ADAPTING FROM THE GROUND UP

Enabling Small Businesses in Developing Countries to Adapt to Climate Change

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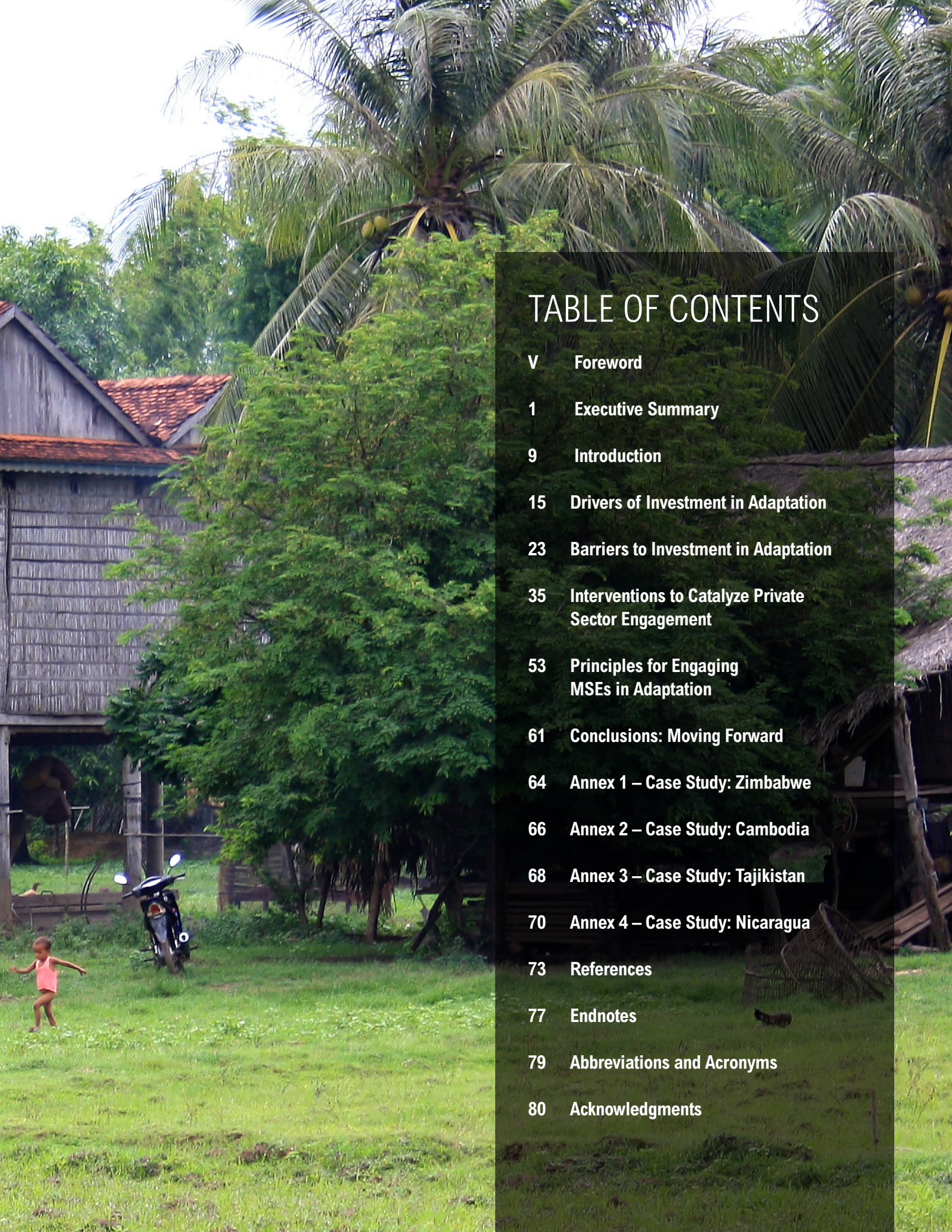

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FOREWORD

Adaptation to climate change is not optional, but an essential element in the pursuit of prosperity in the long term. In the face of a changing climate, vulnerable communities benefit by being more resilient to extreme weather; businesses thrive when they better manage risk and harness new opportunities; and governments succeed when they lead resilient and strong economies. As climate patterns shift and weather events become more severe, the cost of adaptation will increase. The latest findings of the United Nations suggest that adaptation will cost between US $200 billion and US $500 billion per year even if climate negotiators strike a deal to avoid crossing the critical threshold of a 2°C of temperature rise above pre-industrial levels. If they fail, the cost will be exponentially higher.

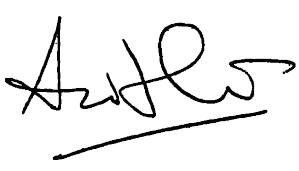
Developing countries need significant financing to adapt to climate change. Governments and development partners have an important role to play in safeguarding vulnerable communities and helping to develop the capacities to manage risks. Existing public funds and likely future funding from global agreements and compacts, however, are nowhere near sufficient for the task.

All forms of finance—public and private, domestic and international—are essential for the transition to inclusive, low-emission, and climate-resilient development. As public finance is limited, a critical challenge is to ensure that it is used in the best possible ways with the aim of catalyzing finance from other sources.

Adapting from the Ground Up highlights the business case for why governments should focus on creating an enabling environment which will encourage micro and small enterprises (MSEs) in developing countries to invest in adaptation. In most countries, the private sector accounts for more than 60% of GDP, and MSEs in developing countries provide around 60% of all employment, supporting the livelihoods of billions globally.

Policymakers need to engage with MSEs in a targeted way. Policies which direct and redirect investments toward appropriate products and services will support, facilitate, and advance adaptation at scale. For businesses, it is in their best interests to invest in adaptation because they must ensure business continuity and profitability in a changing climate. WRI's and UNDP's analysis, based on numerous case studies, shows that there are many opportunities for the public sector, with assistance from development partners, NGOs, and others, to create the conditions in which MSEs can re-orient their investments in ways which more effectively safeguard their current assets against climate change risks. The public sector should send the right signals, and create the right incentives, for the promotion of new economic opportunities which are resilient. The products and services which private entities provide will also be critical for supporting the resilience of the wider community. Through this type of engagement, the public and private sectors can become more active agents of change in advancing resilience in the post-2015 development process.

The unmet financing needs for adaptation reveal an urgent need for new approaches to catalyze the changes required to support transformative adjustments. This report unpacks what it means to engage the private sector from the micro level up as an agent of change. We hope the evidence and the ideas presented in this report will spur further thinking and action in countries around the world on different ways in which resilience to climate change can be promoted.



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EXECUTIVE SUMMARY

Global estimates show that the costs of climate change adaptation in developing countries will far exceed the public sector's financial resources.[1] In order to build climate-resilient societies, both public and private stakeholders need to contribute. To maintain the development pathways of developing countries, urgent action is needed from the public sector to form sound policies that address climate challenges and focus especially on the private sector, which more directly supports the livelihoods of the majority of people living in vulnerable communities. Although leveraging finance from donors is important for adaptation efforts, it will be fundamental to encourage the private sector to invest in adaptation and, in so doing, also minimize business risks and strengthen the resilience of vulnerable communities.

