

Building Competitive Green Industries:

The Climate and Clean Technology
Opportunity for Developing Countries

Executive Summary



 **infoDev**
Growing Innovation

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Climate Change Provides Developing Countries with an Opportunity to Build Local Green Industries

Climate change will have its largest impacts on developing countries, with poor populations particularly hard hit and unable to adequately adapt. There are ongoing efforts to assist developing countries to mitigate these impacts and adapt to climate change through the deployment of appropriate climate and clean technologies. However, the main thrust of many of these efforts is to transfer technology from the developed world without regard to local industry involvement. There is an opportunity for developing countries to pursue a complementary approach, emphasizing building up the capabilities of local firms to participate in the business opportunities surrounding climate change. Climate change therefore represents an opportunity for developing countries to build local green industries that can drive sustainable economic growth and provide environmental benefits.

This report offers insight to policy makers and other stakeholders seeking to develop competitive green industries¹ in developing countries. It provides an overview and estimate of the market opportunity for climate and clean technology business in developing countries over the coming

¹ In this report, the term “green industry” refers to services and technologies aimed at contributing to reducing negative environmental impacts or addressing the consequences of various forms of pollution. This is not to be confused with the term “greening of industries,” an effort under which traditional industries improve their resource productivity and environmental performance (UNIDO, 2011).

decade. It identifies which aspects of these markets are most accessible to local firms and to small and medium enterprises (SMEs) in particular. Using a newly gathered set of firm data, it identifies which parts of the value chain are already being targeted by local industry. Finally, it provides a set of actions that can be considered for countries that intend to build up local green industries.

Developing Countries Are Increasingly Driving Growth and Innovation in the Global Climate and Clean Technology Market

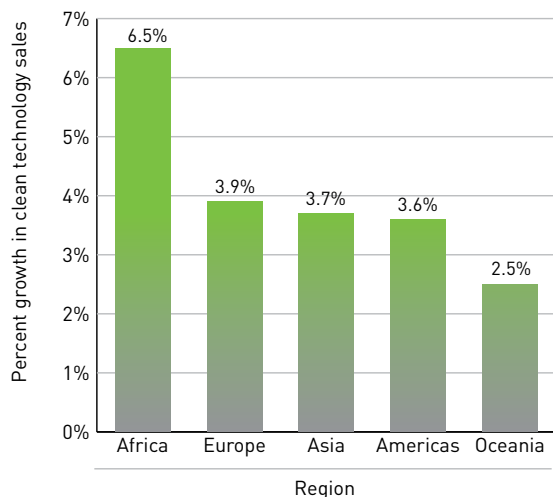
Until recently, businesses and governments in the developed world have been driving growth and innovation in clean technology markets, but emerging economies and developing world markets are increasingly powering the sector as shown in Figure E1.² In 2012, clean technology investment rose by 19 percent in developing countries (to \$112 billion per year) compared with an overall decline of 12 percent globally (to \$244 billion per year), suggesting that clean technology investment is shifting towards developing economies in the near term.

This accelerating shift from the developed to the developing world is driving innovation as technologies, processes, and financing

² This report uses the term “clean technology” to cover the range of technologies that provide climate mitigation or adaptation benefits or positive environmental benefits. A typology of these technologies and related industries is included in Chapter 2 of the full report.



FIGURE E1. Growth in clean technology sales, by region (2012)



Source: U.K. Department for Business, Innovation and Skills (BIS).

mechanisms are adapted to suit local conditions and new innovations are emerging to address local customer needs. It is also opening up opportunities for ambitious entrepreneurs who are well positioned to capitalize on the sector’s growth.

Furthermore, with this accelerating shift, the ability of clean technology to foster job growth and stimulate innovation makes it particularly relevant to developing countries. Clean technology is a growing employment sector globally and green jobs compare favorably to jobs in other sectors: they tend to be more skilled, safer, and better paid. Innovation is central to the development of clean technology products and environmental technologies account for a significant proportion of global patent applications.

However, the unique character of clean technology — such as high upfront capital requirements and longer payback periods for investors — means it has greater difficulty attracting venture capital and requires more

public investment than traditional sectors. This investment obstacle is even more pronounced in developing countries where payback scenarios are more uncertain and SMEs and new ventures are riskier.

