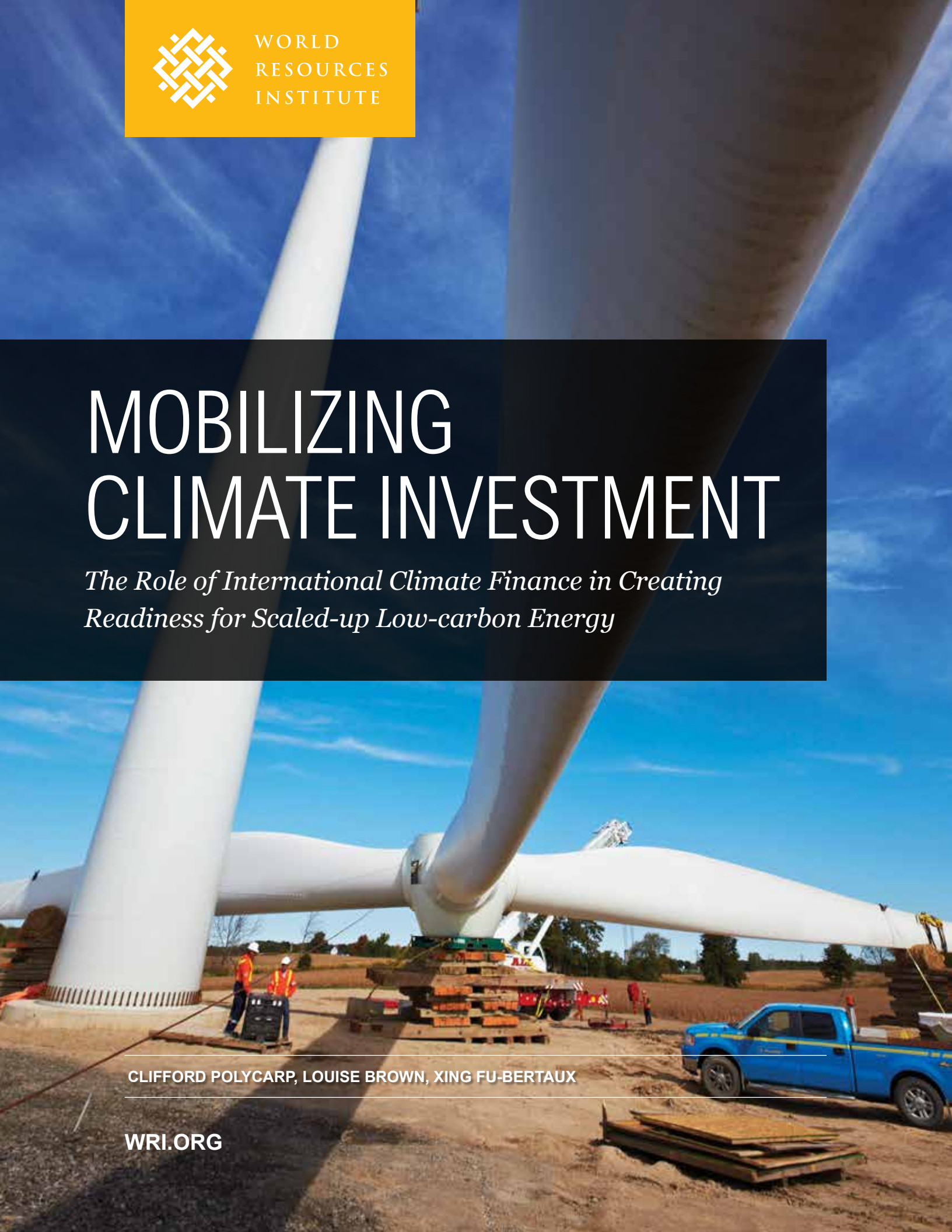

WORLD RESOURCES INSTITUTE

MOBILIZING CLIMATE INVESTMENT

The Role of International Climate Finance in Creating Readiness for Scaled-up Low-carbon Energy

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ACKNOWLEDGMENTS

We would like to thank the many people who contributed thoughtful discussions and ideas that helped shape this report and put time and thought into reviewing drafts and providing valuable feedback and suggestions. Within WRI, we are grateful to the following people who provided guidance, quality control, and review: Athena Ballesteros, Giulia Christianson, Alex Doukas, Ziwei Mao, Shilpa Patel, Janet Ranganathan, Emily Schabacker, Aman Srivastava, Dennis Tirpak, Peter Veit, Shally Venugopal, Lutz Weischer, and Davida Wood. Outside of WRI, we would like to thank Emily Chessin, Nathan Kommers, Robert Livernash, and Jacob Werksman for their valuable input and quality control.

We are also grateful to the following external experts who provided valuable comments and suggestions on earlier drafts of the report: Dipak Dasgupta, Jan Kappen, Abyd Karmali, Kanizio Freddy Manyika, Gilbert Metcalf, Richard Muyungi, Martina Otto, and Don Purka.

The six case studies in this report benefitted from interviews with a number of experts as well as expert reviews and feedback. We would like to thank the following people for their time and patience in helping us develop an in-depth understanding of the cases: Claudio Alatorre, Amal-Lee Amin, Davin Chown, Mike Crosetti, Sanjay Dube, Peter du Pont, Saliem Fakir, Asclepias Indriyanto, Migara Jayawardena, Kavita Kaur, Amit Khare, Dilip Limaye, Edgar López Satow, Sami Marrouki, Dan Millison, Smita Nakhooda, Enrique Nieto Ituarte, Napaporn Phumaraphand, Lazeena Rahman, Thorsten Schneider, Pradeep Tharakan, Chiara Trabacchi, Myriem Touhami. Any omissions, inaccuracies, or errors in the case studies are our own.

Finally, we would like to thank UNEP, whose financial support made this report possible. In particular, we are grateful to Eric Usher with whom we worked closely from the inception and who provided many ideas, thought-provoking discussions, and detailed reviews that helped to shape this report.

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FOREWORD

Climate change is here. From the drowned streets of Bangkok and New Jersey to devastating drought in Brazil and the Sahel, extreme weather over the past two years has mirrored what scientists have told us to expect in a warming world.

Developing countries are on the frontline of the new climate reality. With less resources and more vulnerable populations than richer countries, they will bear the brunt of likely impacts ranging from rising sea levels to longer droughts and more violent weather events. They are also increasingly part of the solution.

Finance is essential to addressing both adaptation and mitigation in developing countries. Industrial countries—those that caused most of the problem in the first place—have an obligation to provide resources. Developing countries, for their part, need to create a conducive environment so that funds are attracted and well used.

This report, *Mobilizing Climate Investment*, suggests guidelines to help ensure maximum impact. Based on in-depth analysis of existing "readiness" activities in six developing countries, it lays out an effective framework for stimulating investment in renewable energy and energy efficiency.

Lessons learned from our case studies—energy efficiency in India and Thailand, wind power in South Africa and Mexico, solar water heaters in Tunisia and geothermal power in Indonesia—suggest two key determinants of success. First, government leadership and commitment to policy and institutional reform is essential to inspiring investor confidence. Second, addressing pricing distortions that strongly favor conventional fossil fuel energy sources is critical to kickstart investment in cleaner alternatives. Beyond these big picture takeaways, the report gives detailed guidance on priority policy, institutional, industry, and financial sector conditions that can attract scaled-up investment.

Encouragingly, WRI's analysts conclude that a small investment in an enabling environment can lead to a big payoff in scaled-up public and private investment in renewable energy and energy efficiency. We hope it will help guide international public funds and institutions, and developing country governments, as they deploy climate finance.

The newly established Green Climate Fund, in particular, has a timely opportunity to act. By putting in place effective support mechanisms for readiness activities, the fund can respond to the pressing energy needs of developing countries. It can also help enable a cleaner energy future, one that limits global temperature rise before it reaches increasingly dangerous levels.

Andrew Steer
President
World Resources Institute

EXECUTIVE SUMMARY

Limiting global temperature rise to 2°C above pre-industrial levels will require billions of dollars in investments each year to mitigate greenhouse gas emissions and shift to low-emissions development pathways. This report examines how public climate finance can help meet the significant investment needs of developing countries by creating attractive conditions for scaled-up investment in low-carbon energy.

Between now and 2050, developing countries need an estimated $531 billion per year of additional investment in energy supply and demand technologies in order to limit global temperature rise to 2° C above pre-industrial levels. To achieve this scale of investment, developing country governments and custodians of international public finance will need to deploy limited public finance in ways that leverage an unprecedented volume of private sector investment. Despite growing global investment in low-carbon energy and falling costs, it will be difficult to achieve the scale and urgency of investments needed without the appropriate policy, institutional, industry, and financial conditions. Governments and their international partners need to undertake "readiness" activities designed to put in place the conditions that attract scaled-up investment and enable a transformation toward low-carbon energy development pathways.

Drawing on six developing country case studies, this report identifies a set of key lessons and insights for readiness. The report develops a framework to identify and prioritize readiness activities that will require public financial support to create the conditions necessary to scale up investments in renewable energy and energy efficiency (collectively referred to as low-carbon energy). The report discusses the implications of the findings for international climate finance and draws a number of recommendations for the Green Climate Fund (GCF). It targets international public funds and institutions looking to accelerate investment in low-carbon energy, as well as developing country governments looking to identify and prioritize activities for funding.

Enabling conditions for scaling up investment

We identify a number of policy and institutional, industry, and financial sector conditions that can attract scaled-up public and private investment in low-carbon energy. Policy and institutional conditions include plans and targets for low-carbon energy, institutional capacity to effectively implement climate change and energy policies, laws supporting investment in low-carbon energy, and regulatory and fiscal instruments to implement laws. Industry conditions include the capacity of developers to prepare bankable projects, information on renewable resource availability or options to conserve energy, engineering capacity, and the presence of a support industry and enabling infrastructure. Financial conditions include a stable financial sector with the capacity and range of financial products needed to support low-carbon energy.

In six case studies, we analyze the role that enabling activities have played in promoting scaled up investment in low-carbon energy, and the role that international public finance has played in supporting such activities. These case studies examine energy efficiency in Thailand, wind power in South Africa, solar water heaters in Tunisia, geothermal power in Indonesia, wind power in Mexico, and energy efficiency in India. Taken together, the case studies suggest two overarching determinants of success in scaling up investment: government leadership and effective responses to pricing distortions. When government leadership is strong, a commitment to policy and institutional reform and implementation of stated goals usually follows. This in turn strengthens the investment climate and increases investor confidence. In cases where market failures severely distort the market in favor of carbon-intensive energy sources, it has been more difficult to create the conditions that attract investment in low-carbon energy.

Lessons learned for the design of readiness activities

The case studies also reveal a number of lessons about the design of readiness activities and the role of international partners in supporting them.

Small amounts of long-term funding for enabling activities can help scale up investment

In each case study, small investments in enabling activities—from several hundred thousand dollars to several million dollars—helped pave the way for scaled up private and public investments by supporting the creation of conducive policies and market conditions. International support has been most effective when sustained over five or more years. Technical support can also be more effective if international advisors are integrated into national institutions and report to national, rather than international, authorities.

International support is likely to be more effective if it identifies and targets a few critical barriers to investment. In countries with comparatively few

enabling conditions for investment, attempts to simultaneously surmount all investment barriers may result in resources being spread too thin to achieve a significant impact. Chapter 4 presents a framework that can aid governments and their international partners in identifying activities to support.

Strengthening the enabling environment should not end when investment begins. In each case study, readiness activities and larger investment took place simultaneously. Even in cases where the investment climate was already strong, there was still scope for additional enabling activities to address specific gaps.

Integrated, inclusive planning processes and policy and institutional reform are key to attracting investment

The integration of low-carbon energy into a broader development agenda can enhance coordination and alignment between different sectors of the economy. Civil society and private sector actors can bring valuable expertise and experience to the planning process, and play important roles in ensuring that low-carbon energy policies and plans are realistic, robust, and tailored to the needs of the country. International support should be aligned with national plans and priorities for effective and sustained outcomes, and should be flexible enough to respond in a timely manner to evolving priorities.

Changes to the policy and regulatory environment proved crucial to attracting investment on a significant scale in the case studies. International support for the design of policies is likely to be effective only if it is demand-driven and not seen as infringing on national sovereignty. Countries that have set up their own financial mechanism to support low-carbon energy projects are well positioned to implement their objectives effectively and independently, thereby reducing their reliance on international partners to finance their low-carbon energy needs.

Having the appropriate institutions in place to develop, implement, and regulate policy reforms—and empowering them with the mandate and resources to carry out their functions effectively—helped ensure that policies were coherent and consistent, which increased investor confidence.

In key institutions, strengthening the capacity of staff and management to carry out their functions is an important readiness activity that often requires international funding support. The case studies suggest that capacity-building support is most effective when carefully targeted to address particular skills gaps.

Tackling information barriers and strengthening industry and financial sector capacity can unlock investment

Public support for broad-scale renewable resource assessments or exploration can provide information on resource availability that is key to attracting investor interest. Similarly, measures to familiarize industry and other actors with low-carbon energy options—such as training centers, awareness campaigns, and seminars and workshops that bring together stakeholders—can strengthen industry knowledge of and capacity to implement renewable energy projects, and raise awareness of the potential cost savings from energy efficiency.

International support plays an important role in facilitating learning and demonstrating new financing models for renewable energy, as well as strengthening industry's capacity to develop and implement low-carbon energy projects. In some cases, international support to strengthen the capacity of small and medium enterprises (SMEs) and improve their access to financing for low-carbon energy projects has helped unlock investment by this sector of the market.

Financial institutions can play a key role in opening the market for low-carbon energy technologies. However, some financial institutions lack knowledge of and experience with these technologies. Strengthening the capacity of financial institutions to support renewable energy and energy efficiency projects, including through pilot financing programs, has been important in scaling up domestic sources of finance for low-carbon energy in several cases. In some cases, the high risk—real or perceived—of investing in low-carbon technologies without a proven track record in the country has deterred domestic financial institutions. Mechanisms that carefully allocate risks to those best placed to manage them can help attract financing from domestic banks and other financial institutions.

A framework for guiding readiness support for low-carbon energy investments

Building on the experiences of the six case studies, we propose a framework to guide governments and their international partners in determining how best to provide readiness support to countries with low-carbon energy sectors in different stages of development. The framework describes some of the activities required to strengthen the enabling policy and institutional environment for investment. In the early stages of development, these include support for assessing energy options, engaging stakeholders in the energy planning process, capacity building for government agencies and civil society, technical support for developing plans and strategies, and outreach activities. In later stages, activities include support for designing and implementing regulations and fiscal instruments, and targeted capacity building for government agencies, including local governments.

The proposed framework also describes some of the activities needed to strengthen the enabling industry and financial conditions for investment. In early stages of development, these include renewable resource assessments and energy conservation awareness campaigns, capacity building for project developers and financial institutions, support for technology transfer and localization, feasibility studies and environmental and social impact assessments, and support for financial sector reform. At later stages, activities include strengthening engineering capacity for low-carbon energy projects, supporting ancillary industries (such as upgrading grid infrastructure), and supporting financial institutions to assess and finance low-carbon energy projects.