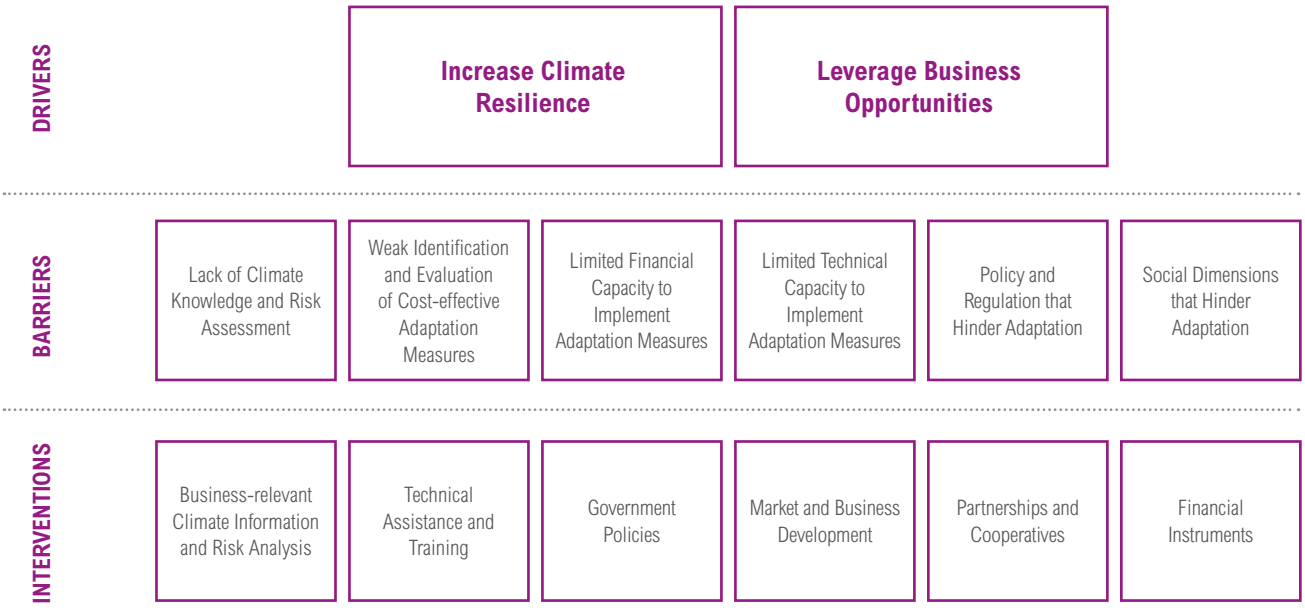
Engaging the private sector in adaptation to build resilient societies must necessarily start from the ground up, from micro and small enterprises (MSEs), which constitute the bedrock of economies where most vulnerable communities exist. *Adapting from the Ground Up* seeks to enhance private sector engagement in adaptation by identifying drivers of and barriers to MSE action in this area, and by outlining a set of interventions that public actors can adapt to create an enabling environment in which MSEs not only become more climate resilient but also contribute toward the resilience of others (Figure ES-1). The report aims to influence policymakers, development partners, and climate funds to support and design policy interventions that unlock, catalyze and/or direct investments by and for MSEs to take into account current and impending climate change risks and opportunities. It provides guidance for policymakers to design interventions to incorporate into their national adaptation plans (NAPs) and long-term development planning.

Adapting from the Ground Up draws upon a growing body of research and projects on private sector adaptation. It shares examples from case studies[2] of interventions in Cambodia, Nicaragua, Tajikistan, and Zimbabwe, which successfully catalyzed MSE investment in climate adaptation measures in the agriculture sector. The report also presents a number of shorter case studies from projects and initiatives in Benin, Cook Islands, Ethiopia, Honduras, India, Namibia, Rwanda, and Tanzania. Our conclusions are necessarily preliminary. Most adaptation projects that target the private sector are still under development, or in the process of being implemented, making results difficult to assess or predict. Therefore, there are only a few completed cases from which we can draw lessons at this time.

Micro and Small Enterprises (MSEs): The Engines of Growth and Livelihoods in Developing Countries

MSEs play a vital role in community livelihoods and resilience but they tend to have fewer resources to adapt to climate change than do larger enterprises. They have limited capacity to assess risks and take advantage of opportunities associated with climate change. Given these challenges, there is considerable scope to increase the contribution that MSEs can make to adaptation. With public sector assistance, MSEs could be incentivized to catalyze investment in risk management and resilience, and thereby become the most direct means of supporting vulnerable communities as they adapt to climate impacts. *Adapting from the Ground Up* describes

Figure ES-1 | **Overview of Drivers, Barriers, and Interventions to Catalyze MSE Investment in Resilience**



the different elements that policymakers need to take into account when designing policies and interventions to catalyze MSE investment in adaptation.

What Drives MSEs to Invest in Adaptation?

To effectively engage businesses, whether MSEs or large corporations, a fundamental consideration (regardless of climate change) is the risk-reward profile associated with a prospective business opportunity. If the return expected is too low, or the risk too high, private investments are unlikely to be made. Policymakers need to have an understanding of what drives (or constrains) businesses to invest, as they try to determine ways in which to catalyze investment in risk management and products and services that support, facilitate, and advance climate change adaptation at scale.

Generally, businesses will make investments in adaptation for two reasons:

- **TO INCREASE THE CLIMATE RESILIENCE OF THEIR BUSINESS.** Businesses need to increase their climate resilience to limit negative impacts on the quality and availability of the goods and services they produce which, in turn, affect their bottom line and long-term viability.
- **TO HARNESS NEW OPPORTUNITIES ARISING FROM A CHANGING CLIMATE.** Climate change could present opportunities for businesses, as demand for risk-management-orientated technologies, products, and services increases, and as new markets open up.

Such investments will benefit from clear and coordinated policy actions and regulations. Governments can stimulate markets through incentives for innovation (for example, in the fields of climate-resilient technology research and commercialization) and provision of financial support. Financial support can take the form of various policy and financial instruments that reduce risks, transfer risks, or compensate for risks (UNDP 2013). Governments can thus affect the risk-reward profile of private investments in adaptation through a variety of policy approaches and instruments.

What Barriers Discourage MSEs from Investing in Adaptation?

MSEs in many parts of the world face multiple barriers to investment in adaptation. The report discusses some of the key barriers that need to be addressed to strengthen the resilience of MSEs and their communities in developing countries. Based

on the findings from case studies and literature review, the barriers that prevent businesses from engaging in adaptation can be grouped into six categories:

1. **CLIMATE KNOWLEDGE AND RISK ASSESSMENT.** Information about the risks and uncertainties that are relevant (by geography and sector) to the planning and decision-making processes of MSEs is sometimes unavailable or inaccessible.

2. **IDENTIFICATION AND EVALUATION OF COST-EFFECTIVE ADAPTATION MEASURES.** Adaptation does not yet have a standard "menu" of actions from which enterprises can choose; they must develop their own location- and time-specific adaptation measures. Few tools are available to help small enterprises develop such measures, or to assess their feasibility and cost-effectiveness. Moreover, adaptation options must be competitive with non-adaptation options in terms of product price, operating cost, or sustainability of production. Many enterprises therefore struggle to identify and choose adaptation options.

3. **FINANCIAL CAPACITY TO IMPLEMENT ADAPTATION MEASURES.** In many cases, adaptation requires new investment. Some investments can have large upfront costs, relatively long payback times, and uncertainties related to future climate impacts. Banks and other financial intermediaries, recognizing unfavorable risk-return profiles, might hesitate to invest in adaptation, making it difficult for MSEs to obtain financing. Knowledge of alternative types of financial instruments that can adjust the risk-reward profile might be limited and/or beyond the capacity of MSEs to access, for a variety of reasons.

4. **TECHNICAL CAPACITY TO IMPLEMENT ADAPTATION MEASURES.** Adopting new business processes, developing new products or services, and implementing new technologies for increased resilience often require technical skills and expertise, which might themselves require upfront investment. This may not always be possible given tight margins in the context of their ongoing business ventures.

5. **POLICIES AND REGULATIONS.** Government institutions can play an important role by removing policy obstacles to the adoption and diffusion of adaptation practices and creating an enabling environment. Investments can be incentivized through a variety of financial instruments at policymakers' disposal, and information and knowledge can be communicated to local businesses. In many developing countries, however, national and local government institutions themselves suffer from capacity constraints that limit these approaches.

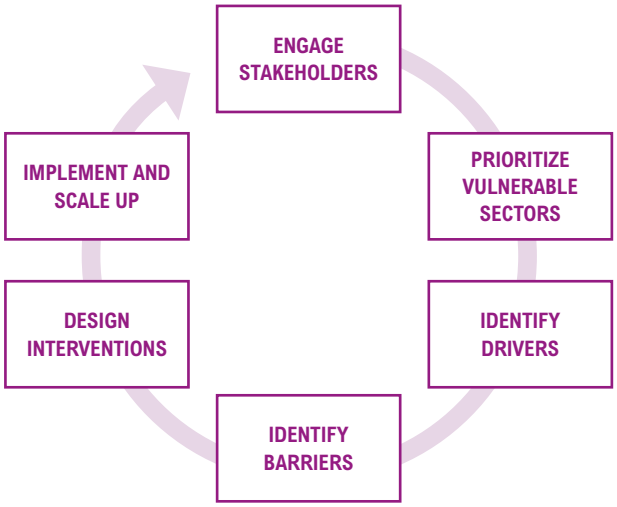
6. **SOCIAL DIMENSIONS OF ADAPTATION.** Class, gender, and culture play a large role when deciding among adaptation options. Although often overlooked, the social context can be a significant barrier to the adoption of new technologies and production methods. Because people's decisions are influenced by cultural and demographic factors, the adaptive capacity of individuals varies across regions and countries.

