizations experienced with incubation, will form a strong regional network with connections

and relationships in at least six CARICOM countries (where hub coordinators will be based). This will enable the CCIC to pursue rigorous promotional and marketing campaigns to connect with and identify potential candidate businesses for both the POC and Financial Accelerator offerings.

There are a number of business development initiatives at both the national and regional levels which are also likely to provide links to potential clients. For example, the i2i program in Trinidad and Tobago, the individual YBT networks with local entities, and ADB's IDEAS Energy Innovation Contest. It is expected that the majority of potential clients will come through strengthening linkages with existing groups and networks in the Caribbean region and complemented by specific targeted marketing and promotional initiatives. Importantly, the CCIC will be able to provide far more targeted and ongoing support than many existing initiatives, especially competitions in the region that typically provide only short-term funding opportunities.

## 6.8 Safeguards

As part of the World Bank, *infoDev* strictly follows World Bank procurement guidelines and procedures. In addition, the CCIC host will be required to follow World Bank grant guidelines including the requirement to demonstrate financial management and procurement capacity. The CCIC will also be subject to an environmental and social safeguards assessment to ensure the CCIC has a plan in place to manage environmental and social impacts. Safeguard triggers will include:

- ✧ Natural habitats
- ✧ Forests
- ✧ Pest management
- ✧ Physical cultural resources
- ✧ Indigenous peoples
- ✧ Involuntary resettlement
- ✧ Safety of dams
- ✧ International waterways
- ✧ Disputed areas
- ✧ Child labor

## 6.9 Other Implementation Considerations

Other implementation issues will be addressed in detail during the grant agreement negotiations with CARIRI, SRC and other partners. In preparation for the grant agreement, the partners will undergo a safeguards, procurement and financial management review. They will also be required to detail specific roadmaps in the form of a work plan and procurement plan. In addition to preparation for the grant agreement, other implementation considerations will be addressed in close coordination with *infoDev*. These include:

- ✧ Management and Advisory Committee membership, key personnel such as CEO and privatization plans including ownership structures.
- ✧ Funding governance and structure of Investment Committee for POC and Financial Accelerator access, as well as external investor and investment group relationship management, facilitation, service provision and risk management.
- ✧ Staffing review including assessment of in-house and outsourced staffing requirements

based on partners' existing capacity.

- ✎ Marketing and communications plan review, including coordination with *infoDev* and donors' communications plans.
- ✎ Technology priorities for the CCIC and how the Center will achieve technology specialization and expertise over the life of the program.
- ✎ Intellectual property rights including addressing ownership issues among the Center, affiliates, partners and investees.
- ✎ Performance metrics and frameworks including the priority impacts and objectives the CCIC will measure over the first phase.

## 6.10 Exit Strategy

### 6.10.1 Donor support

While donor money will be necessary to fund the CCIC over the first five years, it is expected that the CEO and management team will raise additional contributions (both cash and in-kind) for continued operations beyond the first five years. The objective of initial donor funding is to establish the CCIC's network, scale programs, generate successes and demonstrate the program's value for local public and private sector support in the longer term. Donors are expected to exit as majority funders of the CCIC after the first five operational years, with POC royalty returns, repayments and success fees supplementing the ongoing cost of the program. Further support to subsidize the operational budget of the CCIC will be sought from relevant public bodies including host governments and development banks. Other funding sources from international climate finance, philanthropic and corporate sponsorships will also be considered to ensure the sustainability of the program after 6 years.

### 6.10.2 Privatization

It is intended that the CCIC will aim to spin-out of its host organizations after an initial 3-4 years of operations. This timeline will be dependent on a number of factors including levels of funding support, success of programs and necessity. The spin-out strategy will follow a similar process that CICs in other countries are currently undergoing. In the case of the Caribbean, the CCIC may form its own non-profit legal entity which will provide it complete autonomy and flexibility from the host institutions. It will therefore allow the Center to operate outside of the legal and procedural restrictions of the host organizations.

## 6.11 Regional Engagement

The CCIC will be regional in nature, supporting climate technology business ventures from 14 CARICOM countries. It will also be a member of *infoDev*'s CIC network, which will allow the Center to be connected to climate technology markets throughout the world. Through the Climate Technology Program activities, *infoDev* will help facilitate access to markets, build capacity and promote south - south knowledge transfer and trade. The CCIC will also be linked with CICs in Kenya, Ethiopia, Ghana, South Africa, India and Vietnam, to assist entrepreneurs in



accessing foreign markets and expertise. These linkages will also allow the Caribbean Center to benefit from knowledge generated from the implementation of CICs in other countries.

## 6.12 Governance

### 6.12.1 *infoDev* and The World Bank

The World Bank's Development Grant Facility (DGF) will fund the launch phase for the CCIC over the first 12 months. The DGF was established in 1997 as an important grant-making mechanism to further the Bank's development work and complement lending and advisory service offerings. The DGF uses grants to a) encourage innovation, b) catalyze partnerships, and c) broaden the scope of Bank services. *infoDev* has secured USD 1.5 million from the DGF to contribute towards the CIC's regional network activities. For the CIC's scale-up activities, *infoDev* acts as a trustee and implementation partner for the program donors, the Canadian Government.

Financing for the scale-up phase for the CCIC will be allocated from *infoDev*'s EPIC Trust Fund and will leverage the resources, experiences and expertise of *infoDev*'s Climate Technology Program, which is rolling out Climate Innovation Centers in eight countries globally. Implementation oversight, project management and monitoring and evaluation will be executed by the *infoDev* team to ensure timely and successful program delivery.

The program will be executed via i) a grant agreement between the DGF and the CCIC partners for the first phase and ii) a grant agreement between *infoDev* and the CCIC partners for the second phase. Additional agreements may be issued with various partners based on their capability of delivering on a specific activity, such as mentoring and advisory services.

The CCIC's partners will be responsible for sub-contracting specific services as appropriate to other organizations. These services may include mentoring and advisory services, software development such as the matchmaking platform, and market research. This will allow the CCIC's services to be delivered by the most appropriate organizations, leverage existing expertise, networks and overheads while reducing duplication of existing activities.

Grant agreements will outline the following contractual arrangements with grant recipients:

- ✦ Project deliverables
- ✦ Monitoring, reporting, evaluation
- ✦ Financial Management
- ✦ Procurement
- ✦ Eligible expenditures
- ✦ Withdrawal conditions
- ✦ Intellectual property rights/licenses

*infoDev* will coordinate all activities with local World Bank and International Finance Corporation (IFC) colleagues, to leverage existing in-country knowledge and expertise, and link with complementary WBG projects and investments where appropriate. This governance is illustrated in the below diagram.

### **6.12.2 Donor Steering Committee**

Donors to the CCIC will form part of *infoDev*'s EPIC Steering Committee (SC). The SC will meet once a year and will be responsible for: (i) providing overall strategic direction to the Program; (ii) endorsing the annual work plan and budget for the CCIC; and (iii) periodically reviewing overall progress of activities conducted under the Program and providing guidance to the implementation team. The Steering Committee will be chaired by the World Bank's Financial & Private Sector Development Vice President, or its designee. Should additional contributions to the CCIC be made by donors to *infoDev*'s Climate Innovation Trust Fund, they will be invited to partake in both Climate Technology Program and EPIC SC meetings.

### **6.12.3 Management Committee**

For the first phase of the CCIC, a Management Committee (MC) will be formed, comprising representatives from The Caribbean Industrial Research Institute (CARIRI) based in Trinidad and Tobago, and The Scientific Research Council (SRC), based in Jamaica. Both SRC and CARIRI will all have equal weighting in decision making on the CCIC's budget, usage of funding and relevant allocations to the various program components. The Management Committee will also make key decisions on hiring of staff, establishing new partnerships and location of operations. They will report to *infoDev* and be responsible for the delivery of the program in the first 12 months.

### **6.12.4 Investment Committee**

As previously stated, both the selection of clients for the CCIC and the allocation of funding for POC and Financial Accelerator activities will be determined by an Investment Committee and approved by the Management Committee using transparent and competitive processes. The Investment Committee will determine (i) client eligibility, (ii) services, support and funding to be allocated to each company and (iii) the terms and conditions for both allocation and repayment on a case-by-case basis.

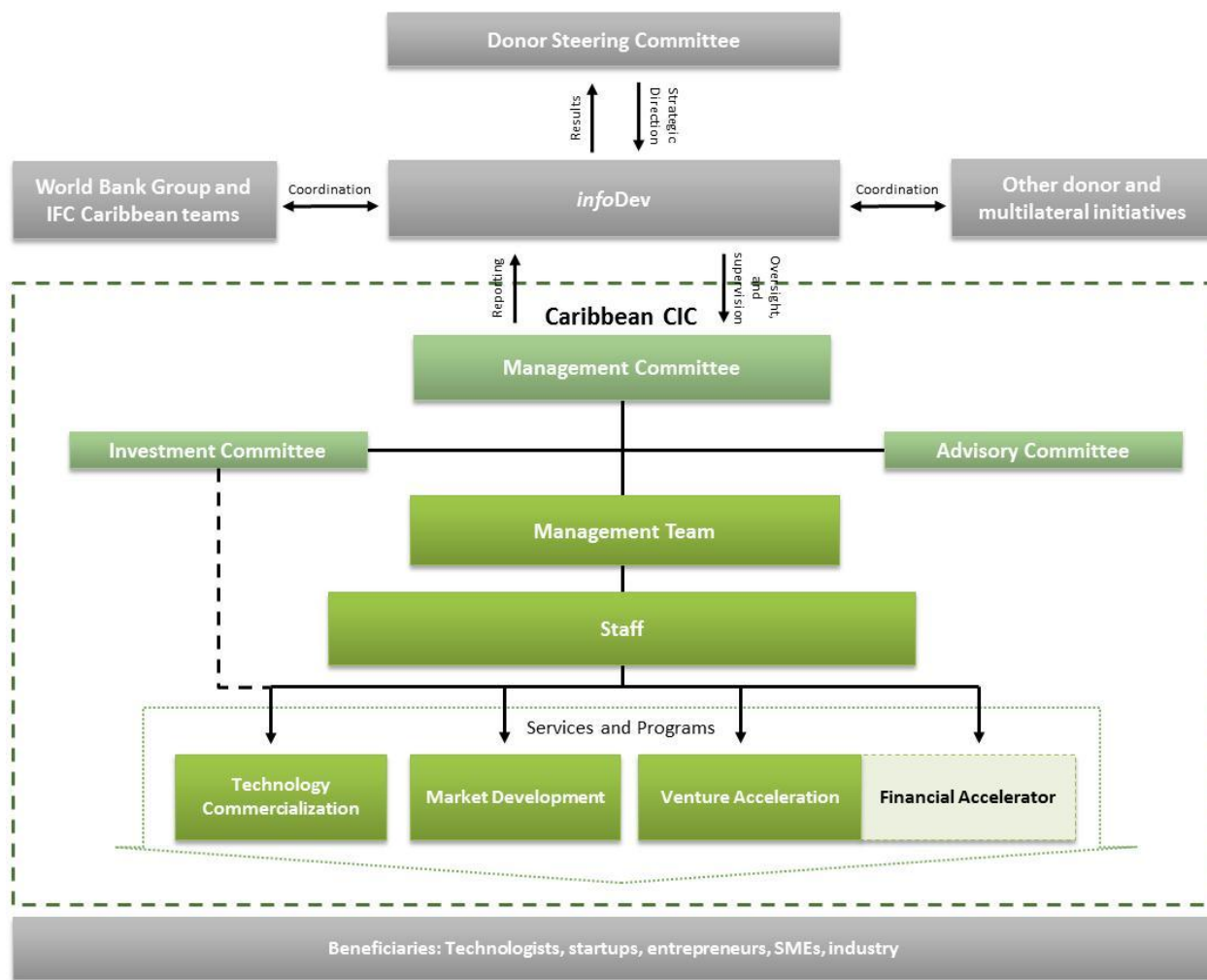
### **6.12.5 Advisory Committee**

The Management Committee will also form an Advisory Committee (AC) for the CCIC. It will be responsible for providing strategic advice, direction and help coordinate with similar activities and initiatives throughout the Caribbean.

It will include up to 7 members, to be composed of relevant private sector and government representation and will be nominated by the CCIC in collaboration with *infoDev* and founding partners. To ensure involvement of the various governments including alignment with relevant policy strategies, the AC will reserve 3 of the 7 committee memberships for representatives of different government bodies from either the country or regional level.

These memberships, which will be provided on a two-year rotating basis, will assist in forming linkages with various public and private partners to help achieve its mandate. The AC will also ensure appropriate coordination is made with existing initiatives of EPIC. The CCIC Management will consult *infoDev* and funding partners on changes in the MC and AC's structure over the duration of the program. The AC, once established, may form separate sub-groups that may be

targeted to specific themes or sectors. For example, the CCIC may have an advisory sub-committee on 'recycling and waste management'.



Management structure of CCIC

## 6.13 Organizational Structure

### 6.13.1 Management Team

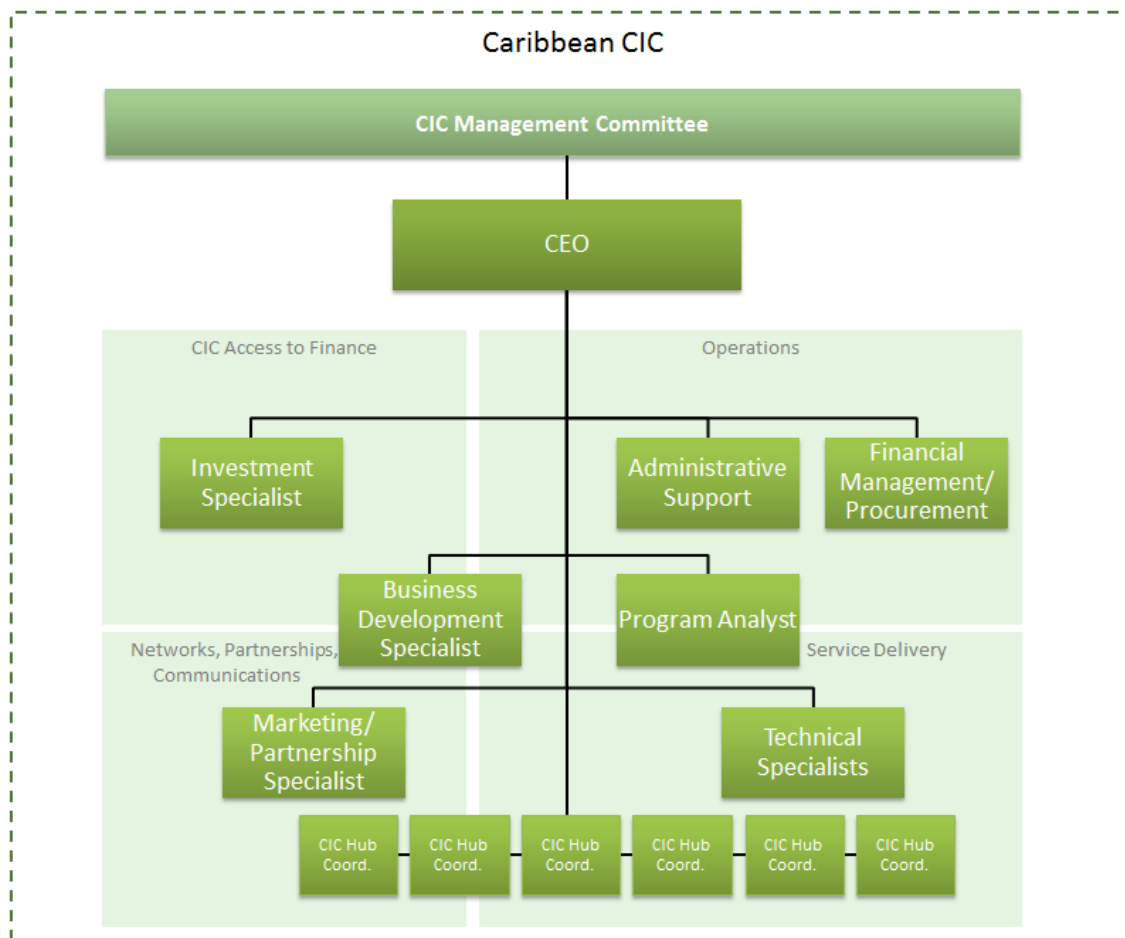
In accordance with the organizational design, program budgets will be managed by a Management Committee led by the CCIC CEO. The CEO will be responsible for the day-to-day operations of the Center, including oversight of programs, reporting to *infoDev*, developing relationships, setting strategic objectives and fund-raising. The CEO will be supported directly by financial management and procurement staff or consultants to ensure appropriate fiduciary systems and guidelines are in place. The CEO will also be supported by senior marketing and staff member that will lead the promotion, branding and publicity of the Center's programs and services as well as develop and maintain key partnerships and relationships.

It should be noted that because of the regional nature of the CIC, a number of the human resource roles associated with the CCIC may be accessed on an outsourced or contractual

basis rather than full-time employees because of the large geographic area and number of countries that the CCIC is required to service.

### 6.13.2 CCIC Staff Overview










Other roles within the CCIC include an Investment Specialist whose primary role will be to manage all the processes, relationships and activities required for the CCIC to deliver the Financial Accelerator services; a Business Development Manager who ensures that the programs developed for each client, including POC funding, are implemented, monitored and meet the targets set for each company (this may well be serviced by several part time contracted persons of a suitable caliber in different geographic locations); Technical Experts to provide specialist technical support and advice to the CCIC and its clients, most likely on an as needed contractual basis; Program Analysts to support senior staff and to ensure that the goals and objectives of the CCIC programs are being monitored and, where necessary, ensuring corrective actions are designed and implemented when and where required; Administrative Support to ensure all the CCIC central administrative requirements are met; and six Local Hub Coordinators who will be contracted part time to identify CCIC deal flow, provide client support and facilitate connections at the local level in six Caribbean countries. An overview of the staff structure, and its relationship to CCIC functions, is shown in the following diagram.



Proposed organizational structure of CCIC

### 6.13.3 Staffing requirements

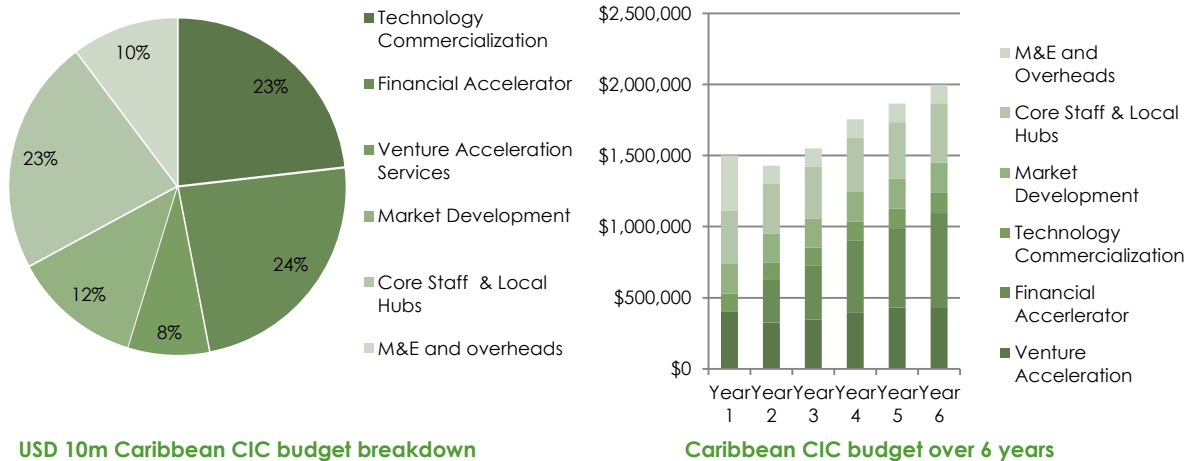
The illustration below outlines the staff requirements for the CCIC totaling the equivalent of 9.5 full-time equivalent (FTE) staff and six part time staff\* per year. As stated previously, the CCIC may choose to outsource many of these roles through contracts with service providers or through partnership arrangements with consortium members. Some of these positions and roles may also form part of the World Bank's implementation team for the Center based on the host organizations' capacity and capabilities. Salary assumptions for the different roles can be found in the annexes.

Role	Description	FTE per year
<b>CIC CEO</b>	Reports to Consortium Management Committee and is responsible for overall strategic direction, hiring of staff, regional coordination, program design and development, budgets and fundraising for the Center.	 (1)
<b>Senior Marketing/ Partnership Specialist</b>	Builds and manages alliances and partnerships, mentors and support networks and oversees marketing and promotional activities (contracted in key locations) as well as knowledge management.	 (1)
<b>Investment Specialist</b>	Has a primary responsibility to oversee the allocation of internally disbursed funding through a transparent committee-based process as well as the development and management of external service providers as well as investor/investment group relationships and networks.	 (1)
<b>Business Development Specialist</b>	Manages the design and effective delivery of the Proof of Concept and business acceleration support programs (contracted in key locations).	 (1)
<b>Technical Specialist(s)</b>	Outsourced specialist advice in the areas of technology and market opportunity evaluation.	 (1.5)
<b>Financial Management/ Procurement</b>	Responsible for CIC's procurement and financial management obligations to meet World Bank Group procedures and guidelines.	 (1)
<b>Program Analyst</b>	Provides a range of support and analytical services to senior staff including managing aspects of the programs' operations and delivery.	 (1)
<b>Administrative Support</b>	Responsible for the CCIC's administrative and office management tasks and supports CEO on a day-to-day basis	 (1)
<b>Local CIC Hub Coordinators*</b>	Part-time support service providers or individuals tasked with managing in-country networks, identifying talent and providing/connecting with venture acceleration services.	 (6)

## 7.0 Financial Plan

### 7.1 Budget for establishment through year six

The included graphics illustrate the budget allocation for the CCIC's operations totaling USD 10m which includes the preparation, implementation and launch over the establishment year and five years of subsequent operation. The establishment year of the CCIC's implementation will primarily be dedicated to building institutional capacity, including establishment of the management team and the launch of some of the major programs. The operational years will scale the CCIC's investment, mentoring, regional and other capacity building programs, expanding the scope and the reach of the Center's services.



The majority of the Center's funding will be allocated towards the financial accelerator and technology commercialization activities, making up USD 2.4 million and USD 2.3 million, respectively. These activities will support CCIC ventures through Proof of Concept grants and unlocking existing sources of financing through the financial accelerator, as well as the provision of technology information and access to facilities. Core staff and local hubs are grouped as the second largest allocation at just over USD 2.2 million. The CCIC's market development activities, including policy advisory, market intelligence and other awareness promotion and network activities represent USD 1.2 million of the budget. Venture acceleration support through mentoring and training comprise just under USD 800,000. The remainder of the budget is allocated to M&E and overheads.

## 7.1.1 CCIC Aggregated Budget in USD

The table below gives the CCIC budget for the establishment and five operational years.

Activity	Est. Year			Year 2			Year 3			Year 4			Year 5			Year 6			TOTAL
	Staff	Prog.	Total	Staff	Prog.	Total	Staff	Prog.	Total	Staff	Prog.	Total	Staff	Prog.	Total	Staff	Prog.	Total	
<b>Proof of Concept Activities</b>	55	230	285	29	265	294	30	285	315	32	335	367	33	365	398	35	365	400	2,059
<b>Technology Information</b>	20	100	120	8	18	26	9	18	27	9	18	27	10	18	28	10	18	28	256
<b>Access to Facilities</b>	-	-	-	4	2	6	4	1	5	5	1	6	5	1	6	5	1	6	29
<b>Mentoring and Advisory Services</b>	10	50	60	59	20	79	62	20	82	65	20	85	69	20	89	72	20	92	487
<b>Training</b>	10	54	64	13	33	46	13	33	46	14	33	47	15	33	48	15	33	48	299
<b>Financial Accelerator</b>	-	-	-	68	230	298	72	305	377	75	430	505	79	480	559	83	580	663	2,402
<b>Internationalization</b>	20	94	114	13	60	73	13	60	73	14	60	74	15	60	75	15	60	75	484
<b>Market Intelligence</b>	-	-	-	26	40	66	28	40	68	29	40	69	30	40	70	32	40	72	345
<b>Policy Advisory</b>	50	50	100	26	35	61	28	35	63	29	35	64	30	35	65	32	35	67	420
<b>Core Staff Center</b>	155	48	203	184	26	210	193	25	218	203	25	228	213	25	238	223	25	248	1,345
<b>Hub Coordinators</b>	108	60	168	113	30	143	119	30	149	125	30	155	131	30	161	138	30	168	994
<b>M&amp;E</b>	13	35	48	13	20	33	14	20	34	14	20	34	15	20	35	16	20	36	220
<b>IT, infrastructure, travel, other costs</b>	-	340	340	-	95	95	-	95	95	-	95	95	-	95	95	0	95	95	815
<b>TOTAL</b>	<b>441</b>	<b>1,061</b>	<b>1,502</b>	<b>557</b>	<b>872</b>	<b>1,429</b>	<b>585</b>	<b>966</b>	<b>1,550</b>	<b>614</b>	<b>1,141</b>	<b>1,755</b>	<b>645</b>	<b>1,221</b>	<b>1,865</b>	<b>677</b>	<b>1,321</b>	<b>1,998</b>	<b>10,100</b>

\*Budget consists of Recipient and Bank Executed components, rounded to nearest 1,000.