Recommendations for the Green Climate Fund

The six case studies illustrate different approaches that various international partners have used to support readiness activities. The lessons learned are intended to inform the recently established GCF as it attempts to identify how best to support a paradigm shift toward low-emission and climate-resilient development pathways. Although the GFC's detailed operational modalities are not yet defined, it could take a number of approaches to support readiness. These include supporting readiness directly or partnering with existing institutions; establishing distinct channels and allocations for readiness or integrating enabling activities into existing channels and allocations; and supporting readiness through the private sector facility.

We argue that the GCF should support readiness through its own activities and in line with its guiding principles. Given the importance of readiness activities in scaling up investment, and the long time frame for creating an enabling environment for investment, we recommend that the GCF set aside dedicated funding for enabling activities, especially for countries in which conditions to attract investment are nascent. It is evident from the case studies that stronger coordination between the various providers of international climate finance could enhance the collective impact of their efforts. We suggest that the GCF put in place incentive structures to encourage partnerships and coordination between various international funds and institutions and that it facilitate a greater role for national institutions in promoting low-carbon development.

The GCF's private sector facility will be particularly well placed to support readiness activities that target industry and financial sector actors, given its expertise and focus. We recommend that the private sector facility take a strategic approach to integrating enabling activities into larger private sector projects in order to address specific gaps and increase the likelihood of success. Given the interest among developing and developed countries in initiating readiness activities that will help countries prepare themselves to access funds once the GCF becomes operational, the GCF should consider establishing a fast-track mechanism to support strategic readiness activities even before it is fully operational.

We conclude by observing that there is no simple approach to supporting readiness activities. The GCF should develop mechanisms to ensure that support for enabling activities is predictable and sustained, allowing countries to draw on these resources at a rate that their absorptive capacity allows. Furthermore, the GCF should be responsive to the needs of individual countries and ensure that its support is both demand-driven and aligned with national low-carbon energy strategies and plans.

Chapter I

INTRODUCTION

It will be difficult to achieve the scale and urgency of climate investments needed in the absence of the appropriate policy, institutional, industry, and financial conditions. Developing country governments and their international partners can undertake a number of enabling or "readiness" activities to create attractive conditions that will catalyze public and private investment in low-carbon energy sectors.

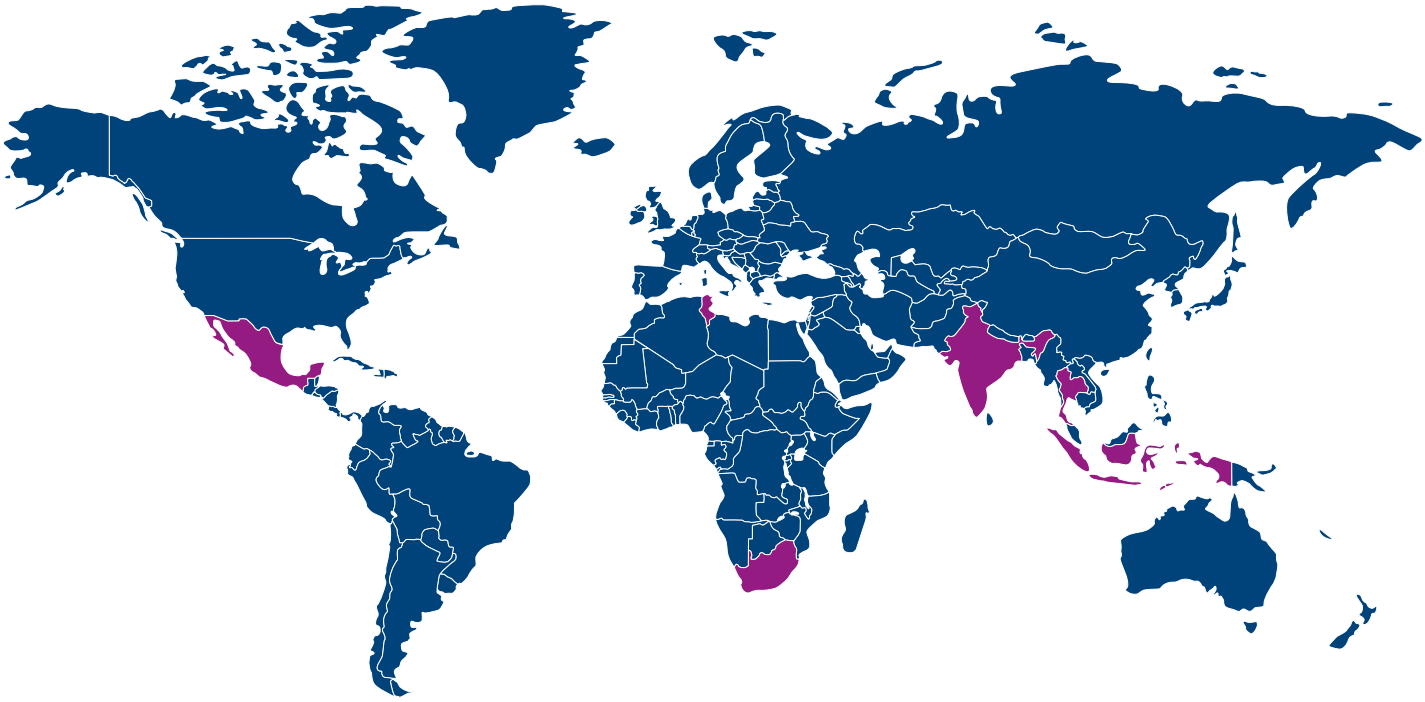
Limiting global temperature rise to 2°C above pre-industrial levels will require significant investments to mitigate greenhouse gas emissions and shift to low-emissions development pathways. Estimates of the scale of needed investments vary, but could reach $900 billion per year in additional[1] investments in energy supply and demand technologies between now and 2050.[2] Of this, approximately 59 percent—or $531 billion—will need to take place in developing countries[3] (IEA 2012). To achieve this scale of investment, developing country governments and custodians of international public finance will need to deploy their limited public finance in ways that leverage an unprecedented volume of private sector investment. Despite growing global investment in low-carbon energy and falling costs (Liebreich et al. 2009), it will be difficult to achieve the scale and urgency of investments needed in the absence of the appropriate policy, institutional, industry, and financial conditions. Developing country governments and their international partners[4] need to undertake readiness activities designed to put in place the conditions that attract scaled up investment and enable the transformation of carbon-intensive energy economies to economies based on low-carbon sources.

The importance of an enabling environment for scaling up investment in low-carbon energy has been recognized before. A number of studies have pointed to the role of clear and predictable long-term policies and regulations, and the need for institutional capacity to provide certainty to investors (Corfee-Morlot et al. 2012; Jones and Ward 2012; Sullivan 2011; Varadarajan et al. 2011; WBCSD 2010). Recent work by the United Nations Environment Programme (UNEP) highlights the importance of addressing industry barriers to investment and the role of public finance in supporting early stage investment in low-carbon sectors when the high risk-to-reward ratio acts as a disincentive to potential investors (Ritchie and Usher 2011). Similarly, a 2012 WRI working paper shows how public sector interventions can create attractive investment conditions by improving the risk-reward calculus of low-carbon markets while also promoting market scale, liquidity, and transparency (Venugopal and Srivastava 2012). Other studies have also emphasized the need for public finance support to enable the financial sector to scale up lending to low-carbon energy projects (UNEP 2012). By creating the conditions that enable and catalyze investment in low-carbon energy, public funds can to be used to attain the desired impact of low-carbon development objectives.

Scope, approach, and limitations

This report begins by identifying a set of policy, institutional, industry, and financial conditions that are likely to be necessary to scale up investment in renewable energy and energy efficiency. We use the term "low-carbon energy" to refer to both renewable energy and energy efficiency technologies. We do not consider other clean energy technologies, such as clean coal and carbon capture and storage, nor do we include other energy-intensive sectors, such as transport, construction, and agriculture.

Figure 1 | **Case Study Countries**



To draw on lessons from existing practice, we examined six cases in developing countries, gathering information from secondary research and through interviews with national and international experts. The six cases, which we selected to include a range of regions and technologies, are:

- Energy efficiency in Thailand
- Wind power in South Africa
- Solar water heaters in Tunisia
- Geothermal power in Indonesia
- Wind power in Mexico
- Energy efficiency in India

Each case study provides an overview of the development of the low-carbon sector and the role of readiness activities in creating the conditions to attract investment. We identify several lessons and insights from the cases. Building on insight from the case studies, we propose a framework to help guide developing country governments and international funds and institutions in prioritizing specific types of readiness activities to support. In the final chapter, we discuss the implications of the framework for international climate finance, especially the Green Climate Fund.

We do not attempt to cover the full range of low-carbon energy technologies, and we do not consider the research and development stage of new technologies.[5] With limited available information, it was often impossible to determine cause and effect between activities and impacts, and we did not attempt to quantify the impacts of readiness activities on subsequent investment. Nor do we attempt to compare the relative effectiveness of various activities.

This report is targeted at international public funds and institutions looking to prioritize and deploy climate finance in ways that promote scaled-up public and private sector investment in low-carbon energy. It is also relevant to developing country governments looking to identify and prioritize activities to attract investment in low-carbon energy.

Chapter II

CREATING THE CONDITIONS FOR INVESTMENT

An enabling environment to attract investment is one which has appropriate policy conditions – including laws, targets, and regulations – and the institutional capacity to implement policy. It also has appropriate industry conditions, including engineering expertise and the presence of enabling infrastructure, and a stable financial sector with the capacity to support low-carbon energy.

Developing country governments and their international partners can undertake a number of enabling activities—sometimes referred to as "readiness" activities—to create the conditions that are needed to catalyze public and private investment in low-carbon energy sectors.[6] In the sections below, we describe the conditions required to attract investments in low-carbon energy sectors and discuss some of the enabling activities needed to put these conditions in place. We build on the analytical frameworks developed by WRI in *Investing in Sustainable Energy Futures* (Nakhooda and Ballesteros 2010) and *Grounding Green Power* (Weischer et al. 2011), and on UNEP's analysis in *Catalyzing Early Stage Investment* (Ritchie and Usher 2011), as well as WRI's ongoing work on energy access and governance.[7] In reality, there may be overlap between the various conditions described below. While the enabling activities discussed here are important for attracting investment and maximizing its impact, these activities often take place alongside—or as a component of—larger low-carbon energy investments.

Conditions for attracting investment

Policy and institutional conditions

The policy and institutional conditions to attract scaled-up investment result from a broad set of government activities and from adequate institutional capacity within in a country. We identify five conditions:

Plans and targets for low-carbon energy developed through inclusive participatory processes

Clearly articulated national energy plans, transparent and inclusive planning processes, and concrete targets are first steps toward providing investors with certainty and a long-term vision of the role of low-carbon energy in a country's energy mix. Integrated planning processes[8] enable a country to assess energy options in the context of its broader economic, environmental, and social development objectives. Transparent, inclusive, and participatory planning processes can increase public support for policies and improve development outcomes.[9]

Enabling activities may include assessments to identify least-cost energy options, taking environmental and social costs and benefits into consideration; developing low-carbon energy plans that are integrated into broader development goals; and engaging civil society and the private sector in the energy planning process.

Institutional organization and capacity to implement policies effectively

Strong technical, managerial, and administrative capacity and appropriate organization and empowerment of institutions within government (including oversight and regulatory bodies) is necessary to design and implement effective low-carbon energy policies and to apply principles of good governance.[10] The skills needed for low-carbon energy planning may be different from those required for conventional fossil fuel energy. Strong capacity within civil society to analyze issues and participate effectively is also critical to bring in independent expertise and create broad-based ownership of low-carbon energy policies.

Enabling activities may include establishing institutions such as intergovernmental or multi-stakeholder coordinating committees; building the technical, planning, managerial, and administrative capacity of national and local government representatives in areas such as policy making and good governance; supporting public access to information; and building the capacity of civil society to understand and engage in energy planning processes.

Laws supporting investment in low-carbon energy

A legal framework that promotes low-carbon energy, establishes legally binding targets and policies, and mandates appropriate institutions to implement them can help bolster investors' confidence that the investment climate is stable and ensure continuity regardless of political change. It is important that laws and policies are aligned across different levels of government and different sectors and are consistent with broad national development goals. Laws can be implemented through regulatory and economic instruments, as discussed below.

Enabling activities may include developing or reforming laws in line with national low-carbon energy and/or development plans, engaging civil society and the private sector in designing laws, and communicating new laws to industry and consumers.

Regulatory instruments

Regulatory instruments provide a set of rules that guide or restrict activities of industry and other actors, in line with relevant laws. Energy efficiency regulations may include standards that prescribe minimum efficiency requirements for power plants or mandate the use of best available technologies. For renewable energy, regulations may provide preferential access and reduced wheeling charges to use transmission and distribution networks, or mandate renewable energy portfolio standards for distribution utilities. Processes to monitor effectiveness and periodically review regulations help ensure that policies continue to achieve their desired results even as market conditions change, including technological breakthroughs that significantly reduce the cost of a renewable energy technology.

Enabling activities may include developing regulations in line with relevant laws, engaging stakeholders in the design process, communicating regulations to industry and consumers, and monitoring and evaluating the effectiveness of regulatory instruments.

Economic instruments

Economic instruments translate policy targets into price incentives to increase the attractiveness of low-carbon investment options compared to conventional fossil fuel technologies. Incentives include tax breaks, demand-side subsidies such as higher feed-in-tariffs, and disincentives for fossil fuel technologies in the form of taxes, removal of subsidies, and caps on carbon dioxide emissions with tradable permits. Pricing structures should encourage more efficient energy consumption while ensuring that the poor can afford energy for basic needs. It is important that incentives reward actual power production, not just installation. Engaging industry and consumers in the design of economic instruments can ensure that these instruments are responsive to needs, and can help garner support for new pricing systems. As with regulatory instruments, processes to monitor and adjust fiscal instruments in line with market conditions help to ensure that they remain effective and affordable.

Enabling activities may include designing and implementing appropriate economic incentives for a particular technology and stage of development (such as a feed-in tariff mechanism[11]), eliminating

disincentives such as fossil fuel subsidies, engaging stakeholders in the design of economic instruments, and monitoring and evaluating the effectiveness of economic instruments.

Industry and financial conditions

Industry-level conditions for investment include not only those in the low-carbon energy industry itself, but also in the industries providing the supporting infrastructure, products, and services to make the low-carbon energy industry competitive. A mature financial sector and adequate capacity within financial institutions are also key, as they enable industry to access different types of financing to match the risk and return characteristics of a project. We identify six industry and financial conditions:

Project developers' capacity to develop bankable projects

Project developers must have the technical and financial capacity to develop low-carbon energy projects that are capable of attracting financing, being built, and operating effectively. More experienced project developers often have the technical and financial wherewithal to develop bankable projects but lack specific knowledge of low-carbon technologies. Smaller and less-experienced project developers often lack the technical skills or financial and business acumen to develop bankable projects. The cost of developing projects is often elevated for a technology that is new to a country, thanks to the associated learning costs.