Interventions to Catalyze MSE Investment in Adaptation

The public sector has a central role to play in helping society adapt to the effects of climate change, while promoting economic development (Cimato and Mullan 2010). Public interventions should be used when markets are not functioning in a way that encourages the private sector to become more resilient. Although many governments do not have the capacity to provide sufficient public support (especially finance) to enable all businesses to invest in adaptation, they do have the influence and capacity to work with non-governmental organizations (NGOs), financial institutions, and international organizations to cooperate in smoothing the path for MSEs trying to develop risk management options.

The report highlights a number of categories of government interventions. They include the provision of business-relevant climate information and risk analysis; technical assistance and training; policy development that enables investments in adaptation; market and business development; encouragement of partnerships and cooperatives; and deployment of financial instruments.

Figure ES-2 | **Principles for Designing Interventions to Catalyze MSE Investment in Adaptation**



Framework for Engaging MSEs in Adaptation

Figure ES-2 illustrates a set of six principles that the public sector can use in designing interventions to better promote adaptation by MSEs:

- Engage stakeholders
- Prioritize vulnerable sectors

- Identify drivers of investment in adaptation
- Identify barriers preventing investment in adaptation
- Design interventions to catalyze MSE investment in adaptation
- Implement and scale up

These principles enable policymakers to tailor their interventions to circumstances specific to a particular country or region. For example, strengthening MSE engagement in adaptation could be a stand-alone policy objective or a part of a larger adaptation policy process, such as the formulation of a national adaptation plan. It could also be an element in efforts to address a specific climate-resilient development objective, such as providing water services or building local seed banks.

Moving Forward

MSEs need to become more resilient, if developing countries—and particularly their most vulnerable populations—are to become resilient to climate change. Part of this change has to come through public support. Policymakers, development partners, and climate funds need to expand their current focus on leveraging private sector finance to include adaptation incentives that support MSEs. Engaging MSEs in adaptation will create an environment that catalyzes sustainable development within a climate-resilient environment.

Recommendations for Developing Country Governments

Policymakers should develop policies that stimulate MSEs to invest in adaptation. This can be achieved through instruments such as national and sector-specific adaptation plans and long-term economic development planning strategies and frameworks. Developing country governments should actively engage with other actors who can assist them in implementing these interventions. Actors include multinational corporations, financial institutions, and investors; all of whom can help to ensure that a variety of financial instruments are brought to bear to support MSEs as they invest in risk reduction/management initiatives. Decentralized approaches to identifying key policy and financial barriers to investing in risk management by MSEs should also be promoted. Public officials can have more direct and effective contact with MSEs at the municipal

Policymakers, development partners, and climate funds need to expand their current focus on leveraging private sector finance to include adaptation incentives that support MSEs.

and district levels. Civil society organizations can be used to reach local community groups who might be hesitant to engage with large and unfamiliar institutions.

Recommendations for Multilateral and Bilateral Partners

Providing financial and technical support for national activities is the most direct way that multilateral and bilateral partners can support the process. This support must, however, be targeted at the risk-reward profiles of investments that MSEs might be considering in the context of managing climate risks, but are hesitant to make because of unfavorable terms. Support might involve removing policy barriers, transferring risk, and/or compensating for risks using a variety of financial instruments. Donor institutions can also act as knowledge banks and facilitate the transfer of information about successful business practices, initiatives, and pilots. Equally, bilateral partners can support the process of catalyzing engagement in adaptation by ensuring market access for products developed by MSEs in developing countries.

Recommendations for Climate Funds

Climate funds, such as the Green Climate Fund, can play a catalytic role by ensuring that they support two kinds of projects and programs: those that create the enabling conditions for MSEs to make investments in building up their own resilience to climate impacts, and those that promote products and services that support, facilitate, or advance adaptation at scale. In developing countries, this specifically includes the use of grants—financial instruments that change the risk-reward profile of investments that have adaptation benefits. Climate funds can also act as matchmaker and clearing-house for private sector adaptation ideas. Climate funds can support and complement national efforts by creating regional or national networks to help MSEs develop product ideas into bankable projects, supporting capacity development for implementation, and linking businesses to possible investors.

Recommendations for Large Private Sector Companies

Large private sector actors (multinationals that are reliant on supply chains involving multiple MSEs) can contribute to building resilient MSEs in developing countries, while benefitting from a more resilient supply chain. Companies and investors can support MSEs by providing finance and technical assistance, or by forming partnerships. Financial institutions can also contribute by providing better access to finance for adaptation efforts by MSEs in low-income countries.

INTRODUCTION

Global estimates indicate that the costs of climate change adaptation in developing countries will far exceed the public sector's financial resources. In order to build climate-resilient societies, both public and private stakeholders need to contribute to climate change adaptation. In developing countries, climate change risks magnify development challenges. Urgent action is therefore needed from the public sector to develop sound policies that address climate challenges, with a special focus on the private sector, which more directly supports the livelihoods of the majority of people living in vulnerable communities. Although leveraging finance from donors is important for adaptation efforts, engaging the private sector to invest in adaptation and minimize business risks will be critical to the effort.

BOX 1 | WHAT IS THE PRIVATE SECTOR?

The private sector is that part of the economy that is run primarily by individuals and companies for profit. The private sector comprises a range of actors, including:

- **LOCAL ENTERPRISES:**
  - **Micro and small enterprises (MSEs):** The local private sector in developing countries consists primarily of MSEs, which include sole proprietors (individuals), smallholder and family farms, and enterprises with 49 and fewer employees (IFC 2012).[4] Many of these entities operate in the informal economy (Bacchetta et al. 2009).
  - **Medium and large enterprises:** These types of enterprises employ 50 or more employees (IFC 2012). Advanced developing economies tend to have a higher number of medium and large enterprises than developing countries (Kushnir et al. 2010).
- **MULTINATIONAL CORPORATIONS (MNCs):** MNCs are increasingly active in developing countries as registered companies with in-country operations. Most MNCs also have indirect investments in developing countries where their supply chains are located.
- **CAPITAL PROVIDERS (INVESTORS) AND MARKET FACILITATORS:** Actors that make direct investments and provide financial services, respectively. These include banks, venture capitalists, angel investors, insurance companies, and investment funds (Venugopal and Srivastava, 2012). Enterprises often act as "capital providers" because they typically provide a portion of a project's financing through their own capital contribution (known as an "equity stake").

Large multinationals are already incorporating climate action into their business plans. Their actions are reducing the harmful drivers of climate change while, at the same time, benefiting their bottom lines by saving money and retaining employees. As climate change intensifies, there is little doubt that smaller businesses, too, will need to be prepared to manage climate-associated risks. Policymakers, development partners, and climate funds can play a role in solidifying the business case for adaptation. Supporting the development of an appropriate enabling environment can make investments in adaptation more attractive. Such support could direct or redirect finance from business opportunities that are at risk from climate change to those that are more climate resilient.

As the principal driver of economic growth, the private sector has a significant influence on the promotion of sustainable development and climate change adaptation. This is recognized in Sustainable Development Goal 17, which includes the encouragement and promotion of effective public, public-private, private, and civil society partnerships.[3] Private sector entities will need to safeguard themselves from climate risks or expand into new frontiers, or both, as a result of change. In many developing countries, MSEs form the bedrock of rural economies and livelihoods. Improving MSEs' approach to climate change risk management is critical to advance inclusive growth, offering the potential to raise income levels and reduce poverty.

1.1 Why Focus on MSEs?

This report focuses on MSEs, the challenges they face when investing in adaptation, and the interventions that the public sector can make to promote more resilient businesses.[5] In general, MSEs tend to have fewer resources to adapt to climate change than larger enterprises, and yet they play a vital role in scaling up investment in community resilience. Until recently, MSEs have been overlooked in international discussions on climate change adaptation, because the emphasis tends to be on larger corporations with the ability to provide finance for adaptation action, particularly in the context of corporate social responsibility.

The report focuses on MSEs for three reasons:

MSEs are an Essential Source of Livelihoods for the World's Poor

MSEs are a key engine of job creation, innovation, and entrepreneurship. Developing countries worldwide depend on MSEs for around 60 percent of their employment (Bacchetta et al. 2009). The proportion is even higher in Sub-Saharan Africa and South Asia (see Figure 1). Because MSEs form the core of developing economies, they are critical to adaptation efforts. They are often the only source of employment, income, and market access for the poor and they underpin the structure of most communities. In many cases, there are no formal

safety nets, so communities rely on their own labor, savings, and assets that can be sold in times of crisis to generate income (Balakrishnan et al. 2013). This situation only increases the importance of climate resilience among MSEs. Their potential investments in the provision of products and services that help people adapt to climate change can benefit businesses, households, and communities as a whole.