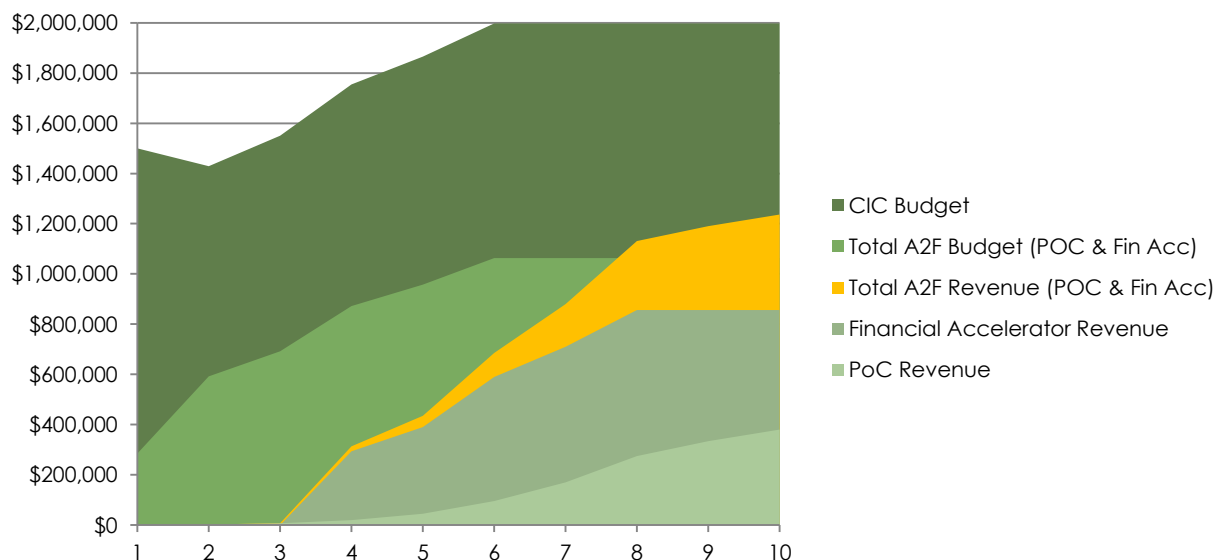
## 7.2 Sustainability

Given the CCIC is has been designed as a long-term capacity building initiative, it will realize much of its impact after the first 6 years. Therefore it is more realistic to calculate results using an investment timeline of 10 years which takes into account the continued return on investment the CCIC will generate after the first 6 years. The CCIC will work for partial sustainability, largely through returns from royalties and fees for funding facilitation activities. These two sources of revenue are anticipated to cover up to 60% of the CCIC's operating costs and replenish the CCIC's annual "Access to Finance (A2F)" (both POC and Financial Accelerator support) activities in by year 8.

The Center can aim to reach a higher level of sustainability by introducing other revenue streams, once a strong value proposition has been achieved in the early years. It is, however, envisioned that the Center will require continued public subsidy given its inherently higher risk of nurturing and supporting early-stage technology companies in a promising, yet challenging region. The detailed assumptions driving this revenue are shared in the annexes.

Sustainability	Years					
	5	6	7	8	9	10
CIC Total	23%	34%	44%	57%	60%	62%
POC	11%	24%	42%	69%	83%	95%
Financial Accelerator	70%	89%	93%	112%	112%	112%

Projected sustainability of overall CCIC, POC and Financial Accelerator Programs

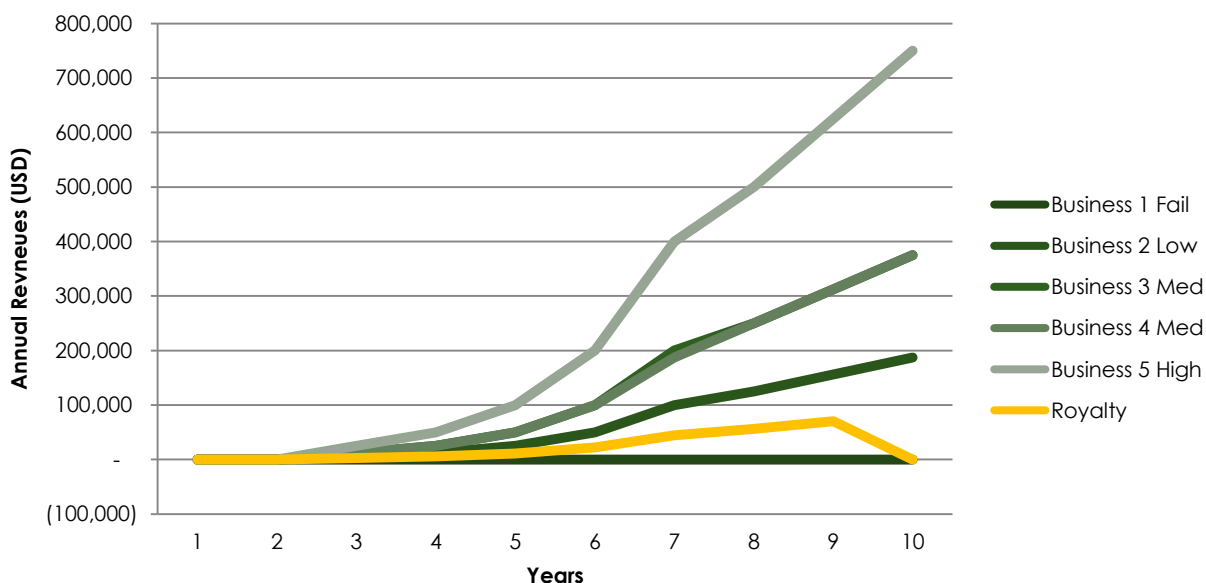


Overall costs and revenues per year of CCIC and various programs in USD



### 7.2.1 POC Revenues

As mentioned in the Operational Plan, successful applicants to the Proof of Concept competition will be required to sign a memorandum of understanding (MoU) with the CCIC and adhere to a royalty arrangement for the Intellectual Property (IP) developed as a result of the funding. Royalties will constitute 5% of gross revenues of product sales for up to seven years sales. It is assumed that only 10-20% of companies will develop high-growth opportunity products and services and therefore most of the POC repayment will be derived from these more successful companies.



Example of revenue and royalty modeling for 1 year of POC recipients projected over 10 years

### 7.2.2 Financial Accelerator

Chapter 6 identifies the primary focus of the Financial Accelerator as supporting growth-stage companies. This is partly motivated by the long-term sustainability these enterprises can provide the CCIC through repayments for services. As such, companies benefiting from the Financial Accelerator program will be required to pay back the cost of the services they have been offered within 3 years at generous zero interest terms. In addition, companies that successfully raise funds from the CCIC's efforts will be required to contribute up to 10% on all funding secured, as an Accelerator Fee. This fee for will be used to fund future CCIC operations. It is anticipated that the Financial Accelerator will provide, on average, the equivalent of USD 50k to 70K of investment syndication, facilitation and promotion services per company.

Funding raised through the Accelerator Fee will be in the range of USD 5k to USD 100K depending on the size of the company and the investment. In later years, the CCIC intends to broker a small number of large deals to secure fees of up to USD 250K. In order to calculate potential fees, company revenues, Earnings Before Interest and Tax (EBIT) ratios, Price per Earnings (P/E) multiples have been modeled to generate projected market values. Parameters for each of were set accordingly with levels of company success and failure rates (failure, low

growth, medium growth, high growth, very-high growth). An estimation of 50% of projected market value was then placed on the average financing each company could raise over 3 years through debt, equity and/or rewards (in the case of crowdfunding). CCIC revenues were then calculated based on a 10% fee levied on the total projected funding raised, in addition to repayment of the services rendered.

Company	Risk	Support provided (\$)	Rev. after 3 years (\$)	EBIT Ratio	PE X	Market Value (\$)	Funds raised by Co. (\$)	Accl. fee	Accl. fee total (\$)	Repayment (\$)	Total CIC Return (\$)
1	Fail	56,250	0	20%	0	0	0	0	0	0	0
2	Low growth	56,250	125,000	20%	5	125,000	62,500	10%	6,250	56,250	62,500
3	Med. growth	56,250	250,000	20%	10	500,000	250,000	10%	25,000	56,250	81,250
4	High growth	56,250	500,000	25%	15	1,875,000	937,500	10%	93,750	56,250	150,000
<b>Total</b>									<b>125,000</b>	<b>168,750</b>	<b>293,750</b>

**Key assumptions based on first year company intake of Financial Accelerator (returns after 3 years)**

It is conservatively estimated that companies with low growth to medium growth will observe (EBIT) of 20%, whilst high growth companies will observe an EBIT of 25%. Therefore, the model assumes that while revenues may grow at the similar rates, existing size (revenues) of companies will vary, as will profitability, valuation multiples and therefore market value. The returns from the CCIC's Financial Accelerator will likely take many years to generate revenues given the high-risk and higher capital requirements of climate tech companies. Assuming the continued operation of the CCIC beyond year 6, Financial Accelerator returns are predicted to grow from ~USD 300K in year 4 to ~USD 850K in year 9, producing a ~USD 90K surplus. After 10 years, the program will recover ~112% of its cost through revenues generated, making it sustainable.

	Years 2-5	Year 6	Year 7	Year 8	Year 9	Year 10
Financial Accelerator Budget	\$1,739,166	\$662,958	\$762,958	\$762,958	\$762,958	\$762,958
Financial Accelerator Revenue	\$977,500	\$295,833	\$709,821	\$856,250	\$856,250	\$856,250
<b>Net Position</b>	-\$761,666	-\$367,125	-\$53,137	\$93,292	\$93,292	\$93,292

**Cumulative budget and revenues of Financial Accelerator services**

The revenue model strategy has two distinct benefits for the CCIC and the companies it assists:

1. The ambitions of both are aligned, sharing the common objective of building a successful business. Actions that benefit the company also maximize the return to the CCIC.
2. Importantly, the success-sharing model builds a sustainable future for the CCIC, with a model that is scalable and replicable. Returns from company success can not only be

used for reinvestment, but also as incentives to management, investment specialists, promoters and mentors who are providing critical advisory support.

### 7.2.3 Other revenue potential

*infoDev* has investigated other potential revenue sources, which may be developed over time. These revenue streams will be evaluated and developed in years 3 to 5, once a strong value proposition for the Center has been achieved. It is assumed that management would periodically revisit the business model of the center to identify sources of funding where appropriate without compromising the objectives of the program. Such sources of revenue could include:

- ✧ Carbon credits: The CCIC and its beneficiaries would ideally apply for available carbon credits as a potential revenue source. The policy advisory and market information services of the Center should aim to identify such sources of funding.
- ✧ Facilities leasing: The CCIC will explore the adoption of a pay-per-use model to generate income from the Center's agreements with facility providers.
- ✧ Sponsorship: The CCIC will recruit corporate sponsors that will attract private sector participation. Industry and the private sector will benefit from this affiliation by gaining, among others, access to new venture activity, technology and market research.
- ✧ Tailored training: In later years, the CCIC may be able to monetize its market and technical knowledge. The capacity building team will develop training models that can be provided to industry at a fixed fee. Charging for training will be explored in years 3-5.
- ✧ Consulting work: The center may in time, leverage in-house talent and resources to provide consulting services to third parties for a fee. Lessons learnt, relationships built and expertise accumulated by the CCIC's work would provide a wealth of information for private sector, government and development partners.

## 7.3 Co-investment and leverage

Leverage for all investments will be sought from affiliated investors contributing at the company "deal" level as described in chapter 6. Leverage may also be achieved through follow-on investments in POC beneficiaries that have raised money outside the assistance of the Financial Accelerator. It is expected that the CCIC will leverage USD 1.50 to 3.00 of private sector finance for every dollar invested in the entire program, equating to approximately USD 6.00 to 8.00 for each dollar invested in the Financial Accelerator component.

## 7.4 Fundraising Plan

For the CCIC's operations in the first five years, *infoDev* has secured an initial budget of USD3.5M from The World Bank's Development Grant Facility and the Canadian government under EPIC. *infoDev* intends to launch the CCIC with the current allocated resources and raise an addition USD 7.5M over the life of the program to secure the entire six-year budget. Identifying and

securing the full budget is important to ensure that the CCIC remains adequately resourced throughout its implementation and not detract from successful operations.

*infoDev* is targeting investors with an aligned mission to the CCIC. The ideal investor base would consist of donors, foundations and potentially corporate sponsors. Funding from partners may be in the form of direct funding support to the CCIC host organizations or an in-kind allocation such as access to office space or infrastructure.

Investment in the CCIC presents a clear value proposition to prospective investors:

- ✧ *Dealflow*: CCIC donors will be exposed to an on-going stream of climate technology ventures that are screened through the finance and advisory services activities of the Center. The CCIC's funders will have the opportunity to learn from and potentially collaborate with enterprises that benefit from the Center's support.
- ✧ *Knowledge*: CCIC donors gain considerable knowledge generated by the operations and activities of the Center. Learnings including key successes and failures of the program will be disseminated by *infoDev* on a regular basis. The CCIC will also produce and aggregate research and market analysis, giving regular information on Caribbean's clean technology sector and related business activity.
- ✧ *Partnerships*: CCIC donors gain access to the complete network of CCIC partners and stakeholders including the public and private sector. These relationships will be strategically valuable to investors who are supporting other climate change, green growth and private sector development initiatives in the region.
- ✧ *Joint ventures and trade*: Investors would also benefit from having a readily available network of partners and companies in the region to serve as a conduit for potential joint-ventures and trade opportunities.
- ✧ *Measured outcomes*: CCIC donors will benefit from transparency concerning the outcomes of the Center's activities. In addition to providing funders with annual performance reports, the CIC will provide data, anecdotal stories, and evidence on economic and social returns to the investors' contributions.
- ✧ *Development Impact*: In addition to directly measureable outputs and outcomes, CCIC funders will be responsible for facilitating real long-term transformation of the Caribbean's innovation system and clean technology sectors. Programs such as the CCIC create strong spill-over effects through the creation. It is expected that these impacts will be in alignment with donors' core mission of promoting sustainable green growth in the Caribbean.
- ✧ *Replication*: Successful delivery of the project would help other developing countries replicate innovative ideas and aspects of the model to address the barriers in their own context. Also, as part of the global CCIC network, lessons can be shared and disseminated across countries.
- ✧ *Sustainability*: The CCIC's Financial Accelerator will prepare businesses to become attractive investment opportunities, thereby allowing them to secure financing from

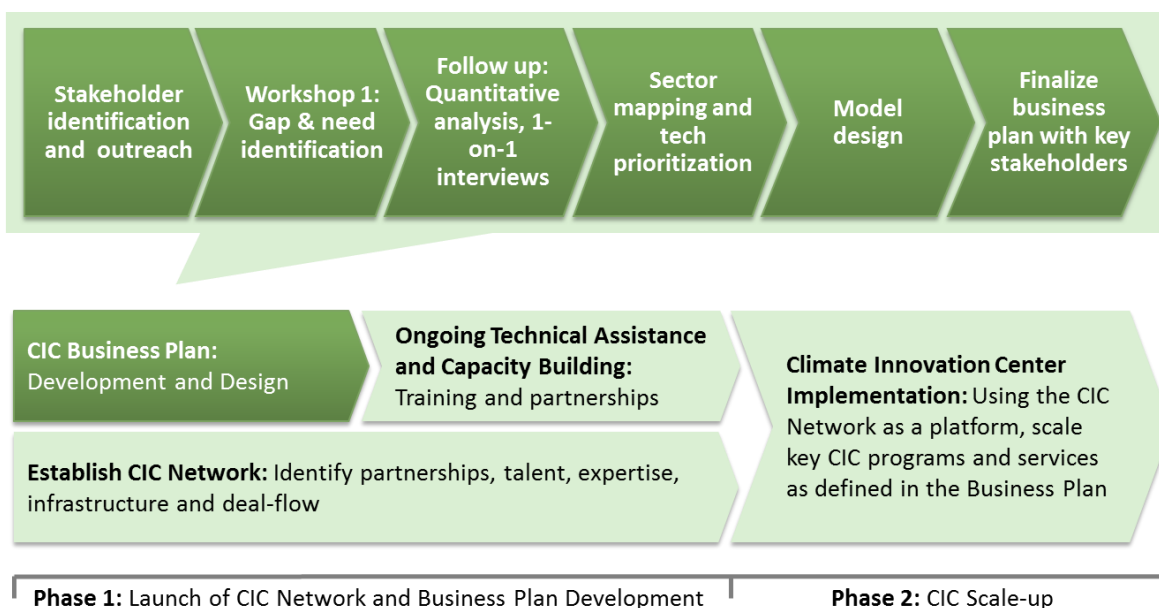
investors, banks and other financial institutions. Client businesses will however be required to pay back a percentage of the leveraged funds earned as a result of the acceleration support, thereby contributing to a sustainable fee-for-services model. As such, the CCIC will be a pioneering investment model for the Caribbean and the region; creating new opportunities to implement the funding model in other developing countries.

- ✦ Leverage: It would unlock sources of funding that would not otherwise be put in use for this critical area of climate change response. It would be well positioned to leverage both additional donor funding and private sector investment.

### 7.4.1 Current Support

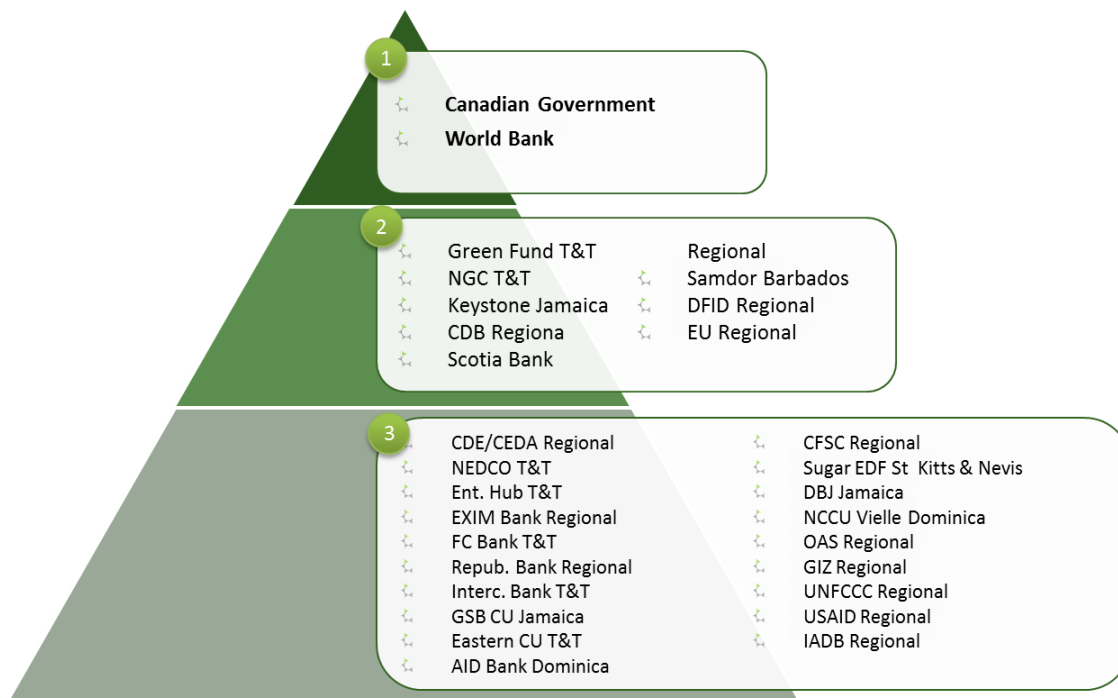
As indicated above, at the time of publishing this business plan, *infoDev* has secured USD 3.5M for the implementation of the CCIC with the support of The World Bank's DGF and in partnership with the Government of Canada supported Entrepreneurship Program for Innovation in the Caribbean (EPIC) managed by *infoDev*. The funds will contribute towards the two phases of the program: Launch and Scale up.

- ✦ **Launch Phase** – Establish Climate Innovation Center and associated network: Build regional linkages across Caribbean markets by identifying talent, facility providers and business support organizations in CARICOM countries. Begin identifying a pipeline of Caribbean clean technology companies for participation in the CCIC in the next phase. Officially launch CCIC through series of media events and outreach.
- ✦ **Scale up Phase** – Scale CCIC Core Activities: Once regional linkages and initial programs have been launched, begin implementing and scaling core services and programs which are outlined in the business plan.



## 7.4.2 Potential Support

infoDev's stakeholder engagement process has identified a number of stakeholders who could provide potential funding and financial support to either the CIC itself or the CCIC clients. The level of potential participation is illustrated below and includes: (i) partners currently supporting the program, (ii) partners that have shown interest in participating and (iii) partners identified, but not yet engaged on the issue of funding support. All the entities depicted fund a range of programs and projects, which have relevance to the CCIC and its objectives. More detail relating to each of the entities included in the annexes.



## 7.5 Long-term Funding

To have a transformative impact on the region, the CCIC requires a long-term approach, and therefore necessitates financing beyond the initial 6 years of donor support. Longer-term funding will depend on institutional performance and results generated in the first five years. It will also depend on the level that annual operating budget can be offset by revenues. With modeled revenues at over USD 7M at year 10, infoDev is projecting an additional capital requirement of approximately USD 3M in a business-as-usual scenario from years 6 through 10 (see table below). The CCIC will go through a detailed reassessment in the 4<sup>th</sup> year to refine the strategy and understand future funding requirements.

Cumulative	Year 1-4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<b>CIC Budget</b>	\$8,099,347	\$10,096,915	\$14,092,049	\$16,089,617	\$16,089,617	\$18,087,184	\$20,084,752
<b>Financial Accelerator Revenue</b>	\$757,813	\$1,443,021	\$3,453,780	\$4,644,092	\$4,644,092	\$5,880,655	\$7,117,217
<b>Net Position</b>	(7,341,535)	(8,653,894)	(10,638,270)	(11,445,525)	(11,445,525)	(12,206,529)	(12,967,534)

## 7.6 Additional Services

If funds are raised beyond the current projected requirements, the Center could increase the scale of its current programming and scope of programs and services. Additional programs to be considered include:

- ✎ Innovation Prizes: The CCIC could make grants available up to USD 500K for international collaborative research projects to solve highly specific technical barriers to technologies that have a wide-reaching impact for the Caribbean region.
- ✎ Demonstration Project Funding: The CCIC may provide larger-scale financing than currently offered to assist in the financing of demonstration projects and field tests. Such activities would involve very innovative technologies that require large capital injections to prove a concept at a large scale and are often highly risky.
- ✎ Workforce Capacity Building: The center could look to expand its current capacity building courses to sponsor and fund larger workforce development activities within Caribbean universities and training institutions.
- ✎ Physical Facilities: The CCIC would build its own facilities and open the use of such facilities to the wider community based on a 'membership model'. Such a facility would house a range of prototyping and manufacturing equipment, including office and networking space.
- ✎ Expansion of regional programs: The CCIC would build regional satellite offices in multiple islands to better deliver programs and services to beneficiaries across the region.

## 7.7 Global Network Participation

In addition to country level activities, the CCIC will also participate and benefit from *infoDev's* Global Climate Technology Program. The CTP focuses on a number of global activities to coordinate national CICs, drive learning for developing country innovation in climate technologies, and collaborate with related initiatives. These programs include: (i) CIC Design & Oversight, (ii) Global Financing, (iii) Learning and Analysis, (iv) Global Networking and Collaboration, and (v) Monitoring and Evaluation. These five global programs will serve the needs of Caribbean climate innovators by helping them access the latest technologies, information, financing and expertise to participate in growing international clean tech industry opportunities.

While the global CTP activities will be operated by the *infoDev*'s Washington DC-based expert team, country CIC's will be implemented through the local World Bank offices. This will ensure that World Bank and IFC knowledge, systems and funding can be leveraged at the country level.



## 8.0 Indicative Impact and Results

The CCIC's economic, environmental, and social impacts will be determined by the technologies the center supports. These have been estimated using a comprehensive model based on the CCIC's budget breakdown and investment rationale, which generates targets for the CCIC program goals and maps them to dimensions of the results chain: global target, intermediate outcomes, ultimate outcomes, outputs and activities. Global and ultimate outcomes are shared across the whole CIC, while intermediate outcomes and outputs are categorized across four key results. The outcomes and outputs have their subsequent indicators, which outline their aims through a target.

### 8.1 Highlights

After 6 years, the revenues of up to 80 CIC-assisted companies will generate the equivalent of approximately USD 11 million in economic impact and help over 35,000 people increase their resiliency to climate change. In the long term (after 10 years), assuming continued financial support, the CCIC's macro-economic impact generated by approximately 150 companies, will have grown to over USD 47 million with over 150,000 people impacted and close to 4,000 cumulative jobs created. Through co and follow-on investments in CCIC companies, the Center is projected to deliver USD 26 million in private sector leverage over the 10 years.

In the long term, the CCIC is projected to achieve a range of technology impacts by contributing to the production of over 87 million kWh of cleaner or saved energy to over 37,000 people. It is expected that over 90,000 tons of CO<sub>2e</sub> will be mitigated<sup>46</sup>.

### 8.2 Spillover Effects

In addition to the measurable parameters outlined in the results framework and calculation of impact data, the CCIC programs and activities will produce numerous beneficial spillover effects to the Caribbean economy. It is envisioned that the CCIC's example will encourage increased innovative activity in the Caribbean region through universities and communities. This can lead to higher commercialization rates of domestic R&D, better access to infrastructure necessary for technology development, and increased workforce capacity of business and technical skills.

The direct and indirect creation of high-paying, sustainable jobs by CIC-supported companies will boost economic output in surrounding communities and Caribbean nations and provide Caribbean citizens with access to innovative products and services. This more active market will be further accelerated by the wider availability of information, which includes new products launched, companies created, industrial activity and export and trade. In parallel, the CCIC will facilitate the creation of new investor networks, enabling ventures in the Caribbean to capitalize on increased investment opportunities and access to follow-on funding.

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<sup>46</sup> More detailed modeling and assumptions are show in annexes

Via its coordination, networking and outreach efforts, the CCIC will endeavor to increase local and regional research cooperation and strengthen industry linkages. This will ensure greater transfer of knowledge, know-how and experience among Caribbean climate technology companies, in addition to their increased internationalization and competitiveness. Mentor and advisor-related services provided by the CCIC will also boost entrepreneurial opportunity and the success rates of invested companies. Marketing and outreach for CCIC technologies will also increase awareness of the industry. This will in turn encourage favorable policy in support of innovation, entrepreneurship and the accelerated scale-up of new technologies.