Enabling activities may include capacity building and specialized training; support for project conceptualization and technical design; feasibility studies; due diligence; environmental and social impact assessments; stakeholder consultations; and financial, technical, and legal advisory services.

Knowledge of resource availability

Project developers must have information on the renewable resources available at various locations and their potential for development. This information allows developers to estimate the size of investment required and the expected return on investment. There is often little incentive for developers to undertake national or regional-scale resource assessments which have features of a public good. In the case of energy efficiency, industry actors need to know the options available for energy conservation and their potential impacts on energy consumption.

Enabling activities include resource assessments of renewable energy potential at the national, regional, and local level. For energy efficiency, readiness activities include awareness campaigns and workshops to provide industry with relevant information on energy conservation.

Engineering capacity

The engineering knowledge and skills for the planning, construction, operation, and maintenance of low-carbon energy technologies within industry are essential for the adoption of low-carbon energy technologies. The capacity to indigenize specific low-carbon energy technologies to local conditions is also important. This process can have the added benefit of developing local knowledge and expertise, driving innovation, and helping to establish

Building the financial sector's understanding of the risks and opportunities associated with low-carbon energy enables the development of appropriate financial instruments for low-carbon energy projects.

domestic production and export capacities, possibly resulting in an accelerated adoption of such technologies. This can be accompanied by the development of an advanced graduate curriculum at local technology institutes and universities, to train future engineers.

Enabling activities may include practical training for specific engineering capabilities for technical staff of industry actors (including utilities), and establishing research facilities to support technology testing and tailoring to local conditions.

Presence of a support industry and enabling infrastructure

The presence of support industries in the country—including technology manufacturers, engineering, procurement and construction companies, ancillary industries such as storage and spare parts manufacturers, and technical service providers—is critical to creating a thriving low-carbon energy industry. An enabling transmission and distribution infrastructure, such as a robust grid capable of managing intermittency, storage, and net metering is an example of an enabling industry condition.

Enabling activities may include developing grid infrastructure and ancillary industries, and certifying technology to assure sufficient product quality standards.

Stable financial sector

The availability of short- and long-term finance and related financial services is an important indicator of a stable or maturing financial sector, as is ease of access to finance in the form of risk-appropriate instruments at reasonable costs and in appropriate currencies. The absence of such conditions and a lack of liquidity, maturity, and transparency in the financial sector can increase financiers' perceived investment risk and therefore the cost of financing, and thus is a barrier to the development of a new sector.

Enabling activities, although not specific to the low-carbon energy industry, may include strengthening the capacity of financial institutions for risk management and project appraisal, enhancing competition within the financial sector, developing appropriate financial regulations and infrastructure, and strengthening the supervision of banks.

BOX 1 | FIRST-MOVER PROJECTS

The first projects developed in a country raise awareness and illustrate the potential benefits of low-carbon energy technologies among industry and other stakeholders. They are also instrumental in building industrial capacity to develop, finance, construct, and operate future projects. In many cases, the first projects undertaken in a country are small-scale plants structured as commercial operations but with strong demonstration effects. Developers may not have an incentive to invest in low-carbon energy technologies because of the higher up-front transaction costs and greater risks of these less familiar technologies. Accordingly, public funding for first-mover projects can be critical to attracting wider private sector engagement. Although demonstration, or first-mover, projects generally require commercial financing like any other investment, governments and international partners often provide public funds to support these projects due to their learning effects.

Financial sector capacity for supporting low-carbon energy

Building the financial sector's understanding of the risks and opportunities associated with low-carbon energy helps to address inflated risk perceptions and enables the development of appropriate financial instruments for low-carbon energy projects. Financial institutions—including commercial and state-owned banks, pension funds, and microfinance institutions—may lack the requisite technical capacity to evaluate low-carbon energy project proposals, and may not have a critical mass of proposals to warrant adding this capacity. Addressing risk perceptions and transaction barriers enables project developers to more easily access finance at costs that are appropriately matched to the real risks associated with the project.

Enabling activities may include providing technical assistance and targeted training to financial institutions for preparing loans, assisting in the development of new financial products and programs, undertaking credit appraisal and due diligence, and familiarizing financial institutions with the risks and opportunities of low-carbon energy investments.

Chapter III

LEARNING FROM EXPERIENCE

Case studies from India, Indonesia, Mexico, South Africa, Thailand, and Tunisia provide insight into each country's experience in creating an enabling environment to scale-up investment in a low-carbon energy sector, and reveal a number of important lessons for the design of readiness activities.

Case studies

The case studies analyze the role that readiness activities have played in promoting scaled up investment in renewable energy and energy efficiency, as well as the role that international public finance has played in supporting such activities. The six case studies span a range of geographic locales and low-carbon sectors. Detailed accounts of each case study are presented in Annexes 1 to 6.[12]

Energy efficiency in Thailand

The government of Thailand identified energy conservation in the early 1990s as the least costly way to meet rapidly rising energy demand (Foran 2006). However, a number of barriers to energy efficiency existed, including lack of information and awareness among industry and consumers of the benefits; limited incentives for adoption of energy conservation measures; lack of awareness in the financial sector, leading to a lack of financing available for energy efficiency projects; and insufficient government staff with the requisite skills to develop and implement energy efficiency standards.

Efforts to create an enabling environment

The government has been proactive in developing programs to facilitate adoption of energy efficiency and conservation measures and creating the institutional framework for their effective implementation. A 1992 Energy Conservation Promotion Act established energy efficiency requirements for industry and created an Energy Conservation Promotion Fund (ECPF), which receives revenue from a dedicated sales tax levied on petroleum products (UNEP 2006). The ECPF has been an important source of domestic finance and has enabled the government to develop and pursue its energy efficiency programs with a great deal of autonomy and limited reliance on international support.

The Thai government has been strategic in securing international support to address key needs and ensuring that this support is aligned with national priorities. The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Germany's agency for international cooperation, supported the Department of Energy Development and Promotion with intensive staff and management training programs after the passing of the Energy Conservation Promotion Act (Meyer et al. 2007). In 1991 the government launched a demand-side management (DSM) plan with funding support from the World Bank, Australia, and Japan. The plan aimed to control electricity demand growth and promote more energy-efficient equipment and cost-effective energy services, targeting a wide range of subsectors and end users (Singh and Mulholland 2000). The plan was based on experiences with DSM in North America, but was adapted to the Thai culture and context.

As part of its DSM plan, the Thai government established a new DSM Office within the Electricity Generating Authority of Thailand. The office was charged with developing, implementing, and evaluating national DSM programs and measures. Several full-time expert advisors supported program design and implementation and helped build the capacity of the DSM Office by transferring skills to local staff.

The DSM Office has effectively promoted its objectives (World Bank 2000). The office has enhanced the capacity of the Electricity Generating Authority of Thailand's staff, created consumer awareness of and support for energy-efficient products and services, and promoted private sector participation in providing these services. The DSM plan was a success, exceeding its own annual energy savings objectives (Singh and Mulholland 2000; World Bank 2000). The first phase of the plan lasted seven years. The Thai government implemented a second phase without international support, using funding from the Electricity Generating Authority of Thailand and the ECPF (ESCAP 2010).

In 2002 the Thai government set up an Energy Efficiency Revolving Fund with funds allocated from the ECPF. The Revolving Fund provides credit lines to banks, which in turn provide low-interest loans for energy efficiency projects in industry and buildings. The initiative started with six banks in the first phase, and expanded to eleven in the second phase, in 2006 (Energy Futures Australia/DMG Thailand 2005).

The Revolving Fund has successfully motivated commercial banks to finance energy efficiency projects by initially providing interest-free credit lines and helping them develop a better understanding of energy efficiency projects (IEA 2011). By 2010 the Revolving Fund had financed projects with a total investment of $453 million and achieved an average leverage ratio of around one dollar for every dollar

committed by the ECPF (IEA 2011). By 2012 the leverage ratio had increased to around two dollars to every dollar committed by the ECPF, as banks gained familiarity with energy efficiency projects (Limaye in press). The Thai government has also recently established a fund to provide specialized financing (including equity financing) to energy service companies. Energy service companies, which tend to be small and viewed by banks as risky, have had difficulties accessing funds from the Revolving Fund to promote energy efficiency activities (Limaye in press).

International partners continue to support the Thai government in readiness activities that address the remaining barriers to investment. The Asian Development Bank (ADB) supported a project to strengthen the capacity of the Provincial Electricity Authority and municipalities to implement energy efficiency measures (ADB 2008), and is currently developing a regional project to support energy efficiency in several Asian countries.[13] The Global Environment Facility (GEF) is funding Thai initiatives that support energy efficiency measures in commercial buildings and industry, and that strengthen the capacity of industry and the financial sector (UNIDO 2011; UNDP 2011). GEF-funded initiatives are also promoting energy efficiency standards and labeling in Thailand (UNDP no date).

Thailand is now scaling up investment in energy efficiency. It recently launched a 20-year energy efficiency development plan (Ministry of Energy 2011), which will be funded through the ECPF with approximately $560 million over 5 years. The plan aims to reduce energy consumption by 20 percent by 2030. The government has also recently completed a revised Clean Technology Fund (CTF) investment plan. Among other things, the plan aims to increase private sector involvement in energy efficiency in Thailand's large corporate, SME, commercial, residential, and municipal sectors, and to provide incentives for local financial institutions to finance energy efficiency projects (CTF 2011a).

Learning from the Thai experience

The Thailand case study clearly illustrates the importance of strong and capable government leadership in driving the transition toward low-carbon energy. This leadership has enabled international support to respond to the needs of the country, and facilitated a constructive partnership between domestic and international actors. The Thai government has been strategic in its approach to technical assistance. By engaging long-term expert advisors in its DSM Office rather than relying on consultants, it was able to reduce costs, strengthen the quality of support, and enable increased knowledge transfer to local staff (World Bank 2000).

This case study also highlights the importance of engaging relevant stakeholders in promoting low-carbon energy. Close coordination with the private sector in developing the DSM plan, and emphasis on education and public awareness, resulted in strong cooperation and buy-in from industry and strong public support for the plan.

The important role that financial institutions can play in scaling up low-carbon energy is clearly demonstrated in Thailand. By providing low-interest credit lines to banks, the Revolving Fund was instrumental in strengthening commercial banks' awareness of, and capacity to lend to, energy efficiency projects.

Wind power in South Africa

Despite considerable potential, renewable energy has been slow to take off in South Africa. Barriers included artificially low electricity prices from coal-fired power (Faure 2009); entrenched vested interests in the state-owned utility (Eskom), which has a monopoly on electricity generation and transmission (Pegels 2010); lack of a transparent and conducive policy framework and appropriate pricing for sale of renewable power into the main grid; and inadequate government capacity to develop and implement renewable energy policies and work with independent power producers. Insufficient information on wind energy resources, lack of industry technical expertise to develop wind projects (UNDP 2007; World Bank 2007), and limited experience among financial institutions in financing renewable energy projects (World Bank 2007) also slowed the development of renewable energy in South Africa.

Efforts to create an enabling environment

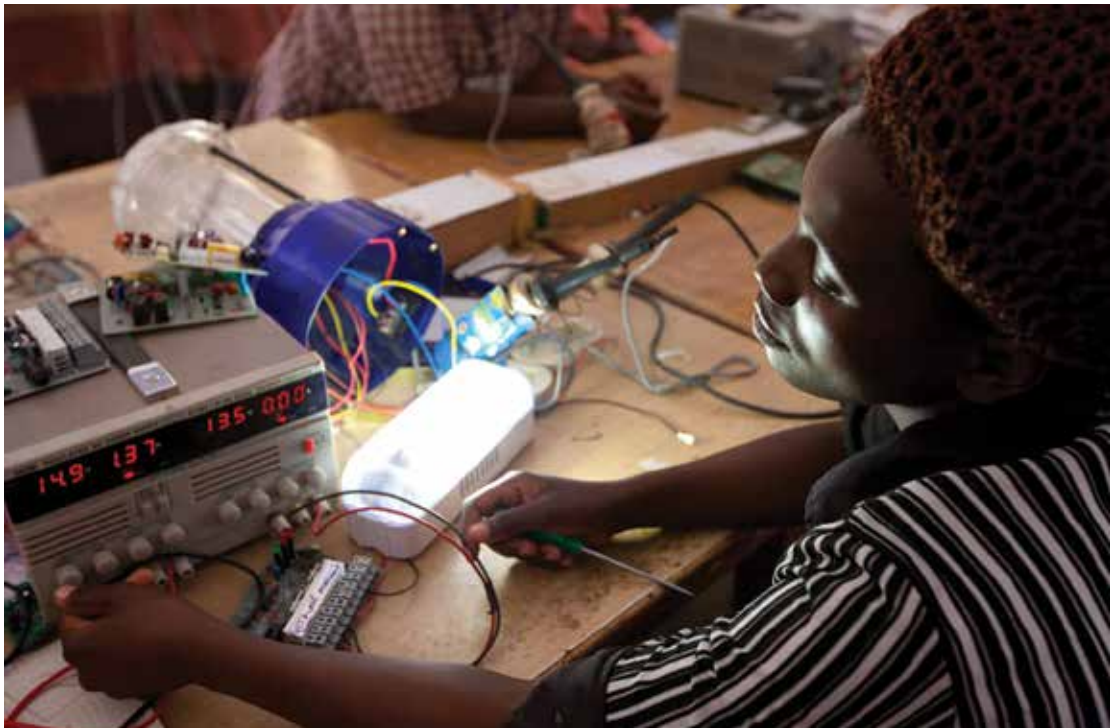
The government of South Africa has taken steps to promote renewable energy. These include a 2003 white paper on renewable energy, which set a target of generating 10,000 GWh of renewable energy, roughly 4 percent of the estimated peak power demand, by 2013 (World Bank 2007); and the establishment of a Department of Energy (DoE) in 2009.

However, these efforts have encountered problems, including inconsistencies between policies and stated objectives and lack of clear and appropriate institutional mandates. In 2009 the National Energy Regulator of South Africa (NERSA) approved guidelines for a renewable energy feed-in tariff, guaranteeing higher prices for electricity generated from renewable energy and obliging Eskom to purchase energy at a set price (NERSA 2009). The private sector welcomed this step, but shortly afterwards the DoE published regulations establishing a bidding process for procuring new generation capacity which did not appear to be aligned with the feed-in-tariff approach (Trollip and Marquard 2010).

In 2009 the government also issued regulations under the Electricity Regulation Act of 2006 that limited the role of Eskom and NERSA in electricity planning. The new regulations proposed an integrated resource planning process to guide decisions on new electricity generation infrastructure (Pienaar and Nakhooda 2010). The first Integrated Resource Plan (IRP)—released by DoE in December 2009—focused mainly on new coal generation and was inconsistent with the government's emerging plans to mitigate its emissions and integrate climate change into policy making.[14] In response to sustained requests from civil society and the private sector, the government launched a consultative stakeholder engagement process to revise the IRP (Pienaar and Nakhooda 2010; Idasa 2010). The resulting "Policy Adjusted IRP," released in 2010, included a renewable energy production target of 19 GW, or 9 percent of total electricity generated by 2030, made up largely of wind and solar power (Government of South Africa 2011a).