MSEs are Highly Vulnerable to Climate Impacts

MSEs in poor and vulnerable areas, often in rural communities, are particularly exposed to climate risks because of their dependence on their natural environment. Many MSEs in low-income countries operate in the agriculture, fisheries, forestry, livestock, or tourism sectors—sectors highly vulnerable to climate change—and most will likely require additional support to cope with long-term impacts on their industries. MSEs also account for a significant part of global supply chains in many of these sectors. The timing of actions to help these businesses is very sensitive because adaptation costs will increase alongside increasing climate impacts.

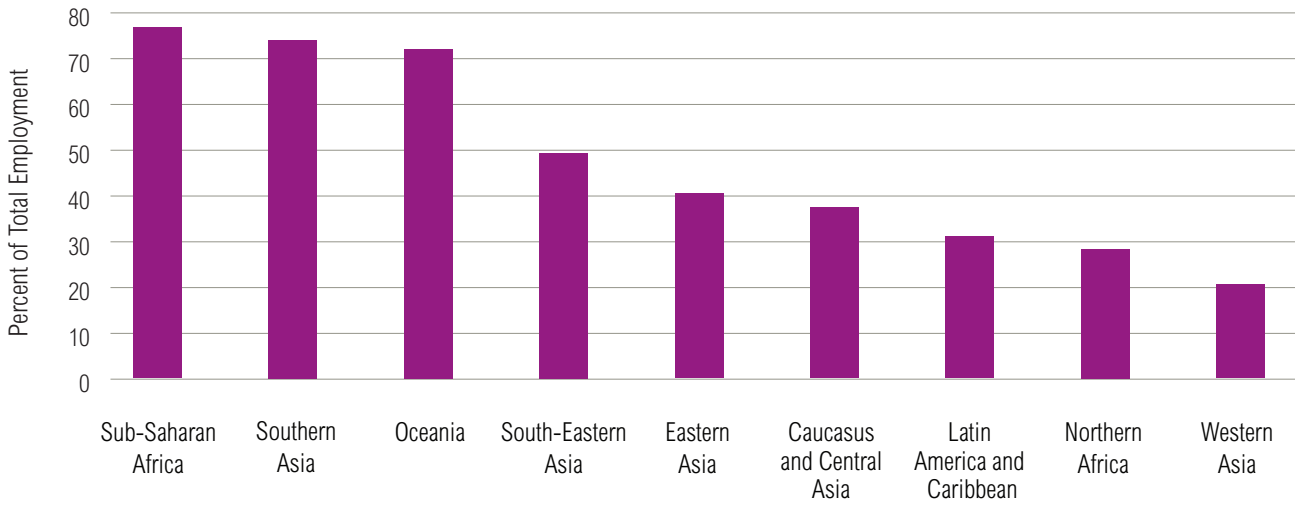
The agriculture sector has the highest concentration of MSEs in developing countries (World Bank 2012) and is expected to be the most damaged by the impacts of climate change (Oxfam et al. 2012). Among least developed countries, agriculture accounts for between 30 and 60 percent of GDP (UNDP and FAO 2007). This sector employs approximately 60 to 80 percent of the labor force in low-income countries, where many workers live in rural poverty (IFC South Asia 2014).

The agriculture sector depends heavily on water and soil resources, and on environmental factors

BOX 2 | DEFINITION OF VULNERABILITY

The term vulnerability refers to states of susceptibility to harm, powerlessness, and marginality of both physical and social systems (Adger 2006). In the context of climate change, vulnerability is the degree to which geophysical, biological, and socio-economic systems are susceptible to adverse impacts of climate change (IPCC 2007). Typically, poverty and vulnerability are correlated.

Figure 1 | **Proportion of MSE Employment to Total Employment, 2014**



Note: Micro enterprises represent workers working on their own account (self-employed) or with one or more partners, and contributing family workers, including unpaid family workers.
Source: Millennium Development Goals Report 2015, statistical annex

determining the local climate (Barbier 2007; Stern 2007). Farming communities rely on successful harvests for their livelihoods. A large part of the income from agricultural activities ends up in the local economy, thus driving economic growth and development efforts. However, the natural resources that sustain the sector are susceptible to the impacts of climate change through both extreme events and gradual changes in weather patterns. If business owners do not take steps to respond to these changes there is a high probability that yields will fall dramatically (World Bank 2013a). Unlike agricultural MSEs in industrialized countries, those in developing countries rarely have access to insurance for protection against poor harvests caused by bad weather. Supporting local MSEs in the agriculture sector as they adapt to climate change is important, not only for global food security, but also to sustain livelihoods in the most vulnerable communities (Mendelsohn et al. 2007).

It is encouraging that many MSEs are already adapting to climate change in response to observed short-term risks. Because agriculture is one of the most important sectors for vulnerable communities, most adaptation interventions to date have been in this sector. MSEs are reforesting land, utilizing soil conservation techniques, experimenting with new crops and drought-resistant seeds, irrigating fields, and adjusting planting periods to the new climate (Benhin 2006, Deressa 2008, Kala et al. 2012, Fleischer and Kurukulasuriya 2012, Waha et al. 2013). They have knowledge of local conditions and have been adapting to changes in the climate for centuries.

MSEs Have Limited Capacity to Assess Climate-Related Risks and Opportunities

MSEs are agile and innovative, and are therefore capable of considerable adaptation. They have relatively flexible business models, and a short investment horizon, and they can respond to new risks and opportunities more easily than some larger businesses. In contrast, larger businesses often have significant capital investments and well-established processes that cannot be changed quickly. The nimbleness of small enterprises makes them instrumental in increasing vulnerable communities' adaptive capacity (Seo et al. 2008).[6]

Nevertheless, the capacity of MSEs to invest in adaptation has limits in practice, especially when confronted by gradual changes in the climate or extreme weather (Wilbanks et al. 2007). Some of these changes, such as slowly decreasing yields, are very gradual, not always noticeable and therefore not on the strategic-planning or risk horizons of MSEs. MSEs often lack the awareness, information, and assessment tools that are necessary for planning and making investment decisions. Even where risks are evident, MSEs are still inclined to postpone managing distant risks such as climate change, when confronted with more immediate risks such as harvest failure, famine, and illness (Jewitt and Baker 2012). As a result, investment in long-term climate change adaptation is often a low priority for MSEs in poor communities.

Many MSEs also do not have enough organizational capacity to analyze risks that appear to be outside the scope of their main business activity (Ingirige et al. 2008). The costs of investing in analyzing and acting on climate risks and opportunities resemble those of the "innovator's dilemma" (Christensen 1997). Without clear or sufficient incentives to invest in adaptation, there is a mismatch between changing climate and businesses' behavior (Linnenluecke et al. 2011) and, ultimately, underinvestment in climate risk management and in the opportunities that come with climate change. MSEs therefore need support to better understand long-term climate risks, and incentives to invest in adaptation.

Given these issues and challenges, there is considerable scope to increase the contribution that MSEs can make to adaptation. With public assistance, these businesses could directly strengthen adaptation in vulnerable communities. The following sections describe the different elements that policymakers need to take into account when designing policies and interventions to catalyze MSE investment in adaptation.