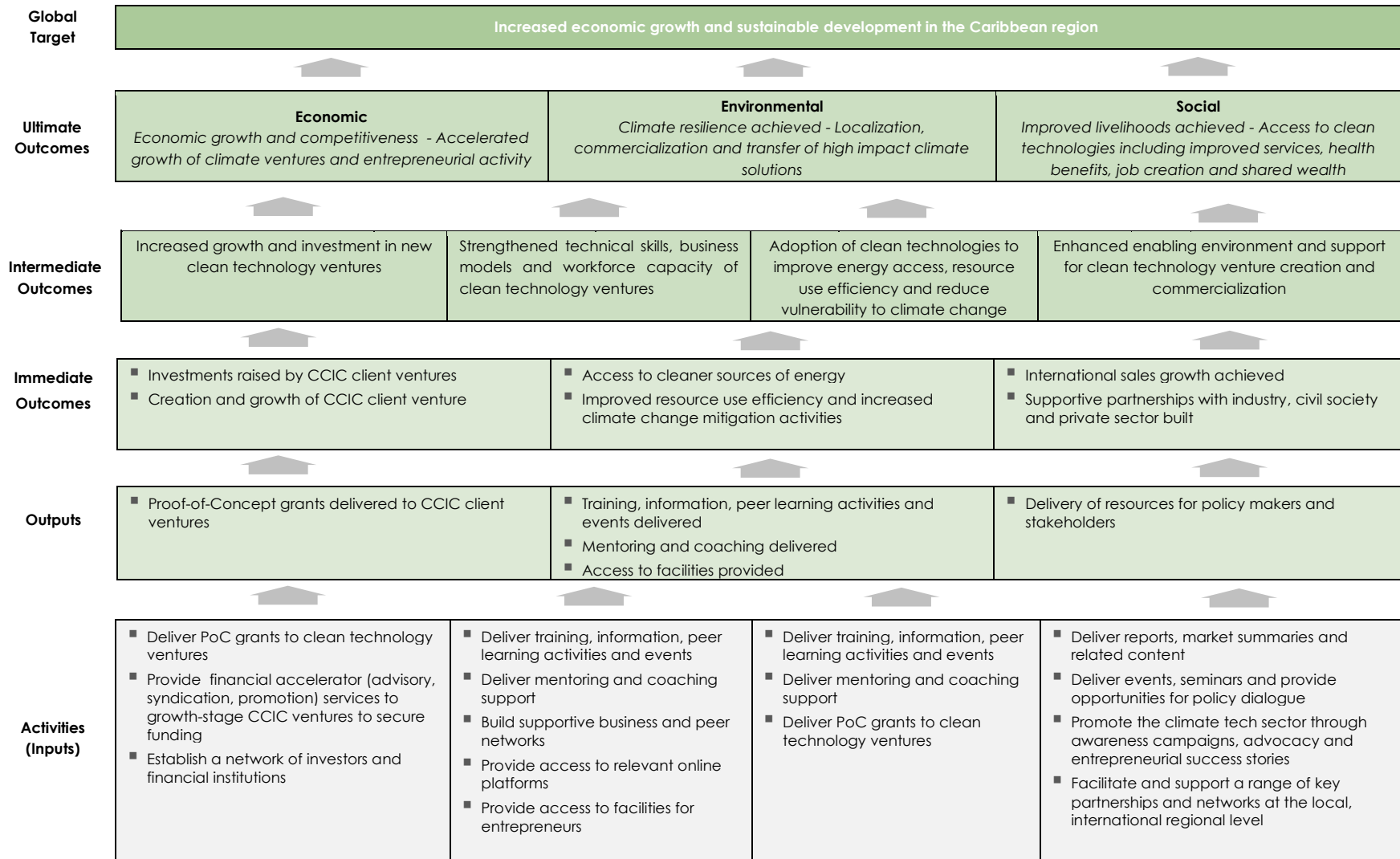
### 8.3 Monitoring and Evaluation

The CCIC will budget approximately USD 35K per year for monitoring and evaluation of both direct and spill-over effects that the center's programs and services are having on beneficiaries and surrounding communities. This will be complemented by infoDev's CTP Innovation Monitoring System (IMS) launching in 2014. M&E will be achieved through the following means of verification:

- ✦ Internal databases and data collection
- ✦ Caribbean CIC annual reports
- ✦ Focus groups and stakeholder follow-up
- ✦ Survey and other quantitative measurements where possible
- ✦ *infoDev* project supervision and assessments
- ✦ Client surveys and interview
- ✦ Government interviews
- ✦ Other stakeholder interviews
- ✦ Website usage statistics

In order to assess the performance of the CCIC, the full set of results indicators were developed in accordance with donor requirements under a Performance Measurement Framework. The PMF focuses on both quantitative and qualitative targets over 3, 6 and 10 years. This will be used to monitor the CCIC's performance on an annual and semi-annual basis.

## 8.4 Logic Model (LM)



## 8.5 Indicative Performance Measurement Framework (PMF)

Expected Results	Indicators	Targets 3yrs	Targets 6yr	Targets 10yr	Assumptions*	Data Sources	Frequency
<b>Ultimate Outcomes</b>							
<b>Economic</b>	Revenues of CCIC ventures generated (USD)	1,546,617	10,964,711	47,076,000	<ul style="list-style-type: none"> <li>■ Anticipated CIC beneficiary companies' cumulative revenues</li> <li>■ Technology impacts have been calculated with 7% increase per year taking into account decreasing costs and increasing efficiencies of clean technologies (Moore's Law of solar)</li> </ul>	CCIC client ventures	3, 6 and 10 years
<b>Environmental</b>	Number of people less affected by climate change	4,964	35,192	151,095	Number of people provided with: <ul style="list-style-type: none"> <li>■ Cleaner energy</li> <li>■ Improved/cleaner water access</li> <li>■ Access to cheaper/better quality food.</li> </ul>	Data from client ventures, calculated by CCIC	3, 6 and 10 years
	Reduction in GHG emissions (tons of CO <sub>2</sub> mitigated)	2,964	20,882	89,658	<ul style="list-style-type: none"> <li>■ Based on off-grid kW produced</li> <li>■ Using growth rate of 7% (Moore's Law of solar)</li> <li>■ 0.8722kg/kWh</li> </ul>	Data from client ventures, calculated by CCIC	3, 6 and 10 years
<b>Social</b>	Number of direct jobs created	102	371	989	<ul style="list-style-type: none"> <li>■ 2 employees for PoC clients</li> <li>■ 5 employees for Financial Accelerator clients with varying growth rates over 3, 6 and 10 years</li> </ul>	Data from CCIC Client ventures	Annual
	Number of indirect jobs created	306	1,113	2,967	<ul style="list-style-type: none"> <li>■ Indirect jobs anticipated at 3 x direct based on benchmark data from US</li> </ul>	Data from CCIC Client ventures, calculated by CCI	Annual
	Number of jobs created for youth	99	302	731	<ul style="list-style-type: none"> <li>■ Based on youth labor force participation rate: 62.3%</li> </ul>	Data from CCIC Client ventures, calculated by CCI	Annual
	Number of jobs created for women	64	231	616	<ul style="list-style-type: none"> <li>■ Based on female labor force participation rate: 55.6%</li> </ul>	Data from CCIC Client ventures, calculated by CCIC	Annual
<b>Intermediate Outcomes</b>							
<b>Increased growth and investment in new clean technology ventures</b>	Amount (USD) of CCIC funding accessed by client ventures (cumulative)	1,596,106	4,461,677	9,113,901	PoC Investments + Financial Accelerator Investments	CCIC Records	Semi-Annual
	Number of client ventures benefitting from CCIC services	33	84	156	Companies benefitting from PoC and financial accelerator funding and services	CCIC Records	Semi-Annual
<b>Strengthened technical skills, business models and workforce capacity of clean technology ventures</b>	Anecdotal evidence of skills developed					Interviews with beneficiary ventures and other stakeholders	Annual

<b>Adoption of clean technologies to improve energy access, resource use efficiency and reduce vulnerability to climate change</b>	Number of people with access to energy from cleaner and/or renewable sources	1,242	8,808	37,818	Based on projected cleaner sources of energy produced by CCIC companies and Caribbean household energy usage	Data from CCIC Client ventures, calculated by CCIC	Annual
	Number of people with access to better or cleaner water supply	3,222	22,843	98,076	Based on projected increased water access by CCIC companies and Caribbean household water usage	Data from CCIC Client ventures, calculated by CCIC	Annual
	Number of people with access to better/cheaper quality food	499	3,541	15,202	Based on projected enhanced agricultural products by CCIC companies and Caribbean household food consumption	Data from CCIC Client ventures, calculated by CCIC	Annual
<b>Enhanced enabling environment and support for clean technology venture creation and commercialization</b>	Anecdotal evidence of entrepreneurial engagement in the innovation ecosystem					Observations and interviews with beneficiary ventures, investors, research institutions and other relevant stakeholders	Annual
	Anecdotal evidence of impact on policy decisions and support structures					Observations of government programs and support structures and interviews with government, civil society and research institutions.	Annual
<b>Immediate Outcomes</b>							
<b>Investments raised by CCIC client ventures</b>	Number of ventures applying for financial accelerator support	45	150	310	Assuming an application success rate of 20%	CCIC Records	Semi-Annual
	Number of ventures receiving financial accelerator support	9	30	62	Average of ~8/year	CCIC Records	Semi Annual
	Number of CCIC ventures that have successfully secured funding	5	19	35	Medium and high growth ventures will secure some level of funding	CCIC Records	Annual
	Amount of investments raised by CCIC clients (USD)	2,750,000	13,437,500	26,750,000	<ul style="list-style-type: none"> <li>■ Ventures will receive 50% of their market value after 4 years in external financing</li> <li>■ Market value is determined by the venture's growth rate and PE multiple</li> </ul>	Data from CCIC Client ventures	Annual
	Number of investors in network	9	18	30	3 additional investors per year	CCIC Records	Annual
	Number of CCIC ventures that have increased international sales (%)	30%	50%	80%	Based on assumed international sales of CCIC ventures	Data from CCIC Client ventures	Annual
<b>Creation and growth of CCIC ventures</b>	Revenue growth (USD) of CCIC client ventures per year (domestic & international)	30%	31%	24%	Average revenue growth rates per year for Financial Accelerator firms based on benchmarks from region and Financial Accelerator model	Data from CCIC Client ventures	Annual
<b>Access to cleaner sources</b>	MW of installed capacity of	1	5	20	Cumulative revenues have been divided into 3	Data from CCIC Client	Annual

<b>of energy</b>	cleaner and/or renewable energy sources				sectors. The modeling assumes that 50% of the products/services sold by CIC ventures will generate energy impacts, 25% water and 25% agriculture.	ventures, calculated by CCIC	
	kL of improved water access	640,000	4,500,000	19,000,000	Cumulative revenues have been divided into 3 sectors. The modeling assumes that 50% of the products/services sold by CIC ventures will generate energy impacts, 25% water and 25% agriculture.	Data from CCIC Client ventures, calculated by CCIC	Annual
<b>Improved resource use efficiency and increased climate change mitigation activities</b>	Anecdotal evidence of more efficient resource use					Interviews with CCIC ventures and end-users	Annual
	kWh of energy saved	2,900,000	20,000,000	90,000,000	Cumulative revenues have been divided into 3 sectors. The modeling assumes that 50% of the products/services sold by CIC ventures will generate energy impacts, 25% water and 25% agriculture.	Data from CCIC Client ventures, calculated by CCIC	Annual
<b>International sales growth achieved</b>	Number of CCIC ventures that have increased international sales (%)	30%	50%	80%	Based on assumed international sales of CCIC ventures	Data from CCIC Client ventures	Annual
<b>Supportive partnerships with industry, civil society and private sector built</b>	Number of partnerships facilitated with industry, civil society and the private sector (domestic, regional and international)	5	25	30	Based on partnership targets	CCIC Records	Annual
	Number of members in supportive networks	200	800	1200	Based on targets for awareness, outreach and network development	CCIC Records	Annual
	Anecdotal evidence of strengthened networks in region					Observations and interviews with beneficiary ventures, investors, research institutions and other relevant stakeholders	Annual
<b>Outputs</b>							
<b>Proof-of-Concept grants delivered to CCIC client ventures</b>	Number of ventures applying for PoC support	120	270	470	<ul style="list-style-type: none"> <li>Assuming an application success rate of 20%</li> </ul>	CCIC Records	Semi-Annual
	Number of CIC ventures receiving PoC support	24	54	94	<ul style="list-style-type: none"> <li>Average of ~10/year</li> </ul>	CCIC Records	Semi-Annual
	Number of PoC competitions launched	3	6	10	<ul style="list-style-type: none"> <li>1 PoC competition launched annually</li> </ul>	CCIC Records	Annual
<b>Training, information, peer learning activities and events delivered</b>	Number of international and domestic training and networking activities delivered, including policy dialogues, online course and business seminars	115	230	380	<ul style="list-style-type: none"> <li>24 online courses per year</li> <li>1 policy forum per year</li> <li>12 business seminars per year</li> <li>1 Partnership and network program per year</li> </ul>	CCIC Records	Annual
	Number of participants engaged in training/networking activities, including policy dialogues,	2070	4140	6900	<ul style="list-style-type: none"> <li>10 participants in online courses</li> <li>25 participants in seminars</li> <li>50 participants in policy forum</li> </ul>	CCIC Records	Annual

	online course and business seminars				<ul style="list-style-type: none"> <li>100 participants in partnership and network event</li> </ul>		
<b>Mentoring and coaching delivered</b>	Number of participants mentored/coached	108	216	360	<ul style="list-style-type: none"> <li>2 team members per company in PoC ventures at ~10 PoC ventures/year</li> <li>2 team members per company in Fin Acc ventures at ~8 ventures/year</li> </ul>	CCIC Records	Annual
	Number of mentors in network	10	20	30	<ul style="list-style-type: none"> <li>Based on targets for mentor network</li> </ul>	CCIC Records	Annual
<b>Access to facilities provided</b>	Number of facilities offered	3	6	10	<ul style="list-style-type: none"> <li>Assumes one facility provider MOU signed per year</li> </ul>	CCIC Records	Annual
	Percentage of ventures using facilities	40%	50%	60%	<ul style="list-style-type: none"> <li>Assumed use of facilities by companies based on surveys</li> </ul>	CCIC Records	Annual
<b>Delivery of resources for policy makers and stakeholders</b>	Number of reports, market summaries, and relevant content made available	50	130	270	<ul style="list-style-type: none"> <li>~4 market summaries per year</li> <li>~2 trend reports per year</li> <li>~1 annual report per year</li> <li>~1 fellowship per year</li> <li>~28 online/other content per year</li> </ul>	CCIC Records	Annual
	Number of international and domestic training and networking activities delivered, including online courses, policy dialogues and business seminars	115	230	280	<ul style="list-style-type: none"> <li>~24 online courses per year</li> <li>~1 policy forum per year</li> <li>~12 business seminars per year</li> <li>~1 Partnership and network program per year</li> </ul>	CCIC Records	Annual

## 9.0 Risks

Along with expected successes, there are a range of risks associated with establishing an innovative program such as a regional CIC in the Caribbean; in terms of (i) Operational Risks, (ii) Market Environment Risks and (iii) Implementing Agency Risks. The stakeholder outreach engagement process outputs provide an indication of the major risks that will be encountered and potential management strategies. However, a key role of the Center's Advisory Committee and management team will be to examine, evaluate, and manage risks over time. Included below is an overview of the key risks identified and their associated rating, description and mitigation strategies:

Risk Category	Risk Rating	Risk Description	Proposed Mitigation Measure
<b>1. CCIC Operational Risks</b>			
<b>1.1 Stakeholder support</b>	L	<ul style="list-style-type: none"> <li>Stakeholders including beneficiaries, partners, government and private sector that were involved in design process are not supportive of the CCIC's implementation.</li> </ul>	<ul style="list-style-type: none"> <li>Locally based <i>infoDev</i> staff will maintain relationships with key stakeholders throughout implementation period</li> <li>Center will be staffed with a Marketing/ Partnership Specialist</li> <li>Board will include seats for key stakeholders</li> <li><i>infoDev</i> will monitor implementation to ensure stakeholders' design is followed</li> </ul>
<b>1.2 Host institution/ implementation partners</b>	M	<ul style="list-style-type: none"> <li>There is a risk that potential host institutions/ implementation partners for the CCIC do not have the adequate capacity, skills and resources to successfully bid and host the center.</li> </ul>	<ul style="list-style-type: none"> <li>Throughout the design phase, <i>infoDev</i> has assessed the capacity of existing institutions and identified such risks</li> <li>Competitive process to select implementing partners encouraged strengthened bids and consortia</li> <li>The project implementation team will provide ongoing support and technical assistance throughout the implementation phase.</li> </ul>
<b>1.3 Management team and staff</b>	M	<ul style="list-style-type: none"> <li>There are risks associated with the unavailability or lack of talent to manage the center</li> <li>Other risks include the selection of a manager and/or staff who are ineffective at delivering the CCIC's expected results</li> </ul>	<ul style="list-style-type: none"> <li>Salaries of CCIC management have been calculated at competitive market rates to attract required talent</li> <li>Identification of management and staff will follow WBG procurement guidelines and competitive selection procedures</li> <li>Local advisory committee will specify the job description and associated terms and conditions of employment for each employee, oversee the performance of management and staff, set the required performance metrics to monitor management performance and results delivery, and initiate corrective processes in the event that such delivery does not meet the performance metrics specified.</li> </ul>



<p><b>1.4 Performance</b></p>	<p>M-H</p>	<ul style="list-style-type: none"> <li>▪ CCIC does not achieve adequate performance results as agreed in the grant agreement</li> <li>▪ Investments do not generate required returns to achieve CIC sustainability objectives</li> </ul>	<ul style="list-style-type: none"> <li>▪ <i>infoDev</i> and the CCIC board will monitor the results of the Center to ensure grant agreement milestones are being met. This will be achieved through the establishment of a comprehensive M&amp;E framework that incorporates a well-defined set of relevant Key Performance Indicators.</li> <li>▪ In coordination with donors, <i>infoDev</i> will retain the flexibility of reallocating budgets based on the performance of specific budget items of the CCIC. Grant agreements will be canceled and reissued if milestones in the M&amp;E framework are not achieved.</li> <li>▪ Should the performance of the implementing partners in the establishment year be less than satisfactory, new partnerships will be sought to deliver on years 2 – 5.</li> <li>▪ The Center's first 6 years of funding are not contingent upon returns on investment. Expectations for ROI are long-term and will be monitored regularly to adjust the CCIC's future funding requirements.</li> </ul>
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**2. Market Environment Risks**

<p><b>2.1 Country</b></p>	<p>L</p>	<ul style="list-style-type: none"> <li>▪ Political support for the CCIC weakens and/or political opposition to the CCIC impacts</li> <li>▪ Introduction of perverse subsidies and/or decrease of conducive policies to support climate technologies</li> </ul>	<ul style="list-style-type: none"> <li>▪ CCIC has been designed in close coordination with Caribbean governments, including multiple ministries in a number of countries</li> <li>▪ Center is not contingent on government funding</li> <li>▪ Government has minority role on CCIC board</li> <li>▪ Many Caribbean governments have National Strategies on Climate Change</li> <li>▪ CARICOM recently announced an energy policy in line with the CCIC's mandate</li> <li>▪ CCIC investments made will not be based on speculative or short-term policy measures.</li> <li>▪ CCIC's policy advisory business line will conduct outreach to government decision makers to ensure such risks are fully considered.</li> </ul>
<p><b>2.2 Market demand</b></p>	<p>L</p>	<ul style="list-style-type: none"> <li>▪ Poor demand for CCIC's services</li> <li>▪ Lack of quality deal-flow for center's investments</li> </ul>	<ul style="list-style-type: none"> <li>▪ Assessment of market demand has been incorporated into the design phase by interviewing and analyzing potential CCIC beneficiaries</li> <li>▪ Center builds extensive regional and local stakeholder networks to encourage demand for the CCIC services and the associated deal flow</li> <li>▪ Center continually adapts to market gaps and reallocates budgets as necessary</li> <li>▪ Emphasis on customer feedback, quality control and M&amp;E.</li> </ul>

2.3 Competition	L	<ul style="list-style-type: none"> <li>▪ Overlap with other initiatives.</li> <li>▪ Other donor/development program/company plan to implement a CIC.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Close coordination with existing initiatives accompanied by a focus on Center visibility.</li> <li>▪ Strength of the chosen regional and local Center consortium partners.</li> <li>▪ Demonstrable support from stakeholders and local governments to ensure CIC is aligned with national goals</li> </ul>
<b>3. Implementing Agency Risks</b>			
3.1 CCIC financing/donor support	L	<ul style="list-style-type: none"> <li>▪ Risks that full initial financing for center's implementation in first 6 years is not secured.</li> <li>▪ Budget outlined in business plan is insufficient to execute current model.</li> <li>▪ Additional risk of financing beyond year 6 not being secured.</li> </ul>	<ul style="list-style-type: none"> <li>▪ More than 35% of budget currently secured and ongoing discussions with a number of donors &amp; investors.</li> <li>▪ Project still viable at lower levels although not ideal. Various scenarios have been planned and accounted for and will be updated and reviewed annually to assess how options which enhance longer term sustainability could be implemented.</li> <li>▪ Financial sustainability as an explicit aim of the Center post year 6 with a clear focus on revenue generation.</li> <li>▪ Close monitoring by <i>infoDev</i> of financing decisions including flexibility in reallocating program budgets as needed.</li> </ul>
3.2 Capacity & Governance	L	<ul style="list-style-type: none"> <li>▪ Risk that the <i>infoDev</i>'s project implementation team lacks adequate staffing, processes and/or systems sufficient to allow for successful achievement of the results envisaged by the project.</li> </ul>	<ul style="list-style-type: none"> <li>▪ As part of project preparation, <i>infoDev</i> will ensure that the staffing arrangements and project management procedures are adequate to implement the CCIC.</li> <li>▪ Through review of relevant financial management capacity of the host/implementing partners, necessary training will be provided to equip <i>infoDev</i>'s project implementation team with the required skills to ensure sufficient financial management and procurement capacity of the CCIC.</li> </ul>
3.3 Fraud & Corruption	L	<ul style="list-style-type: none"> <li>▪ Grants provided to implementing partners and host institution/s will be mismanaged.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Host institution/s and implementing partners will adhere to World Bank Procurement Guidelines. Financial management and technical progress will be routinely supervised during implementation.</li> </ul>

## 10.0 Conclusion

In the global context of climate change, while the Caribbean's contribution to greenhouse gas emissions (GHGs) is negligible, the projected climate change impacts are expected to be significant. The region faces severe threats from rising sea levels, extreme weather conditions including hurricanes, tropical storms and flooding, that impact land, energy, water and food resources. These threats will require a substantial and sustainable investment of resources for the necessary adaptation and mitigation activities. This is an opportunity to locally develop technologies and business models to address these climate change threats. However, a number of gaps and barriers in financing, market awareness, technical capacity and government policies hinder the growth of the Caribbean's climate innovation ecosystem.

The Climate Innovation Center in the Caribbean will be a targeted yet holistic mechanism to overcome these gaps and accelerate the domestic development, deployment and transfer of climate technology solutions. The CCIC's service and programmatic offerings will include: access to finance, technology commercialization support, venture acceleration and market development assistance. In addition to stimulating innovation and market linkages within the Caribbean, the CIC will be able to deliver regional and international collaboration, knowledge exchange and value chain partnerships through *infoDev*'s global Climate Technology Program.

The CCIC will provide mentoring, direct funding and investment facilitation to up to 80 new ventures over 6 years and, over ten years, it is projected the CCIC will create approximately 3000 direct and indirect jobs and mitigate 90,000 tons of CO<sub>2</sub>e. The projected cost to implement, launch and operate a CIC as designed by the Caribbean stakeholders is USD 10 million over a 6 year period, of which 24% is allocated to the financial accelerator, 23% for technology commercialization, 8% for venture acceleration services, 12% for market development and the remaining 33% for core staff, local hubs, M&E and overheads. Donor funding will be initially required for the Center; however, it is anticipated that returns from the CCIC's activities will cover up to 60% of the Center's operating costs by year 8. The Center will also aim to introduce other revenue streams once a strong value proposition has been achieved in the initial years.

The stakeholder engagement process has identified and built a strong coalition of stakeholders and identified a pipeline of potential investees, that can support the Center itself or the CCIC clients. Jamaica's SRC and Trinidad and Tobago's CARIRI will host the CCIC and forge important partnerships, alliances and linkages across the region. Pending the success and outcomes of the CCIC's programs, the direction, scope and scale of the Center (and business plan) will evolve over time with guidance from *infoDev*, a strong management team and Advisory Committee.

The CIC will serve as a catalyst for long-term transformative impact in the Caribbean's climate technology sectors and help develop new industries, thereby creating jobs and producing products and services that equip the region and its people to respond effectively to energy and resource security challenges.