The South African government has since made progress in promoting renewable energy through the launch of a Renewable Energy IPP Procurement Program under the Policy Adjusted IRP to tender out 3,725 MW for renewable energy projects, including 1,850 MW of wind. The first two rounds of bidding have been completed and forty-seven projects have been awarded to independent power producers (IPPs) (Clean Technica 2012; Flak 2012).

The clear role of renewables in the IRP—combined with a tendering process that was effectively managed by DoE (advised by the National Treasury) and a price ceiling that makes wind energy commercially viable—has created optimism in the private and financial sectors, despite the initial policy uncertainty. The largest commercial bank in Africa, Standard Bank Group, agreed to underwrite 27 billion Rand ($3.5 billion) for projects in the first and second round of bidding (Cooke 2012). The government also launched the South African Renewables



Initiative at the end of 2011, which aims to support the scaling up of renewable energy in the context of the Policy Adjusted IRP and to ensure the alignment of energy, industrial, economic, climate, and public finance policies (Government of South Africa 2011b).

International partners have supported various government efforts to promote wind energy development, with mixed success. Grant support from the Danish government and financing from the Development Bank of Southern Africa enabled an IPP to establish the 5.2 MW Darling wind farm, which began operating in 2008. The United Nations Development Programme (UNDP), with GEF funding, supported a project intended to design and support a pricing mechanism for the Darling wind farm. However, the project underwent a change of focus; the IPP signed a "green" power purchase agreement in 2007 with the City of Cape Town to sell power directly to interested users at a premium (Faure 2009; UNDP 2007), and the green power model was not found to be aligned with the direction that national policy was taking (LTE Energy 2011). The UNDP project was, however, successful in developing a wind resource atlas in collaboration with various national and international research and academic institutions and with co-financing from the Danish government (Faure 2009). The Darling wind farm has encountered numerous problems and is only intermittently operational (Faure 2009), in part due to high generating costs and a pricing model that requires consumers to pay a higher price for wind power.[15]

The South African government has also received support from various other international partners for readiness activities to promote wind energy. GIZ supported the Western Cape provincial government with a study of grid capacity for wind energy and training on the technical, economic, and regulatory aspects of wind energy (Faure 2009). The World Bank is supporting a renewable energy market transformation project with GEF funding which includes capacity building of government agencies for renewable energy and a matching grants program to facilitate private sector renewable energy investments (World Bank 2007). More recently, a number of international partners—including the governments of Denmark, Germany, Norway, and the United Kingdom, as well as the European Investment Bank—have pledged to provide technical assistance, grants, results-based payments, and low-cost loans of up to $9 billion, as well as insurance and other risk mitigation instruments, to support the implementation of the South African Renewables Initiative (Government of South Africa 2011b).

Learning from the South African experience

The South African case study highlights the importance of consistent policy signals and clear institutional mandates in creating a stable investment climate for renewable energy. The uncertainty created by seemingly misaligned policies issued by NERSA and DoE in 2009—and the resulting lack of clarity regarding which institution had the mandate for developing energy policy—created private sector skepticism about the government's commitment to promoting renewable energy. Creating the appropriate institutions with the requisite powers to determine and implement policy was an important step toward creating investor confidence in the government's commitment to renewable energy. The creation of DoE—with the responsibility for the IRP process—reduced the potential for conflicts of interest between the mining and energy sectors, and between Eskom and private developers.

The important role of stakeholder engagement in the energy planning process is also highlighted in this case study. Sustained pressure by civil society and the private sector eventually led DoE to undertake a broader consultation process in the development of an integrated resource plan. The greater emphasis on renewable energy in the revised IRP was in large part due to the input of these stakeholders. The government has proceeded to launch the South African Renewables Initiative, which aims to catalyze international support to pursue the renewable energy targets set out in the Policy Adjusted IRP in a manner that is aligned with broader development objectives. This is a positive move toward promoting consultative, integrated planning and policy coherence, and coordinating international partners around a shared goal. It remains to be seen whether DoE will succeed in bringing together the various government departments and in continuing to engage all relevant stakeholders to ensure the IRP's effective implementation.

Solar water heaters in Tunisia

Tunisia has significant potential for solar power. Since the 1980s, the government of Tunisia has been interested in exploiting this potential to meet its growing energy demand and reduce reliance on fossil fuels. However, there were a number of barriers to exploiting renewable energy in Tunisia, including significant subsidies on imported liquefied petroleum gas (LPG)-fired boilers (Menichetti and Touhami 2007), lack of awareness among consumers about solar water heaters (SWH), and lack of available financing (Olz 2011).

Efforts to create an enabling environment

The Tunisian government developed the first solar thermal energy strategy in 1984 and established the National Energy Conservation Agency (ANME) in 1985. In the early 1990s it passed several laws to promote energy conservation and renewable energy (Trabacchi et al. 2012).[16] In 1996 ANME implemented a project with funding from the GEF and the Belgian government through the World Bank to subsidize 35 percent of the capital cost of SWHs to commercial (public and private) institutions and later to the residential sector (World Bank 2004). Although the project successfully stimulated market growth and resulted in the installation of 50,000 square meters of new solar thermal panels, the project design did not consider the long-term sustainability of the initiative.[17] Once international support ended in 2002, the SWH market collapsed (Olz 2011).

In 2005 ANME and the Tunisian Minister for Industry, Energy, and Small and Medium Enterprises launched the "Programme Solaire" (Prosol), with financial support from the Italian Ministry of the Environment for the Protection of Land and Sea and technical support from UNEP. Prosol aimed to revive the market for SWHs in the residential sector by engaging local financial institutions to provide credit lines to consumers. It provided a 20 percent subsidy on the capital costs of SWHs and a temporary interest rate subsidy, which was gradually phased out after eighteen months. Commercial banks provided loans to consumers which were repaid via the state electricity utility, Tunisian Company of Electricity and Gas (STEG), through the electricity bill. Prosol also included awareness-raising campaigns targeted at consumers and commercial banks, and provided capacity building to financial institutions and technology providers to develop long-term knowledge and expertise.

After Prosol had operated for a few months, the government enacted a law making residential SWHs eligible for a 20 percent capital cost subsidy. It was the first policy intervention of its kind—energy subsidies had previously been directed exclusively toward fossil fuel sources (Trabacchi et al. 2012). The law also created a National Fund for Energy Conservation, to support renewable energy and energy efficiency initiatives. The fund was to be supported through tax revenues from motor vehicle registrations and customs duties on air-conditioning systems. The law mandated the use of SWHs in new public buildings (Olz 2011). By 2010, more than 119,000 SWH systems totaling around 355,350 square meters were installed in Tunisia, with a fivefold increase in annual deployment compared to previous initiatives (Trabacchi et al. 2012).

Total public and private investment in Prosol between 2005 and 2010 amounted to an estimated $134 million, including an estimated $21.8 million in government funding to cover the capital cost subsidy. The public sector provided 18 percent of investments and local private investors (commercial banks and households) accounted for the remaining 82 percent, a leverage rate of five dollars of private capital for every dollar of public resources (Trabacchi et al. 2012). Furthermore, the shift in consumer demand reduced the government's fossil-fuel subsidy spending by an estimated $15.2 million (Trabacchi et al. 2012).

Prosol's success inspired three related programs designed to spur the adoption of SWHs in the tertiary and industrial sectors, and solar panels in the residential sector. Like Prosol, these programs provide a combination of capital cost subsidies and interest rate subsidies. They are funded largely by the National Fund for Energy Conservation and have also received financial support from the Italian Ministry of the Environment for the Protection of Land and Sea and technical support through UNEP (Marrouki 2012).[18]

The Tunisian government has also recently launched a $2.2 billion (TND 3.4 billion) Tunisian Solar Plan 2010–2016, which is proposed as Tunisia's nationally appropriate mitigation action (NAMA) under the United Nations Framework Convention on Climate Change (UNFCCC) (Trabacchi et al. 2012). The Tunisian Solar Plan aims to increase the share of renewable energy in total electricity production by 16 percent, and achieve 25 percent in energy savings by 2016. The Plan anticipates funding primarily through the domestic private sector (more than 70 percent of the total cost), together with a small amount of technical assistance from international partners (roughly 1 percent of the total cost) (Trabacchi et al. 2012; Consortium MVV decon/ENEA/RTE-I/Terna/Sonelgaz 2011). Notwithstanding the regime change in January 2011, the new Tunisian government appears committed to continuing support for the widespread adoption of energy efficiency and renewable energy policies, and to achieving national targets (Olz 2011).

Learning from the Tunisian experience

As the Tunisian experience prior to Prosol highlights, financial incentives alone are not sufficient to create a viable market for SWHs on a long-term basis. Readiness activities, including targeted awareness and communication campaigns, interest rate incentives and capacity-building activities to familiarize banks with SWHs, were fundamental to ensuring Prosol's success.

The case study also shows that the careful allocation of risks among key actors can help attract banks and other private investors. STEG's involvement was critical to engaging local financial institutions. It enabled consumers to make loan repayments through the electricity bill, reduced the risk of default (since STEG could withhold electricity services in the event of non-payment), and allowed banks to offer loans to households with softer credit conditions and longer repayment terms (from 3 to 5 years). It also reduced the transaction costs for banks, as STEG handled the paperwork and credit checks.[19] The near-zero default rate of Prosol loans has made the initiative profitable for banks despite the lower interest rate, and more affordable for households, improving the prospects for the mechanism to be replicated.

Commitment from the Tunisian government to support SWH investments, including policies to promote SWHs, was important in allowing the sector to be competitive in a market distorted by fossil fuel subsidies. The legally mandated capital cost subsidy has in effect shifted public support from a fossil fuel subsidy for LPG-fired boilers to a one-off subsidy on SWHs for households that have made the shift, resulting in a significant reduction in public spending on fossil fuel subsidies.

Geothermal power in Indonesia

Despite its large geothermal resources—an estimated potential of approximately 27 GW (World Bank 2008)—Indonesia has been slow to develop its geothermal potential, with only 1,200 MW of installed capacity to date (Crosetti 2012) and 80 percent of electricity from fossil fuels (World Bank 2011). Although Indonesia progressed in attracting investment in geothermal power in the 1990s, development stalled during the Asian financial crisis in 1997-98 and has been slow to pick up since then. A number of barriers deterred investment in the sector, including a policy framework that favored conventional energy sources, including subsidies for oil- and coal-based electricity (Beaton and Lontoh 2010); and lack of a regulatory framework for pricing renewable energy, requiring developers to negotiate a power purchase agreement on a case-by-case basis with the state-owned utility, Perusahaan Listrik Negara (PLN), which had no obligation to buy renewable electricity and no incentive to do so given its higher price. Further barriers included lack of government management and planning capacity for geothermal energy at the national and local government levels; insufficient domestic technical capacity among industry for geothermal development; lack of access to finance for geothermal projects due to the high risk perceived by financial institutions; and high costs and risks associated with exploration of geothermal resources, which had to be borne by the developer (World Bank 2008).[20]

Efforts to create an enabling environment

The government of Indonesia passed a Geothermal Law in 2003 allowing for private sector participation in geothermal development. Contracts were awarded through a competitive tender process (previously the only private sector participation was through joint operating contracts with Pertamina), and the authority to license geothermal working areas was devolved to regional governments (Wahjosoedibjo and Hasan 2012). The government also launched a roadmap for geothermal development that established a target of 6,000 MW of installed geothermal capacity by 2020.

Despite these ambitious targets, progress toward addressing investment barriers and scaling-up geothermal capacity was slow. It was not until 2007 that pricing regulations were issued under the law; these regulations were subsequently revised several times. In 2012 a favorable revision to the pricing regulations introduced a variable feed-in-tariff for geothermal electricity that sets prices for different regions based on cost of production, ranging from 10¢ to 17¢ per kWh (Pramudatama 2012).

International support has been a key driver of geothermal development in Indonesia. In 1972 a number of international partners—including the United States, Italy, Japan, and New Zealand—provided technical assistance for an inventory of geothermal resources, which led to the pre-crisis policy reforms that stimulated geothermal power development until it was stalled during the Asian financial crisis (Fauzi et al. 2000). After recovery from the crisis, international partners have again begun to support initiatives to promote geothermal development. A World Bank, GEF-funded program initiated in 2008 is supporting policy and regulatory reform and strengthening institutional capacity within the Ministry of Energy and Mineral Resources for planning and engaging investors in geothermal transactions, as well as supporting settlement of a number of ongoing and pending transactions (World Bank 2008). This program is ongoing and has had only modest success thus far, although it is still too early to judge given the long time horizon for such reforms.

Several other international partners—including the Japan International Cooperation Agency (JICA), ADB, the German development bank (KfW), the Netherlands, and New Zealand—have supported resource assessments, feasibility studies, environmental and social impact assessments, and institutional strengthening. In some cases, this support has been in addition to providing project finance for geothermal power plants. KfW is also providing support for exploration at two sites, as well as technical assistance and training for provincial governments, which are responsible for the tendering of working areas under the 2003 law. KfW's readiness support is in the range of 3 to 5 percent of its committed investments in geothermal development in Indonesia.[21] In 2010, the CTF approved an investment plan for Indonesia (Climate Investment Fund 2010). The plan provides $300 million in concessional finance through the ADB, World Bank, and International Finance Corporation (IFC) to support public and private sector geothermal development. A $575 million project was approved in 2011 for construction of a geothermal plant (CTF 2011b).

Under the 2003 law, the high risk of geothermal exploration is borne by the developer. To address this possible barrier, the Indonesian government set up a geothermal fund in 2011 under the Ministry of Finance, with $145 million from the 2011 national budget to fund initial exploration before tendering geothermal working areas (Wahjosoedibjo and Hasan 2012). The ADB has expressed interest in supporting the fund with financing roughly equal to the government's own commitment. However, the ADB has attached some pre-requisites to the proposed funding that the government has not agreed to, and thus far there has been no international financing for the fund.[22]

Investment in geothermal development has been limited to date, and much of the existing ~1,200 MW capacity was installed under the pre-crisis regime,[23] with only ~260MW of new capacity added over the past decade under the new legal framework (Crosetti 2012). The first large-scale IPP exploration to take place under the 2003 law was only initiated in 2012 (Siahaan 2012). Despite this, Indonesia has made gradual progress in creating a more attractive investment climate and there is growing interest in geothermal energy. Since 2010, the government has shown a strengthened commitment to geothermal development, including high-level commitments

made at the World Geothermal Conference in 2010 (hosted in Indonesia). In 2011 the government created a new Directorate General for New and Renewable Energy that includes a directorate for geothermal energy. Nevertheless, a number of barriers to more widespread investment in geothermal remain, including complex and bureaucratic permitting requirements and limited capacity of local governments for tendering geothermal sites. While the government is not on track to reach its targets, by some estimates ~600MW may be added by 2014, and ~1,400MW by 2016 (Crosetti 2012).