Objective and Outline of the Report

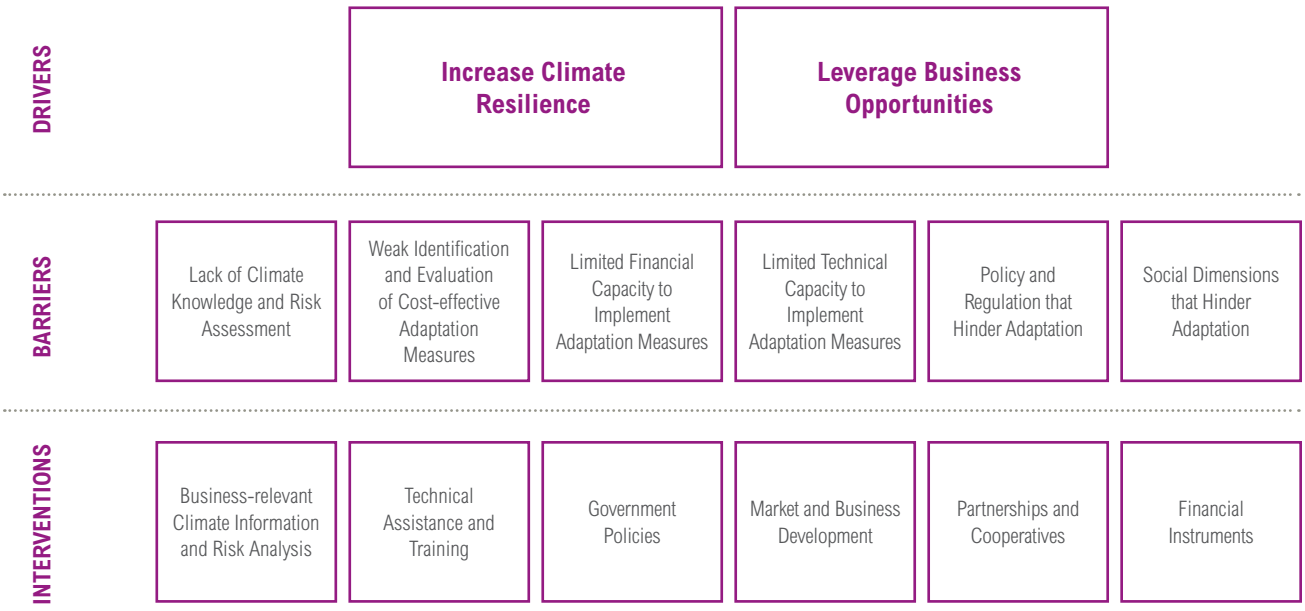
This report aims to influence policymakers, development partners, and climate funds to support and design policy interventions that unlock, catalyze and/or direct investments by and for MSEs in ways that take into account climate change risks and opportunities. It provides guidance to help policymakers design interventions that can be incorporated into their national adaptation planning and long-term development planning.

The report draws on real-world projects, as well as a growing body of research on private sector adaptation. It shares examples from case studies of interventions in Cambodia, Nicaragua, Tajikistan, and Zimbabwe. The interventions focused on catalyzing MSE investment in climate adaptation measures in the agriculture sector (see Annexes 1 to 4). The choice of case studies was determined by the desire to reflect regional diversity as well as the availability of concluded evaluations or reviews. The report also presents a number of shorter case studies that highlight the engagement of the private sector in adaptation, as part of projects and initiatives in Benin, Cook Islands, Ethiopia, Honduras, India, Namibia, Rwanda, and Tanzania. Most adaptation projects that target the private sector are still in the process of implementation or under development, making results difficult to assess or predict. Therefore, there are only a few cases from which we can draw lessons at this time.

The section "Drivers of Investment in Adaptation" describes the drivers behind MSE investment in climate-resilient business practices. "Barriers to Investment in Adaptation" focuses on the barriers that MSEs commonly face when trying to become more resilient. "Interventions to Catalyze Business Investment in Adaptation" suggests a number of interventions that policymakers can make to engage MSEs and encourage them to reduce their risks to climate change and invest in new techniques and business opportunities. "Principles for Engaging MSEs in Adaptation" presents a set of principles, which might serve as a guide for policymakers when designing interventions geared toward catalyzing MSE investment in climate-resilient business practices. Some conclusions are presented in the final section.

Because the design of interventions depends largely on contextual factors, the report does not seek to be prescriptive. Rather, it provides a suite of examples and potential interventions for policymakers to consider as they seek to address the barriers that currently inhibit MSEs from investing in adaptive measures and in products and services that will both support their own resilience and promote adaptation to climate change at scale. Additional country-specific research and cost-benefit analyses will be required to draw conclusive lessons.

Figure 2 | **Overview of Drivers, Barriers, and Interventions to Catalyze MSE Investment in Resilience at the Global to the Local Level**



DRIVERS OF INVESTMENT IN ADAPTATION

To effectively engage businesses on the topic of climate change and adaptation, policymakers need a good understanding of what businesses are already doing in response to (or in anticipation of) climate-induced changes. Policymakers need to take into account the level of skills, expertise, and knowledge that exist in the business sector and locale in question. Businesses will be motivated to invest in adaptation when they can see the impacts of doing so on their bottom line. Regardless of how the bottom line is defined—whether in terms of financial profitability or other objectives—private actors will logically seek to maximize their returns by exploiting opportunities, including those that emerge as a result of changing climate conditions.

Generally, businesses make investments in adaptation for two primary reasons:

- To increase the climate resilience of their business
- To harness new opportunities arising from a changing climate

Policymakers who wish to incentivize micro and small businesses to adapt need as thorough an understanding as possible of the effects that climate change will have on these particular businesses. This is necessary in order to design effective policies as well as provide the necessary incentives to internalize risk management practices and/or encourage the production and diffusion of risk-management-focused products and services. This section examines the two key reasons why MSEs might be motivated to increase their resilience in the face of climate change.

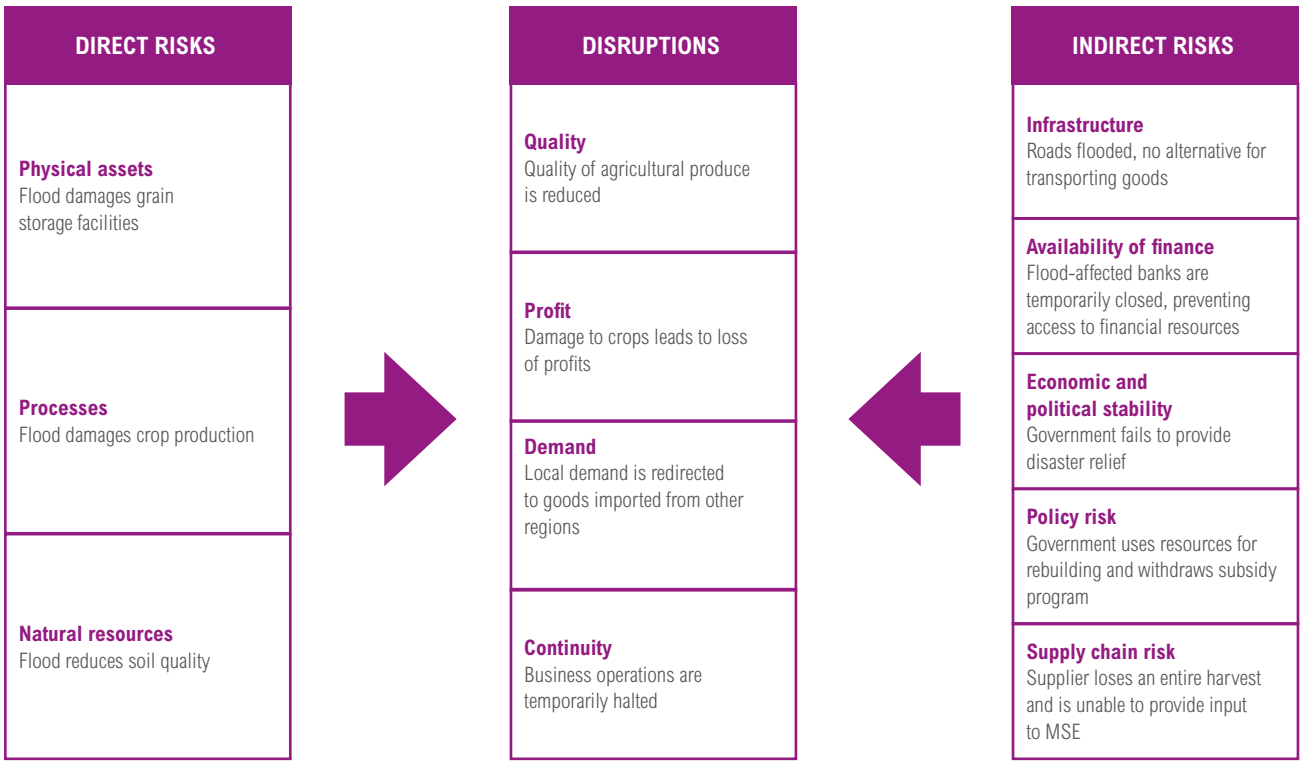
Increase Climate Resilience of Businesses

Climate risks faced by MSEs can be categorized in two ways, namely, direct risks and indirect risks (see Figure 3 for an example of direct and indirect risks arising from a flood event and the resulting impacts on an agribusiness).

Direct risks are risks related to assets and processes that are under the control of the MSE owner. These are risks of adverse impacts on physical assets such as damage to stores and factories; impacts to processes such as flooding in an artisan's workshop that halts production; and impacts on natural resources on which the business relies. In the case of MSEs in the agriculture sector, natural resource impacts include negative changes in water availability, soil moisture, air temperature, soil temperature, and soil quality (Reilly et al. 1996).