## 11.0 Stakeholder Support

Organization Name & Type	Contact Person	Location
<b>Government</b>		
Barbados National Oil Company	Richard Goddard	Barbados
Division of Energy & Telecoms, Prime Minister's Office	William Hinds	Barbados
Ministry of Health	Mikala Hope-Franklyn	Barbados
Department of Agriculture, Forestry & Fisheries	Sean Sealy	Barbados
Caribbean Export Development Agency	Damien Sorhaindo	Barbados
Office of Trade Negotiation	John Malcolm Spence	Barbados
Ministry of Science, Technology, Energy & Mining	Hillary Alexander	Jamaica
Planning Institute of Jamaica	Richard Kelly	Jamaica
Planning Institute of Jamaica	Richard Lumsden	Jamaica
Ministry of Energy and Energy Affairs (MEEA)	Hannibal Anyika	Trinidad & Tobago
Invest Trinidad & Tobago	Shyamal Chandradathsingh	Trinidad & Tobago
Youth Training & Employment Partnership Programme	Nigel Forgenie	Trinidad & Tobago
Ministry of Labour & Small Enterprise EDD	Michael Gordon	Trinidad & Tobago
Green Fund Executing Unit, Min. of The Environment	Richard Laydoo	Trinidad & Tobago
Green Fund Executing Unit, Min. of The Environment	Runako Osborne	Trinidad & Tobago
Ministry of Energy and Energy Affairs (MEEA)	Randy Ramadhar Singh	Trinidad & Tobago
Invest Trinidad & Tobago	David Cockburn	Trinidad & Tobago
<b>International</b>		
UK Department for International Development	Simone Bannister	Barbados
Inter-American Development Bank	Michael Hennessey	Barbados
UK Department for International Development	Nicola Jenns	Barbados
World Bank	Valentini Giorgio	Jamaica
Director, Friedrich Ebert Stiftung	Judith Wedderburn	Jamaica
Technical Centre for Agricultural & Rural Cooperation	Judith Francis	Netherlands
Zernike America Latina SA	Alessandro Favalli	Panama
Warren Caribe	Chris Koch	Puerto Rico
World Bank	Herbert Samuel	St Vincent & The Grenadines
World Bank	Carmen Gomez-Trigg	Trinidad & Tobago
World Bank	Ian Ivey	Trinidad & Tobago
Julian Hall	Julian Hall	UK/Barbados
World Bank	Anthony Lambkin	USA
World Bank	Eleanor Ereira	USA
<b>NGOs</b>		
Caribbean Group of Youth Business Trusts	Marcia Brandon	Barbados
Barbados Youth Business Trust	Cardell Fergusson	Barbados
Caribsav	Natalie Hutchinson	Barbados

Barbados Youth Business Trust	Josiah Kirton	Barbados
Jamaica Solar Energy Association	Roger Chang	Jamaica
The Competitiveness Company	Margaret Mais	Jamaica
The Competitiveness Company	Beverly Morgan	Jamaica
The Competitiveness Company	Hilda Vaughan	Jamaica
SVG Chamber of Agriculture & Nutrition Inc	Lennox Lampkin	St Vincent & The Grenadines
Global Water Partnership - Caribbean	Avril Alexander	Trinidad & Tobago
Youth Business Trinidad & Tobago	Shedron Collins	Trinidad & Tobago
The Energy Chamber	Thackway Driver	Trinidad & Tobago
Fondes Amandes Community Reforestation Project	Kemba Jaramogi	Trinidad & Tobago
Fondes Amandes Community Reforestation Project	Thembegi Jaramogi	Trinidad & Tobago
The Energy Chamber	Sherwin Long	Trinidad & Tobago
The Energy Chamber	Priya Maharaj	Trinidad & Tobago
Citizens for a Greener T&T	Sheldon A. Mitchell	Trinidad & Tobago
Green Building Association	Mandilee Newton	Trinidad & Tobago
Youth Business Trinidad & Tobago	Gloria Rolingson	Trinidad & Tobago
Sustrust	David Shim	Trinidad & Tobago
Niko Resources Ltd	Adrian Thomas	Trinidad & Tobago
<b>Private Sector/Financial Institutions</b>		
Caribbean Development Bank	Cheryl Dixon	Barbados
Development Bank of Jamaica	Audrey Richards	Jamaica
Caribbean Water Treatment	Mario Bento	Antigua & Barbuda
Themba Biofuels Ltd	Elliott Lincoln	Antigua & Barbuda
Brammavich	Renaldo Bramble	Barbados
Clarke Energy Associates	Roland Clarke	Barbados
Dream Chasers Inc	Troy Cumberbatch	Barbados
Atom Energy	Erwin Edwards	Barbados
ForteCorp	Paul Forte	Barbados
Flying Fish Studios	Steve Fung	Barbados
Wind Sol Technology	William Goddard	Barbados
Clarke Marketing	Alison Harewood	Barbados
Consultant	Frank René Holder	Barbados
Nibiru Concepts	Maria Kublalsingh	Barbados
Grapefruit & Molasses Foodies Inc	Paul Lucas	Barbados
Aeroponics Farm	Cherie Pounder	Barbados
In Fusion Catering Services	Omar Robertson	Barbados
Consultant	Cedric Stoute	Barbados
EE&M Consulting/GVEP International	Leighton Waterman	Barbados
Green Technologies	Orville Yearwood	Barbados
O D Brisbane & Sons	Susan Watty	Dominica
Grenada Solar Power Ltd	Kevin Burkhardt	Grenada
3BI	Chadwick Anderson	Jamaica

Brittenwoods International	Silbert Barrett	Jamaica
EnBar Consulting	David Barrett	Jamaica
BCI Solutions Company Ltd	Yvette Batts	Jamaica
MODE Ltd	Brian Bernal	Jamaica
HBS Consulting	Hermon Edmondson	Jamaica
Consultant	Elizabeth Emanuel	Jamaica
Caribbean Solar Energy Co Ltd	Shineika Hacker-Milton	Jamaica
PAUL HAY Capital Projects	Paul Hay	Jamaica
Quality Management Consultancy Co	Nsombi Jaja	Jamaica
CaribShare Biogas	Carol Lue	Jamaica
Businessman	Darien Manhertz	Jamaica
Caribbean Solar Energy Co. Ltd	David Milton	Jamaica
The RMP Group / Keystone Augusta	David Mullings	Jamaica
EcoTec	Chinyere Nwaogwugwu	Jamaica
Diamond Paint Manufacturing Co Ltd	York Seaton	Jamaica
Canary Investments Ltd	Herman Shim	Jamaica
Development Synergies	Katrine Smith	Jamaica
A1 Solutions	Phillip Thomas	Jamaica
Keystone Augusta	Bianca Welds	Jamaica
Doug Wright + Associates	Omari Wright	Jamaica
Applied Renewables Caribbean	Ken Aldonza	Saint Lucia
Consultant	Wazeer Aleem	Trinidad & Tobago
Enman Group	Donald Baldeosingh	Trinidad & Tobago
DC Power Systems	Ian Boon	Trinidad & Tobago
TOSL Engineering Ltd	Gary Clyde	Trinidad & Tobago
Connil Enterprises	Conrad Enill	Trinidad & Tobago
Energy Dynamics LAC	Andre Escalante	Trinidad & Tobago
ABT Engineers & Constructors	Anthony F Greene	Trinidad & Tobago
Tri-Continental Group	Senissa Jobity-Harewood	Trinidad & Tobago
Inspection Services Company Ltd (ISCO)	Aldwyn Lequay	Trinidad & Tobago
TOSL Engineering Ltd	Rishi Mahadeo	Trinidad & Tobago
Veruscura Ltd	Rene Marcellin	Trinidad & Tobago
CME Consulting	Judith Mark	Trinidad & Tobago
Energy professional	Kevin Mills	Trinidad & Tobago
TYE Manufacturing Co Ltd	Suzette Mohammed	Trinidad & Tobago
TYE Manufacturing Co Ltd	Jason Pantin	Trinidad & Tobago
New Horizon Energy Services Ltd	Martin Pinard	Trinidad & Tobago
Smart Energy	Ian Smart	Trinidad & Tobago
SITEK	Johan Sydow	Trinidad & Tobago
Energy Dynamics LAC	Christian Tom Yew	Trinidad & Tobago
TSL Group	Aura Watson-Bereaux	Trinidad & Tobago
Consultant (Banking)	Richard Young	Trinidad & Tobago
<b>Research Institutions/Experts</b>		

St Georges University	Dirk Burkhardt	Grenada
St Georges University	Calum MacPherson	Grenada
St Georges University	Hugh Sealy	Grenada
St Georges University	Randall Waechter	Grenada
International Centre for Env. & Nuclear Sciences	Richard Annells	Jamaica
University of Technology, Jamaica	Clive Broomfield	Jamaica
University of the West Indies	Leonardo Clarke	Jamaica
Scientific Research Council	Curtis Deenah	Jamaica
Scientific Research Council (SRC)	Roslyn Fisher	Jamaica
Caribbean Agricultural Research and Development Institute	Rasheeda Hall-Hanson	Jamaica
Scientific Research Council	Marcia Henry	Jamaica
University of the West Indies	Tracy-Ann Hyman	Jamaica
Centre for Leadership and Governance	Joel Jones	Jamaica
Scientific Research Council	Bevon Morrison	Jamaica
University of Technology, Jamaica	Shamene Parker	Jamaica
UWI Institute for Sustainable Development	Heather Pinnock	Jamaica
University of the West Indies	Michael Taylor	Jamaica
University of the West Indies	Sheray Warmington	Jamaica
Bio Tech Research & Development Institute	Charah Watson	Jamaica
Scientific Research Council (SRC)	Hawthorne Watson	Jamaica
Scientific Research Council	Mona Whyte	Jamaica
Scientific Research Council / CEIS	Tricia Williamson	Jamaica
Northern Caribbean University	Hazel Wright O'Connor	Jamaica
CARIRI	Liaquat Ali-Shah	Trinidad & Tobago
Arthur Lok Jack Graduate School of Business	Candace Brathwaite	Trinidad & Tobago
Arthur Lok Jack Graduate School of Business	Miguel Carrillo	Trinidad & Tobago
National Institute for Higher Ed, Research & Tech	Joanne Chin Sang	Trinidad & Tobago
CARIRI	Ronald Dubrisingh	Trinidad & Tobago
Arthur Lok Jack Graduate School of Business	Tamara Edwards	Trinidad & Tobago
University of the Southern Caribbean	Devon Gardner	Trinidad & Tobago
CARIRI	Megnath Gosein	Trinidad & Tobago
Caribbean Institute of Sustainability	Steven Greenleaf	Trinidad & Tobago
University of The West Indies	Indra Haraksingh	Trinidad & Tobago
Arthur Lok Jack Graduate School of Business	Nirmala Harrylal	Trinidad & Tobago
Arthur Lok Jack Graduate School of Business	Zaffar Khan	Trinidad & Tobago
University of The West Indies	Graham King	Trinidad & Tobago
University of The West Indies	Gurmohan Kochhar	Trinidad & Tobago
University of The West Indies	Renique Murray	Trinidad & Tobago
University of The West Indies	Cathy Radix	Trinidad & Tobago
CARIRI	Barbara Whittington	Trinidad & Tobago

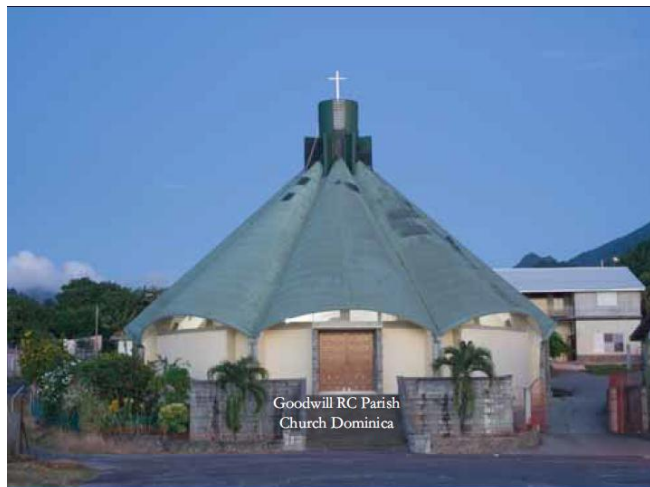
# Annex 1: Chapter 3 Additional Support Information

The sections that follow provide additional narrative and data relevant to the Climate Innovation Technology Market Landscape described in chapter 3.

## A1.1 Climate Adaptation Methods

### A1.1.1 Extreme Weather 'Proofing'

The Caribbean has seen notable examples of innovative design and practice in building for hurricane and earthquake resistance. Of particular note are reinforced concrete folded-plate and thin-shell roof structures engineered by CEP Ltd (a Caribbean consulting engineering firm) and primarily built in Dominica, several of them in rural areas.



**Goodwill RC Church in Dominica incorporating reinforced concrete, thin-shell roof structure**

These structures are said to have lower construction costs and maintenance costs than the steel-portal-framed building structures commonly erected in the Caribbean for industrial and commercial purposes<sup>47</sup>, but the conventional wisdom (that steel-framed structures are more economical) has prevailed and thin-shell RC construction is now relatively rare, despite its proven advantages.

In agriculture, there are opportunities for severe weather proofing in the region. These include the use of dwarf trees (e.g. nutmeg), integrated cropping systems that include less storm vulnerable crops such as root crops<sup>48</sup> or rapid rotation growing systems where saleable products

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<sup>47</sup> Email from Tony Gibbs, FEng, director of CEP Ltd, to H A Samuel, 20<sup>th</sup> Feb 2013

<sup>48</sup> Pers comm. Dr Guido Marcelle, Produce Chemist, Grenada



can be grown and delivered within several weeks of a hurricane impacting<sup>49</sup>. Dr. Janet Lawrence, a scientist at the Caribbean Agricultural Research and Development Institute, has developed collapsible protective cropping structures in Jamaica that can be quickly 'de-constructed' in advance of a hurricane and just as quickly re-constructed in its wake<sup>50</sup>.

### **A1.1.2 Drought Control**

The region's agriculture is largely dependent on rainfall and consequently, water resource management and water use efficiency are underdeveloped across the Caribbean. Insufficient and ineffective harvesting and storage of rainwater for utilization during dry times at national and household level is a critical issue. Conservation-based irrigation systems (drip and tape irrigation) are rarely-used agricultural practices and indeed in the dry season many farmers simply stop farming until the rains come<sup>51</sup>. There is considerable potential to utilize the regional water resources more effectively and efficiently, even as droughts become more frequent.

### **A1.1.3 Flood Control**

There are several aspects relevant to flood control from a climate change adaptation perspective. These include addressing coastal flooding due to higher sea levels, addressing the flooding of urban and rural areas caused by more extreme rainfall events and greater runoff rates, and utilizing agricultural production systems designed to address extreme weather events, including flooding. For example, *Goodfellow Farms*<sup>52</sup> in The Bahamas has developed the simple raised media-based hydroponic growing system, shown below, which ensures crops do not get 'drowned' if heavy rainfall causes flooding.



**Design and innovation as a means to adapt to flooding: raised hydroponics growing systems (Goodfellow Farms, The Bahamas)**

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<sup>49</sup> [http://www.tffi.net/article\\_view/256](http://www.tffi.net/article_view/256)

<sup>50</sup> [http://www.rienet.net/ri\\_cfm?cat\\_research%20update&ID=496](http://www.rienet.net/ri_cfm?cat_research%20update&ID=496)

<sup>51</sup> Caribbean Agro-Meteorological Initiative: Project Mid-Term Evaluation Report, Ian Ivey, CCST, 10/2011

<sup>52</sup> [http://www.tffi.net/article\\_view/256](http://www.tffi.net/article_view/256)

## A1.2 Energy technologies

The Caribbean, with its high solar insolation (Schwerin, 2011) and impressive wind energy potential (Jargstorf, 2011) is considered by many to be an ideal region for the utilization of renewable energy sources. Hydro, solar, wind, biofuels and geothermal energy sources in particular are often highlighted as those with the most potential to make a significant contribution to the region's energy mix. But despite this apparent abundance, penetration of renewables is very low. It is estimated by CARICOM that renewables accounted for 9% of electricity supply in the region in 2007 and has declined since<sup>53</sup>. A summary of the region's electricity profile is presented in the table below; these data suggest that 8.8% of the region's total electricity supply in 2011 was supplied by renewables.

Country	Electricity Production, MWh	% RE	Annual Electricity Consumption per Capita (kWh)
Antigua & Barbuda	120,000	0%	1,339
The Bahamas	2,139,000	0%	5,493
Barbados	1,001,500	0%	3,656
Belize	483,270	65%	1,355
Dominica (2010)	99,259	23%	1,467
Grenada	204,524	0%	1,950
Guyana	653,000	8%	864
Jamaica	4,136,879	6%	1,527
St. Kitts & Nevis	142,000	NA	2,677
Saint Lucia	370,609	0%	2,106
St Vincent & the Grenadines	140,739	22%	1,287
Suriname	1,618,000	53%	3,056
Trinidad & Tobago	8,589,000	0%	6,379

Table A1.1: Summary electricity supply profile of CARICOM countries in 2011 (Sources: Utility data, World Bank, IRENA)

The table below shows that only seven of the fifteen CARICOM countries had any utility-scale, grid-connected renewable energy resources in place as at the end of 2011, and only three technologies (biomass, hydro and wind) are represented.

Country	Utility-scale, Grid-connected Renewable Energy (as of Dec 2011)
Antigua & Barbuda	-
Bahamas	-
Barbados	-

<sup>53</sup> CARICOM Energy Policy, approved March 2013.

Belize	Hydro
Dominica	Hydro
<b>Grenada</b>	-
Guyana	<b>Biomass (Bagasse)</b>
<b>Haiti</b>	-
Jamaica	<b>Hydro, Wind</b>
<b>Montserrat</b>	-
<b>St Lucia</b>	-
St Kitts & Nevis	<b>Wind</b>
St Vincent & The Grenadines	<b>Hydro</b>
Suriname	<b>Hydro</b>
<b>Trinidad &amp; Tobago</b>	-

**Table A1.2 Utility- scale, Grid-connected Renewable Energy in CARICOM**

From the small-scale, distributed energy perspective, the picture does not look much better. Barbados, with its world-class solar water heating industry, is the region's leader in the use of distributed renewable energy resources. Over the past few years Grenada has developed a growing inventory of grid-connected solar photovoltaic (PV) systems and other countries are using these as examples of how to adopt the technology. However, progress has been limited to date. For example, despite Grenada's lead in establishing grid-connected PV systems since 2007, only five of the fifteen electricity companies in CARICOM today have published policies for the interconnection of small RE sources to their national grids.

However, the Barbados solar water heating (SWH) industry is the Caribbean's most impressive and most-cited example of how indigenous, bottom-up climate innovation and entrepreneurship can grow to deliver large-scale results for a country and a region. It is estimated<sup>54</sup> that the installed thermal capacity (for the replacement of heating by electricity) of solar water heating in CARICOM is 170 MW<sub>th</sub> – which places SWH in the category of a small-scale, distributed renewable energy intervention that is having a utility-scale impact; this is a unique outcome in the region.

Energy technologies relevant to the CCIC include:

### **A1.1.1 Bio-energy**

**Biomass energy** – The simplest example is heat energy derived from the direct combustion or conversion of wood and plant matter (primary energy sources). A primary example is the combustion of bagasse from sugar cane farms used for on-site cogeneration process heat and steam for electricity production.

**Biofuels** – secondary fuels converted from primary biomass sources. Examples are ethanol produced from sugar cane and biogas (methane) from agricultural and industrial waste streams.

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<sup>54</sup> Gardner, Devon, 2012. *Development and implementation of a strategy for the promotion of solar water heating in CARICOM member states*. CARICOM Energy Unit, CARICOM Secretariat, Georgetown, Guyana.

### **A1.1.2 Energy Efficiency (EE)**

EE Technology – includes a wide range of passive and active technology options, ranging from reflective roof coatings, roof/ceiling insulation and external window shading systems through to high-efficiency light bulbs, energy-efficient appliances, high efficiency air conditioning systems, and hybrid vehicles, which reduce the amount of energy consumed for provision of a given level of energy service.

EE Solutions – Approaches and systems ranging from energy audits coupled with EE technology and process redesign<sup>55</sup> through to 'intelligent' building systems utilizing smart sensors, meters and data analytics software to monitor building parameters and control energy usage in entire buildings.

EE Behavior – changing behavior is dependent upon being able to motivate consumers to act in desired ways. This motivation arises not from simply demonstrating net benefits, but rather from a complex interaction of information, feedback and other behavioral factors that are now being addressed by software-based, virtual energy monitoring and management tools and systems<sup>56</sup>.

### **A1.1.3 Solar Energy**

Solar Electricity – in particular modular photovoltaic (PV) systems that produce electricity in grid-connected or standalone mode. Installations can be household or utility scale. Falling prices of the PV modules makes this an increasingly attractive technology option in the region where electricity prices are generally very high.

Solar Water Heating – the simplest use of solar insolation by heating water in a flat-plate collector, usually located on a roof, from where the water is stored in a tank and piped to the building for use. For residential installations, solar water heating is by far the most economical way to provide hot water.

Solar Cooling – uses the sun as the energy source to drive a refrigeration fluid in a closed-loop refrigeration system (which would normally be driven by an electric-powered pump) to provide cooling.

### **A1.1.4 Wind Energy**

Distributed Wind kW Scale – small scale wind-powered generator systems that may be grid-connected or off-grid, and can service an individual household, commercial building or building complex, or that can provide electricity for pumping, irrigation and other processes.

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<sup>55</sup> For example, BICO in Barbados saved about 45% of its energy use by installing a range of energy innovations and re-engineering their process design several years ago (pers. comm. Edwin Thirwell, CEO of BICO)

<sup>56</sup> Samuel, Herbert, 2009: *Under the Influence: The Role of the Energy Conservation Influence Factors*.  
<http://bit.ly/greenfig>



**Small-scale wind-power solutions: Wind turbines installed at a private residence in St Vincent & The Grenadines (left) and at an eco-resort in Dominica<sup>57</sup>**

Wind Farms MW Scale – large scale wind generation installations that require substantial funding, regulatory approval and implementation timeframes. Recent developments in the region include Jamaica’s Wigton 38.7 MW Windfarm and (on a much smaller scale) the 1.1 MW Madden’s wind farm development in Nevis.

### **A1.1.5 Hydroelectricity**

Micro-Hydro kW Scale – the use of small, run-of-river turbines to harness water flows on small rivers for local or grid-connected electricity production. Turbine capacities can range from one kilowatt, as at the Rosalie Forest Eco Lodge in Dominica<sup>58</sup>, to several hundred kilowatts. Schemes can utilize turbines combined in series or parallel to increase output.

Hydro MW Scale – large, utility-scale installations that require commensurate time and resources to implement. Such installations, dating back to the 1950s, exist in Suriname, Jamaica, St. Vincent & the Grenadines and Dominica.



**A utility-owned hydro scheme in St. Vincent and the Grenadines showing water intake infrastructure (left) and the wood-stave pipeline (right) that delivers the water to the power station turbines<sup>59</sup>**

### **A1.1.6 Energy Storage**

Chemical (battery) storage – this is currently the most common way of storing energy generated by variable renewable sources for use during low- or no-generation periods. Simple lead-acid (automobile) battery arrays are already being used to provide storage for small solar and wind

<sup>57</sup> NEXT archives

<sup>58</sup> [http://www.rosalieforest.com/eco life\\_energy\\_hydro.php](http://www.rosalieforest.com/eco life_energy_hydro.php)

<sup>59</sup> NEXT Archives

energy systems. The Fraunhofer Institute in Germany<sup>60</sup> has developed relatively small reduction-oxidization (redox) battery systems that currently can store 25 kW and support loads of 500 amperes, with research proceeding on developing 1 MW batteries that will power up to 2,000 households. Lithium-ion (L-ion) batteries are most widely used in portable applications and increasingly in electric vehicle applications. However, a large proportion of the world's lithium supply is concentrated geographically, and concerns about possible future supply restrictions (similar to oil supply restrictions by producer-countries in the 20<sup>th</sup> century) have been raised<sup>61</sup>.



**25 kW redox battery developed by Fraunhofer (left) and a simple car-battery based system developed by Omega Telecom in Trinidad & Tobago for an off-grid solar energy supply system (right)**

Mechanical and Thermal Energy Storage – are areas which offer potential for both small scale and larger scale solutions, particularly the latter. Examples of mechanical storage technologies and systems include Compressed Air Energy Storage (CAES), flywheel energy storage, hydraulic accumulators, hydroelectric or pumped energy storage (the most common), springs, and gravitational potential energy devices<sup>62</sup>. There is also a range of thermal storage options available including massive heat storage systems, such as a 2 GW unit in Krems an der Donau in Austria<sup>63</sup>, through to concentrated solar power (CSP) systems of various sizes down to small household scale simple systems that use bricks. These systems can be used for both heating and cooling purposes as well as electricity generation where higher temperatures can be realized, such as with CSP. However, systems that use water as a medium for either storage or electricity generation may have limitations in areas where water shortages can occur (e.g. Barbados).

### **A1.1.7 Energy Systems**

Distributed Systems/Microgrids – perhaps the simplest examples include the household solar units that are used in some parts of India and Africa, including the innovative pre-paid system that Simpa Networks offers in India<sup>64</sup>, and the household-size biogas production units that have been installed in a number of households in Nepal which provide both cooking heat and light<sup>65</sup>. In

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<sup>60</sup> <http://www.fraunhofer.de/de/presse/presseinformationen/2013/Maerz/Durchbruch-fuer-neuartige-Stromspeicher-Redox-Flow.html>

<sup>61</sup> <http://www.mcclatchydc.com/2009/01/30/61110/lithium-could-be-bolivias-future.html>

<sup>62</sup> [http://en.wikipedia.org/wiki/Energy\\_storage](http://en.wikipedia.org/wiki/Energy_storage)

<sup>63</sup> <http://www.meinbezirk.at/krems-an-der-donau/chronik/kraftwerk-theiss-feierte-15-jahre-fernwaerme-krems-d335864.html>

<sup>64</sup> [http://www.springwise.com/eco\\_sustainability/in-india-home-solar-energy-pay-as-you-go-plan/](http://www.springwise.com/eco_sustainability/in-india-home-solar-energy-pay-as-you-go-plan/)

<sup>65</sup> <http://www.fastcompany.com/1771107/heating-homes-human-waste-saving-lives-and-tigers-nepal>

Trinidad and Tobago, Omega Telecoms is a small business in Siparia which functions entirely off the electricity and water grids and uses a solar energy generation and micro-grid system as well as rainwater harvesting to remain self-sufficient<sup>66</sup>. There are areas in some Caribbean countries where traditional grid supplies are still not available or are unreliable. Micro-grids and distributed solutions offer a solution to households, businesses, and communities where this is the case. However, the monopoly powers held by most Caribbean electric utilities have in some cases created barriers to such developments, even in areas without public grid supplies<sup>67</sup>.

ICT/Smart Grid Technology – an area which offers a significant growth opportunity for both large and small business players. At the big player level major corporations such as Cisco Systems and IBM have invested substantial resources into developing ICT-based smart metering and grid technologies<sup>68, 69</sup>. In Trinidad and Tobago the local utility, the T&T Electricity Commission (TTEC), is testing smart metering technology at several sites where small-scale renewable systems have been installed to measure bidirectional flows of electricity. The goal is to develop a fair and equitable basis for both utilities and small-scale electricity generators to operate for mutual benefit and ensure that interconnection tariffs and grid capacities are realistic and compatible<sup>70</sup>.

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<sup>66</sup> [http://www.tffi.net/article\\_view/401](http://www.tffi.net/article_view/401)

<sup>67</sup> Pers. comm. – Ministry of Energy and Energy Affairs staff members, Trinidad and Tobago, 2012.

<sup>68</sup> [http://www.cisco.com/web/strategy/energy/external\\_utilities.html](http://www.cisco.com/web/strategy/energy/external_utilities.html)

<sup>69</sup> [http://www.ibm.com/smarterplanet/us/en/smart\\_grid/ideas/](http://www.ibm.com/smarterplanet/us/en/smart_grid/ideas/)

<sup>70</sup> Pers. comm. MEEA and TTEC stakeholder representatives and a feed-in tariff project meeting, Port of Spain, September 2012.

## A1.2 Water Technologies

If the region does not divert from 'business as usual' in terms of adaptation to climate change, the impact on water resources in the Caribbean will be exacerbated by the current institutional state of affairs which is characterized by limited water resource management practices, policies and legislative and institutional frameworks. Increasing demand, substandard storage and transportation facilities, ineffective water pricing, and a general lack of consumer awareness regarding efficiency, recycling and conservation options are some of the factors contributing to inefficient use of what is becoming an increasingly finite resource. For example, it is estimated that between 40 and 50% of Trinidad & Tobago's potable water supplies are lost due to an antiquated water distribution infrastructure that is subject to frequent breakages and leaks<sup>71</sup>. Only 16.6% of residential households in Trinidad receive a full-time water service and only 1.5% of households have water meters<sup>72</sup>.