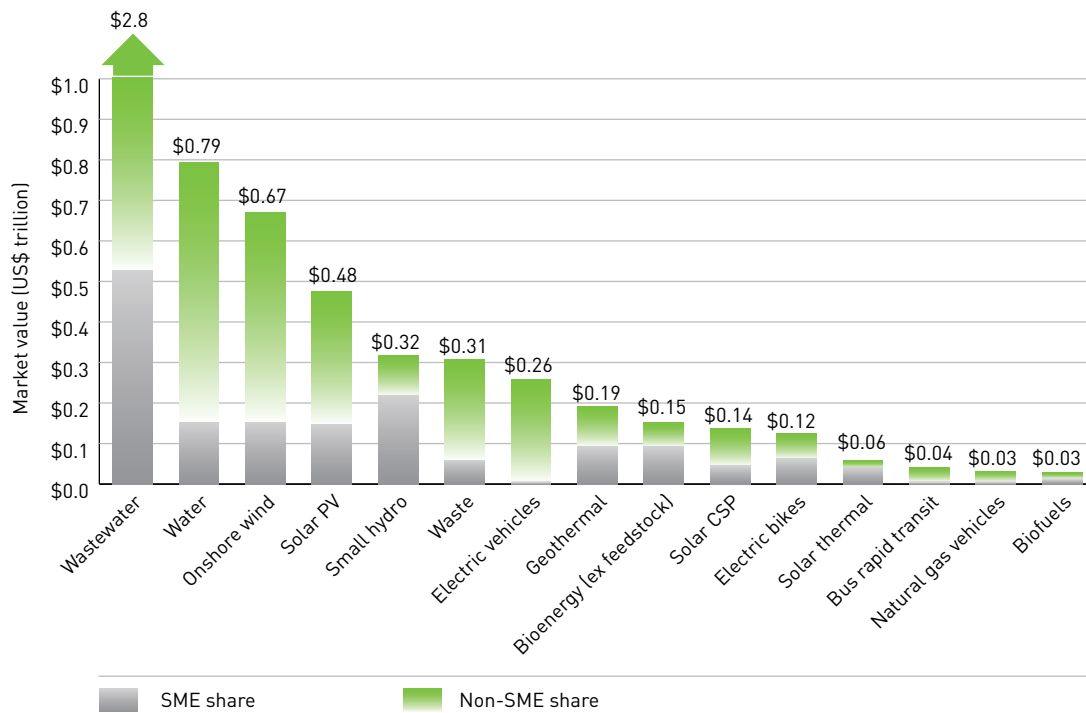
A \$1.6 Trillion Market Is Accessible to SMEs in Developing Countries Over the Next Decade

This report illustrates the nature and likely size of the clean technology opportunity for SMEs in 145 developing countries over the next decade.³ In that time, expected investment across 15 clean technology sectors in these developing countries will top \$6.4 trillion overall. Of that total market, roughly \$1.6 trillion will be accessible to SMEs, as shown in Figure E2. Even when excluding China, India, Russia and Middle Income Europe, these opportunities are still significant: \$4.1 trillion



³ In this report, an SME is defined as an institution with a maximum of 300 employees, maximum revenues/turnover of \$15 million, and maximum assets of \$15 million.

FIGURE E2. Market size through 2023 for 15 clean technologies in developing countries (\$ trillion)



Source: Authors' analysis.