Indirect risks are influenced by disruptions to infrastructure, availability of finance, economic and political stability, policy risk, and supply chain risk. Indirect risks are difficult for any MSE to influence or avoid on its own. Benefits that come from acting on these risks are, by nature, indirect because they are diffused among the business that takes action and other stakeholders and companies.

Figure 3 | **Direct and Indirect Risks of a Flood Event to an Agribusiness**



MSEs need to increase their climate resilience in order to limit negative effects on the quality and availability of goods and services produced (which affect their supply chain), and on anticipated profits, both current and long term. It is already clear that MSEs will be driven to take action to keep internal operations functioning in the face of extreme or gradual weather events. For instance, after the 2001 floods in Thailand, Western Digital—a maker of computer hard drives—moved some of its operations to Malaysia and increased flood protection around its plant near Bangkok.[7] At the smallholder scale, similar adjustments take place. To prevent repeated crop failures, MSEs have invested in drought-resistant or flood-resistant seed varieties. For example, in Cambodia, with the support of UNDP, agricultural MSEs adopted scientifically improved seeds, which ultimately improved yields and profits (see Box 3).

Adaptation is intended to reduce vulnerabilities to future impacts of climate change; it therefore entails long-term planning. However, in some instances businesses might tend to look for cheaper, short-term adaptation options that bring immediate benefits but might actually increase vulnerability over time. Therefore, it is critical that businesses assess both short- and long-term risks and undertake cost-benefits analyses involving longer horizons.

Building up climate resilience of businesses can produce spillover effects that increase the adaptive capacity of the community. Climate-resilient investments on the part of MSEs can benefit employees, their families, value-chain actors, and other more indirect beneficiaries, all of whom might enjoy greater stability of income and livelihood. The community at large also benefits when MSEs become more resilient, because they are then more likely to support community organizations, or provide

BOX 3 | CAMBODIA: REDUCING RISKS FROM FLOODS AND DROUGHTS WITH RESILIENT RICE CULTIVARS[8]

Sorn San had some doubts when asked to try new rice seeds that were thought to be capable of withstanding harsh weather conditions. After consulting his wife, the 63-year-old Cambodian farmer decided to allocate two 100-square-meter plots in his paddy field to the new seeds. The seeds for the trial were provided by Cambodian Agricultural Research and Development Institute (CARDI), a semiautonomous government institution.

Five months later, in December 2010, Sorn San harvested the crop and declared the trial a success. What impressed him most about the seed varieties—CAR3 and CAR4—was that they had stronger and taller stems and gave higher yields than traditional varieties.

Sorn San's family was among the 15 households in the Kratié province that recently volunteered for the On-Farm Adaptive Trial (OFAT), an experiment with rice seed varieties that are more resilient to floods and droughts. The intervention is supported by UNDP, with funding from the Least Developed Countries Fund (LDCF).

The 15 households live in the Bos Leav commune, which is situated in the upper part of the Mekong River. The area is no stranger to floods in the rainy season and droughts in summer, making it ideal for testing the seeds.

Sorn San reports that he is pleased with how the new, scientifically researched seeds have performed: "I got 34 kg from the CAR3 seed and 45 kg from the CAR4 seeds. I usually got less than 30 kg from traditional seed on the same area of land." Sorn San says his family was lucky to be chosen to test the new seeds. "Many farmers nearby asked me if I could share the seeds with them." Cambodian Agricultural Research and Development Institute (CARDI) provided training in seed purification to Sorn San so that he does not need to buy the seeds on the market every year.

Sources:
UNDP. 2012. Annual project report 2011 – Promoting Climate-Resilient Water Management and Agricultural Practices in Rural Cambodia (NAPA Follow-Up).
LDCF Project Highlights (http://www.thegef.org/gef/content/cambodia-promoting-climate-resilient-water-management-and-agricultural-practices-rural-cambo).

in-kind services and goods to social causes (Jeppesen et al. 2012). In the Cambodian case (Box 3) the use of resilient seeds by MSEs directly benefited the community by increasing the availability of high-quality food, which is scarce in times of flood and drought. Similarly, with a loan from IFAD, the government of Kenya formulated The Mount Kenya East Pilot Project for Natural Resource Management. The project benefited the nearby community by providing improved access to water, which allowed more intensive crop production and increased yields (IFAD 2013). When policies contribute to overall development while addressing risks associated with climate change, they directly address adaptation and make communities more resilient.

Leverage Business Opportunities Arising from Climate Change

Climate change could represent an opportunity for MSEs. Demand for new technologies, products, and services will increase, and new markets will emerge. MSEs engaged in developing products or services that can support, facilitate, or advance adaptive practices could gain a financial or strategic advantage. For example, as crops fail during droughts, floods, and storms, the market for crops that thrive under changing climate conditions can be expected to expand. Latent market opportunities, financial incentives, or mandatory drivers such as regulations, value-chain requirements, and standards all encourage businesses to innovate.

MSEs typically operate at the "bottom of the pyramid," close to poor and vulnerable communities that are most impacted by climate change. Business opportunities exist in providing access to technologies, products, and services to communities (for example, climate-risk information and market information on mobile phones, risk-insurance products, and drought-resistant seeds); investing in ecosystem-based adaptation (for example, community-based wood lot management, and sustainable forestry-based enterprises); and co-venturing with local communities (distribution/sales networks, diversified supply chains, access to finance, etc.).

BOX 4 | ZIMBABWE: CONNECTING SMALL BUSINESSES TO LARGE COMPANIES

Resilient value chains will benefit both large and small companies as they face the growing disruptions of climate change. In Zimbabwe, for example, a beer-brewing company played its part in adaptation, with respect to red sorghum farming in the Chiredzi district. The brewery produced beer with small grains such as red sorghum, which are more climate resilient than the crops typically grown in the region. As a result, red sorghum production has grown considerably.

By making new products and services available, or extending existing products and services into new areas, MSEs can ensure some level of growth in the face of climate change. Businesses could also gain a market advantage from investing in new resilient products or processes. At the same time, local communities gain improved access to technically and financially accessible adaptation options. For example, in communities prone to drought, a business owner might sell rain barrels made of recycled products, promoting water-saving techniques. MSEs, business associations, or cooperatives are particularly well positioned to promote adaptive practices in their communities, among customers, employees, and members. Shop owners, for example, play a central role in most communities, and tend to know their customers personally. This close relationship gives them the chance to inform their customers about resilient goods and services, or relay information on weather and on practices that reduce the impact of flooding or drought.[9]

Some small enterprises have had success introducing new adaptation products into local and national markets. For example, in Zimbabwe, a brewery developed beer products using red sorghum, thereby stimulating demand for these resilient small grain varieties (see Box 4). Other businesses are also redesigning current products to prepare for future weather changes. For example, because cassava is more drought-resistant than maize or rice, street vendors, restaurants, and even breweries in

Coordinated and clear policy actions and regulations can also help to drive climate-appropriate investments by MSEs.

Africa[10] are starting to incorporate more of this root vegetable into their food and beverage products (Sanni et al. 2009).

In urban areas where recurring flooding is an issue, sanitation businesses are redesigning pit latrines. For instance, Biofil Digester, a sanitation company located in Ghana, builds pit latrines above ground in areas where flooding occurs. Additionally, their pit latrines produce biofiltered water that owners can use on gardens and orchards to grow extra food, thereby helping to improve food security.[11]

Policy Change Can Catalyze Private Sector Investment in Adaptation

Coordinated and clear policy actions and regulations can also help to drive climate-appropriate investments by MSEs. For example, enabling access to climate risk information as a public good and supporting investment in climate risk modeling in specific sectors (investment both in tools and in capacity building) can help MSEs to improve their risk management. Governments can stimulate markets through policy incentives for innovation, which lower the investment risks taken on by MSEs.

The use of financial instruments to correct market inefficiencies is another direct way to incentivize MSEs. When market inefficiencies are clearly identified, then targeted subsidies that remove those inefficiencies can be applied, at least in the initial stages, to reduce the costs of adaptation and lead to more firms investing in adaptive measures. Use of targeted tax credits or deductions can also result in businesses investing more in adaptation. For example, a business that implements a reusable water system might receive a tax deduction, because of the positive externalities on society. The United States Internal Revenue Service provides a tax deduction to small farmers who have an approved water conservation plan through the Natural Resources Conservation Service of the Department of Agriculture (IRS.gov 2013). However, these macroeconomic policies will be most effective if businesses operate in the formal economy.