Significant investments have been made in energy intensive sea-water desalination systems in some countries and in some sectors (notably the tourism sector). However, as the figure below illustrates, most Caribbean countries are actually only drawing on a small proportion of their total potential potable resources (20% or less) except in the case of Barbados. This is another indicator that water resource use in the region is inefficient; insufficient supplies are gathered and conserved during periods when rainfall is plentiful for use to cover shortfalls in supply during the dry season.

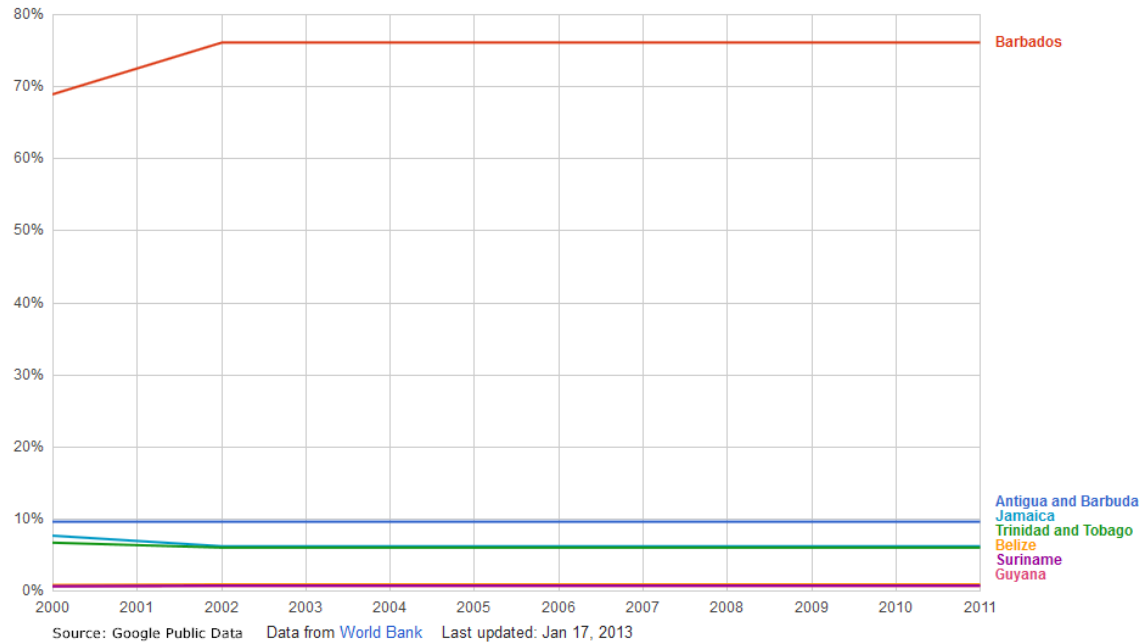
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<sup>71</sup> [http://www.ianas.org/meetings\\_water/files/Presentation\\_water\\_Cas.pdf](http://www.ianas.org/meetings_water/files/Presentation_water_Cas.pdf)

<sup>72</sup> <http://www.miya-water.com/our-experience/case-studies/trinidad-and-tobago>



Annual freshwater withdrawals, total (% of internal resources)



**Annual freshwater withdrawals as a percentage of total internal resources for selected Caribbean countries<sup>73</sup>**

Water technology sectors of particular relevance in the Caribbean region which offer opportunities include:

Water harvesting – modern rainwater harvesting systems have the potential to significantly supplement existing public water supplies, which are often limited. For example, 5% of the population in Trinidad and 15% in Tobago receive no water supply service at all<sup>74</sup> and the CCST and the Global Water Partnership Caribbean have been working to introduce modern rainwater harvesting technologies to the region<sup>75</sup>. In association with NIHERST they recently collaborated with a community-based NGO in T&T, the Toco Foundation, to install demonstration rainwater harvesting, treatment and distribution systems at several schools. The objective was to provide greater water supply security in places where supplies were often unreliable<sup>76</sup>.

Water Treatment, Management & Reuse – on a national scale water treatment for reuse is only in its infancy. While statistics are difficult to find for Caribbean countries, it seems likely that only a small percentage of the total wastewater flows are treated and re-used. This contrasts with the levels of water reuse being achieved in countries where water supplies are more limited as shown in Table A3.3.

<sup>73</sup> [World Bank water data link](#)

<sup>74</sup> <http://www.miya-water.com/our-experience/case-studies/trinidad-and-tobago>

<sup>75</sup> <http://www.niherst.gov.tt/s-and-t/projects/rainwater-harvesting-model.htm>

<sup>76</sup> <http://www.niherst.gov.tt/s-and-t/projects/rainwater-harvesting-installation-barrackpore-june-2012.pdf>

### Current and future reuse of wastewater in various countries

Locality	Country	% reuse of treated wastewater			
		Base yr	% reuse	Later yr	% reuse
<b>Sydney</b>	Australia	2003	2.3	2030	17.0+
<b>California</b>	USA	2003	10.0	2030	30.0+
<b>Middle East</b>	Jordan	1999	95.0*		
<b>Middle East</b>	Bahrain	1999	19.4	2005	100.0*+
<b>Middle East</b>	Israel	1999	65.0	2020	81.4+
<b>Tucson</b>	USA	2000	33.3	2050	100.0#+
<b>Asia</b>	Singapore	2004	2.0	2011	15.0+

\* All for agriculture + Stated goal # Part used to recharge groundwater supplies

**Table A1.3: Trends in wastewater treatment and reuse for selected international locations<sup>77</sup>**

The government of Trinidad and Tobago recently received a large loan from the IDB to upgrade the country's wastewater treatment capacity (currently only 30% of all wastewater is effectively treated) and use treated wastewater from one major facility to supply the Point Lisa's industrial estate with industrial quality water<sup>78</sup>. Caribbean Water Treatment, based in Antigua and Barbuda, has developed a significant business in the Caribbean region built around adapting large scale water treatment, management and recycling technologies developed overseas to suit the smaller scale needs of Caribbean countries, communities and individual clients. Their focus on partnership-based adaptive innovation has enabled technology transfers to be made to the Caribbean which would otherwise have not been practical, because of their scale and/or cost effectiveness<sup>79</sup>. While it is difficult to get up-to-date figures on the amount of water recycling and reuse that is taking place in Barbados, perhaps the most 'water challenged' country in the Caribbean ahead of Antigua, a number of reports indicate that significant steps have been made<sup>80</sup> and/or are planned<sup>81</sup> and specialist businesses have evolved to provide solutions in this field (e.g.<sup>82</sup>).

Water Use Efficiency – this is becoming an area where activity in the Caribbean is increasing, particularly in association with the tourism sector. For example, 30 hotels in Jamaica have saved over 40 million imperial gallons of water by implementing water use efficiency technologies, systems, and practices as part of a USAID-funded sustainable tourism project<sup>83</sup>. These include installing water conservation devices, high efficiency irrigation systems, sub-metering and asking guests whether they really need to have their towels washed and replaced every day.

<sup>77</sup> Water reuse briefing paper, Leighton Group, Australia, Ian Ivey and Gudrun Strohmeier, 2005

<sup>78</sup> [http://www.trinidadexpress.com/news/US\\_246m\\_loan\\_to\\_upgrade\\_wastewater-193451431.html](http://www.trinidadexpress.com/news/US_246m_loan_to_upgrade_wastewater-193451431.html)

<sup>79</sup> [http://www.rienet.net/ri\\_cfm?ID=391&cat=Value%20Propositions&Selfform=391&CFID=72287501&CFTOKEN=10217728](http://www.rienet.net/ri_cfm?ID=391&cat=Value%20Propositions&Selfform=391&CFID=72287501&CFTOKEN=10217728)

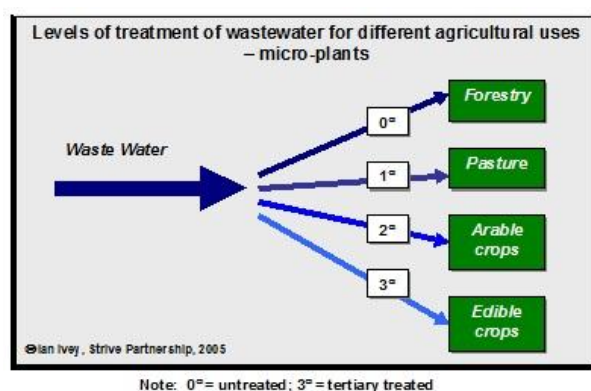
<sup>80</sup> <http://www.oas.org/dsd/publications/Unit/oea59e/ch37.htm>

<sup>81</sup> <http://www.nationnews.com/articles/view/recycle-water-urges-estwick/>

<sup>82</sup> <http://www.newwaterinc.com/index.php?/newwater/about>

<sup>83</sup> [http://www.gwptoolbox.org/index.php?option=com\\_case&id=98](http://www.gwptoolbox.org/index.php?option=com_case&id=98)

Irrigation – Recent climate change reports indicate that significant parts of the Caribbean are likely to become drier over the coming decades<sup>84</sup>. Internationally, agriculture uses around 70% of all the water that is withdrawn from fresh water sources each year<sup>85</sup>. The competition for water between different user groups – households, industry, recreational users, environmentalists fighting to preserve natural ecosystems and agriculture - is intensifying<sup>86</sup>. In Barbados water supplies for agriculture are rated as a major concern and a future challenge<sup>87</sup>. The Caribbean section of the Global Water Partnership recently trained 20 practitioners to improve their capacity to use water for agricultural irrigation purposes more efficiently in Barbados<sup>88</sup>. Training has also taken place in several other Caribbean island states including St. Kitts and Nevis and Saint Lucia in recent years. There are many options for water recycling and reuse with different levels of treatment in agriculture as shown in the figure below.



**Degree of wastewater treatment and potential for reuse in forestry and agriculture**<sup>89</sup>

Because there is a drive to expand agricultural production in the Caribbean (e.g.<sup>90</sup>), increasing competition for finite water resources, and a traditional 3 – 4 month dry season (which may extend and/or intensify as a result of climate change), greater water use efficiency and the use of recycled water will become an imperative and a growth opportunity area in the region.

### A1.3 Agriculture

The economic importance and contribution of the agricultural sector has declined across the Caribbean since the turn of the century, as illustrated for selected countries in Table A2.4.

<sup>84</sup> The realities of climate change in the Caribbean – The use of climate change models, Michael Taylor, Climate Studies Group, Department of Physics, UWI Mona. Presented at the joint CARDI/CTA/CCST climate change and Agriculture Conference in Grenada, October 2010

<sup>85</sup> <http://www.unwater.org/worldwaterday/faqs.html>

<sup>86</sup> <http://www.guardian.co.uk/environment/2012/mar/22/water-wars-countries-davey-warns>

<sup>87</sup> [http://www.unep.org/greeneconomy/Portals/88/documents/SYNTHESIS%20REPORT\\_Barbados.pdf](http://www.unep.org/greeneconomy/Portals/88/documents/SYNTHESIS%20REPORT_Barbados.pdf)

<sup>88</sup> <http://www.gwp.org/en/gwp-in-action/Caribbean/News-and-Activities-GWP-Caribbean/Water-Use-Efficiency-in-Barbados/>

<sup>89</sup> Water reuse briefing paper, Leighton Group, Australia, Ian Ivey and Gudrun Strohmeier, 2005

<sup>90</sup> [http://www.trinidadexpress.com/commentaries/Food\\_for\\_thought-175107241.html](http://www.trinidadexpress.com/commentaries/Food_for_thought-175107241.html)

Country	Past Year	% GDP	Recent Year	% GDP	Change
<b>Jamaica</b>	1995	9.0%	2011	5.8%	- 36%
<b>Trinidad &amp; Tobago</b>	1995	2.3%	2011	0.3%	- 87%
<b>St Vincent &amp; the Grenadines</b>	1995	14.1%	2010	6.5%	- 54%
<b>Dominica</b>	1995	18.9%	2010	13.4%	-29%
<b>Saint Lucia</b>	1995	10.2%	2010	3.2%	-69%

**Table A1.4: The declining contribution of agriculture to GDP in selected Caribbean countries <sup>91</sup>**

A combination of anachronistic sector structures, outdated sector policies, and limited private sector development has contributed to the marked decline<sup>92</sup>.

The decline in Caribbean agriculture has generally not been accompanied by the compensatory development of alternative high-value-creation sectors, although this is difficult to quantify because of the limited statistical records available. In Trinidad and Tobago, based on an analysis of data from various sources, it appears that the food and beverage sector contributes about 2.8 % to GDP – half that of manufacturing, which was estimated to be contributing 5.34% to GDP in 2010<sup>93</sup>.

At the political level there has been a recent resurgence of interest in agriculture because of rising global food prices and concerns about national food and nutrition security. However, the approach being adopted by some governments often places most emphasis on opportunities for creating employment rather than on creating a sustainable sector that generates both economic and social value over the longer term<sup>94</sup>.

The consensus at the joint CTA/CCST ‘Adding Value to Local Foods for Food and Nutrition Security: Myth or Strategic Option’ workshop session in Jamaica in November 2012 was that there are considerable opportunities in the region for specialised, focused, niche-oriented high value sustainable agriculture production and value adding businesses in small island Caribbean states, which have long-term viable prospects.

The technological and business opportunity areas in agriculture that are relevant to the CCIC include:

Sustainable Agricultural Systems & Practices - There are few sustainable production systems in the Caribbean region. A handful of leading edge entrepreneurs, such as those behind *Montpelier Farms* in Antigua<sup>95</sup>; the *Bellevue Growers Cooperative* in Saint Lucia<sup>96</sup>; *Market Movers* in Trinidad and Tobago<sup>97</sup> and Lennox Lampkin<sup>98</sup>, owner of *Lampkin's Natural Farms*, are

<sup>91</sup> <http://www.indexmundi.com/facts/indicators/NV.AGR.TOTL.ZS/compare?country=vc#country=im:tt> (primary source).

<sup>92</sup> Adding Value to Local Foods for Food and Nutrition Security: Myth or Strategic Option. The Role and Impact of State Marketing Boards and Agencies. Ian Ivey (in association with the CTA and CCST), November 2012.

<sup>93</sup> <http://www.indexmundi.com/facts/trinidad-and-tobago/manufacturing>

<sup>94</sup> Adding Value to Local Foods for Food and Nutrition Security: Myth or Strategic Option, The Role and Impact of State Marketing Boards and Agencies. Ian Ivey (in association with the CTA and CCST), November 2012.

<sup>95</sup> [http://www.tffi.net/article\\_view/300](http://www.tffi.net/article_view/300)

<sup>96</sup> [http://www.tffi.net/article\\_view/318](http://www.tffi.net/article_view/318)

<sup>97</sup> [http://www.dmarketmovers.com/index.php?route=information/information&information\\_id=4](http://www.dmarketmovers.com/index.php?route=information/information&information_id=4)

<sup>98</sup> <http://www.svg-cic.com/>

examples of those who are leading the way in developing and delivering sustainable farming models linked to innovative marketing methods.

Renewable energy for farms – advances in the basic system technologies and falling prices now allow small and medium-sized farms the opportunity to produce significant proportions of their own energy needs from a range of indigenous and on-site sources including wind, solar and biomass. In the Caribbean such technologies are generally underutilized but may offer significant promise. For example, biogas digesters developed (and patented) by the SRC in Jamaica<sup>99</sup> are a home-grown option that is applicable to widespread regional use.



Scientific Research Council (SRC) small-scale biogas digester<sup>100</sup> for farms (left) and PV panels at the Grenada Chocolate Company cocoa processing factory<sup>101</sup>

## A1.4 Transportation technologies

The transportation sector accounts for a large proportion of total commercial energy consumed in the Caribbean – as much as 60% in some countries. Much of the transport infrastructure is underdeveloped and heavily congested<sup>102, 103, 104</sup>, particularly in urban areas, which results in high costs for transporting persons and goods. In addition there are constraints in air freight capacity and the frequency of services that impact regionally.

Many vehicles imported into the Caribbean are used vehicles, although a number of countries have a restriction of the age of used vehicles that may be imported. Barbados is the first country in the region to support the introduction of electric and hybrid cars<sup>105</sup>. The Ministry of Energy and Energy Affairs has also imported a hybrid Toyota Prius vehicle into Trinidad and Tobago for demonstration purposes<sup>106</sup>. However, the issue of infrastructure to support both hybrid and

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<sup>99</sup> <http://www.src-jamaica.org/products/biodigester.htm>

<sup>100</sup> <http://cipore.org/demo-centre/photo-galleries/biomass/?album=7&gallery=40>

<sup>101</sup> NEXT Archives

<sup>102</sup> <http://www.barbadosadvocate.com/newsitem.asp?more=3Dlocal&NewsID=27504>

<sup>103</sup> <http://m.guardian.co.tt/editorial/2013-02-08/traffic-jamming-commuters-daily>

<sup>104</sup> [http://www.mtw.gov.jm/general\\_information/reports/Vision%202030%20Jamaica%20-%20Final%20Draft%20Transport%20Sector%20Plan%20\\_Jul.pdf](http://www.mtw.gov.jm/general_information/reports/Vision%202030%20Jamaica%20-%20Final%20Draft%20Transport%20Sector%20Plan%20_Jul.pdf)

<sup>105</sup> <http://www.unep.org/transport/pcf/PDF/MatrixLACVEHMarch08.pdf>

<sup>106</sup> <http://www.newsday.co.tt/news/0,167355.html>

electric vehicles is one that requires entrepreneurship and innovation, as servicing such vehicles is currently not available in any Caribbean country. In terms of electric vehicles, 54% of those surveyed in in four Caribbean countries said they would be prepared to drive an electric vehicle and 32% said they would not<sup>107</sup>. However, until support infrastructure and rapid charging technology is in place (e.g. <sup>108</sup>) the transition to electric vehicles is likely to be slow.

#### **A1.4.1 Vehicle and Traffic Management**

Intelligent transport systems have not been introduced into the Caribbean, and imported GPS vehicle systems are not functional as there is no local infrastructure to support them. Only the inbuilt intelligence, mainly in higher-end imported vehicles that offers rear end video, distance-measuring, and parking management functions, is present in most Caribbean countries. Some young mobile phone developers are endeavoring to design apps that enable electronic ticketing for public transport, crowd-sourced traffic congestion communication networks over smart phones, and the tracking of vehicles<sup>109</sup>. In Jamaica, app and online tool developers are working to deliver solutions that help people use public transport more effectively, such as providing bus timetable information electronically<sup>110</sup>.

### **A1.5 Buildings**

The prevailing situation regarding green buildings in the Caribbean is well summed up by the United Nations Environment Programme in a report<sup>111</sup> on greening the economy in Barbados, which notes that *"There is currently no single vision for greening the housing/ building industry that represents a coordinated effort from all stakeholders – including government, industry associations, educational institutions and companies."*

Many buildings (particularly newer commercial buildings modelled on cosmopolitan styles) are inefficient in relation to design, resource use efficiency and occupant behaviour. For example, in water-constrained Barbados, many hotels still have high-volume flush toilets installed; throughout the region air conditioning units using expensive electricity are used to cool rooms that are not well-insulated; furthermore, it is rare for a new building to be designed in such a way that its on-site orientation optimises lighting, cooling, and other resource demands<sup>112</sup>. In some office buildings, there is a marked dependence on artificial light – occupants typically have curtains and blinds closed even at windows not facing direct sunlight.

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<sup>107</sup> <http://www.nationnews.com/articles/view/electric-vehicles-can-cut-fuel-bill/>

<sup>108</sup> <http://www.foxnews.com/leisure/2013/02/27/maltese-company-announces-electric-car-with-621-mile-range-10-minute-charge/>

<sup>109</sup> [http://www.tffi.net/article\\_view/531](http://www.tffi.net/article_view/531)

<sup>110</sup> Pers. comm. Ingrid Riley, CEO of Connectimass, Kingston, Jamaica.

<sup>111</sup> *Green Economy Scoping Study – Synthesis Report BARBADOS*, 2012. United Nations Environment Programme, University of West Indies, Government of Barbados.

<sup>112</sup> Pers. comm. Erwin Edwards, managing Director, Atom Solutions, Barbados

A green building council was established in 2010 in Trinidad and Tobago, allied to the US Green Building Council<sup>113</sup> and another is in its formative stages in Barbados<sup>114</sup>. Green hotel certifications such as Earth Check and Green Globe are becoming assets as resort operators become aware of changing international customer demands<sup>115</sup>. There are also several entrepreneurs in the region who are specializing in green buildings and smart building technologies including Erwin Edwards of Atom Solutions in Barbados (building design and smart custom solutions) and Andre Escalante of Energy Dynamics in Trinidad and Tobago. According to them, payback times of two years or less and Internal Rates of Return of 50% on green building (high resource use efficiency and smart technologies) investments are said to be readily realisable in some Caribbean countries where energy costs are very high by international standards<sup>116</sup>.

### **A1.5.1 Green Building Technologies**

An important factor for the Caribbean is that there are numerous technologies that can be retrofitted into existing buildings to improve their resource use efficiency and reduce their carbon footprint. These include water saving devices and systems, as described above. Energy Dynamics lists a number of technologies that can be used to improve the efficiency of many building functions and operations including low energy lighting and lighting systems, sensors that switch electrical equipment and devices on and off when people enter different parts of buildings, high efficiency motors, and low flush toilets - many of which have very short payback periods to recover the initial investment cost, often a few months or less<sup>117</sup>.

#### **Green Building Materials**

There is an increasing range of green building materials coming onto the market which can improve sustainability performance. One source that provides an up-to-date overview of 'eco-construction' and green building materials is a European report from the Eco-Innovation Observatory<sup>118</sup>. There are numerous opportunities in this area for the Caribbean, including:

- Reducing the resource intensity of construction materials
- Eco - materials
- Resource - light construction
- Rethinking functionality
- Using and re-using resources more effectively
- Industrialized construction

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<sup>113</sup> <http://www.newspday.co.tt/politics/0,128070.html>

<sup>114</sup> [http://businessbarbados.com/ebook/2013\\_files/assets/basic-html/page130.html](http://businessbarbados.com/ebook/2013_files/assets/basic-html/page130.html)

<sup>115</sup> <http://www.johansens.com/news/green-certified-caribbean-resort-galley-bay-resort-and-spa-one-of-the-worlds-top-properties>

<sup>116</sup> [http://energydynamics-lac.com/site/repository/files/EnergyConservation10\\_12\\_07.pdf](http://energydynamics-lac.com/site/repository/files/EnergyConservation10_12_07.pdf)

<sup>117</sup> [http://energydynamics-lac.com/site/repository/files/EnergyConservation10\\_12\\_07.pdf](http://energydynamics-lac.com/site/repository/files/EnergyConservation10_12_07.pdf)

<sup>118</sup> [http://www.eco-innovation.eu/images/stories/Reports/eio\\_thematic\\_report\\_resource\\_efficient\\_construction\\_2011.pdf](http://www.eco-innovation.eu/images/stories/Reports/eio_thematic_report_resource_efficient_construction_2011.pdf)

- Urban mining
- Building smarter to save energy and water
- Resource efficient cladding
- Green roofs
- Low energy materials

For example, a number of countries are re-using concrete demolition materials as aggregate for new construction and buildings<sup>119</sup>, which is of particular relevance where quarrying is becoming controversial and environmentally detrimental, as is the case in Trinidad and Tobago<sup>120</sup>. As noted above, lighter construction and a reduced need for aggregate based materials is another opportunity area.

### **Green Building Design**

At the leading edge internationally, new technologies are emerging which can enhance the green building design process by optimizing the use of resources and delivering the most efficiently designed and built structures<sup>121</sup>. However, in the Caribbean region opportunities abound in almost every area including energy and water efficient design, site positioning to optimize lighting and cooling needs, heat transfer between the inside and outside of buildings, the inclusion of smart building materials such as glass coatings that adjust to different light levels, and holistic green building design approaches such as those being used in eco-city design and construction (e.g. <sup>122, 123, 124</sup>). Architectural apps are also a tool that can support collaborative design projects within and between countries<sup>125</sup>.

## **A1.5 Resource Use Efficiency**

Resource use efficiency encompasses the practice of recycling and reuse, with the goal of net zero waste – the aim of which is for everything to be used in a cycle of materials harvesting, production, use, recycling and return – thereby having a net zero impact on the environment.

In overall terms, the Caribbean is lagging behind much of the rest of the world when it comes to resource use efficiency in many areas – energy, water, food production and processing, transport, construction and packaging. The region still largely operates on an ‘open cycle’ basis while many countries are moving towards partially closed or fully closed (zero waste) models. For example, the city of Bremen in the north of Germany recycles and reuses 97% of the locally produced waste streams. In contrast, a recent report by the United Nations Environment

<sup>119</sup> [http://www.cement.org/tech/cct\\_aggregates\\_recycled.asp](http://www.cement.org/tech/cct_aggregates_recycled.asp)

<sup>120</sup> <http://www.earthwise-trinidad.com/2012/03/21/quarry-industry-out-of-control-in-trinidad-tobago/>

<sup>121</sup> <http://www.technologyreview.com/news/423565/buildings-made-with-a-printer/>

<sup>122</sup> <http://io9.com/5894571/how-to-grow-a-biological-city-of-the-future>

<sup>123</sup> <http://www.stefano-boeri-architetti.net/?p=207>

<sup>124</sup> <http://hbswk.hbs.edu/cgi-bin/print/6845.html>

<sup>125</sup> [http://www.nytimes.com/2012/02/09/garden/qa-timothy-sakamoto-and-apps-on-architectural-works.html?nl=todaysheadlines&emc=th26&\\_r=0](http://www.nytimes.com/2012/02/09/garden/qa-timothy-sakamoto-and-apps-on-architectural-works.html?nl=todaysheadlines&emc=th26&_r=0)



Program (UNEP) notes that the Caribbean largely does not accord any priority to resource use efficiency and waste as a resource<sup>126</sup>. Binger also notes in a 2011 paper that recycling and reuse is almost non-existent in the Caribbean<sup>127</sup>. There is little understanding of the composition and value of today's waste streams<sup>128</sup> and the vast majority of waste is dumped. Binger has presented perhaps the most comprehensive overview of current recycling and reuse opportunities in the Caribbean region<sup>129</sup> and points to a number of opportunities where value can be (and has already been) created from waste. For example, about 5% of Jamaica's primary energy consumption is estimated to be supplied by sugar-cane bagasse, used for heating and electricity processes on sugar farms.