Learning from the Indonesian experience

The Indonesia case study demonstrates the importance of addressing pricing distortions. Although the real life-cycle costs of generating geothermal energy are competitive with conventional energy sources, subsidized prices for fossil fuel electricity and the lack of a clear pricing structure for geothermal energy have been a disincentive for investment.

The case study also illustrates the need for public support for resource assessments and exploration. The high risk and cost associated with geothermal exploration, and the lack of commercial financing available to support it, create little incentive for private developers to undertake exploration.

A lack of decisive government leadership has also contributed to the slow development of Indonesia's geothermal potential. Although the government passed a geothermal law in 2003, it did not introduce pricing regulations to implement the law until 2007. Even after the government issued the regulations, it continued to revise them; the most recent revisions were in 2012. This continuously changing regulatory framework undermined investor confidence in the government's commitment to creating an attractive investment climate for geothermal energy. A renewed commitment to geothermal development in recent years has led to some promising reforms, including an improved pricing structure, new institutional arrangements, and the establishment of the geothermal fund. As a result, Indonesia seems positioned for a gradual scaling up of geothermal energy over the coming years.

Wind power in Mexico

Since the 1980s, the government of Mexico has been researching and promoting the development of wind energy (UNDP 2003). An unfavorable policy, legal, and institutional framework was a major barrier to commercial development of renewable energy in Mexico, with the state-owned utility Federal Electricity Commission (CFE) the only buyer of electricity. CFE was required to buy at the lowest cost and was not obliged to buy renewable energy. Furthermore, regulatory restrictions prevented significant private sector development under the self-supply modality (AMDEE 2011; Energypedia 2011; UNDP 2003),[24] especially for intermittent technologies such as wind power (Davis et al. 2012). Further barriers included insufficient wind resource data; lack of industry expertise in the development and implementation of wind power projects; and the high perceived investment risks associated with wind projects, which undermined investor confidence in the financial viability of the wind power market (UNDP 2003).

Efforts to create an enabling environment

Since the 1990s, the Mexican government has made several efforts to promote wind power development. In 1994 CFE established the first grid-connected wind demonstration project (UNDP 2003). Over several years, the government organized a number of international meetings on wind energy, which brought together representatives from the government, the private sector, and international funding agencies (UNDP 2003). In 2001 the Energy Regulatory Commission (CRE) issued a model contract for the interconnection of intermittent energy sources to the national electricity grid, to foster the penetration of wind and solar energy (UNDP 2003).

In 2002 CFE financed the construction of an 83.3MW turnkey wind farm, which was the first large-scale wind investment in Mexico. At the same time, it entered into an emissions reduction purchase agreement with the World Bank through the Clean Development Mechanism (CDM) (World Bank 2006a). The project was instrumental in building CFE's understanding of and capacity for wind projects (Davis et al. 2012). In 2003 the government launched an initiative to expand transmission infrastructure to facilitate the connection of wind parks to the national grid. The costs of infrastructure

development were shared between the government and the private developers (Energypedia 2011).

In 2008 the Mexican Congress passed a law to promote the use of renewable energy resources, which mandated the Energy Ministry (SENER) and CRE to develop a national strategy—including targets, regulations, and financing mechanisms—to promote renewable energy. The law enlarged the private sector's role in renewable energy generation and shifted power away from CFE to SENER and CRE, which were more supportive of wind power and private sector involvement. In 2010 CRE issued a series of new regulations to strengthen the regulatory framework for renewable energy projects in the self-supply modality, including reductions in the transmission charges for private developers (AMDEE 2011).

While the government has actively promoted the development of wind energy and taken steps to attract private investment, international partners have played a role in making the case for renewable energy among government and industry, as well as supporting efforts to create an enabling environment for investment. A number of international partners have supported wind resources assessments, including the United States and UNDP in 2003. The UNDP project, with funding from GEF, also established a training center, and was the first project to receive a permit to operate as a small power producer in Mexico (UNDP 2003). Although the training and demonstration center contributed to strengthening industry expertise in wind energy, its impact was limited because it did not make information freely available to industry.[25]

In 2006, the World Bank—with $25 million from GEF—supported a project for large-scale renewable energy development to reduce policy and financial barriers to private sector investment in wind energy. The project included support for readiness activities, including technical advice and capacity building for SENER and CFE, support for developing a pricing mechanism for renewables, support for policy development, and a wind resource assessment (World Bank 2006b). It also provided a production incentive for the first five years of operation of a 103MW wind farm (La Venta III) developed by an IPP, awarded through competitive tender (World Bank 2006b). In 2008 CFE launched an expansion program to tender four additional 100MW wind farms (Oaxaca I-IV) to IPPs, which did not require tariff support to be viable (although they all qualified as CDM projects) (Davis et al. 2012).

In 2009, the CTF provided $15 million in concessional finance for the first wind project to be developed under the self-supply modality. The 67.5 MW "La Ventosa" wind farm also received financing from the Inter-American Development Bank (IDB), IFC, and the U.S. Export-Import Bank (IFC

2009; Venugopal et al. 2012). A second self-supply project, the 250 MW "Eurus" wind farm, received $30 million from the CTF as well as financing from the IDB and IFC and commercial finance (Amin and Tully 2009; Transitional Committee of the GCF 2011). These investments were followed by a 396 MW project by a private developer under the self-supply framework that did not require any concessional finance and received commercial finance and a $72 million loan from the IDB (IDB 2011a). Subsequently, a number of self-supply projects have been developed with commercial finance. The IDB also provided technical assistance through CTF funds to strengthen the capacity of a state-owned development bank Nacional Financiera (NAFIN) for financing renewable energy, and has subsequently provided $70 million from the CTF to help NAFIN establish a financing facility for renewable energy (IDB 2011b).

Several factors were instrumental in stimulating significant growth in the wind industry after 2008. These include a more supportive policy, legal, and regulatory environment; increased access to finance; the availability of new transmission capacity; and external factors such as the declining price of wind turbines (AMDEE 2011). In 2011 over 500 MW of wind projects were in operation (85 MW by CFE and 439 MW by self-suppliers and small producers). An additional roughly 1,470 MW of wind projects were in different stages of construction and expected to come into operation between 2011 and 2013 (509 MW by IPPs under contract with CFE and 959 MW for self-supply), as well as a further 461 MW in self-supply projects that had received generation permits from CRE but not yet begun construction. Furthermore, a pipeline of at least 3,400 MW of committed wind energy was set to come on-line through 2016 (Davis et al. 2012). Private sector investment in wind energy has grown rapidly, from only two small private sector wind projects operating in Mexico in 2003, with less than 1 MW combined capacity (UNDP 2003), to more than 17 private sector wind projects in operation or under construction in 2011, including 12 under the self-supply modality and five IPP projects (Davis et al. 2012). By the end of 2011, it was estimated that the total investment in the construction of wind power plants was around $1.14 billion (Borja 2012).

Learning from the Mexican experience

The Mexico case study illustrates the importance of a strong government commitment combined with timely support from international partners for critical readiness activities and concessional capital. The Mexican government's commitment to wind and other clean energy sources is evident in a climate change law passed in April 2012 that requires Mexico to generate 35 percent of its electricity from clean sources by 2024 (WWF Mexico 2012). Consistent government support and leadership have led to several legislative and pricing reforms to promote wind energy and have given investors confidence in the government's commitment to renewable energy.

The case study also highlights the important role of the private sector in scaling up renewable energy production. More than 95 percent of Mexico's wind capacity additions over the last ten years have come from the private sector. The legal and regulatory changes to promote private sector engagement in the wind sector were, therefore, essential for the scale up of investment in wind energy.

Finally, the case study demonstrates the important role that international support has played in creating industry awareness and capacity and demonstrating the viability of wind projects under various financing models. The World Bank supported the first project to receive carbon finance and the first wind project to be developed by an IPP. UNDP supported a demonstration project that became the first small producer, and the CTF supported the first two projects under the self-supply modality. Each of these models was subsequently replicated by private sector developers without international support.

Energy efficiency in India

Energy efficiency has been a priority for the government of India since the 1980s. Mounting concerns about the sustained supply of conventional energy sources to fuel India's growth (Balachandra et al. 2010) and the significant share of export earnings spent on importing fossil fuels (Yang 2006) drove the government's interest in energy efficiency. However, a number of barriers to investment in energy efficiency existed, including low electricity prices that did not incentivize energy conservation; lack of clarity in energy pricing policy; lack of expertise in the design and management of energy efficiency programs in government and industry; lack of consumer awareness of options for conserving energy; and lack of financial sector expertise in evaluating energy efficiency projects (Balachandra et al. 2010; Sathaye et al. 1999).

Efforts to create an enabling environment

In the 1980s and 1990s the Indian government introduced a number of institutional arrangements to promote energy efficiency. It created an interministerial working group on energy conservation and an advisory board on energy (Balachandra et al. 2010), and an Energy Management Center under the Ministry of Energy, charged with formulating policy guidelines and promoting energy efficiency (Yang 2006). In 1995 the government created a Department of Industrial Policy and Promotion within the Ministry of Commerce and Industry to promote energy efficiency investment and activities in the industrial sector (Yang 2006). It also pursued policy and pricing reforms to promote energy efficiency in various sectors, reduce market distortions, and enhance industrial competitiveness (Yang 2006). In 1987 the government established the Indian Renewable Energy Development Agency Limited (IREDA), a government-owned non-bank financial institution under the administrative control of the Ministry of New and Renewable Energy[26] to provide financial support to renewable energy and energy efficiency projects.

In 2001 the Indian government passed the Energy Conservation Act, which articulated a number of policies to promote energy efficiency, including requirements for large energy consumers to implement specific actions and energy consumption labels and performance standards for electrical appliances. The act established the Bureau of Energy Efficiency (BEE), which was mandated to coordinate energy efficiency policies; enhance awareness of energy efficiency; establish standards and labeling conventions for energy efficient equipment; develop building codes to promote efficiency; and certify auditors (UNEP 2006).

Since its inception, BEE has launched a wide range of programs and initiatives, including promoting energy efficiency in the industrial sector, standards and labeling for appliances, demand-side manage-

ment, energy efficiency in commercial buildings, capacity building of energy managers and energy auditors, energy performance codes, and manual preparation (Balachandra et al. 2010). BEE's leadership has been strong and it has successfully promoted energy efficiency among industry as a means of attaining competitiveness. In addition, BEE has encouraged the government to participate in several energy efficiency programs.

Energy efficiency featured as an important component of India's eleventh five-year plan (2007-12), which set a target to increase energy efficiency by 20 percentage points by 2016-17 (Balachandra et al. 2010). In 2008, India adopted an integrated energy policy to ensure energy choices are embedded in broader development goals, which included a number of initiatives to promote energy efficiency and demand-side management (ESCAP 2010).

The government also adopted a National Action Plan on Climate Change, which included a National Mission for Enhanced Energy Efficiency. The mission comprises a number of initiatives to promote energy efficiency which are implemented by the BEE. In July 2012 BEE launched the "Perform, Achieve and Trade" scheme, which sets energy efficiency targets for industries and awards tradable energy savings certificates to those who exceed their target (Paliwal 2012). The mission also includes measures to incentivize financial institutions to provide financing for energy efficiency projects, and a market transformation scheme to enable an accelerated shift to energy efficient appliances. It further includes a partial risk guarantee fund and a venture capital fund to incentivize commercial banks to lend to energy efficiency projects and to promote the role of energy service companies (ABB 2011; Bhargava 2012).

The Indian government has shown strong leadership in promoting energy efficiency, and international support has complemented the government's efforts by providing technical assistance and financing to address specific barriers. A number of international partners have supported readiness activities to promote policy and institutional reforms, including technical support to BEE and the former Energy Management Center (which merged with BEE) from the World Bank, UNDP, the French Development Agency (AFD), and others. International support has also targeted financial institutions. In 1995/1996, ADB approved a loan of $150 million to the Industrial Development Bank of India (IDBI) for an industrial energy efficiency project, which aimed to promote energy efficiency in Indian industry combined with technical assistance to improve IDBI's capacity to identify, appraise, and implement energy efficiency and environmental management projects (ADB 2002). The project catalyzed an investment of over $1 billion, of which the ADB loan accounted for 14 percent. Another 52 percent came from Indian financial institutions, and project developers contrib-

uted 34 percent (ADB 2002). The Investment Corporation of India also received support around the same time from the ADB and USAID to strengthen its management's ability to support energy efficiency projects (ADB 2002).

In 2001 the World Bank, with GEF funding, provided a $20 million credit line to IREDA to promote energy efficiency projects. At the time, IREDA had a successful track record of lending to renewable energy projects, but less experience with energy efficiency. The GEF-funded initiative also provided technical assistance to support capacity building and training of IREDA staff, public and private sector energy and industry officials and staff, and state governments in energy efficiency. By 2008 IREDA had approved 19 energy efficiency projects totaling $60 million, of which 11 had been completed, and a number of commercial banks had increased their lending to energy efficiency projects (Taylor et al. 2008). Despite this progress, there remained much scope for improvement of financial sector knowledge of and capacity for financing energy efficiency projects.[27]

The Indian government and international partners have made efforts to help SMEs undertake energy efficiency projects. In 2001 UNEP and the World Bank supported a project to catalyze the financial sector to promote energy efficiency in three countries, including India, which focused on increasing the capability of banks to make loans for energy efficiency projects and promoting energy service companies. The project supported the State Bank of India in incorporating energy efficiency improvement projects into its lending to SMEs (World Bank et al. 2006). Subsequently, four other banks have developed similar programs for financing energy efficiency projects for SMEs (Taylor et al. 2008). In 2010 the World Bank (with GEF funding) supported a project to finance energy efficiency efforts by SMEs, including readiness support to BEE for activities to build awareness and capacity for energy efficiency among SMEs and local banks, and funding to the Small Industries Development Bank of India (SIDBI) to provide partial grant support to make energy efficiency projects more attractive to SMEs (World Bank 2010). The National Mission for Enhanced Energy Efficiency also places importance on enhancing the role of SMEs, in particular energy service companies, in promoting energy efficiency, through measures to increase their access to financing.[28]

Learning from the Indian experience

The India case study demonstrates the importance of strong leadership in driving the adoption of energy efficiency. The Indian government has shown consistency and commitment in promoting energy efficiency, through a series of policy and institutional reforms in the 1980s and 1990s and the mainstreaming of energy efficiency targets and policies into its development agenda in the 2000s. The recent launch of a range of initiatives under the national mission further solidifies this commitment. The establishment of BEE and its mandate to coordinate energy efficiency policies and programs was an important milestone that enabled a coherent and coordinated approach to energy efficiency planning and promotion. BEE has successfully stimulated energy efficiency in a range of sectors through a combination of targeted measures, as well as marketing energy efficiency as a means of attaining competitiveness.

This case study also demonstrates the importance of involving the financial sector in promoting energy efficiency. International readiness support has been instrumental in building capacity and experience in lending to energy efficiency projects in several financial institutions. The government is also implementing measures to promote the role of the financial sector in financing energy efficiency projects through the National Mission on Enhanced Energy Efficiency. This support has led several financial institutions to develop energy efficiency lending programs.