Governments can directly increase investment in adaptation through regulations, provided that there is a well-functioning mechanism to enforce them and the regulations are well designed. In agriculture, property rights and land-use rights are vital to smallholder operations. A clear system of property rights facilitates investment in irrigation or other improvements and ensures farmers' control over the land, which tends to limit degradation. In the construction and land-use planning sectors, building codes and zoning ordinances are examples of regulations that can drive businesses toward upgrading their operations or preventing them from inhibiting the adaptive capabilities of local communities. For example, creating zoning ordinances that require businesses to build a certain distance away from the beachfront can protect businesses and local communities from storm surges or sea level rise (Kousky et al. 2011).

The relevant set of policy and regulatory mechanisms to drive MSE investment in adaptation should be identified in consultation with business representatives from the sector in question. If there are clear incentives for MSE investment in adaptive measures, such as reduced exposure to risk, but MSEs are not investing, then government intervention could be necessary. The first step for policymakers is to identify barriers that might be holding MSEs back from taking action on adaptation.


500
Five Hundred Naira
Central Bank of Nigeria
₦500
500

BARRIERS TO INVESTMENT IN ADAPTATION

MSEs in different countries and economic sectors face multiple and varied barriers to investment in adaptation. This section discusses some of the key barriers that need to be addressed to strengthen the resilience of MSEs in developing countries. Corruption and public sector inefficiencies that affect the general business environment are not within the purview of this report.

Based on the findings from the case studies and literature review,[12] the barriers that prevent businesses from engaging in adaptation can be grouped into six categories, namely:

1. Lack of awareness and knowledge of climate risks
2. Limited availability or knowledge of adaptation options
3. Lack of technical capacity to implement
4. Lack of financial capacity to implement
5. Policy and regulation that hinder adaptation
6. Social attitudes toward adaptation

Climate Knowledge and Risk Assessment

Surveys show that most medium and large companies in Europe and the United States are increasingly aware of the risk that climate change poses to their business (Metcalf et al. 2010; UN Global Compact 2011; IFC and EBRD 2013; CDP 2014a; CDP 2014b). A survey in the United Kingdom found that smaller companies tend to be less aware of climate risks than their larger counterparts (Howe 2011; Ballard et al. 2013). Comparable surveys from Africa, Asia, and Latin America do not exist, but it is likely that awareness of long-term risks among MSEs in these countries is equally low or lower, when compared to larger businesses in the same countries.

Poor information—information that is unavailable or inaccessible—about the risks and uncertainties that are relevant to the scale and location of MSE activity makes it difficult for businesses to incorporate these risks in their decision-making. Investing in adaptation requires understanding how a specific industry or sector, in a specific place, is likely to be impacted by climate change. It requires the technical ability to assign probability to the risks associated with climate change impacts, to weigh alternative risk reduction options, and to determine the most cost-efficient and cost-effective options for that sector and geography.

An important consideration when it comes to MSEs is that smaller businesses often make costs with relatively short payback times (Danielson and Scott 2006).[13] This makes them flexible but also limits their perspective and reduces the likelihood that they will invest in adapting to long-term climate change. Even when relevant climate information is available and risk awareness is high, MSEs find it

BOX 5 | ZIMBABWE: CLIMATE KNOWLEDGE

Information on weather and climate patterns is important for the vast majority of farmers in Zimbabwe, who rely on rainfall. Rain-fed agriculture accounts for 95 percent of food production. The productivity of rain-fed crop farming in Chiredzi is low and very sensitive to rainfall fluctuations.[14] Because rainfall patterns are erratic, farmers find it difficult to predict the timing of seasons or plan for these seasonal changes; they often lose much of their harvest as a result. Climate sensitivity analyses have found that climatic factors in Zimbabwe significantly constrain agricultural production by smallholder farmers.[15] Access to accurate meteorological information is a particular weakness. Deficient telecommunications infrastructure in rural areas remains an issue. Even when new adaptation technologies are available in the country, most farmers in remote areas have limited access to information; they have no access to radio communications or newspapers.[16] In addition, literacy rates are low among farmers, especially women, who make up approximately 70 percent of smallholder farmers.[17]

The intervention, implemented by the Zimbabwean Environmental Management Agency, with assistance from UNDP and the Special Climate Change Fund, installed eight weather stations and developed a customized rainfall forecasting system to assist farmers in Chiredzi. As a result, those farmers can now plan for climate variability and extreme events. There have been visible improvements in crop cycle planning, drought preparedness, and adjusted farming practices to protect yields from low-rainfall seasons.

difficult to incorporate this information into practical business planning. Danielson and Scott (2006) also found that many MSEs make investments based on "gut feeling." This suggests that, when MSEs make investment decisions concerning risk management, sectoral trends, horizontal learning, demonstrations, and investments made by competitors are more important signals than net-present value calculations or other economic tools used to measure the costs and benefits of investments.

MSEs have limited tools and capacity to undertake risk-benefit assessments to support investments in climate-related risk reduction or new business opportunities. Providing business owners with a high-level analysis of sectoral risks is not enough, because such information is not necessarily actionable—especially in the case of climate change where the specific timing and location of impacts are so uncertain. Information about climate risks must therefore be available to businesses in a format that is understandable and actionable. In Zimbabwe, agricultural MSEs struggled to plan for rain-related weather events until (perhaps for different reasons) the public sector, with external development assistance, installed a higher density of weather stations to provide better information about upcoming local weather events (see Box 5). Such information should be coupled with guidance on what actions businesses can take to reduce their vulnerability—with an emphasis on the effectiveness of these actions (Howe 2011)—and the benefit of the investment for the business owner (Turpie et al. 2014). In the agriculture sector, especially, such horizontal learning from investments made by other MSEs would enhance the spread of adaptation options among communities (Conley and Udry 2008).

Cost-Effective Adaptation Measures

Adaptation options must have attractive risk-reward profiles, be cost-effective at a small scale, and be competitive against non-adaptive options with regard to price, operating costs, or sustainability of production. Businesses will not invest in an adaptation measure—especially when there are high, upfront investments—unless there are clear benefits in terms of increased resilience and/or profitability. MSEs may find that investing in increased climate resilience requires adaptation measures that are not within their scope of action (for instance, early warning systems, which are largely public goods) or necessitates costly infrastructure that does not make financial sense to purchase on their own.[19] Even when MSEs are aware of and can assess climate risks, they need to have the skills and ability to identify and evaluate viable adaptation measures. Knowledge is limited

BOX 6 | BENIN: GENERATING ALTERNATIVE INCOMES THROUGH RABBIT BREEDING AND CREATING NEW MARKETS

More frequent and severe floods in Benin have impacted vulnerable communities, especially in the fisheries sector, and led to reductions in their incomes. In response, UNDP partnered with the Department of Livestock and assisted MSEs in the livestock sector to develop rabbit breeding facilities on elevated platforms where they would have protection from the increased frequency of flooding. In addition to realizing an alternative income during periods when fishing cannot be undertaken, the diversification of economic activity has also created a new local market for rabbit meat and begun to transform the local economy of the village. This intervention was possible only because of resources from the LDCF and the Government of Benin, as well as contributions from beneficiaries themselves.[18]

32-year-old Beatrice Dossou, married with two children, is one of 10 rabbit breeders supported in the village of Sèhomi, a commune of Bopa. In July 2013, she received 10 two-month-old breeding rabbits (two males and eight females) and livestock equipment, including hutches, boots, a wheelbarrow, and a thermometer. Beatrice was trained in rearing rabbits. After five months of activity, Beatrice is reaping the fruits of her labor. In total she has sold 45 rabbits and made 125,000 CFA francs (approximately USD$300). The money generated by this first sale provided the means to cover important expenditures such as the school fees for her children, which would not have been affordable had she continued to rely on fishing alone.

and few tools are available for cost-benefit analyses of location- and time-specific adaptation measures.

If adaptation measures are to drive potential opportunities, owners of MSEs need to know what options they have and why they would benefit from investing in adaptation. For example, if farmers are accustomed to growing certain crops year after year, they can be reluctant to plant alternative crops unless they can see the potential business benefits. Sensitizing local communities is a powerful way to convey information about alternative crops that are more resilient in their locality, and that could bring in more revenue year-round. Such was the experience in Benin, where a UNDP-supported intervention helped business owners adopt new business models to move away from highly climate-sensitive industries. Now former fishing businesses have learned about and switched to rabbit breeding. The support offered for this transition involved a number of actions including initial upfront training and start-up materials to engage in this new business (see Box 6).