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<sup>126</sup> <http://www.centrogeo.org.mx/unep/documentos/Ceo/CEOurbanamb.pdf>

<sup>127</sup> [http://www.uncrd.or.jp/env/spc/docs/plenary1/PS1-g\\_SIDS\\_%20AI%20Binger.pdf](http://www.uncrd.or.jp/env/spc/docs/plenary1/PS1-g_SIDS_%20AI%20Binger.pdf)

<sup>128</sup> <http://www.oas.org/dsd/reia/Documents/LimitsandPotentialofWastetoEnergy.pdf>

<sup>129</sup> [http://www.uncrd.or.jp/env/spc/docs/plenary1/PS1-g\\_SIDS\\_%20AI%20Binger.pdf](http://www.uncrd.or.jp/env/spc/docs/plenary1/PS1-g_SIDS_%20AI%20Binger.pdf)

## Annex 2: Technology Prioritization

The scoring of the technology prioritization sectors (low, medium or high score) against the evaluation criteria, is shown in Table A2.1. First, the *infoDev* team scored the prioritization with input from several experts who were present at the stakeholder workshops. This scoring resulted in a raw score and a weighted score, which are shown in the table.

**Table A2.1: Technology prioritization scoring incorporating expert feedback**

Technologies Landscape	Technology break down (Sub-sectors)	Technology Readiness: Potential of the technologies to enter the market in near future	Market Demand: Subsidies, consumer orientation, competing technologies, affordability, etc.	Availability of Funding: Near-term fund for R&D, commercialization & expansion	Clear, Ready Stakeholders: Stakeholders able to affect the likelihood of adoption of a given technology	Business Model: How viable is the business model today? Includes supply-chain, distribution, consumer access, etc.	Leverage of Indigenous Resources: Ability to utilize and/or leverage the region's natural resources.	Entrepreneurial Capacity: Existence or ability to develop/recruit talent to make the technology companies successful.	Workforce: Current or potential workforce capabilities necessary to commercialize given technology	Policy: Regulations, incentives and policies impacting a given technology.	Economic Impact: Potential impact of a given technology on local economy.	Carbon Impact: Potential impact of a given technology on CO2 reduction.	Social: Ability to impact rural poor and marginalized populations	High	Med	Low	Factor	Totals				
														5	3	1						
1	Bioenergy	Biomass	High	Low	Low	Low	Low	Med	Med	Med	Med	Med	High	High	3	5	4	2.8	2.7	Low	1	2.83
		Biofuels	High	Low	Low	Low	Med	Med	Med	Med	Med	Med	Med	Med	Med	1	7	4	2.5	2.3	Low	1
2	Energy efficiency	EE Technology	High	Low	Low	Med	Med	Med	High	Low	Low	Low	Low	Low	2	3	7	2.2	2.3	Low	1	2.17
		EE Solutions	High	Med	Low	Med	Med	Med	High	Med	Low	Med	Med	Low	2	7	3	2.8	2.3	Low	1	2.83
		EE Behavior	Low	Low	Low	Low	Med	Med	Med	Med	Low	Med	Med	Low	0	6	6	2.0	2.0	Low	1	2.00
3	Solar energy	Solar Electricity	High	Low	Low	Med	Med	Med	Low	Med	Low	Med	Med	Med	1	7	4	2.5	3.2	Low	1	2.50
		Solar Water Heating	High	Med	High	High	High	High	High	High	Med	High	High	Med	9	3	0	4.5	2.5	Med	0.5	2.25
		Solar Cooling	Med	Med	Low	Low	Med	Med	Med	Med	Low	Med	Med	Med	0	9	3	2.5	2.5	Low	1	2.50
4	Transportation	Vehicle Technology	Med	Low	Low	Low	Low	Med	Low	Low	Low	Low	Med	Low	0	3	9	1.5	1.5	Low	1	1.50
		Vehicle & Traffic Mgmt	Low	Low	Low	Low	Med	Low	Low	Low	Low	Low	Low	Med	Med	0	3	9	1.5	1.5	Low	1
5	Water management	Water treatment, recycling & reu	High	Med	Low	Med	Med	Med	Med	Med	Low	High	Med	Med	2	8	2	3.0	3.1	Low	1	3.00
		Water use efficiency	High	Med	Low	Med	Med	Med	Med	Med	Med	High	Med	High	3	8	1	3.3	3.1	Low	1	3.33
		Irrigation	High	Med	Low	Med	Med	Low	Med	Med	Med	High	Med	Med	2	8	2	3.0	3.0	Low	1	3.00
6	Wind energy	Distributed Wind kW	Med	Low	Low	Med	Low	Low	Med	Low	Low	Med	Med	Med	0	6	6	2.0	2.5	Low	1	2.00
		Wind Farms MW	High	Med	Med	High	High	Low	Low	Med	Low	Med	Med	Med	3	6	3	3.0	3.0	Low	1	3.00
7	Hydroelectricity	Micro Hydro kW	Med	Low	Low	Med	Med	Med	Low	Low	Low	Low	Med	High	1	5	6	2.2	2.8	Med	0.5	1.08
		Hydro MW	Med	Low	Med	Med	High	Med	Med	Med	Med	High	High	Med	4	7	1	3.5	2.9	High	0.1	0.35
8	Sustainable agribusiness	Sustainable agri systems/practic	Med	Med	Med	Med	Med	High	Med	Med	Low	High	Low	High	3	7	2	3.2	2.9	Low	1	3.17
		RE for farms	High	Low	Low	Med	Low	Med	Med	Med	Low	Med	Med	High	2	6	4	2.7	2.7	Low	1	2.67
9	Climate adaptation	Extreme weather 'proofing'	Med	Low	High	Med	Med	Med	Low	Low	Low	Med	Low	Med	1	6	5	2.3	2.9	Med	0.5	1.17
		Drought control	Med	Med	Med	Med	Med	Med	Med	Med	Med	High	Low	High	2	9	1	3.2	3.2	Low	1	3.17
		Flood control	Med	Med	Med	Med	Med	Med	High	Med	Med	Med	High	Low	High	3	8	1	3.3	3.3	Low	1
10	Buildings	Green building technologies	Med	Low	Low	Med	Med	Low	Low	Low	Low	Med	Med	Low	0	5	7	1.8	2.0	Low	1	1.83
		Green building materials	Med	Low	Low	Med	Low	Low	Low	Low	Low	Low	Med	Low	0	3	9	1.5	1.5	Low	1	1.50
		Green building design	Med	Med	Low	Med	Med	Med	Med	Med	Low	Med	Med	Med	Med	0	10	2	2.7	2.7	Low	1
11	Energy Storage	Chemical Storage	Med	Med	Low	Med	Med	Low	Med	Med	Low	Med	Med	Low	0	8	4	2.3	2.3	Med	0.5	1.17
		Mechanical Storage	Med	Med	Low	Low	Med	Med	Med	Med	Low	Med	Med	Low	0	8	4	2.3	2.3	Low	1	2.33
12	Energy systems	Distributed systems/microgrids	Med	Low	Low	Med	Med	Med	Low	Low	Low	High	Med	High	2	6	4	2.7	2.5	Low	1	2.67
		ICT/Smart grid technology	Med	Med	Low	Med	Low	Low	Med	Med	Low	Med	Med	High	1	6	5	2.3	2.3	Low	1	2.33
13	Resource use efficiency	Recycling / re-use	High	Med	Med	High	Med	High	High	High	Low	High	Med	Med	6	5	1	3.8	3.0	Low	1	3.83
		Net zero waste	Low	Low	Low	Low	Low	Low	High	High	Med	Low	Med	Med	1	5	6	2.2	2.2	Low	1	2.17

The survey results provided the scores allocated to the technologies by the survey respondents. The weighted score and the survey scores were then averaged to derive a combined score and the technology ranking. These score tables are shown below.

**Table A2.2: Technology prioritization – raw scores**

TECHNOLOGY	RAW SCORE 1 Low, 5 High
Bioenergy	2.7
Buildings	2.0
Climate adaptation	2.9
Energy efficiency	2.3
Energy storage	2.3
Energy systems	2.5
Hydroelectricity	2.8
Resource use efficiency	3.0
Solar energy	3.2
Sustainable agribusiness	2.9
Transportation	1.5
Water management	3.1
Wind energy	2.5

**Table A2.3: Technology prioritization – weighted scores**

TECHNOLOGY	WEIGHTED SCORE 1 Low, 5 High
Bioenergy	2.7
Buildings	2.0
Climate adaptation	2.6
Energy efficiency	2.3
Energy storage	1.8
Energy systems	2.5

Hydroelectricity	0.7
Resource use efficiency	3.0
Solar energy	2.4
Sustainable agribusiness	2.9
Transportation	1.5
Water management	3.1
Wind energy	2.5

**Table A2.4: Technology prioritization – survey scores**

TECHNOLOGY	SURVEY SCORE 1 Low, 5 High
Bioenergy	3.3
Buildings	3.8
Climate adaptation	3.7
Energy efficiency	4.1
Energy storage	3.3
Energy systems	3.4
Hydroelectricity	3.2
Resource use efficiency	3.9
Solar energy	4.2
Sustainable agribusiness	3.8
Transportation	3.5
Water management	3.8
Wind energy	3.7

**Table A2.5: Technology prioritization – combined scores**

TECHNOLOGY	COMBINED SCORE 1 Low, 5 High
Bioenergy	3.0

Buildings	2.9
Climate adaptation	3.1
Energy efficiency	3.2
Energy storage	2.5
Energy systems	2.9
Hydroelectricity	2.0
Resource use efficiency	3.4
Solar energy	3.3
Sustainable agribusiness	3.3
Transportation	2.5
Water management	3.4
Wind energy	3.1

**Table A2.6: Technology prioritization – ranking**

TECHNOLOGY	COMBINED SCORE	PRIORITY RANK
Bioenergy	2.962	8
Buildings	2.913	10
Climate adaptation	3.119	6
Energy efficiency	3.228	5
Energy storage	2.537	11
Energy systems	2.949	9
Hydroelectricity	1.960	13
Resource use efficiency	3.444	1
Solar energy	3.327	4
Sustainable agribusiness	3.339	3
Transportation	2.488	12
Water management	3.437	2
Wind energy	3.078	7

## Annex 3: Survey Results

The following presents a selection of relevant responses from the survey. Seventy-two responses were received from 253 invitations to participate; 68% of respondents were male and 32% were female. The survey contained 17 questions and was conducted online via SurveyMonkey, from 18<sup>th</sup> January to 13<sup>th</sup> February 2013.