Lessons learned

The six case studies provide lessons on political and economic factors that can help determine the success of efforts to create an attractive investment climate for low-carbon energy. They also provide insights into activities that can be instrumental in creating an enabling environment for scaling up investment in a diverse range of settings and technologies. A degree of inference is inherent to the lessons and insights discussed below, largely because it is often difficult to make conclusive assessments of causality and to precisely identify the activities that were instrumental in driving successes and those that were less effective.

Economic and political determinants of success

The case studies reveal two overarching factors that are important determinants of success in scaling up low-carbon energy investment: sustained government leadership and effective responses to pricing distortions. The cases show that where government leadership is weak, or where market failures severely distort incentives in favor of conventional energy sources, it is more difficult to create the conditions that attract investment in low-carbon energy.

Government leadership

Government leadership was a key factor in successfully scaling up investment in all six cases. In Thailand, India, and Mexico, the government demonstrated political commitment from the outset, and implemented a series of policy reforms, institutional arrangements, and other initiatives to raise awareness, stimulate markets, and promote private sector investment. By assuming a leadership role, governments were able to proactively coordinate international support and ensure that it was aligned with national priorities. In Thailand, for example, the government was strategic in mobilizing international support for priority initiatives and addressing capacity gaps.

In South Africa, inconsistent policy signals and institutional mandates contributed to investor uncertainty about the government's commitment and approach to renewable energy. This resulted in international support appearing to be less coordinated and aligned with national priorities. In Indonesia, a lack of decisive efforts by the government to address barriers to investment and implement the Geothermal Law and subsequent targets discouraged potential investors. Since 2010, however, the governments of both South Africa and Indonesia have shown a renewed commitment and stronger leadership in promoting renewable energy, which has sent positive signals to investors. In South Africa, for example, the IRP released in 2010 set clear targets for renewable energy, which was followed by the tendering of renewable energy projects that have garnered strong private sector interest. The South African Renewables Initiative released last year sets out a path for renewables within the context of South Africa's broader development goals, and has positioned the South African government to coordinate support from several international partners toward a common goal.

Sustained government leadership and effective responses to pricing distortions are two overarching determinants of success in scaling up investment in low-carbon energy.

In some cases, the leadership of a particular individual or institution is an important factor in promoting a low-carbon energy sector. For example, the strong leadership of BEE in India was an important factor in its success in promoting energy efficiency.

National leadership is also important at the project level. Projects designed by national actors are more likely to be effective than those designed by international partners because national actors are familiar with the country context and are more likely to support their own project. In Thailand, a DSM plan was prepared with international support, but the Electricity Generating Authority of Thailand adapted it to better suit its cultural context. The resulting plan exceeded its own energy conservation targets.

Addressing price distortions

Price distortions, such as fossil fuel subsidies, were prevalent in several of the case studies. Price distortions increase the relative price of low-carbon energy options, making them less attractive to investors and consumers. In South Africa and Indonesia, fossil fuel subsidies have historically led to very low prices for coal-sourced electricity, making it difficult for renewable sources to compete. In Tunisia, subsidies to LPG-fired boilers made it difficult for solar water heaters to enter the market.

Addressing price distortions is politically challenging because they are designed to achieve social objectives such as making energy more affordable to the poor. However, carefully designed pricing reforms can use more efficient and targeted mechanisms to achieve social objectives, while going some way toward more accurately reflecting the costs of various energy options in the market. Creating a level playing field for low-carbon energy by addressing price distortions is an important step in scaling up low-carbon energy. In South Africa, recent efforts to address price distortions led to increases in the electricity prices charged by the state-owned utility and guaranteed minimum prices for renewable energy. In Tunisia, a legally mandated capital cost subsidy on solar water heaters in the residential sector has shifted government spending from an ongoing LPG subsidy to a lower, one-off renewable energy subsidy for consumers who switch to solar water heaters. In Thailand, the government has gone a step further: it taxes the sale of petroleum products and uses the revenues to fund its energy efficiency programs.

Lessons in designing and supporting readiness activities

The case studies also reveal a number of important lessons for countries looking to invest in an enabling environment to promote low-carbon energy, and for the international climate funds and institutions looking to support readiness activities.

Small amounts of funding for enabling activities sustained over long periods of time can help scale up investment

In each of the six cases, small investments in enabling activities—ranging from several hundred thousand dollars to several million dollars—supported the creation of policies and market conditions that paved the way for scaled up private and public investments. Many of these activities were implemented with the financial and technical support of international partners. In Mexico, international readiness support of roughly $10 million in the first five years of the wind sector's development contributed to the mobilization of over $1 billion in investments, including major investments by the private sector. In Tunisia, international support of roughly $10 million for Prosol and previous initiatives, combined with just under $22 million in government investment, led to over $100 million in private sector investment in solar water heaters by 2010.

Where international support has facilitated renewable energy and energy efficiency projects without also addressing the underlying policy, industry, or financial barriers to investment, successes have not always lasted. In Tunisia, for example, a World Bank-supported project to promote solar water heaters through a subsidy on the capital cost was only successful in stimulating market growth while funding lasted. It did not lead to sustained results because a number of investment barriers remained.

CREATING AN ENABLING ENVIRONMENT IS A PROCESS, NOT AN END

Creating a supportive enabling environment for investment takes time. In the cases studied, it took years—sometimes over a decade—of sustained support to address the barriers to investment, and initiatives may take several years to demonstrate results. International support has tended to be more effective when sustained over a long period of time (five years or more). The World Bank supported Thailand's DSM program for seven years, and the program was subsequently sustained with financing from the government. Thailand also benefited from long-term technical assistance from expert advisors who were stationed within government ministries. Technical support may be more effective if international advisors are integrated into national institutions and report to national, rather than international institutions, as demonstrated in Mexico and Thailand.

INTERNATIONAL SUPPORT SHOULD FOCUS ON IDENTIFYING AND TARGETING THE MOST CRITICAL BARRIERS

In countries that have fewer enabling conditions for investment, there will likely be a large number of enabling activities that need support in order to attract investment. However, attempting to tackle all the barriers simultaneously with limited resources may lead to resources being spread too thinly to have a significant impact. International support is likely to be more effective if it identifies and targets a few critical barriers to investment. For example, ADB's technical assistance to the IDBI in India focused on strengthening its capacity to assess energy efficiency projects. UNDP support to South Africa's wind sector, while initially broad, was eventually narrowed to focus on developing a wind resource atlas for the country. International support has targeted different activities in different countries, reflecting the different country contexts, capacities, and needs. A strategic assessment of the key needs and barriers can help to identify where best to target support.

READINESS ACTIVITIES SHOULD NOT END WHEN INVESTMENT BEGINS

Strengthening the enabling environment does not end when investment begins. In all cases, readiness activities and larger investment took place simultaneously, and even in cases where the investment climate was already strong, there was still scope for further enabling activities to address specific gaps. For example, Thailand's 20-year energy efficiency development plan includes small capacity building components. In some cases enabling activities have been included as a component of a larger investment in order to address specific barriers, as is the case in a number of investments supported by the CTF.

Policy and institutional reform are key to attracting investment

ENABLING ACTIVITIES SHOULD BE INTEGRATED INTO NATIONAL DEVELOPMENT PLANNING THROUGH INCLUSIVE, PARTICIPATORY PROCESSES

The integration of renewables and energy efficiency into a broader development agenda and the involvement of a wide range of stakeholders in the planning process can help increase support for the resulting plans and initiatives. Civil society and private sector actors can bring valuable expertise and experience to the planning process, and play an important role in ensuring that low-carbon energy policies and plans are ambitious, robust, realistic, and tailored to the needs of the country. In South Africa, civil society and the private sector were strong advocates of renewable energy, active participants in an integrated resource planning process, and instrumental in the development of an IRP with more ambitious renewable energy goals than originally intended by the government. The government of Thailand emphasized engagement with industry and consumers in the design and implementation of its DSM plan. The resulting plan had strong support from these groups and was ultimately successful in meeting its goals.

International support should be aligned with national plans and priorities for effective and sustained outcomes. In cases where international support was not well-aligned with national plans (e.g., if national plans and priorities were not clearly articulated), the project was not always effective.

For example, a UNDP-supported wind project in South Africa aimed to design a financial mechanism to stimulate wind power development and implement a model guarantee scheme for the Darling wind project. However, the government was pursuing a different financial mechanism to promote wind power, and the model guarantee scheme was not replicated because it was not well-suited to the national context.

In cases where national plans are not clearly articulated, or are in the process of development, it may be difficult for international partners to identify where best to place their support. This highlights the need for flexibility on the part of international partners to respond in a timely manner to the plans of the country as they evolve. The above-mentioned UNDP project, for example, demonstrated flexibility by refocusing its budget on an area that was a country priority.

There may be cases in which new technologies and innovations could emerge exogenously. These technologies may not be aligned with national plans, but nonetheless offer potential for significant and unexpected benefits and could benefit from readiness support.

STRENGTHENING INSTITUTIONS AND CAPACITY CAN INCREASE COORDINATION AND OWNERSHIP

As the cases suggest, policies are more likely to be coherent, consistent, and appealing to investors when appropriate institutions are in place to develop, implement, and regulate them. Critically, these institutions must be empowered with the mandate and resources to carry out their functions effectively. Ensuring that institutional arrangements avoid unnecessary conflicts of interest is also important. The creation of BEE in India helped promote investment in energy efficiency; BEE was able to coordinate a broad range of energy efficiency policies and mechanisms in a diversity of sectors toward a common goal. In South Africa, lack of clarity on the roles and responsibilities of various actors in energy planning and policy making diminished private sector confidence until the government established the DoE in 2009 and directed it to take the lead in developing the country's IRP.

Limited capacity of staff and management in key institutions to carry out their functions is often a barrier in developing countries. International funding support and technical assistance has been important in addressing capacity barriers in all of the cases studied. Capacity-building support has ranged from intensive targeted staff and management training programs, to long-term advisors positioned in government departments to work closely with staff and transfer skills over time. In the cases studied, capacity-building support was most effective when carefully targeted to addressing particular skills gaps. For example, GIZ support for the Department of Energy Development and Promotion in Thailand in 1993 focused on intensive staff and management training to implement the Energy Conservation Promotion Act. World Bank support to the government of Indonesia in 2008 focused on strengthening the capacity of the Ministry of Energy and Mineral Resources to engage with industry in the transaction of geothermal projects.

In countries with few enabling conditions for investment, international partners can also play a role in empowering the government and civil society actors to take greater ownership of low-carbon energy planning by strengthening the capacity of staff in key departments for integrated planning, supporting stakeholder engagement, and sharing lessons and best practice from other countries.

PUTTING THE RIGHT POLICIES IN PLACE IS NECESSARY TO ATTRACT INVESTMENT

In the six cases studied, changes to the policy and regulatory environment proved crucial to attracting investment on a significant scale. In many cases, nongovernmental actors—including civil society, consumers, and the private sector—have been influential in advocating for more progressive and ambitious policies and measures. Legal and regulatory changes to address barriers to the private sector were instrumental in scaling up investment in several cases. In Mexico, changes to the pricing rules for renewable energy were key reforms that enabled scaled-up private sector investment in wind energy. In Indonesia, recent regulations requiring PLN to buy geothermal power at a variable rate based on the cost of production have addressed a key barrier to private sector investment in geothermal energy.

The role of international partners in supporting policy reform has been mixed. In Thailand and India, international support for policy design was limited. These countries were successful in driving their own policy reform agenda. International support was limited to addressing specific technical and financial barriers. In Mexico, Indonesia, and South Africa, international partners provided support for the design of policies and laws to varying extents and with varying degrees of success. International support for the design of policies is likely to be effective only if it is demand-driven and not seen as infringing on national sovereignty.

Countries that have set up their own financial mechanism to support low-carbon energy projects are in a strong position to implement their objectives effectively and independently, thereby reducing their reliance on international partners to finance their low-carbon energy needs. Thailand's ECPF, which raises funds through a tax on petroleum products, allows the government to finance a range of energy efficiency projects and enhances its negotiating position with international partners.

Barriers need to be addressed within industry and the financial sector

SOME PUBLIC GOODS MUST BE PROVIDED THROUGH PUBLIC FUNDING

As the cases suggest, lack of knowledge about resource availability has been a key barrier to investment. However, there is little incentive for the private sector to undertake large-scale resource assessments or exploration due to the high cost and uncertainty of the benefits. International partners have supported resource assessments in Indonesia, Mexico, and South Africa, providing information that has attracted the interest of potential investors.

STRENGTHENING AWARENESS AND CAPACITY WITHIN INDUSTRY IS IMPORTANT FOR THE ADOPTION OF LOW-CARBON ENERGY

In some of the cases, a lack of familiarity with renewable energy technologies or limited capacity among potential developers to develop bankable projects has limited renewable energy development. Similarly, lack of awareness of the options available to conserve energy and potential cost savings has been a major barrier to energy efficiency.

Seminars and workshops can bring together a range of stakeholders—including government, industry, research institutes, and international partners. In Thailand, Mexico, and India, and more recently in Indonesia at the World Geothermal Conference, seminars and workshops have facilitated learning and exchange of ideas in the early stages of renewable energy and energy efficiency. In Mexico, a training center on wind energy, established with UNDP support, helped strengthen industry technical capacity for wind projects. Extensive awareness campaigns by the Thai government (with international support) also raised awareness of the potential benefits of energy efficiency in Thailand.

PUBLIC SUPPORT FOR FIRST-MOVERS CAN DEMONSTRATE THE EFFECTIVENESS OF NEW TECHNOLOGIES

International support has played an important role in facilitating learning and demonstration of new financing models for renewable energy, as well as strengthening the capacity of industry to develop and implement low-carbon energy projects. In Mexico, the World Bank supported the first project to receive carbon finance and the first wind project developed by an IPP. UNDP supported a demonstration project that became the first small producer, and CTF supported the first two projects under the self-supply modality. Each of these models was subsequently replicated by private sector developers, without international support.

SMALL AND MEDIUM ENTERPRISES ARE IMPORTANT PROMOTERS OF LOW-CARBON ENERGY

SMEs can be important players in promoting low-carbon energy. In some cases, international support to strengthen SMEs' capacity and improve their access to financing for low-carbon energy projects has helped unlock investment by this sector of the market. In India, international support to SIDBI and the State Bank of India has enabled these institutions to support energy efficiency projects by SMEs, and has led to the adoption of similar lending programs by other financial institutions and the wide adoption of energy efficiency projects by SMEs. In Thailand, a recently established fund aims to increase the involvement of SMEs—which often struggle to access finance from commercial banks—in promoting energy efficiency.