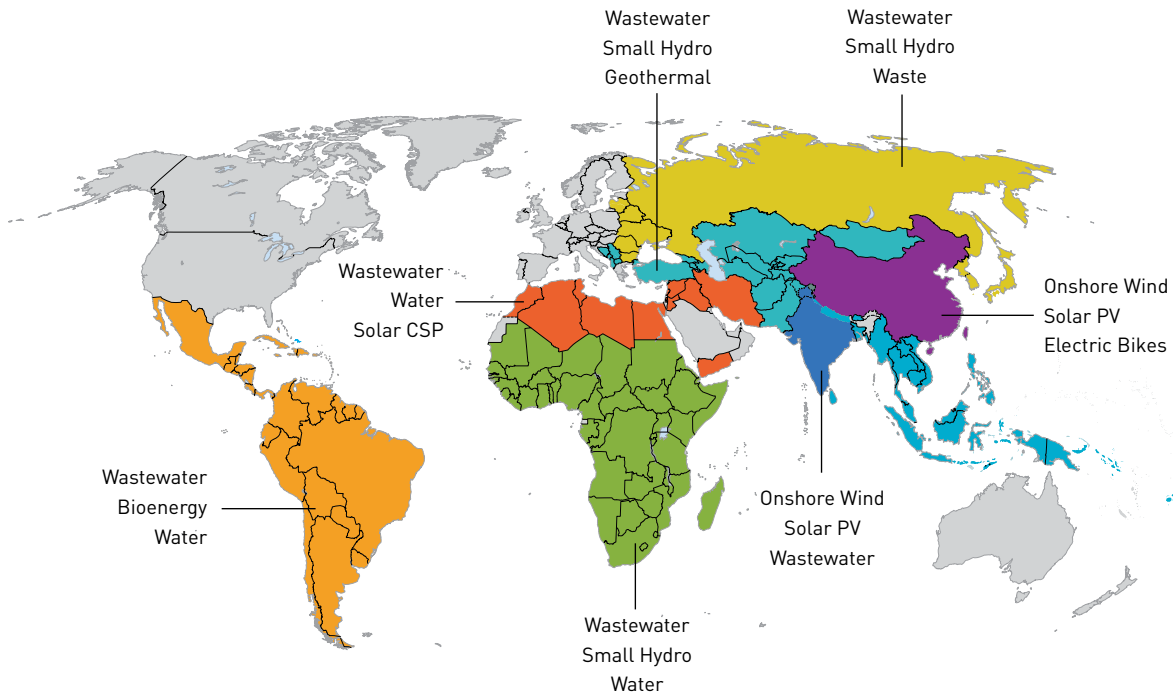
overall, of which \$1.0 trillion is accessible to SMEs (see Chapter 2 of the full report for more detail).

The SME opportunity is largest in the wastewater treatment sector, which makes up about one-third of the total, with small hydro, water treatment, onshore wind power, solar PV, geothermal and bioenergy the next largest SME opportunities.

A number of the renewable and nonrenewable technologies are expected to present significant opportunities for SMEs as well and they are each discussed in turn with the top three opportunities for each region highlighted in Figure E3. While energy efficiency is not covered specifically, both the abatement potential and SME opportunity are large.

Opportunities are available for SMEs across the entire clean technology value chain, but are particularly prevalent in minor equipment manufacture, installation, civil works, retailing, and operations and maintenance (O&M) activities. Knowledge of local markets, the need for specialization, and lower financial and technical barriers to entry make these activities especially accessible to SMEs. While some opportunities exist

FIGURE E3. Top 3 regional opportunities for SMEs



Source: Authors' analysis.

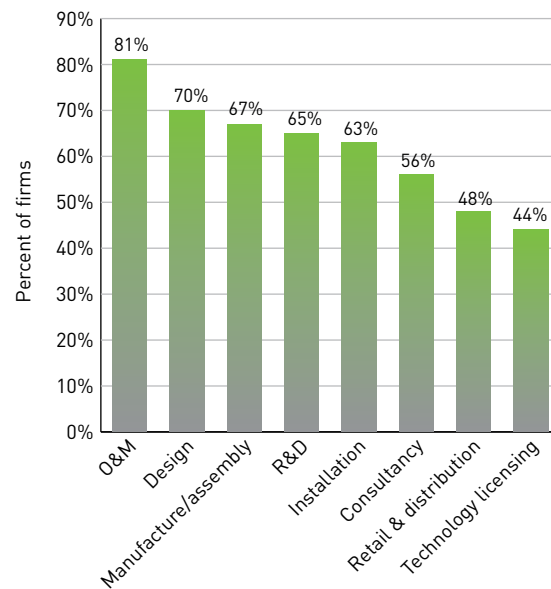
in major equipment manufacturing, SMEs tend to face barriers such as high startup capital costs and the need for highly technical expertise and equipment.

SMEs Are Already Operating and Innovating Across Clean Technology Value Chains

The report examines three technology areas across India and Kenya. The focus is on solar technology in India and bioenergy in Kenya, while climate smart agriculture is explored across both countries.