**Figure A3.1: Survey question #3**

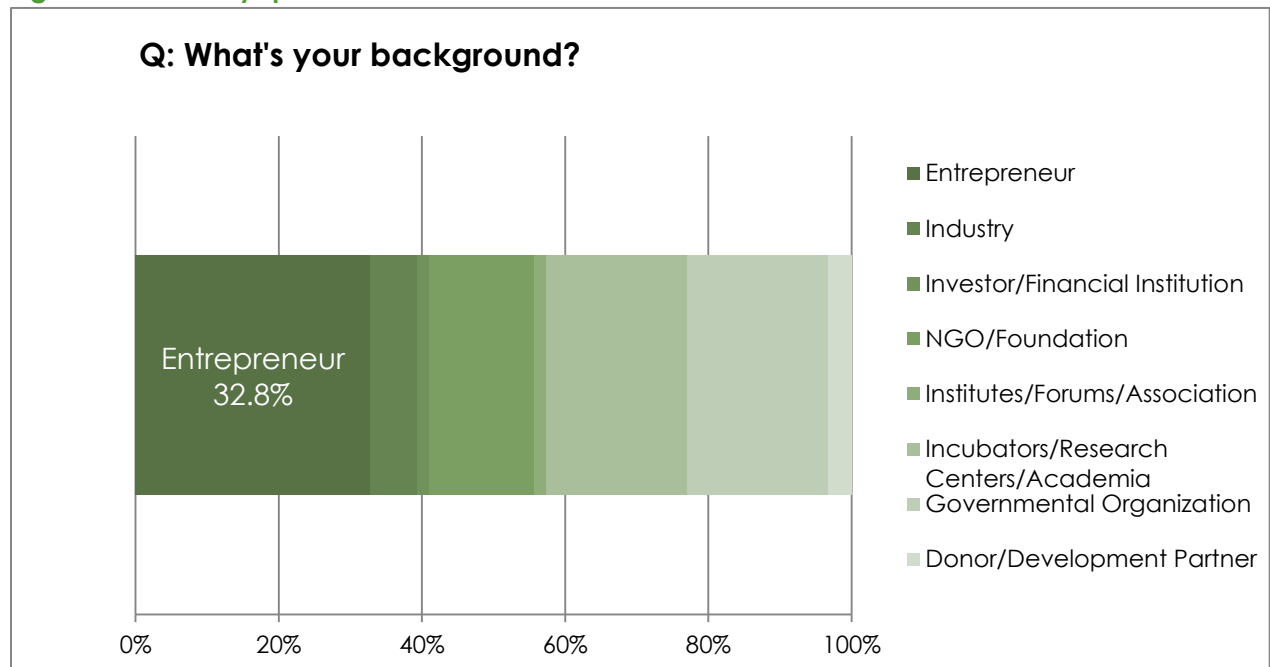


Figure A3.2: Survey question #4

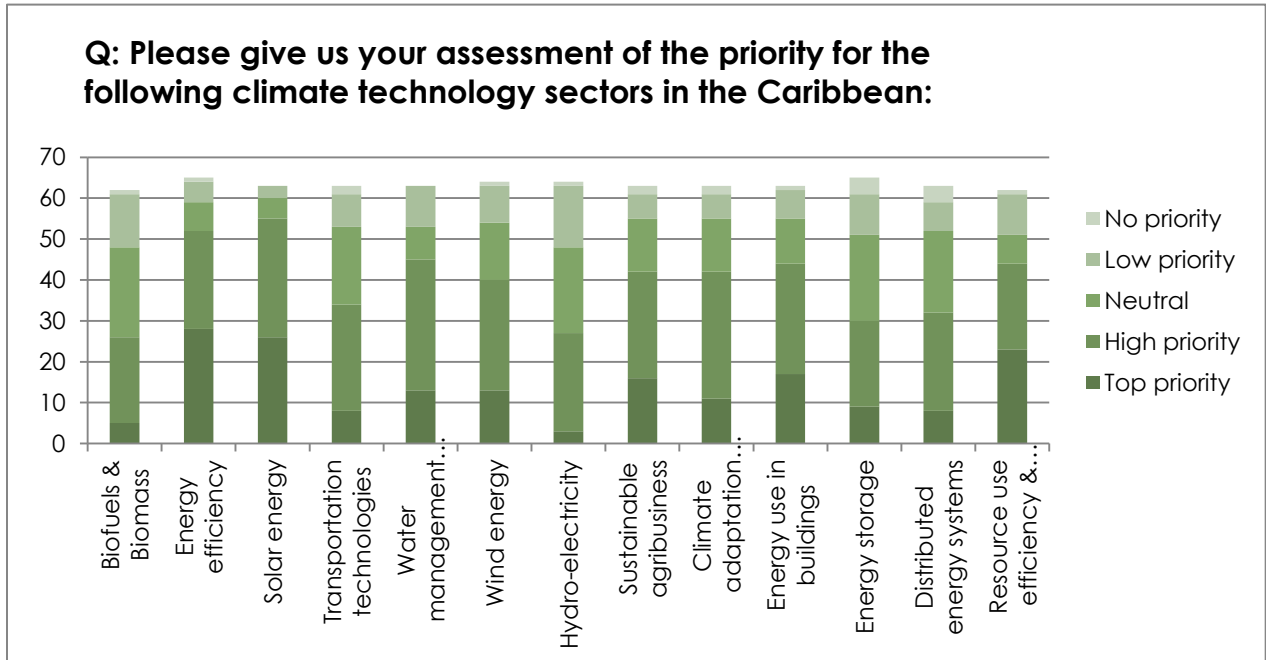


Figure A3.3: Survey question #5

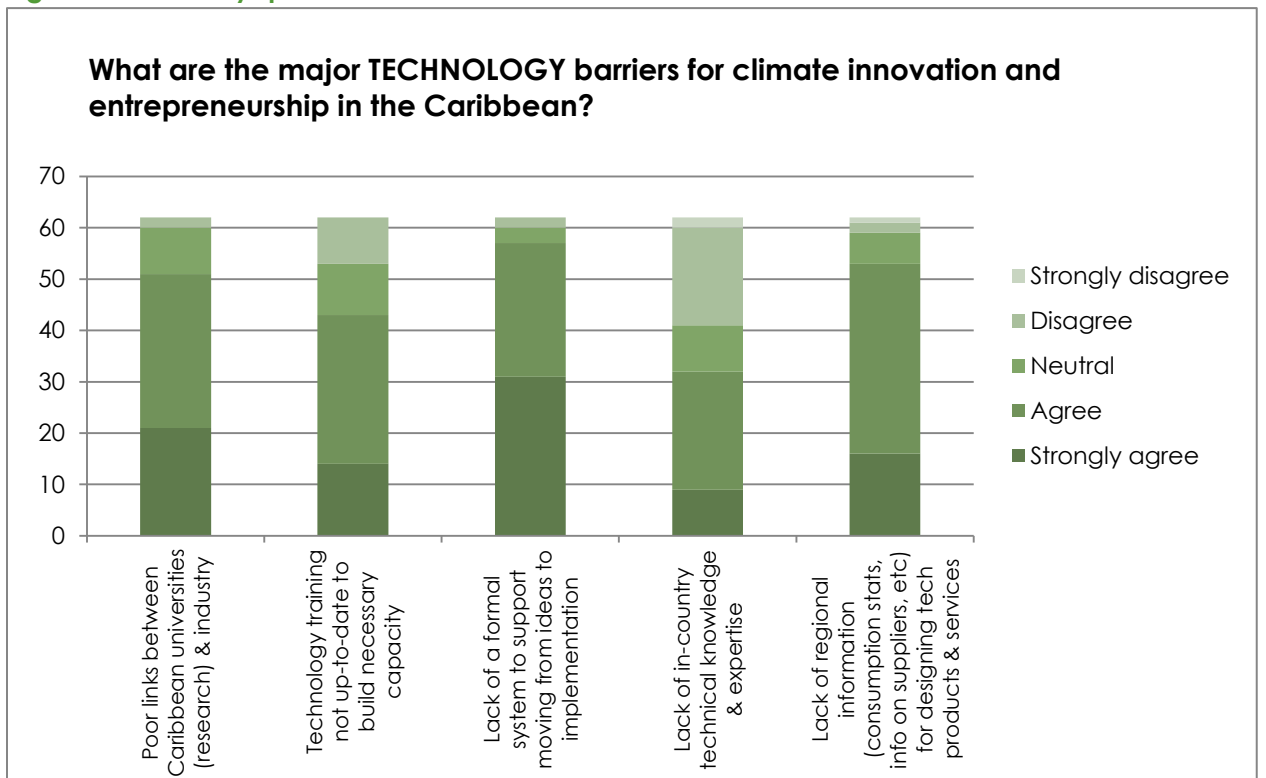




Figure A3.4: Survey question #6

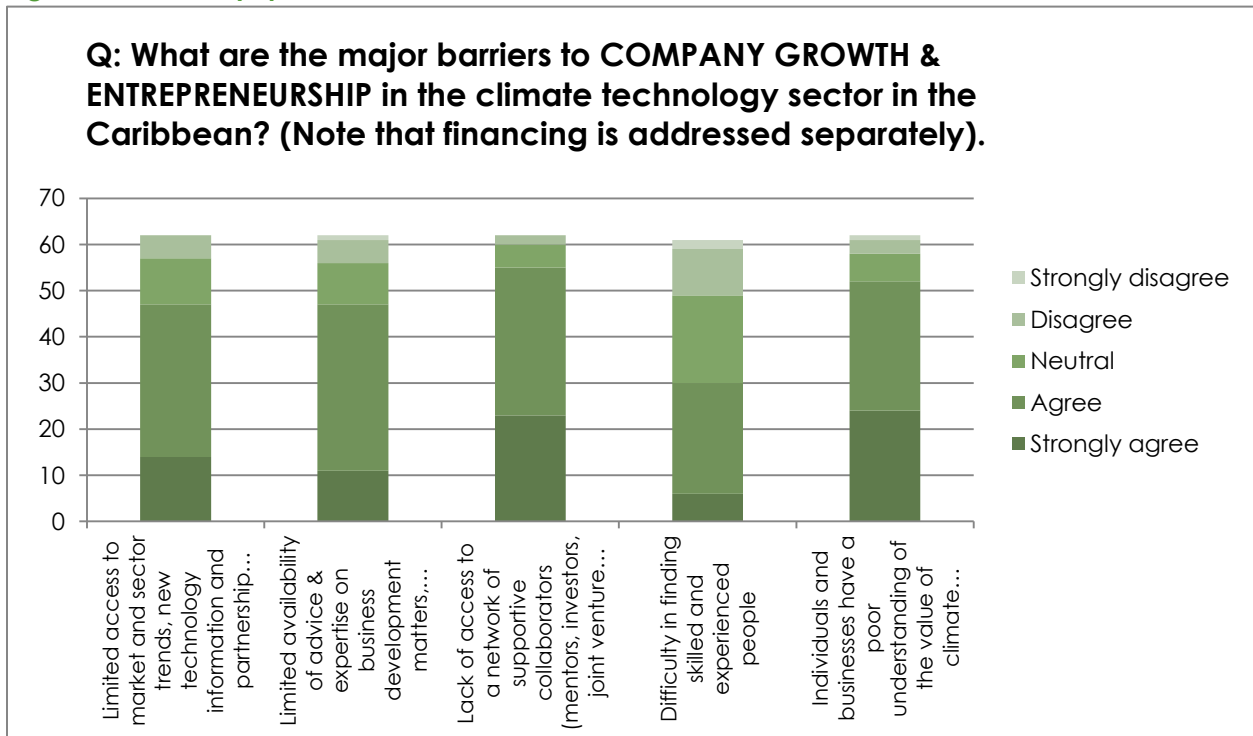


Figure A3.5: Survey question #7

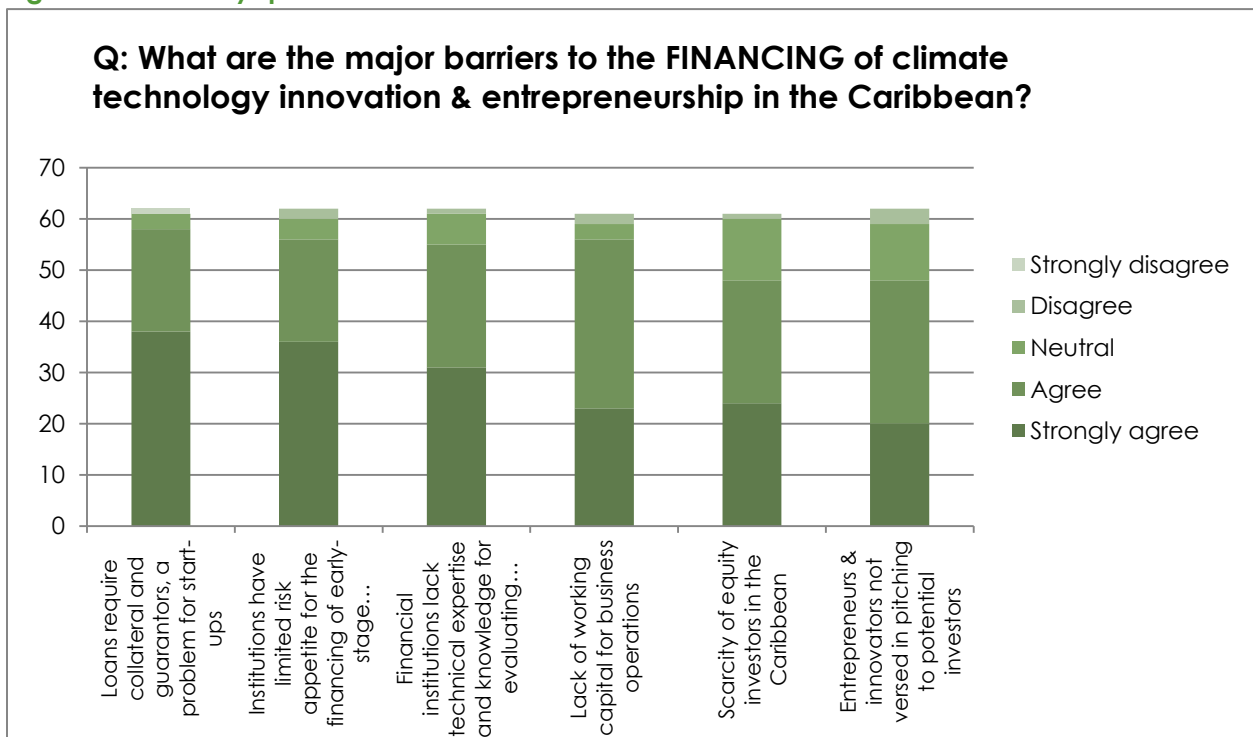


Figure A3.6: Survey question #8

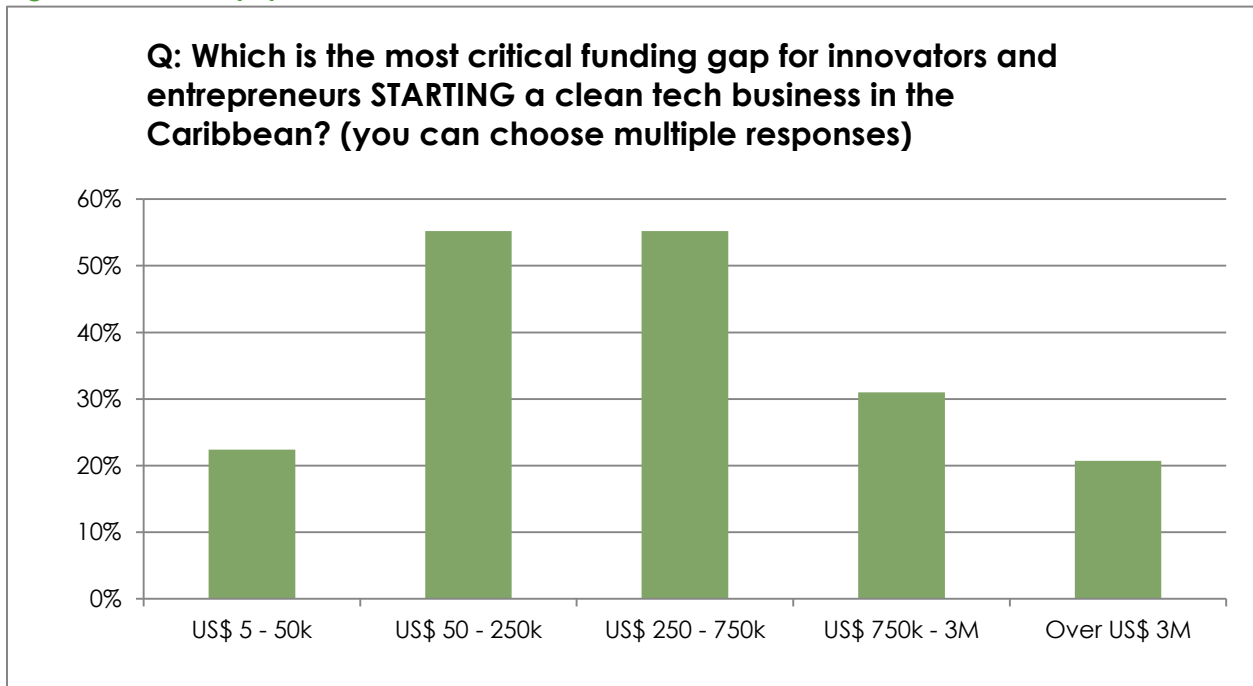


Figure A3.7: Survey question #9

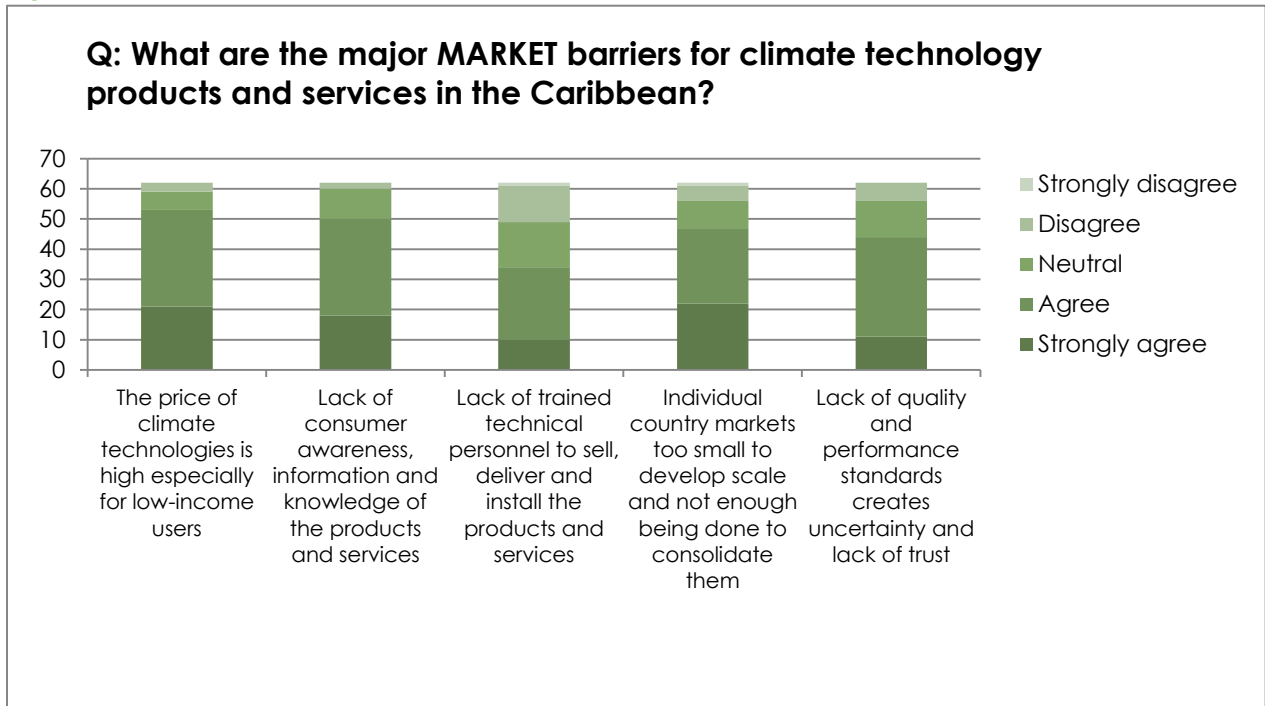


Figure A3.8: Survey question #10

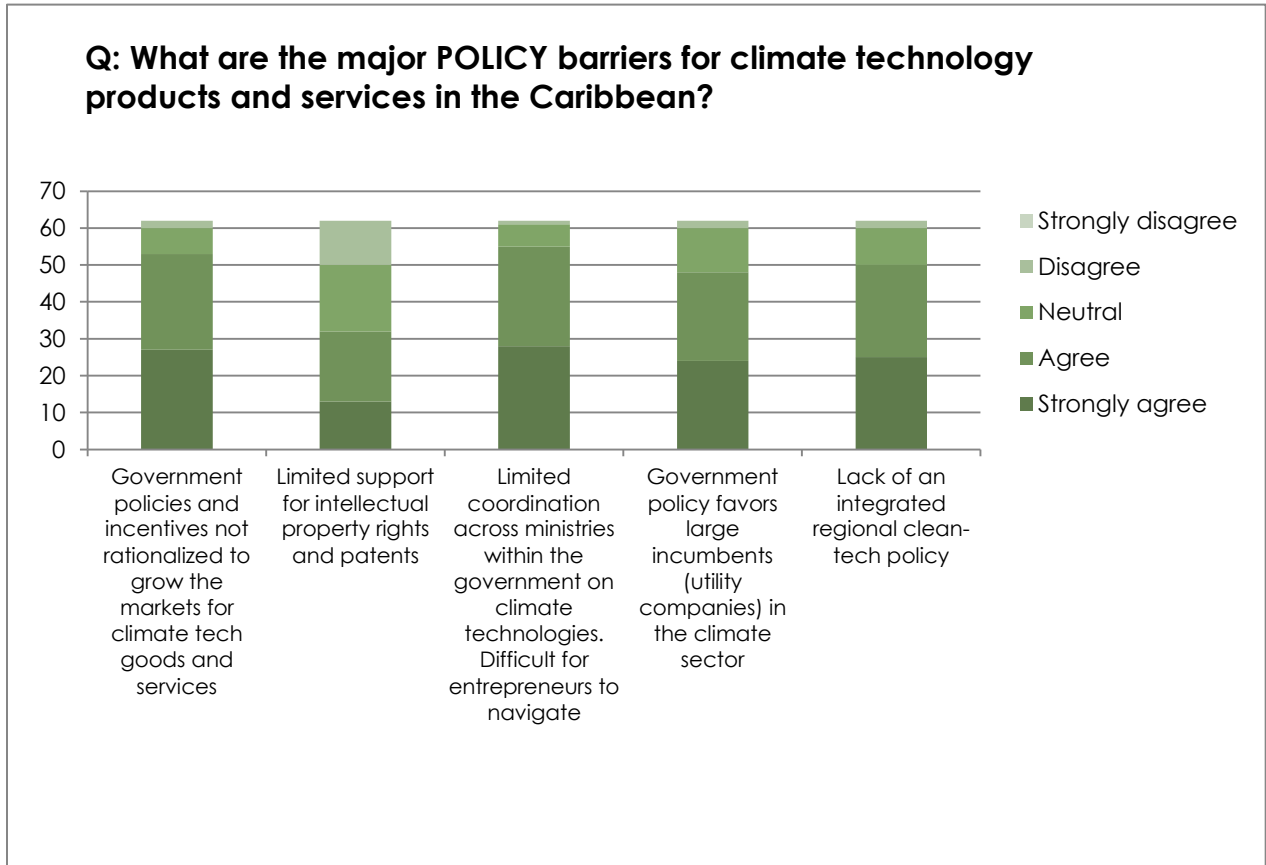


Figure A3.9: Survey question #11

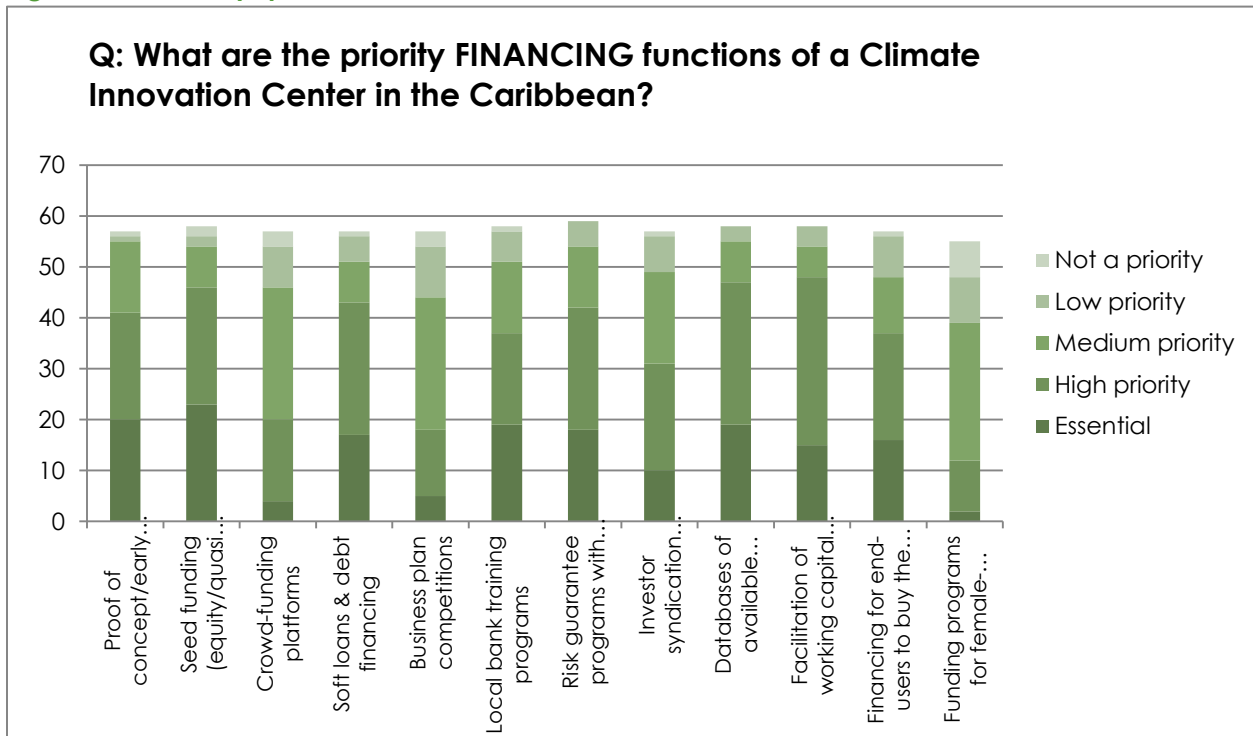


Figure A3.10: Survey question #13

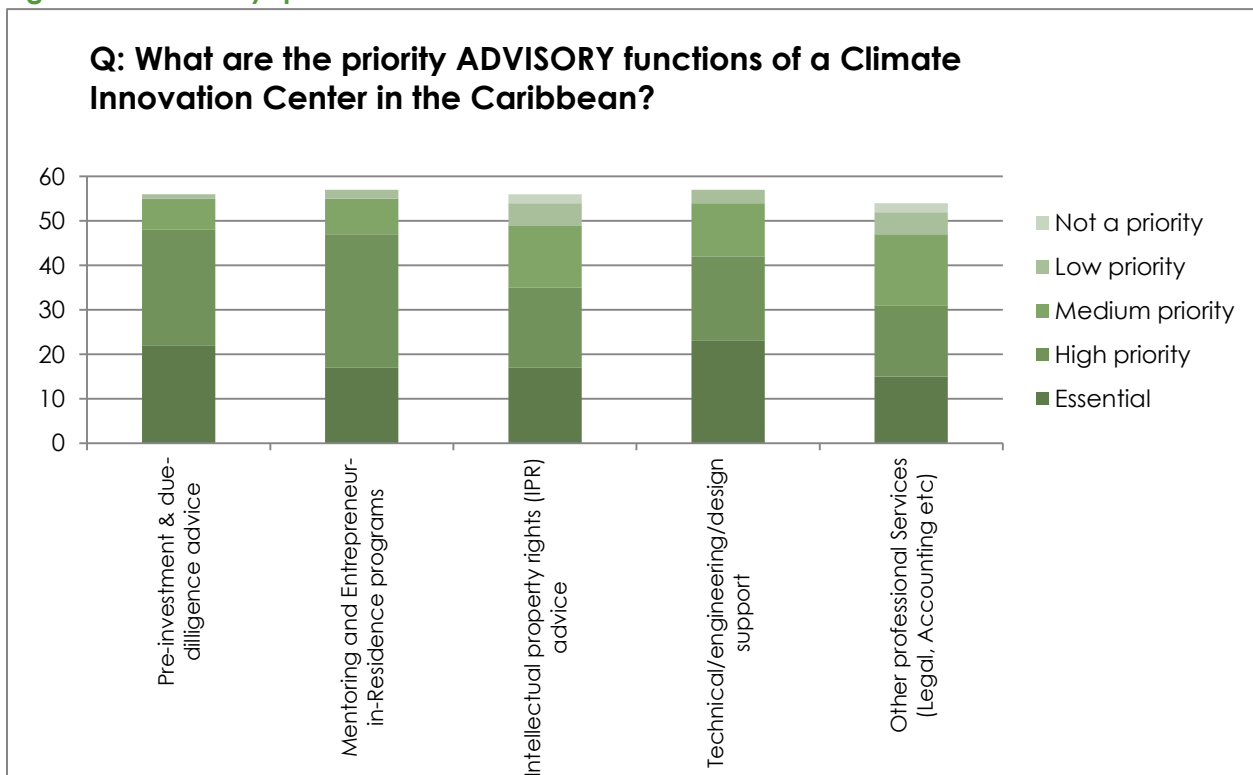


Figure A3.11: Survey question #14

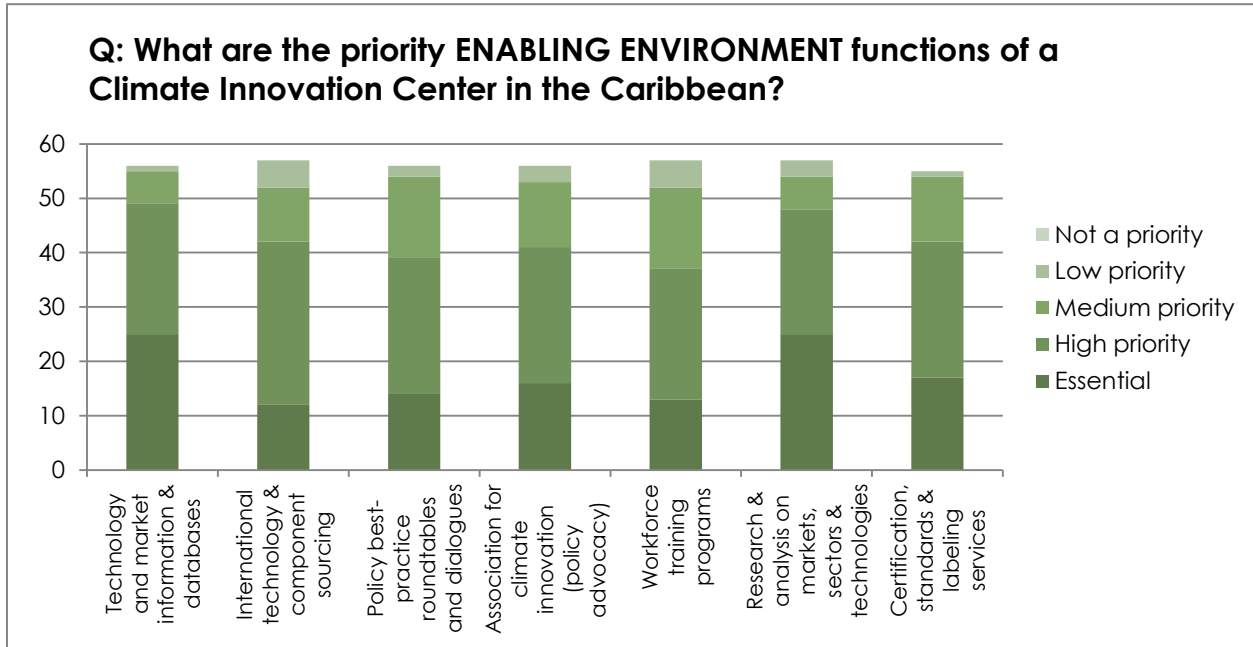


Figure A3.12: Survey question #15

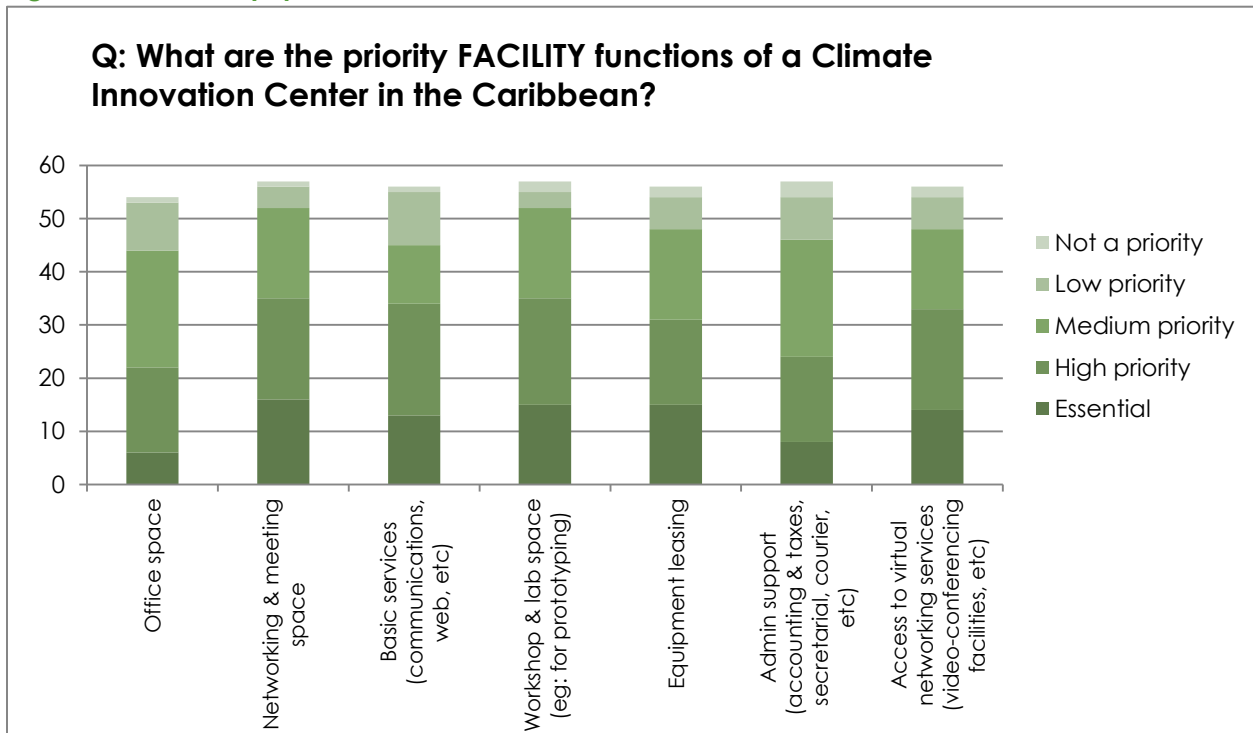
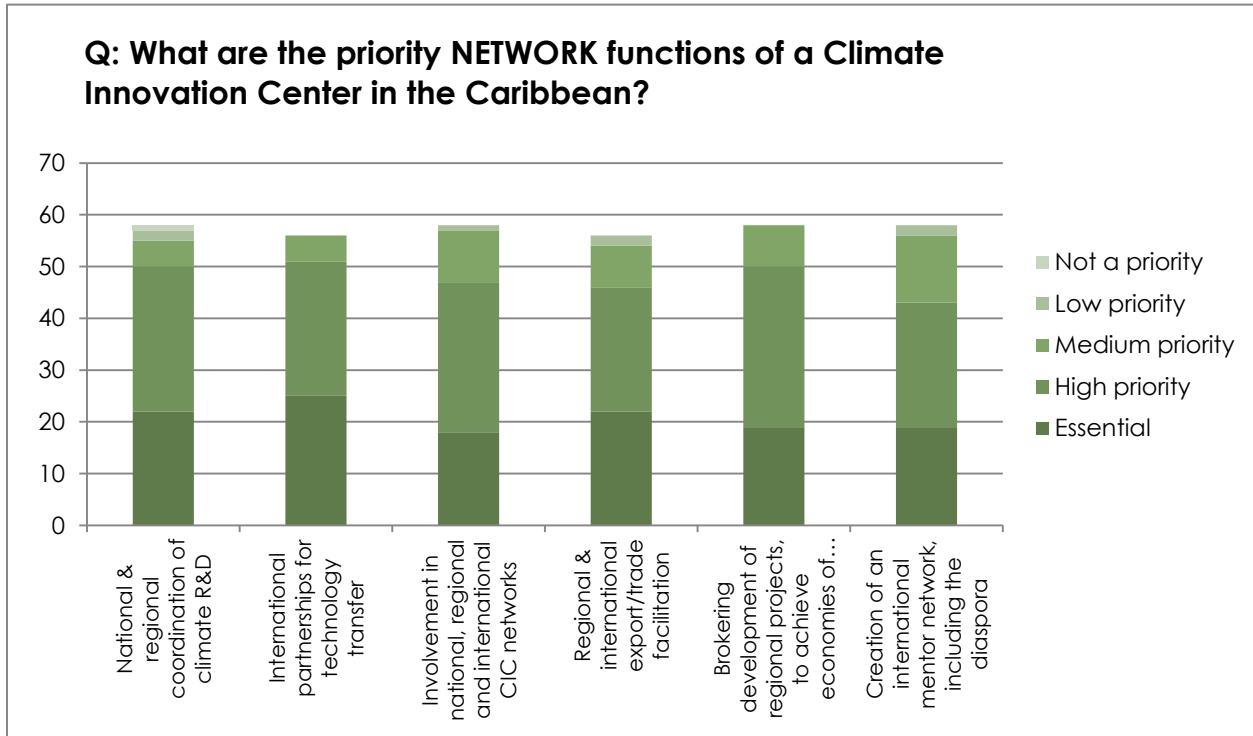


Figure A3.13: Survey question #16



## Annex 4: Five Year Financial Budget

ACTIVITY	Establishment Year		
	PERSONNEL TOTAL	PROGRAM TOTAL	TOTAL
Technical services	\$0	\$0	\$0
Mentoring/incubation	\$0	\$0	\$0
Mentoring platform	\$10,000	\$50,000	\$60,000
Online courses	\$10,000	\$53,500	\$63,500
Seminar series	\$0	\$0	\$0
Case studies	\$0	\$0	\$0
Investment promotion/syndication	\$0	\$0	\$0
Pre-investment advisory	\$0	\$0	\$0
Proof of concept	\$55,000	\$230,000	\$285,000
Database access	\$20,000	\$100,000	\$120,000
Supplier information	\$0	\$0	\$0
Service provider agreements	\$0	\$0	\$0
Awareness campaigns	\$10,000	\$43,500	\$53,500
Standards and export promotion	\$0	\$0	\$0
Partnerships and networks	\$10,000	\$50,000	\$60,000
Sector/market reports	\$0	\$0	\$0
Policy forums	\$50,000	\$50,000	\$100,000
Sector support and advocacy	\$0	\$0	\$0
CIC CEO	\$80,000	\$17,500	\$97,500
Marketing and knowledge management	\$37,500	\$15,000	\$52,500
Financial management and procurement services	\$20,000	\$10,000	\$30,000
Local Hub Coordinators	\$108,000	\$60,000	\$168,000
Administrative staff	\$17,500	\$5,000	\$22,500
Monitoring and evaluation	\$12,500	\$35,000	\$47,500
Travel and related expenses	\$0	\$60,000	\$60,000
IT/Infrastructure/Facilities (Centre)	\$0	\$100,000	\$100,000
IT/Infrastructure/Facilities (Hubs)	\$0	\$180,000	\$180,000

<b>TOTAL</b>	<b>\$440,500</b>	<b>\$1,059,500</b>	<b>\$1,500,000</b>
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ACTIVITY	Year 1		
	PERSONNEL TOTAL	PROGRAM TOTAL	TOTAL
Technical services	\$26,250	\$5,000	\$31,250
Mentoring/incubation	\$28,875	\$5,000	\$33,875
Mentoring platform	\$4,200	\$10,000	\$14,200
Online courses	\$4,200	\$12,000	\$16,200
Seminar series	\$4,200	\$15,000	\$19,200
Case studies	\$4,200	\$6,000	\$10,200
Investment promotion/syndication	\$34,125	\$225,000	\$259,125
Pre-investment advisory	\$34,125	\$5,000	\$39,125
Proof of concept	\$28,875	\$265,000	\$293,875
Database access	\$4,200	\$10,000	\$14,200
Supplier information	\$4,200	\$7,500	\$11,700
Service provider agreements	\$4,200	\$2,000	\$6,200
Awareness campaigns	\$4,200	\$30,000	\$34,200
Standards and export promotion	\$4,200	\$10,000	\$14,200
Partnerships and networks	\$4,200	\$20,000	\$24,200
Sector/market reports	\$26,250	\$40,000	\$66,250
Policy forums	\$13,125	\$20,000	\$33,125
Sector support and advocacy	\$13,125	\$15,000	\$28,125
CIC CEO	\$84,000	\$10,000	\$94,000
Marketing and knowledge management	\$39,375	\$10,000	\$49,375
Financial management and procurement services	\$42,000	\$2,500	\$44,500
Local Hub Coordinators	\$113,400	\$30,000	\$143,400
Administrative staff	\$18,375	\$2,000	\$20,375
Monitoring and evaluation	\$13,125	\$20,000	\$33,125
Travel and related expenses	\$0	\$45,000	\$45,000
IT/Infrastructure/Facilities (Centre)	\$0	\$20,000	\$20,000
IT/Infrastructure/Facilities (Hubs)	\$0	\$30,000	\$30,000