STRENGTHENING CAPACITY IN THE FINANCIAL SECTOR IS KEY TO ENSURING SUSTAINABLE SOURCES OF FINANCE

Financial institutions can play a key role in opening the market for low-carbon energy technologies, but in some cases they lack the awareness and experience to do so effectively. In several cases, strengthening the capacity of financial institutions to support renewable energy and energy efficiency projects has been important in unlocking domestic sources of finance for low-carbon energy. In Tunisia, capacity building to strengthen the knowledge and expertise of domestic financial institutions in solar water heaters was an important component of Prosol, which led to significant leveraging of private capital. International support to enable banks and other financial institutions to provide loans to low-carbon projects, combined with targeted training of staff and managers, have had strong learning effects. In India, technical assistance from ADB to strengthen the capacity of IDBI to appraise energy efficiency projects, combined with a loan to enable lending to such projects, was effective in securing financing from IDBI, raising awareness among other banks, and catalyzing investment in energy efficiency. In Thailand, a government-financed revolving fund provided low interest rate credit lines to eleven commercial banks to promote lending to energy efficiency projects in industry and buildings, and was effective in increasing financial sector awareness of and involvement in energy efficiency.

CAREFUL ALLOCATION OF RISKS CAN ATTRACT FINANCIAL SECTOR ENGAGEMENT

The high real or perceived risks of financing investments in low-carbon technologies that may not have a proven local track record has deterred domestic financial institutions in several cases. Mechanisms that carefully balance risk across different actors can play an important role in attracting finance from domestic banks and other financial institutions. In Tunisia, the state-owned utility guaranteed the loans for residential solar water heaters and collected and enforced loan repayment through electricity bills. This arrangement shifted the credit risk away from the lenders, making it more attractive for banks to finance SWHs. India is establishing a fund that will use public resources to guarantee part of the risk to commercial banks for loans to energy efficiency projects, with the aim of attracting greater financial sector involvement in energy efficiency.

Civil society and private sector actors bring valuable expertise and experience to the planning process. They play important roles in ensuring that policies and plans are realistic, robust, and tailored to the needs of the country.

Chapter IV

A FRAMEWORK FOR ALLOCATING INTERNATIONAL CLIMATE FINANCE FOR READINESS

Drawing on the experiences of the six case studies, a simplified framework provides guidance to developing country governments and their international partners in determining how to allocate limited funding toward the most appropriate enabling activities.

The experiences described in the case studies provide insight to governments and international funds and institutions in determining how to allocate limited funding toward the most appropriate enabling activities. This chapter draws on the cases to propose a framework to guide the funding of readiness activities, based on the extent to which the enabling conditions described in chapter 2 are in place.

The precise nature, type, and scale of activities needed to create an enabling environment for investment will differ depending on the initial conditions and the development goals and priorities of the country. Nevertheless, there is a similar progression in the types of activities undertaken. In most of the case studies, early actions to create enabling policy conditions focused on the development of plans or policies, the passing of laws relating to low-carbon energy, and the establishment of new (or reorganization of existing) institutions. This has often been complemented with activities to strengthen the capacity of government agencies, and in some cases, to engage with nongovernmental stakeholders. In most cases, activities such as developing regulations to implement laws and designing fiscal instruments, and in some cases market mechanisms, have come several years later.

Early actions to address industry barriers have included conducting renewable resource assessments and promoting awareness of energy conservation options through energy efficiency. They have also included research and small (usually government-funded) demonstration activities, workshops that convene various stakeholders, and activities to build the capacity of industry to promote low-carbon energy. At later stages, readiness activities included larger demonstration projects (often funded with international support) and development of enabling infrastructure. Financial sector activities have primarily focused on building the capacity of financial institutions to lend to low-carbon energy projects.

The following framework provides an initial tool to guide international climate funds and institutions in identifying how best to provide readiness support to countries with renewable energy and energy efficiency sectors in different stages of development. It starts by distinguishing between two dimensions of the enabling environment: (1) policy and institutional conditions, and (2) conditions within industry and the financial sector. Industry and financial conditions, although distinct, are grouped together because they are complementary and because both are needed.

As developing countries begin to create the conditions for investment in low-carbon energy sectors, their readiness requirements will change. For example, capacity building may need to be more targeted toward specific gaps in expertise.

The framework then characterizes the enabling environment for a low-carbon energy sector as "nascent," "emerging," or "well-established" along each of these two dimensions, depending on the extent to which the conditions described in chapter 2 are in place. Figure 2 describes the types of activities that will likely be needed to strengthen conditions for investment along each of these two dimensions.

The list of activities in figure 2 is not intended to be exhaustive. Rather, it indicates the main types of activities needed. In figure 3 we apply the framework to the cases described in chapter 3, showing how the low-carbon energy sector has developed over time for each case. It is difficult to ascribe a "nascent," "emerging," or "well-established" categorization to the various cases at any given point in time, since it is rare that all of the conditions describing those categories are fulfilled. Figure 3 is therefore intended to illustrate the transitions that have taken place over time as a result of a series of enabling activities.

Figure 2 | **Enabling Activities for Investment in Low-carbon Energy**

NASCENT

- Enabling conditions for investment are limited or nonexistent

EMERGING

- Plans and targets are in place, but there may be barriers to implementation
- Institutions are in place, but may lack resources to function effectively
- Some capacity for effective planning exists within government and civil society, but stakeholder engagement may be limited
- Laws are in place, but implementation may be limited

WELL-ESTABLISHED

- Plans and targets are in place and achievable, and progress is being made in their implementation
- Institutions are in place and functioning effectively
- Sufficient capacity exists within government and civil society for effective planning and stakeholders are actively engaged
- Laws are in place; implementation is supported by appropriate regulatory and fiscal instruments

POLICY AND INSTITUTIONAL

ENABLING ACTIVITIES

- PARTICIPATION | Support for stakeholder engagement and participation in the planning process
- RESEARCH | Support for research and analysis of various energy policy options and their costs
- PLANNING | Technical advice for developing plans and laws
- CAPACITY | Strengthening the capacity of government and non-government actors through targeted training and technical assistance
- OUTREACH | Support for outreach to communicate new plans and laws to stakeholders

ENABLING ACTIVITIES

- REGULATIONS | Support for creating or reforming regulations and fiscal instruments
- PARTICIPATION+ | Support for stakeholder engagement in designing regulations and fiscal instruments
- OUTREACH+ | Support for communicating new regulations and fiscal instruments to industry and consumers
- CAPACITY+ | Strengthening the capacity of national and local government to design and implement regulations and fiscal instruments

INDUSTRY AND FINANCIAL

NASCENT

- Enabling conditions for investment are limited or nonexistent

ENABLING ACTIVITIES

- STUDIES | Support for feasibility studies, environmental and social impact assessments, or due diligence
- INFORMATION | Support for resource assessments or energy conservation awareness campaigns
- TECHNOLOGY | Support for technology transfer and refining to local conditions
- FINANCE | Strengthening the capacity of financial institutions in project appraisal and risk management
- CAPACITY | Strengthening the capacity of public and private sector project developers
- REFORM | Support for financial sector reform

EMERGING

- Limited information on resource availability and energy conservation options is accessible to industry actors
- Project developers have the capacity to develop bankable projects, but limited engineering capacity may hamper their development
- Financial markets are mature but financial institutions have limited experience in lending to low-carbon energy projects

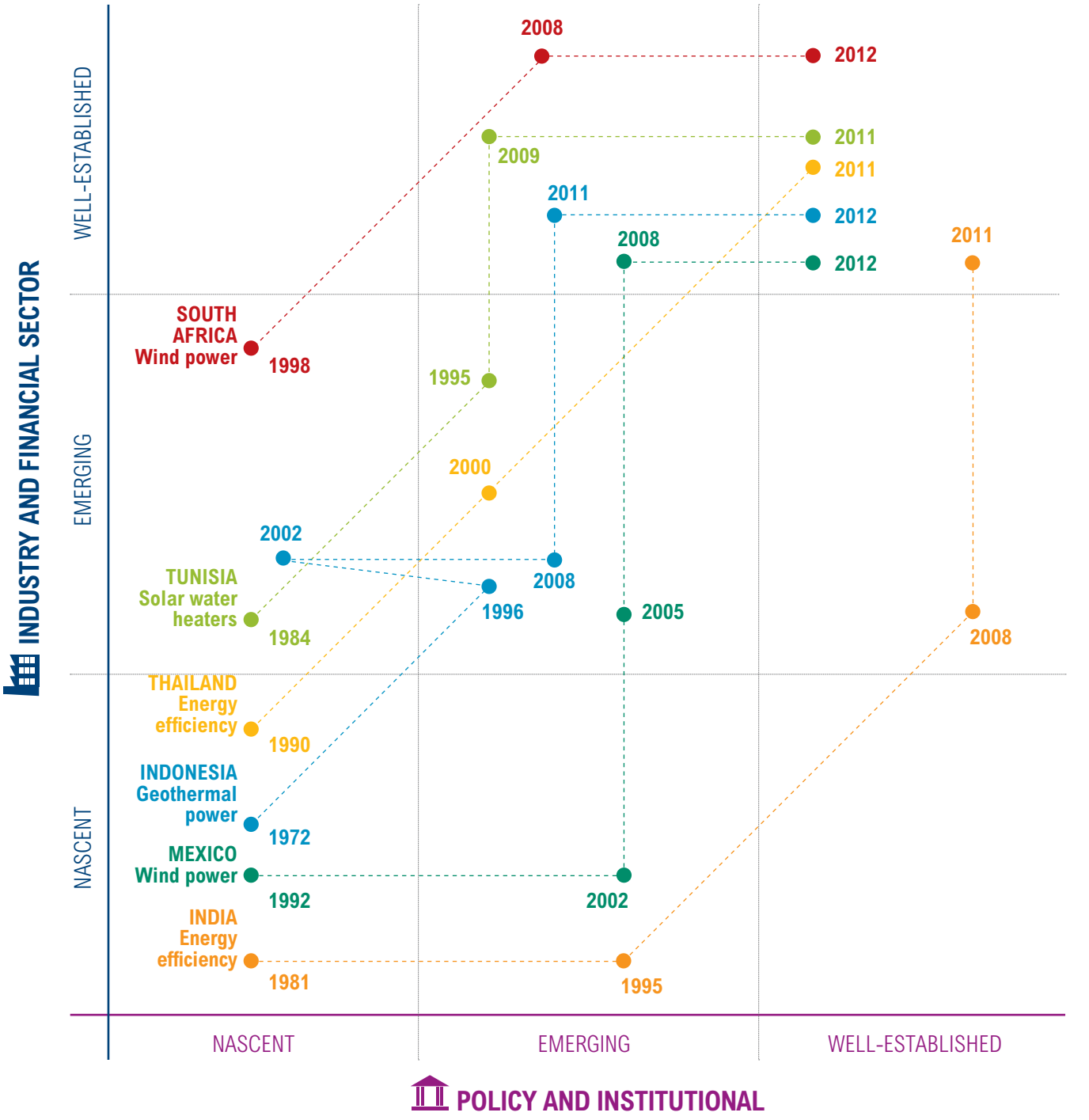
ENABLING ACTIVITIES

- INDUSTRY | Support to ancillary industries, such as upgrading grid infrastructure
- FINANCE+ | Strengthening the capacity of financial institutions for assessment of low-carbon energy projects
- CAPACITY+ | Strengthening engineering capacity through joint ventures, targeted training, or establishment of research or demonstration facilities

WELL-ESTABLISHED

- Adequate information on resource availability and energy conservation options is accessible to industry actors
- Project developers have the capacity to develop bankable projects; sufficient engineering capacity exists
- Supporting industry is present and sufficient enabling infrastructure exists
- Financial markets are mature and financial institutions have experience and financial products tailored to low-carbon energy projects

Figure 3 | **The Development of the Low-carbon Energy Sector Over Time**



Implications of the framework for international funds and institutions

The framework offers preliminary guidance on the types of activities that may be needed for any given sector; it is not intended as a prescriptive tool for identifying specific activities to fund. Governments and international funders should conduct additional country-specific research on the conditions and readiness needs in the target sector. Furthermore, it is unlikely that any country's sector or technology will neatly fit into these categories. Enabling activities need not always occur in the order described here, and some activities may still be needed even after a country has graduated to a "well-established" category.

Despite these limitations, the framework points to a set of readiness needs for any given set of initial conditions. While it is unlikely that there is any country in which the enabling conditions for investment in a low-carbon energy sector are completely absent, there may be countries in which these conditions are limited and there is little understanding of low-carbon energy technology. In such countries, it is likely that international partners will want to allocate a large proportion, if not all, of the available climate finance for a particular low-carbon energy sector toward readiness activities.

At the other extreme, in countries where nearly all the enabling conditions for investment in a low-carbon energy sector are in place, there would be minimal need for readiness support. In these cases international partners could focus support on project and program investments. Support for enabling activities would be determined based on an assessment of the remaining gaps and barriers.

As developing countries, with support from international partners, begin to create the conditions for investment in low-carbon energy sectors, their readiness requirements will change. Not only will the needs be different, but they are also likely to become more specific. International partners will need to adapt their support accordingly. For example, capacity building may be more targeted toward specific gaps in expertise. Support may shift from developing plans and laws to designing specific regulations and fiscal instruments; from assessments of resource potential to site-specific explorations; or from enterprise development support to strengthening engineering capacity for specific technologies. It is also worth noting that while many of the activities described in figure 2 will be the focus of international climate finance, there are some (such as financial sector reform) that have economy-wide benefits and should be the focus of development finance more broadly.

Chapter V

IMPLICATIONS FOR INTERNATIONAL CLIMATE FINANCE AND RECOMMENDATIONS FOR THE GREEN CLIMATE FUND

The six case studies illustrate different approaches that various international partners have used to support readiness activities and can inform the newly established Green Climate Fund as it attempts to identify how best to support a paradigm shift toward low-emission and climate-resilient development pathways.

As the six case studies indicate, several international funds and institutions have supported and continue to support enabling activities for low-carbon energy in developing countries. Different international financial institutions have different mandates, objectives, and modalities for delivering support to recipient countries. These varying approaches determine their suitability for providing support to particular activities.

The GEF provided grant funding for activities that aimed to address investment barriers in all the case studies, including capacity building and support for developing policy and regulatory or fiscal instruments. GEF-funded projects have primarily been implemented through the UNDP and the World Bank. Given that the GEF is a financial mechanism of the UNFCCC with a mandate to provide grants to developing countries for climate-related activities, it is not surprising that GEF has been an important source of funding for readiness activities. However, despite its recognition of the importance of funding enabling activities, results from GEF-funded projects were mixed in the case studies. For example, similar GEF-funded, UNDP-implemented projects aimed at removing barriers to wind energy investment were implemented with more positive and lasting impact in Mexico than in South Africa.

The multilateral development banks (MDBs) have also been important actors in supporting readiness activities in the case studies. In many cases, MDBs have combined small investments in readiness activities—in the form of grants or technical assistance—with project financing on a much larger scale. In recent years, this has often been complemented by concessional financing from the CTF. In such cases, the enabling activities supported by MDBs have tended to be quite specific to facilitating the larger investment. For example, a private sector wind project in Mexico blended financing from the IDB and IFC with concessional financing from the CTF, and included a small readiness component for activities to assess supporting infrastructure and the financial feasibility of wind projects, and to support implementation of the new renewable energy law (IFC 2009).