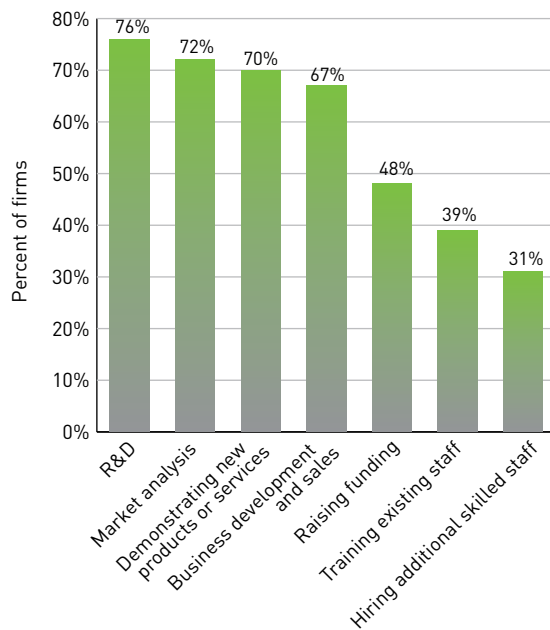
These case studies reveal that clean technology SMEs are already working in the value chain segments with the most opportunities for SMEs. Most firms in India said they worked in several different parts of the value chain, as shown in Figure E4, with over 70 percent of firms saying they worked in design and/or operations and maintenance, and over 60 percent saying they worked in one or more of installation, manufacture, and assembly, and/or R&D.

FIGURE E4. Value chain activities in which Indian clean technology firms are involved



Source: Survey of clean technology firms in India undertaken in July and August 2013.

FIGURE E5. Innovation activities undertaken by clean technology SMEs in Kenya



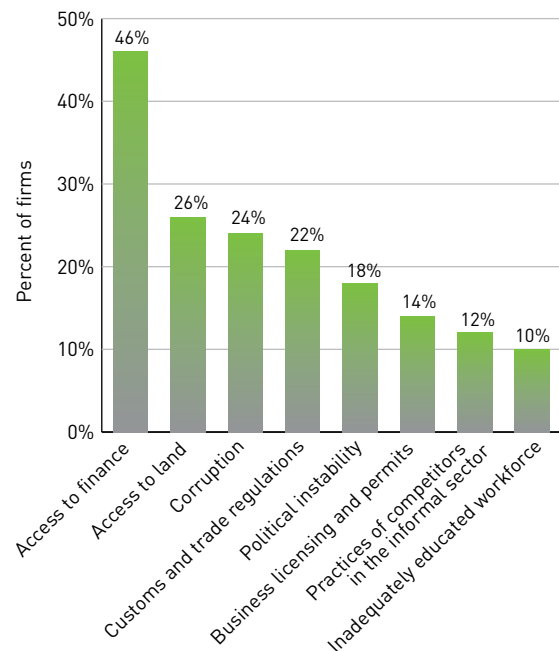
Source: Survey of clean technology firms in Kenya undertaken in July and August 2013.

The potential for local innovation is demonstrated by the clean technology SMEs interviewed for this report. Innovation in Kenyan SMEs is undertaken through a breadth of activities as shown in Figure E5, including research and development (R&D), business development, new products and services, and innovative financing options.

Removing Barriers for Clean Technology SMEs Could Promote Faster Growth of Local Green Industries

Accessing these clean technology opportunities comes with a number of challenges for SMEs. Clean technology SMEs find it difficult to access the capital needed to grow and expand, with almost half of Indian SMEs (see Figure E6) and two-thirds of Kenyan SMEs surveyed for this report rating access to finance as a major constraint. It is also a risk to rely on government policy to sustain markets, as is the case for most renewables, major water and waste public works projects, and new clean transport options. The required technical capacity can also be a challenge, especially

FIGURE E6. Most common barriers cited by clean technology SMEs in India



Source: Survey of clean technology firms in India undertaken in July and August 2013.