<b>TOTAL</b>	<b>\$557,025</b>	<b>\$872,000</b>	<b>\$1,429,025</b>
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ACTIVITY	Year 2		
	PERSONNEL TOTAL	PROGRAM TOTAL	TOTAL
Technical services	\$27,563	\$5,000	\$32,563
Mentoring/incubation	\$30,319	\$5,000	\$35,319
Mentoring platform	\$4,410	\$10,000	\$14,410
Online courses	\$4,410	\$12,000	\$16,410
Seminar series	\$4,410	\$15,000	\$19,410
Case studies	\$4,410	\$6,000	\$10,410
Investment promotion/syndication	\$35,831	\$300,000	\$335,831
Pre-investment advisory	\$35,831	\$5,000	\$40,831
Proof of concept	\$30,319	\$285,000	\$315,319
Database access	\$4,410	\$10,000	\$14,410
Supplier information	\$4,410	\$7,500	\$11,910
Service provider agreements	\$4,410	\$500	\$4,910
Awareness campaigns	\$4,410	\$30,000	\$34,410
Standards and export promotion	\$4,410	\$10,000	\$14,410
Partnerships and networks	\$4,410	\$20,000	\$24,410
Sector/market reports	\$27,563	\$40,000	\$67,563
Policy forums	\$13,781	\$20,000	\$33,781
Sector support and advocacy	\$13,781	\$15,000	\$28,781
CIC CEO	\$88,200	\$10,000	\$98,200
Marketing and knowledge management	\$41,344	\$10,000	\$51,344
Financial management and procurement services	\$44,100	\$2,500	\$46,600
Local Hub Coordinators	\$119,070	\$30,000	\$149,070
Administrative staff	\$19,294	\$2,000	\$21,294
Monitoring and evaluation	\$13,781	\$20,000	\$33,781
Travel and related expenses	\$0	\$45,000	\$45,000
IT/Infrastructure/Facilities (Centre)	\$0	\$20,000	\$20,000

IT/Infrastructure/Facilities (Hubs)	\$0	\$30,000	\$30,000
<b>TOTAL</b>	<b>\$584,876</b>	<b>\$965,500</b>	<b>\$1,550,376</b>

ACTIVITY	Year 3		
	PERSONNEL TOTAL	PROGRAM TOTAL	TOTAL
Technical services	\$28,941	\$5,000	\$33,941
Mentoring/incubation	\$31,835	\$5,000	\$36,835
Mentoring platform	\$4,631	\$10,000	\$14,631
Online courses	\$4,631	\$12,000	\$16,631
Seminar series	\$4,631	\$15,000	\$19,631
Case studies	\$4,631	\$6,000	\$10,631
Investment promotion/syndication	\$37,623	\$425,000	\$462,623
Pre-investment advisory	\$37,623	\$5,000	\$42,623
Proof of concept	\$31,835	\$335,000	\$366,835
Database access	\$4,631	\$10,000	\$14,631
Supplier information	\$4,631	\$7,500	\$12,131
Service provider agreements	\$4,631	\$500	\$5,131
Awareness campaigns	\$4,631	\$30,000	\$34,631
Standards and export promotion	\$4,631	\$10,000	\$14,631
Partnerships and networks	\$4,631	\$20,000	\$24,631
Sector/market reports	\$28,941	\$40,000	\$68,941
Policy forums	\$14,470	\$20,000	\$34,470
Sector support and advocacy	\$14,470	\$15,000	\$29,470
CIC CEO	\$92,610	\$10,000	\$102,610
Marketing and knowledge management	\$43,411	\$10,000	\$53,411
Financial management and procurement services	\$46,305	\$2,500	\$48,805
Local Hub Coordinators	\$125,024	\$30,000	\$155,024
Administrative staff	\$20,258	\$2,000	\$22,258
Monitoring and evaluation	\$14,470	\$20,000	\$34,470
Travel and related expenses	\$0	\$45,000	\$45,000

IT/Infrastructure/Facilities (Centre)	\$0	\$20,000	\$20,000
IT/Infrastructure/Facilities (Hubs)	\$0	\$30,000	\$30,000
<b>TOTAL</b>	<b>\$614,120</b>	<b>\$1,140,500</b>	<b>\$1,754,620</b>

ACTIVITY	Year 4		
	PERSONNEL TOTAL	PROGRAM TOTAL	TOTAL
Technical services	\$30,388	\$5,000	\$35,388
Mentoring/incubation	\$33,426	\$5,000	\$38,426
Mentoring platform	\$4,862	\$10,000	\$14,862
Online courses	\$4,862	\$12,000	\$16,862
Seminar series	\$4,862	\$15,000	\$19,862
Case studies	\$4,862	\$6,000	\$10,862
Investment promotion/syndication	\$39,504	\$475,000	\$514,504
Pre-investment advisory	\$39,504	\$5,000	\$44,504
Proof of concept	\$33,426	\$365,000	\$398,426
Database access	\$4,862	\$10,000	\$14,862
Supplier information	\$4,862	\$7,500	\$12,362
Service provider agreements	\$4,862	\$500	\$5,362
Awareness campaigns	\$4,862	\$30,000	\$34,862
Standards and export promotion	\$4,862	\$10,000	\$14,862
Partnerships and networks	\$4,862	\$20,000	\$24,862
Sector/market reports	\$30,388	\$40,000	\$70,388
Policy forums	\$15,194	\$20,000	\$35,194
Sector support and advocacy	\$15,194	\$15,000	\$30,194
CIC CEO	\$97,241	\$10,000	\$107,241
Marketing and knowledge management	\$45,581	\$10,000	\$55,581
Financial management and procurement services	\$48,620	\$2,500	\$51,120
Local Hub Coordinators	\$131,275	\$30,000	\$161,275
Administrative staff	\$21,271	\$2,000	\$23,271
Monitoring and evaluation	\$15,194	\$20,000	\$35,194

Travel and related expenses	\$0	\$45,000	\$45,000
IT/Infrastructure/Facilities (Centre)	\$0	\$20,000	\$20,000
IT/Infrastructure/Facilities (Hubs)	\$0	\$30,000	\$30,000
<b>TOTAL</b>	<b>\$644,826</b>	<b>\$1,220,500</b>	<b>\$1,865,326</b>

ACTIVITY	Year 5		
	PERSONNEL TOTAL	PROGRAM TOTAL	TOTAL
Technical services	\$31,907	\$5,000	\$36,907
Mentoring/incubation	\$35,098	\$5,000	\$40,098
Mentoring platform	\$5,105	\$10,000	\$15,105
Online courses	\$5,105	\$12,000	\$17,105
Seminar series	\$5,105	\$15,000	\$20,105
Case studies	\$5,105	\$6,000	\$11,105
Investment promotion/syndication	\$41,479	\$575,000	\$616,479
Pre-investment advisory	\$41,479	\$5,000	\$46,479
Proof of concept	\$35,098	\$365,000	\$400,098
Database access	\$5,105	\$10,000	\$15,105
Supplier information	\$5,105	\$7,500	\$12,605
Service provider agreements	\$5,105	\$500	\$5,605
Awareness campaigns	\$5,105	\$30,000	\$35,105
Standards and export promotion	\$5,105	\$10,000	\$15,105
Partnerships and networks	\$5,105	\$20,000	\$25,105
Sector/market reports	\$31,907	\$40,000	\$71,907
Policy forums	\$15,954	\$20,000	\$35,954
Sector support and advocacy	\$15,954	\$15,000	\$30,954
CIC CEO	\$102,103	\$10,000	\$112,103
Marketing and knowledge management	\$47,861	\$10,000	\$57,861
Financial management and procurement services	\$51,051	\$2,500	\$53,551
Local Hub Coordinators	\$137,838	\$30,000	\$167,838
Administrative staff	\$22,335	\$2,000	\$24,335

<b>Monitoring and evaluation</b>	\$15,954	\$20,000	\$35,954
<b>Travel and related expenses</b>	\$0	\$45,000	\$45,000
<b>IT/Infrastructure/Facilities (Centre)</b>	\$0	\$20,000	\$20,000
<b>IT/Infrastructure/Facilities (Hubs)</b>	\$0	\$30,000	\$30,000
<b>TOTAL</b>	<b>\$677,067</b>	<b>\$1,320,500</b>	<b>\$1,997,567</b>

## Annex 5: Revenue Model

The aggregated revenues presented in the CCIC budget were derived by developing revenue models for individual businesses that achieved varying degrees of success (fail, low, medium, and high to very high). The annual gross revenues and the annual growth rates in those revenues were both derived using actual revenue figures and annual percentage growth rates in revenue achieved by individual Caribbean businesses currently operating in each of the five CCIC priority categories. The owners of these businesses supplied this information upon request. These businesses were located in a range of countries including Barbados, Jamaica, Trinidad and Tobago, St. Vincent and the Grenadines and Antigua and Barbuda.

In summary, the aggregated revenue model developed for the CCIC is based upon actual commercial results achieved by existing businesses operating in the Caribbean region in recent years, and is not based upon purely theoretical models.

## Annex 6: Deal Schedule and Levels of Innovation

### PROOF OF CONCEPT FUNDING

Type	Range	Establishment Year			Year 1			Year 2			Year 3		
		Deals	Average	Budget	Deals	Average	Budget	Deals	Average	Budget	Deals	Average	Budget
POC	25k-100k	2	\$50,000	\$100,000	2	\$50,000	\$100,000	2	\$50,000	\$100,000	3	\$50,000	\$150,000
		2	\$35,000	\$70,000	3	\$35,000	\$105,000	3	\$35,000	\$105,000	3	\$35,000	\$105,000
		3	\$20,000	\$60,000	3	\$20,000	\$60,000	4	\$20,000	\$80,000	4	\$20,000	\$80,000
<b>Totals</b>		<b>7</b>	<b>\$32,857</b>	<b>\$230,000</b>	<b>8</b>	<b>\$33,125</b>	<b>\$265,000</b>	<b>9</b>	<b>\$31,667</b>	<b>\$285,000</b>	<b>10</b>	<b>\$33,500</b>	<b>\$335,000</b>

### PROOF OF CONCEPT FUNDING

Type	Range	Year 4			Year 5			Total		Av per year
		Deals	Average	Budget	Deals	Average	Budget	No	Value	
POC	25k-100k	4	\$50,000	\$200,000	4	\$50,000	\$200,000	15	\$750,000	\$50,000
		3	\$35,000	\$105,000	4	\$35,000	\$140,000	16	\$560,000	\$35,000
		3	\$20,000	\$60,000	2	\$20,000	\$40,000	16	\$320,000	\$20,000
<b>Totals</b>		<b>10</b>	<b>\$36,500</b>	<b>\$365,000</b>	<b>10</b>	<b>\$38,000</b>	<b>\$380,000</b>	<b>47</b>	<b>\$1,630,000</b>	<b>\$34,681</b>

**Total POC & Fin Acc Funding      \$            3,055,000**

## ROI SUMMARY: PROOF OF CONCEPT INVESTMENT DEALS

Investment Summary	ROI	Royalty Revenue											
		YEAR											
		0	1	2	3	4	5	6	7	8	9	10	Total
Investment		131,429	165,625	190,000	268,000	292,000	304,000	304,000	304,000	304,000	304,000	304,000	2,871,054
Royalty Recovery		-	2,188	7,188	19,688	45,000	95,625	170,000	274,688	334,063	380,313	380,313	1,709,063
Net Position		(131,429)	(163,438)	(182,813)	(248,313)	(247,000)	(208,375)	(134,000)	(29,313)	30,063	76,313	76,313	(1,161,991)

Cumulative Revenues	Co	YEAR											
		0	1	2	3	4	5	6	7	8	9	10	Total
		0	0	43,750	143,750	393,750	900,000	1,912,500	3,400,000	5,493,750	7,993,750	10,825,000	31,106,250



## FINANCIAL ACCELERATOR INVESTMENT DEALS

### FINANCIAL ACCELERATOR FUNDING

Type	Range	Establishment Year			Year 1			Year 2			Year 3		
		Deals	Average	Budget	Deals	Average	Budget	Deals	Average	Budget	Deals	Average	Budget
Seed/ growth	250k- 3m	0	\$0	\$0	0	\$100,000	\$0	0	\$100,000	\$0	1	\$100,000	\$100,000
		0	\$0	\$0	1	\$75,000	\$75,000	2	\$75,000	\$150,000	3	\$75,000	\$225,000
		0	\$0	\$0	3	\$50,000	\$150,000	3	\$50,000	\$150,000	2	\$50,000	\$100,000
<b>Totals</b>		<b>0</b>	<b>\$0</b>	<b>\$0</b>	<b>4</b>	<b>\$56,250</b>	<b>\$225,000</b>	<b>5</b>	<b>\$60,000</b>	<b>\$300,000</b>	<b>6</b>	<b>\$70,833</b>	<b>\$425,000</b>

### FINANCIAL ACCELERATOR FUNDING

Type	Range	Year 4			Year 5			Total		Av per year
		Deals	Average	Budget	Deals	Average	Budget	No	Value	
Seed/ growth	250k- 3m	1	\$100,000	\$100,000	2	\$100,000	\$200,000	4	\$400,000	\$100,000
		3	\$75,000	\$225,000	3	\$75,000	\$225,000	12	\$900,000	\$75,000
		3	\$50,000	\$150,000	3	\$50,000	\$150,000	14	\$700,000	\$50,000
<b>Totals</b>		<b>7</b>	<b>\$67,857</b>	<b>\$475,000</b>	<b>8</b>	<b>\$71,875</b>	<b>\$575,000</b>	<b>30</b>	<b>\$1,425,000</b>	<b>\$47,500</b>

**Total POC & Fin Acc Funding      \$            3,055,000**

## ROI SUMMARY – FINANCIAL ACCELERATOR INVESTMENT DEALS

Investment ROI Summary			Investment Recovery										
			YEAR										
			1	2	3	4	5	6	7	8	9	10	Total
Investment			225,000	300,000	425,000	475,000	575,000	575,000	575,000	575,000	575,000	575,000	4,875,000
Promoter fee			-	-	125,000	150,000	243,750	381,250	443,750	443,750	443,750	443,750	2,675,000
Repayment			-	-	168,750	240,000	345,833	328,571	412,500	412,500	412,500	412,500	2,733,155
Net Position			(225,000)	(300,000)	(131,250)	(85,000)	14,583	134,821	281,250	281,250	281,250	281,250	533,155

			YEAR										
			1	2	3	4	5	6	7	8	9	10	Total
Cumulative Revenues	Co	5 year funding	437,500	1,218,750	2,531,250	4,156,250	6,406,250	8,218,750	10,031,250	12,781,250	15,937,500	18,875,000	80,593,750

			YEAR										
			1	2	3	4	5	6	7	8	9	10	Total
IRR	1%	(4,875,000)	-	-	293,750	390,000	589,583	709,821	856,250	856,250	856,250	856,250	5,408,155

## SUSTAINABILITY DERIVED FROM THE PROOF OF CONCEPT AND FINANCIAL ACCELERATION INVESTMENT DEALS

	Years										
Sustainability	0	1	2	3	4	5	6	7	8	9	10
CIC Total	0%	0%	0%	18%	23%	34%	44%	57%	60%	62%	62%
PoC	0%	1%	2%	5%	11%	24%	42%	69%	83%	95%	95%
Financial Accelerator	0%	0%	0%	58%	70%	89%	93%	112%	112%	112%	112%

## Annex 7: Calculations of Impact Data

The specific figures in this document are from the Caribbean CIC business plan; however, the process used is consistent across CICs to date.

### A7.1 Company Value

Valuations of CIC invested companies were estimated based on investment levels of Proof-of-Concept and financial accelerator over both 5 and 10 years as outlined in the below schedules.

Investment	Average \$	Ownership held by CIC	yr 1	2	3	4	Total \$
<b>PoC</b>	34,681	Nil	8	9	10	10	\$1,630,000
<b>Seed Investments</b>	47,500	Nil	4	5	6	7	\$1,425,000

Given the CIC is has been designed as a long-term capacity building initiative, it will realize much of its impact after the first 5 years. Therefore it is more realistic to calculate results using an investment schedule of 10 years which takes into account (i) continued investment in the CIC and (ii) investment returns that the CIC will use to replenish its own fund.

Investment	Average \$	Ownership held by CIC	yr 1	2	3	4	5	6	7	8	9	10	Total \$
<b>PoC</b>	36,392	Nil	8	9	10	10	10	10	10	10	10	10	\$3,530,000
<b>Seed Investments</b>	45,000	Nil	4	5	6	7	8	8	8	8	8	8	\$3,150,000

As explained above, it takes time to realize investments in early stage companies, therefore it is more realistic to calculate results using an investment timeline of 10 years, which takes into account the continued return on investment the CCIC will generate after the first 5 years. The CCIC will work for partial sustainability, largely through returns from royalties and fees for funding facilitation activities. These two sources of revenue are anticipated to cover up to 60% of the CCIC's operating costs and replenish the CCIC's annual "Access to Finance (A2F)" (both POC and Financial Accelerator support) activities in by year 8.

### A7.2 Technology Impact

Based on the technology prioritization assessment in the CCIC business plan, an assumption was made that 50% of CIC companies would sell energy related products (including resource use efficiency products), 25% water related and 25% agricultural related. In reality, climate related products and services often include solutions that cut across these three sectors. However using

this percentage breakdown as a reasonable assumption, the following 10-year CIC projected impacts were calculated with associated assumptions:

Technology Impacts				
Impacts	Scenarios		Indicator	Indicator assumptions
	Worst	Base		
Energy				
<b>Off-grid kWh produced</b>	23,93 1,250	47,07 6,392	0.27	Average cost per unit (\$)
<b>MW</b>	10	20	4380	Assumes yearly energy production at 50% capacity factor per day
<b>Off-grid access # households</b>	6,202	12,200	3.1	People per household
<b>Off-grid access # of people</b>	19,225	37,818	2305	Total energy consumption per capita (kWh)
Water				
<b>Water access kL</b>	9,971 ,354	19,61 5,163	0.6	Avg water cost per kL (\$)
<b>Access # households</b>	16,083	31,637	3.1	People per household
<b>Access # of people</b>	49,857	98,076	200	Water usage in kL per person per year
Agriculture				
<b>Small holder farmers with increased yield from greenhouses</b>	811	1,595	6000	Based on cost of construction of a 170 m <sup>2</sup> greenhouse and average farm size of 1.23
<b>Number of households with access to cheaper/better quality food</b>	2,493	4,904	2400	Food expenditure per household
Mitigation /Adaptation				
<b>No. of people, including women and girls, less vulnerable to the effects of climate change</b>	76,809	151,095	N/A	Addition of the above
<b>Value of forest assets protected / losses avoided in acres</b>	709	1,396	6.42	Based on acre of forest required to offset carbon by 6.42 tons
<b>Tons CO2 Mitigated*</b>	45,577	89,658	0.82	Based on kg/kWh coal CO2 emissions +25% from water and agriculture
<b>Carbon Price in USD</b>	222	113	10M	Based on ton of CO2 mitigated per donor contribution

\*CO2 calculated from kWh produced plus a conservative 25% that assumes CO2 savings will also be captured in water and agricultural products that the CIC supports.

Levels of innovation have been used to calculate a number of 'scenarios' for the above impacts. Scenario 1 (or worst case, as per the table above) assumes that impacts will be created as of the Caribbean's *current* technology sophistication, access and prices. In the base case scenario, technology impacts have been multiplied using the "Moore's Law of Solar" growth rate of 7%, to take into consideration any future enhancements in technology availability, complexity and/or cost reductions that would generate higher market impacts per investment.

An example of this would be an investment in an off-grid solar distribution/service company. Assuming the price of importing solar modules declines over the next 5 years (or the efficiency of modules increases), the cost per kilowatt hour would reduce and therefore, have a theoretical higher market penetration, thereby delivering more kWh to more households. While these assumptions are somewhat speculative, calculating impact as of today's technology standards does not capture the full potential of future technology advances.

## A7.3 Jobs impact

Direct jobs figures have been based on the level of investment at various stages (USD 25k-750k), multiplied by assumptions on the probability of success and various company employee growth rates at given levels of company growth. Failure and growth rates of companies have been benchmarked against performance of companies in infoDev's incubator network with historical Caribbean employment figures. Calculations are shown in the tables below:

Based on budget for years 1-5

Jobs model	Probability	Employees	Job Growth	Year 1	Year 2	Year 3	Year 4	Year 5	Total
<b>POC (Grants)</b>		2		8	9	10	10	10	47
<b>POC</b>	100%			16	18	20	20	20	94
<b>Seed (Investments)</b>		5		4	5	6	7	8	30
<b>Seed</b>	100%			20	25	30	35	40	150
<b>Do not succeed</b>	25%		-	-	-	-	-	-	-
<b>Low or no growth</b>	30%		25%		2	3	6	8	19
<b>Med growth</b>	30%		75%		5	10	17	25	56
<b>High to V high growth</b>	15%		100%		3	7	11	17	38
<b>Totals - Direct jobs created by CIC</b>				36	52	70	89	110	<b>357</b>

Based on budget for years 1-10

Jobs model	Probability	Employees	Job Growth	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
<b>POC (Grants)</b>		2		7	8	9	10	10	10	10	10	10	10	97
<b>POC</b>	100%			14	16	18	20	20	20	20	20	20	20	194
<b>Seed (Investments)</b>		5		4	5	6	7	8	8	8	8	8	8	70
<b>Seed</b>	100%			20	25	30	35	40	40	40	40	40	40	350
<b>Do not succeed</b>	25%		-	-	-	-	-	-	-	-	-	-	-	-
<b>Low growth</b>	30%		25%		2	3	6	8	11	14	17	20	23	105
<b>Med growth</b>	30%		75%		5	10	17	25	34	43	52	61	70	315
<b>High to V high growth</b>	15%		100%		3	7	11	17	23	29	35	41	47	210
<b>Totals - Direct jobs created by CIC</b>				14	36	52	70	89	110	128	146	182	200	1,174

Based on comparative data of high-growth tech sectors in other countries, a ratio of 1:3 was used for the calculation of indirect employment figures of the CCIC (e.g. a recent study in Massachusetts found that high-tech companies in the Boston area created 3 times as many indirect jobs in the surrounding community). Therefore after the first 5 years of the CCIC's operations, an estimated 1,426 direct and indirect jobs will be created, whereas close to 4,696 direct and indirect jobs can be expected to be created over 10 years (assuming continued

funding of the CCIC past year 5). In the first 5 years, the CIC will also target the creation of at least 1,681 jobs for women and youth (based on the percentage participation of women and youth in the Caribbean economy).

## Annex 8: Stakeholder Groups

Non-Governmental Organisations (NGOs)	Location	Description
<b>Barbados Coalition of Service Industries</b>	Barbados	An overarching representative body for service industry sector groups in Barbados
<b>Barbados Manufacturers Association</b>	Barbados	The main representative body for manufacturing in Barbados
<b>Caribbean Network (CAFAN) Farmers</b>	St. Vincent and the Grenadines	A regional group based in SVG which promotes the interests of 500,000+ small farmers throughout the region and assists with trade development
<b>Caribbean Institute of Sustainability</b>	Trinidad and Tobago	A small non-profit organization dedicated to the sustainable development and protection of the environment in Trinidad and Tobago and the Caribbean region
<b>Caribbean Environmental Youth Network (CYEN)</b>	Barbados	Whilst based in Barbados the group has national representation in 17 Caribbean countries. It supports youth engagement in projects and activities that improve local environments
<b>Centre of Excellence for Youth Entrepreneurship (CEYE)</b>	Barbados	The overarching regional group for national youth business trusts -currently 9 in total in the region with 7 more planned for the near future
<b>Chamber of Agriculture and Nutrition</b>	St. Vincent and the Grenadines	An NGO focused on encouraging sustainable agriculture and improved nutrition in the Caribbean
<b>Chamber of Commerce and Industry</b>	Jamaica	A private sector business representative body
<b>Citizens for a Greener T&amp;T</b>	Trinidad and Tobago	An activist group focusing on improving attitudes in society towards protecting the environment
<b>Empretec</b>	Guyana	A non – profit institution with a mission of enhancing private sector development by providing support to established and emerging SMEs
<b>Fondes Community Amandes Re-Forestation</b>	Trinidad and	A community group running a local re-forestation project in the north-west of

<b>Project (FACRF)</b>	Tobago	T&T
<b>Frederich Ebert Stiftung</b>	Jamaica	Focuses on enhancing social and political progress in Jamaica and the Eastern Caribbean. Part of a global network with the parent NGO based in Germany
<b>Global Water Partnership (GWP) Caribbean</b>	Trinidad Tobago	and A regional network of businesses and organisations involved in all aspects of the water sector. Part of a global network based in Sweden
<b>Hill 60 Bump</b>	Jamaica	A Caribbean professional network that aims to share and promote sustainable development of every type across the Caribbean region
<b>Jamaica Manufacturers Association</b>	Jamaica	A private sector business representative body
<b>Jamaica Solar Energy Association</b>	Jamaica	A private sector group promoting the interests of businesses in the solar energy sub-sector
<b>MSME Alliance</b>	Jamaica	A private sector business representative body focusing on micro and small to medium size enterprises
<b>Private Sector Organisation of Jamaica</b>	Jamaica	A private sector business representative body
<b>The Competitiveness Company</b>	Jamaica	This group works to increase and enhance the competitiveness of firms, to ensure that their products and services command a premium in the marketplace and to move exports farther up the value chain. A subsidiary of the Jamaica Exporters Association
<b>The Energy Chamber</b>	Trinidad Tobago	and The representative organization for private sector businesses in the energy sector. Also has regional and international connections
<b>The Future Centre Trust</b>	Barbados	Focuses on the environment of Barbados, its resources and methods by which the community can take a greater role in conserving and preserving these resources for current and future generations



<b>The Green Building Institute</b>	Trinidad Tobago	and	A sector group within the T&T Coalition of Service Industries (TCSI) promoting green building construction and design techniques
<b>The Toco Foundation</b>	Trinidad & Tobago		A group supporting the development of sustainable communities, predominantly in poor rural areas within T&T
<b>The Trini Eco Warriors</b>	Trinidad Tobago	and	An activist group focusing on improving attitudes in society towards protecting the environment
<b>The Trust for Sustainable Livelihoods (SUSTRUST)</b>	Trinidad Tobago	and	This is a regional NGO based in T&T which aims to help people in the Caribbean better manage the natural resources on which their livelihoods depend
<b>World Intellectual Property Organisation (WIPO)</b>	Trinidad Tobago	and	An organisation which promotes the protection of intellectual property rights. The regional representative of this global organisation is based in T&T
<b>Youth Entrepreneurship Scheme</b>	Barbados		An NGO which assists aspiring entrepreneurs to develop small businesses through support programmes and training