Bilateral institutions have also played a role in supporting readiness activities in several case studies. These actors tend to have more flexibility to choose where to put their resources and can be strategic in identifying and targeting specific barriers to investment in a low-carbon energy sector. For example, GIZ supported a grid study for wind energy in South Africa's Western Cape Province, and a capacity building program for the Department of Energy Development and Promotion in Thailand after the passage of the Energy Conservation and Promotion Act. In Indonesia in the 1970s, a number of bilateral partners supported an assessment of geothermal resources, and JICA supported a more recent assessment.

In some cases, bilateral partners have also included readiness components in their support for larger investments. For example, KfW supported Indonesia with geothermal exploration and technical assistance, with the aim of providing financing for a geothermal project if the exploration was positive. However, in some cases bilateral and multilateral financing for low-carbon energy was accompanied by little or no support for enabling activities.

As the case studies illustrate, international partners have supported numerous readiness activities in the six countries; some have been complementary and built on previous efforts, and others have been more isolated. While there are different approaches to supporting enabling activities, and some funds and institutions place more emphasis on readiness support than others, it is clear that there is scope for improvement in the consistency and effectiveness in the use of climate finance for creating attractive investment conditions for low-carbon energy. Stronger coordination between the various providers of international climate finance could enhance the collective impact of their efforts and better capitalize on their various strengths and competencies.[29]

Recommendations for the Green Climate Fund

The case studies provide insights into the different approaches that six countries and their international partners have taken to overcome barriers to investment. The cases provide glimpses into activities that have—and have not—worked well. The framework set out in chapter 4 offers preliminary guidance to international partners on how to approach decision making in allocating funds to support readiness activities. This guidance is rele-

vant to the Green Climate Fund (GCF)[30] —expected to become the main global fund for climate change finance[31] —as it attempts to identify how best to support a paradigm shift toward climate-resilient development pathways.

There are a number of questions that the GCF Board will need to grapple with as it puts in place operational modalities for the fund, and a number of approaches that it could take to supporting readiness. Our recommendations on some of these options are discussed below.

The GCF should support readiness through its own activities

The GCF could choose to support readiness activities through its own activities, either as components of larger investments or as standalone activities, depending on the needs of the country. Alternatively, the GCF may consider approaching readiness activities in partnership with other institutions or funds so that it focuses on supporting climate-related investments, and a partner organization such as GEF or a UN agency supports readiness activities. This would allow each partner organization to focus on an area in which it is most specialized, and would enhance the complementarity of the various institutions involved.

We recommend the former approach, which would help ensure that readiness support is governed by the principles enshrined in the GCF—including pursuing country-driven approaches and strengthening engagement at the country level through effective involvement of relevant stakeholders and institutions. It would also give the GCF the autonomy to determine how, and how much, to support readiness and to ensure that adequate funding is set aside for enabling activities.

Irrespective of whether it chooses to support readiness activities itself or in partnership with existing institutions (or both), the GCF has an opportunity to bring various funds and institutions together and enhance the coordination of support. More strategic assessments by governments and their international partners on the barriers to investment and prioritization of the most pressing needs would allow limited funds to be used where they can have the biggest impact. The GCF should put in place incentive structures to encourage partnerships and coordination between various international funds and institutions—for example, by requiring various MDBs and other GCF implementing institutions to coordinate their engagement with recipient country governments to identify priorities for funding that are aligned with long term development plans.

National institutions—such as the Development Bank of Southern Africa in South Africa and NAFIN in Mexico—are becoming increasingly important actors in climate finance and will likely play a more central role in supporting readiness in the future. The GCF should support these institutions and promote greater coordination and cooperation between international and domestic institutions. By enabling partnerships and facilitating cooperation, the GCF could promote coherent and integrated approaches to supporting enabling activities, allowing countries to better align international support with their national plans and priorities.

The GCF should dedicate funding for enabling activities within its adaptation and mitigation windows

The governing instrument of the GCF[32] establishes funding windows for mitigation and adaptation, but leaves open the option to establish others. A separate funding window or discrete allocation of funds within existing funding windows for readiness activities would have the advantage of ensuring that adequate funds are set aside for investing in creating enabling environments in target countries. This may be particularly advantageous to less-developed countries, which may wish to focus, at least initially, on enabling activities, and will need the certainty of predictable and sustained support over a decade or more to build the necessary conditions.

The creation of such a dedicated funding window will need to be linked to the broader discussion about how the GCF allocates funding between activities and countries.[33] In some cases, countries may need support for discrete readiness activities, such as for the development of a plan or policy and the stakeholder consultation that goes with it; for conducting an economic assessment of energy options; or for a resource assessment. However, it is also likely there will be many cases in which a larger investment will include a number of enabling activities to strengthen capacity for implementation and address specific gaps. A challenge for the

GCF will be how to provide the flexibility to support readiness activities in a way that is responsive to the needs of recipient countries and aligned with national development plans and priorities.

Given the importance of readiness activities in scaling up investment, and the long time frame for creating an enabling environment for investment, it is our recommendation that the GCF set aside dedicated funding for enabling activities within both its adaptation and mitigation windows, especially for countries in which enabling conditions are nascent. Furthermore, the GCF should allow countries to draw on these resources at a rate that their absorptive capacity allows, without the risk of losing access to funding if it is not used within a pre-determined time frame. This allocation of dedicated funding to readiness activities should not prevent the inclusion of enabling activities in larger projects, using funds not specifically earmarked for readiness, where necessary to address specific gaps.

The GCF will need to find ways to ensure that its funding for readiness activities is demand-driven and well-aligned with other areas of support for adaptation and mitigation activities, including through its private sector facility. One approach would be for countries to develop low-carbon, climate-resilient development strategies that articulate a vision and pathway to achievement—or to integrate climate change considerations and goals into existing development plans—and identify needs for funding support, including for enabling activities. Aligning GCF support with countries' national development strategies would ensure that funding from different windows or mechanisms, including the private sector facility, contributes to the same objective. Many developing countries have long-term visions and medium-term development strategies in place, but they do not always take climate change impacts into account or include climate-related goals. Several countries have already begun to put in place low-carbon, climate-resilient development strategies, and many others have embarked on developing NAMAs, national adaptation plans, national adaptation programmes of action, and other planning processes (see Hermwille 2011) that could be integrated into a broader development strategy.

The GCF should incorporate enabling activities into private sector projects to address specific gaps

In the case studies, there are several examples in which MDBs have supported private sector projects that included a small technical assistance or grant component in addition to project finance on a larger scale. It is likely that the GCF's private sector facility will follow a similar approach, including targeted support for specific enabling activities as part of a larger package of support. This can be an effective way to address specific gaps and barriers and increase the likelihood of success. Alternatively, the GCF may choose to focus the private sector facility on investments. In such a scenario, it would need to ensure that a complementary approach to supporting readiness in the private sector is available, either through other windows of the GCF or through other climate finance channels.

We recommend the former approach, as it would allow the GCF to integrate strategic enabling activities into larger private sector projects, thereby increasing the likelihood of success while also strengthening the capacities and knowledge of national institutions involved in the project. The private sector facility will be particularly well placed to support readiness activities that target industry and financial sector actors, given its expertise and focus. For example, it could play an important role in supporting activities to strengthen the capacity and involvement of SMEs in low-carbon sectors in developing countries. Similarly, it could be instrumental in familiarizing domestic financial institutions with low-carbon investment opportunities and strengthening their capacity to assess and finance such investments.

The GCF should consider a fast-track mechanism to support readiness during its operationalization

There is a lot of interest among developing countries in initiating readiness activities that will position them to establish national implementing entities and access funds quickly once the GCF becomes operational. A number of developed countries have also indicated an interest in supporting readiness activities for the GCF.

The GCF should consider establishing a fast-track mechanism to support readiness activities even before it is fully operational. However, it will take some time to develop this mechanism, and in the meantime developed and developing countries are looking to existing institutions, such as the GEF and UN agencies, to play this role. Types of activities that may be particularly useful as countries prepare themselves to access funds from the GCF include support for developing low-carbon, climate-resilient development plans and stakeholder consultation as part of the planning process; conducting needs assessments; creating institutional arrangements such as multi-stakeholder committees on climate change; and strengthening systems for measuring the impacts of climate investments.

Moving forward with the GCF

There is no single approach to supporting readiness activities for scaling up investment in low-carbon energy that will be appropriate to all countries. The GCF will need to customize its approach depending on country circumstances. The most appropriate readiness activities will depend on the extent to which enabling conditions for low-carbon energy technologies are already in place.

The framework presented in this report offers a starting point in guiding an assessment of the type and scope of readiness activities needed in any given country. The specific activities supported will depend on the gaps and priorities identified for each country. Building an attractive investment climate is a process that takes over a decade of sustained support, extending beyond when scaled-up investment begins.

The GCF will need to develop mechanisms to provide countries—especially those in which low-carbon energy technologies are nascent—with support for enabling activities that may be small in quantity of funding, but is predictable and sustained over five to ten years or more. International partners can draw on their experience and expertise to provide guidance and support to enable countries to take a holistic and long-term approach to development planning. But ultimately, it should be up to the country itself to determine its priority areas for investment. International partners should respect and support these priorities, and ensure that readiness activities are responsive to the needs of recipient countries.

The GCF's private sector facility could be instrumental in strengthening the capacity of SMEs in developing countries to invest in low-carbon sectors and of domestic financial institutions to finance such investments.

ENDNOTES

1. In addition to the roughly $2.6 trillion in annual investments under a "business as usual" scenario.
2. Energy supply technologies are defined as investments in power generation, transmission and distribution; investments in oil, gas, and coal exploration and extraction are not included. Energy demand technology includes the building, industry, and transport sectors.
3. Developing countries in this case refers to non-OECD countries.
4. We use the term "international partners" to refer generally to the range of international, multilateral, and bilateral funds and institutions that provide financial and technical support to developing countries for low-carbon energy projects and initiatives.
5. Although we consider research and development associated with indigenizing technologies to new contexts.
6. While the term sector could be used to apply to the energy sector as a whole, in this paper we refer to the range of economic activity around a particular technology as a sector, such as the wind sector or the geothermal sector. We refer to the range of economic activity around low-carbon energy more broadly as the low-carbon energy industry.
7. WRI's work on sustainable energy access is aimed at bridging the gap between on-the-ground practitioners and international policymakers and funding providers to improve efforts to provide sustainable energy to underserved populations in developing countries. See Ballesteros et al. 2013.
8. Integrated resource planning in the electricity sector involves assessing energy demand and supply over a specified period of time in order to determine options for meeting electricity demand while simultaneously attaining other policy goals, such as economic efficiency and environmental protection. Many developed and some developing countries are moving toward integrated resource planning as a tool for managing electricity growth; see, for example, South Africa's integrated resource plan for electricity 2010-2030. A similar approach can be used to assess demand and supply-side options to meet a country's energy needs more broadly; see, for example, India's integrated energy policy.
9. See, for example, Foti et al. 2008.
10. WRI and Prayas Energy Group's work on electricity governance looks at the extent to which four principles of good governance—participation, transparency, accountability, and capacity—are practiced in electricity policy and regulation. See, for example, Dixit et al. 2007.
11. A feed-in-tariff is a pre-defined guaranteed rate that a power producer will be paid for every kilowatt hour of electricity.
12. See Annexes at WRI.org
13. Personal interview with international expert.
14. South Africa's National Climate Change Response White Paper was subsequently released in 2011.
15. Personal interview with in-country expert.
16. Including the Energy Conservation Law in 1990 to promote the rational use of energy, and the Investment Incentives Code in 1993 to support investment in energy conservation and renewable energy.
17. Personal interviews and correspondence with in-country and international experts.
18. Personal communication with international expert.
19. Personal communication with international expert.
20. Personal interviews with in-country experts.
21. Author calculations.
22. Personal interviews with in-country experts.
23. Geothermal fields that were awarded under the pre-crisis regulatory regime are not subject to the new regulations; instead, development has continued under joint operating contracts between Pertamina and the private sector following the previous regulations, and negotiating a power purchase agreement is on a case-by-case basis with PLN.
24. In 1992, the Mexican government passed changes to the electricity law to allow private sector participation in power generation for IPPs, which sell power to the grid, as well as for self-supply generation, or power production for export. IPPs with plants over 30 MW need to have long-term power purchase agreements, awarded through competitive bidding. Power produced by IPPs under 30 MW (small producers), as well as the surplus from self-suppliers, are sold to the grid at a variable tariff below the location's short-term marginal cost.
25. Personal interviews with in-country expert.
26. Formerly named the Ministry of Non-Conventional Energy Sources.
27. Personal interviews with in-country expert.
28. Personal interviews with in-country expert.
29. Coordination and coherence in climate finance is the subject of another forthcoming working paper by WRI.
30. The GCF was agreed to in the UNFCCC negotiations in Cancun in late 2010 and its governing instrument approved in Durban in late 2011. Its board, constituted in 2012 and consisting of 12 members each from developed and developing countries, is tasked with completing the design and operationalization of the fund.
31. According to its governing instrument, which was adopted by the Conference of Parties to the UNFCCC in Durban in December 2011.
32. For more, see: http://unfccc.int/files/meetings/durban_nov_2011/decisions/application/pdf/cop17_gcf.pdf
33. WRI's work on allocation looks at how existing funds and institutions allocate resources across themes, countries, and activities, and distills some of the key tradeoffs and principles that will be important for GCF. A working paper on the subject, in collaboration with the Overseas Development Institute, is forthcoming.

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ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
AFD	*Agence Française de Développement*
AMDEE	Mexican Wind Energy Association
ANME	National Energy Conservation Agency - Tunisia
BEE	Bureau of Energy Efficiency - India
CDM	Clean Development Mechanism
CIF	Climate Investment Funds
CFE	Federal Electricity Commission - Mexico
CRE	Energy Regulatory Commission - Mexico
CTF	Clean Technology Fund
DoE	Department of Energy - South Africa
DSM	Demand-Side Management
ECPF	Energy Conservation Promotion Fund - Thailand
ESCAP	Economic and Social Commission for Asia and the Pacific
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIZ	*Deutsche Gesellschaft für Internationale Zusammenarbeit*
IDB	Inter-American Development Bank
IDBI	Industrial Development Bank of India
IEA	International Energy Agency
IFC	International Finance Corporation
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IREDA	Indian Renewable Energy Development Agency Limited
JICA	Japan International Cooperation Agency
KfW	*KfW Entwicklungsbank* (German development bank)
LPG	Liquefied Petroleum Gas
MDB	Multilateral Development Bank
MEMR	Ministry of Energy and Mineral Resources - Indonesia
NAFIN	*Nacional Financiera* - Mexico
NAMA	Nationally Appropriate Mitigation Action
NERSA	National Energy Regulator of South Africa
OECD	Organisation for Economic Co-operation and Development
PLN	*Perusahaan Listrik Negara* - Indonesia
Prosol	*Programme Solaire*
SAWEP	South Africa Wind Energy Program
SENER	Mexico's Energy Ministry
SIDBI	Small Industries Development Bank of India
SME	Small and Medium-sized Enterprise
STEG	Tunisian Company of Electricity and Gas
SWH	Solar Water Heater
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

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ISBN 978-1-56973-801-6