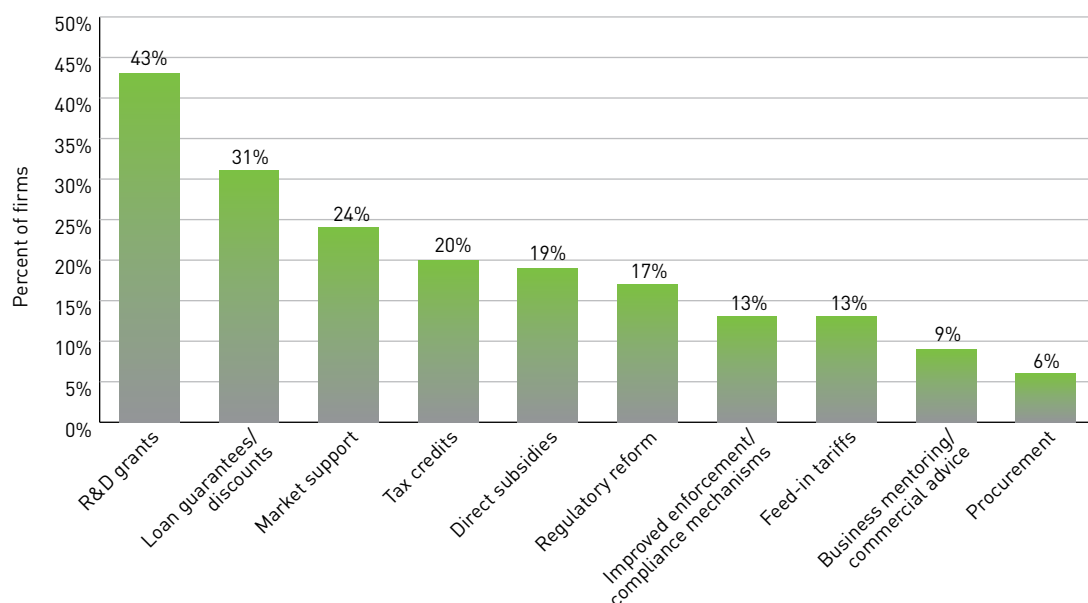
in developing countries where highly skilled workforces are still nascent.

Nevertheless, the SMEs surveyed were optimistic about the future prospects of their own businesses and of the clean technology market more generally. They tended to have a strong history of growth, with 90 percent of firms experiencing revenue growth even through the global economic downturn. Most firms are planning to hire additional staff. About 90 percent of surveyed firms are fairly or very confident in the business environment for clean technology.

To make the most of this opportunity that clean technology provides, SMEs would benefit from a supportive and reliable policy and regulatory environment that favors more resource efficient technologies and processes. Targeted business support can also help SMEs in this space thrive, in such ways as indicated in Figure E7.

With a \$1.6 trillion clean technology opportunity available to developing world SMEs over the next decade, policy makers have a chance to stimulate local innovation and capture economic value by supporting the dynamism of their clean technology SMEs.

FIGURE E7. Areas for government support identified by clean technology SMEs in Kenya



Source: Survey of clean technology firms in Kenya undertaken in July and August 2013.

Actions to Support Clean Technology SMEs

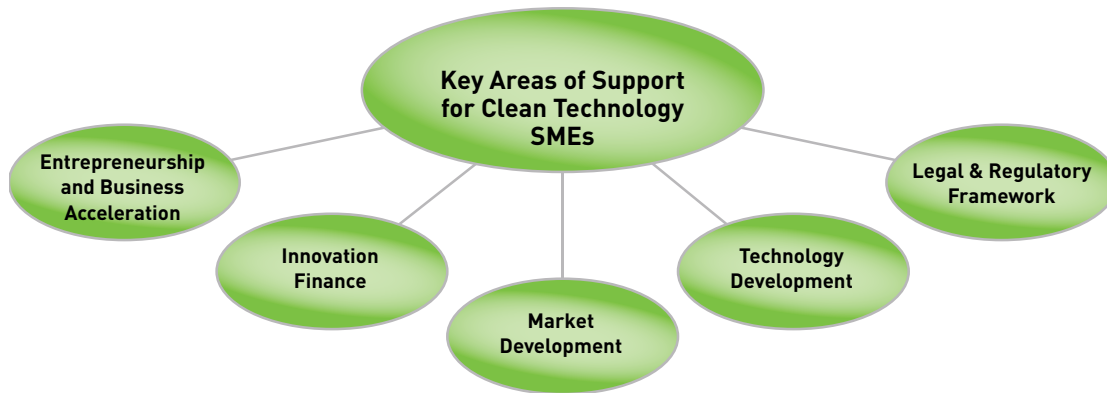
This report describes the importance of SMEs to the growth of competitive clean technology industries. It also illustrates that opportunities exist for developing country SMEs across clean technology industries and value chains. However, the growth of these firms is also dependent on consistent support to overcome the challenges characteristic of clean technology firms, including higher upfront capital requirements, longer payback periods for investors and a heavier reliance on government policy than other technology sectors.

Five areas of action should be considered by governments, development agencies and other public and private actors to support clean technology SMEs in developing countries. These areas, illustrated in Figure E8, are: entrepreneurship and business acceleration, innovation finance, market development, technology development and the legal and regulatory framework.

Policy makers and other stakeholders can draw upon a broad tool-box of instruments in each of these five areas, listed in Appendix C and discussed in Chapter 7 of the full report.

- Entrepreneurship and business acceleration:** There is a range of programs for businesses, as well as international collaborations and networks, which countries and businesses can draw upon to help strengthen SME entrepreneurship and business acceleration in clean technology sectors. Here, countries can pursue programs offering direct technical assistance and the linking of foreign investors with local clean technology SMEs for technology development and/or production capacities. More hands-on and in-country business incubation is also expanding, such as *infoDev*'s Climate Innovation Centers.
- Innovation finance:** There are various instruments available to support early stage financing and risk capital for clean technology SMEs, to complement traditional financing sources. These include providing soft loans and loan guarantees and stimulating seed and venture capital investment. On the demand side, there is a significant opportunity to establish technology-specific consumer credit facilities, which have proven particularly useful for technologies that require higher up-front investments such as renewable energy systems.
- Market development:** A range of instruments aim to increase demand for the products and services of local SMEs, and facilitate the

FIGURE E8. Key areas of support for clean technology SMEs



overall growth of the clean technology market. For renewable energy these include portfolio standards, renewable energy certificates and feed-in tariffs. Clean technology markets can also receive a rapid boost through strict sustainable procurement policies, manufacturer standards, product labeling and product testing and certification, as well as indirect and/or “soft” interventions such as education, campaigns and performance rankings.

- **Technology development:** Instruments designed to stimulate technology development include R&D tax credits, research grants, publicly funded competitive research collaborations, competitions, public investment in R&D, public or private agreements on technology cooperation, demonstration projects and applied research networks.
- **Legal and regulatory framework:** The overall enabling framework for clean technology SMEs can be strengthened by implementing a number of legal and regulatory policies, including sector-specific tax incentives, cap-and-trade emission schemes, emission reduction credits, taxation on pollution or natural resource use, import tax reductions or waivers and incentives to attract skilled labor. These can be designed to create business incentives and/or obligations that address both the supply and demand side of clean technology markets.

Policy makers, in particular, must adopt and adapt these instruments to fit their country’s circumstances. They should also seek to mitigate key risks, including failures to coordinate policy design and implementation, market distortions, and the effects of policy discontinuity.

It is also important to design and implement these instruments in parallel, as part of a broader, national strategy to support clean technology SMEs. Policy makers are advised to take into account their national circumstances and focus attention on developing policy interventions on “fertile ground,” as opposed to supporting technologies and sectors that do not have the support of already-existing human and natural resource capacities.

In order to achieve complementarities and policy coherence, policy makers are also advised to survey the portfolio of existing policies and conduct a harmonization analysis, that is, to understand if and how other policies and national economic circumstances stand to conflict with, or undermine, planned interventions to support clean technology SMEs.

To illustrate policy considerations within specific national contexts, the report offers case studies of national programs targeting SMEs within green industry. These include South Korea’s Green Growth Strategy, India’s National Solar Mission, Thailand’s Energy Conservation Program, and Ethiopia’s Climate Resilient Green Economy Strategy.

About *infoDev*

infoDev, a global trust fund program in the World Bank Group, supports growth-oriented entrepreneurs through creative and path-breaking venture enablers. It assists entrepreneurs to secure appropriate early-stage financing; convening entrepreneurs, investors, policy makers, mentors and other stakeholders for dialogue and action. We also produce cutting-edge knowledge products, closely linked to our work on the ground.

About *infoDev*'s Climate Technology Program

The Climate Technology Program (CTP), housed at *infoDev*, empowers developing countries to proactively and profitably adapt, develop, and deploy climate-smart technologies and business models. The CTP is creating a global network of Climate Innovation Centers (CICs) that provide a country-driven approach to addressing climate change and fostering green growth. The CICs are designed as locally owned and run institutions that provide a suite of services and venture financing that address the specific needs of local climate technology SMEs and entrepreneurs. At the global level, the CTP is providing linkages between CICs by facilitating market entry, access to information, and financing for the private sector, while also offering important tools for policy makers to measure and improve domestic climate innovation activities. Currently, the program is establishing CICs in eight countries: Kenya, the Caribbean, Ethiopia, Ghana, India, Morocco, South Africa and Vietnam.

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