Financial Capacity

When a business case is made for adaptation and MSEs have the capacity to understand and assess risks and viable adaptation options, limited financial capacity can still impede implementation of adaptation measures. According to the International Finance Corporation (IFC), small and medium enterprises worldwide face a US $2.1 to US $2.6 trillion gap in financing. Put another way, roughly 200 to 245 million formal and informal businesses need loans, insurance, and credit, but are unable to access these financial and risk management instruments (Stein et al. 2010).

As noted before, some adaptation investments involve large upfront costs, relatively long payback time, and uncertainties related to climate impacts. Consequently, banks and other financial intermediaries can be reluctant to invest in adaptation because the risks of lending appear too high. In rural areas, banks themselves might not have the policies or technical ability to assess these kinds of risks. Therefore, the capacity of bank employees in developing countries can also be a significant barrier to businesses accessing finance to invest in adaptation.

In addition, commercial banks can be risk-averse when it comes to new MSE investments because contract enforcement frameworks in many low- and middle-income countries are ineffective (World Bank 2010). Many countries have weak judicial systems, where the rules of the market and economic rights are not effectively upheld (World Bank 2015). When contracts are not protected under the legal system, banks and other businesses are less likely to conduct business transactions. In such countries, the private sector is often less developed and grows more slowly than in countries where a strong contract enforcement framework is in place.

Ultimately, in sectors where all these risks (both direct and indirect) are priced into financing costs, the financing costs of equity and debt tend to be relatively high. These high costs can limit investments in adaptation. This leaves MSEs with few financial services options and makes business owners focus more on short-term survival and less on long-term resilience and profitability. Innovation related to climate-resilient technologies and services is subject to even higher risks and financing costs because the policies and regulations, research and development capacity, commercialization incentives, and market linkages for such technologies are in their infancy in most developing countries. Coupled with lack of technical capacity, MSEs will face major challenges to developing climate-resilient businesses.

It is already well recognized that most MSEs, be they formal or informal, have to rely on social networks and family members for small loans and start-up cash (Dalberg 2011). Existing banking structures in low- and middle-income countries do not always reach rural villages, they might not support microfinance, and many banks charge smaller enterprises higher interest rates and fees (Stein et al. 2013). During the development of new products and services, the type of finance required changes over time. Initially, there is usually very little money for research and development of new products and services in developing countries (Grueber and Studt 2013; Naseem et al. 2010). Furthermore, the development of an idea into a prototype is often risky, because there is a high chance that the product or service will fail. Lastly, MSEs often have few assets that can be used as collateral. These three issues make it hard for businesses to access finance in the early stages of product and service development, and they limit the commercialization of new products and services.

BOX 7 | NAMIBIA: LACK OF AFFORDABLE CREDIT AND MARKET ACCESS

The terminal evaluation of the UNDP-supported intervention in Namibia to promote the production of guinea fowl highlighted the lack of finance and market access as barriers to economic sustainability.[20] The review noted that, because of these factors, the pilot activities on crop and livestock farming are unlikely to be sustained or scaled up. For example, while the intervention secured livelihoods by developing guinea fowl products, "little has been done to develop sales and marketing channels." As a result, most beneficiaries sold their eggs to individual farmers or in informal markets.

Similarly, for most farmers, the start-up costs needed for an investment in drip irrigation, estimated at US $11,000 for one to two hectares, were prohibitive for many smallholders. Currently, no financing scheme exists to reach these smallholder farmers and reform of existing financing schemes and identification of viable financing models would be required.

The same problem applied to the introduction of plastic granaries. These granaries provide better protection against loss and diseases, which might increase because of climate change. However, current financial barriers were too high to allow investment in these granaries. The evaluation therefore recommended developing a subsidization mechanism in the form of a (soft) loan so that farmers can purchase the granaries on credit or at reduced rates.

Source: MAWF 2012.

In Nicaragua and Namibia, the financial capacity challenge played out in a couple of adaptation interventions. In Nicaragua, lack of finance was a major challenge to supporting MSEs in the development and implementation of agro-ecological transformation plans. An intervention supported by UNDP improved MSEs' business models. However, it did not improve the formal credit or banking system that serves MSE owners in rural areas. Without access to finance, MSEs are not able to make the investments that are needed to implement their plans (see Annex 4). In Namibia, MSEs were unable to develop the production of crops and livestock (such as guinea fowl) because of a lack of credit and market access, which limited their choices in terms of sustainable livelihoods (see Box 7).

Technical Capacity

In addition to understanding climate risks and available adaptation options, MSEs must also have the technical capacity to implement adaptation options that will climate-proof their operations. Adopting new business processes, developing new products or services, and implementing new practices and technologies for increased resilience often involve technical skills that require upfront investment.

First, new business processes and operations require systematic planning if they are to be both climate-resilient and profitable investments. New systems require technical knowledge that MSEs in developing countries might not be able to access. The diffusion of relevant technical and operational knowledge could greatly benefit owners of MSEs who try to integrate climate change risks into their businesses.

Second, MSEs might have promising business ideas but find it difficult to develop a credible business model for full-scale commercialization of their product (PwC 2013). Development of new products and services, in particular, requires specific skills and knowledge of how to guide and implement the process from idea to commercialization that are often not readily supported in developing countries.

Third, capacity constraints can discourage MSEs from adopting new climate-resilient practices and technologies in their business. For instance, technological options in the agriculture sector have been shown to improve productivity. However, without capacity building and proof-of-concept, MSEs will not be willing to invest or indeed may not even know that such investments are possible. In Ethiopia, several approaches were tried in various states to show MSEs the benefits of new crops and how to build the expertise needed to grow them (see Box 8). Various kinds of enterprises and associations between farmers provided the training and resources necessary to diversify their incomes and become more resilient to climate change. Such experimentation is vital to develop cost-effective, locally adapted solutions.

BOX 8 | ETHIOPIA: PROMOTING AUTONOMOUS ADAPTATION IN COMMUNITIES

The Promoting Autonomous Adaptation (PAA) project, funded by the Least Developed Countries Fund (LDCF), is working in four regional states in Ethiopia. The project established green enterprises for farmers who want to undertake climate change adaptation actions within their locality.

In Oromiya regional state, 17 farmers became members of the Batu Keltu Irrigation Water Use Association. They benefited from the enterprise's efforts to introduce solar pumps, the provision of drought-resistant seeds, and the organization of successive skills trainings on climate-smart agriculture. With an investment of US $1,380 in new techniques, the farmers generated US $3,480 in one season, largely due to increased sales of maize and tomatoes. This enterprise helped support their community's livelihood through income diversification.

In Tigray Ederta regional state, the establishment of the Maichelfo Small-Scale Irrigation Farmers Association has benefitted 54 farmers through small irrigation projects and the production of a variety of vegetables. This intervention is generating diversified incomes for the community, strengthening their resilience to climate change. Thanks to this intervention, wheat production has greatly increased, from 12 quintals per hectare to 35 quintals since the project began. The project also introduced multiple cropping using Irish potatoes, carrots, and cabbage.[21]

In addition to improved cropping, this intervention established fattening associations for livestock and animal farming. The 46 beneficiaries—24 of them women—benefited from increased sales of oxen and education on new livestock-farming techniques in fattening. The Freyat Dairy Farming Association helped increase incomes, too. The association purchased six cows, each producing 30 liters of milk a day, which sells at the market for US $87 per day. That income rapidly covered the initial investment in the cows of US $6,391.

In Gambela regional state, the intervention established a green enterprise to support 34 youth farmers to grow fruits and vegetables. The farmers received training on agricultural practices and small-scale irrigation management. They subsequently planted 600 banana seedlings on six hectares of land, which was donated by the district. In one season, they harvested 1,200 bunches of bananas, which sold for more than the initial capital investment.

In Benishabgul Gumuz regional state, the intervention helped establish the Balbel Kerim Irrigation Youth Association, comprising 85 members. The association initiated trainings in climate-smart agriculture, installed solar pumps, and provided improved sorghum seeds, vegetable seeds—such as red pepper, onion, and tomato seeds—and improved varieties of banana plants. The project also supported access to nine hectares of land for planting. During the first harvest, teff and sorghum crops generated US $3,147 in revenue, largely exceeding the initial capital of US $823.

Various kinds of enterprises and associations between farmers provided the training and resources necessary to diversify their incomes and become more resilient to climate change.

BOX 9 | INDIA: OVERCOMING DEPENDENCE ON GOVERNMENT SUBSIDIES FOR IRRIGATION

Jain Irrigation Systems, a large private company based in India, attempted to market drip irrigation technologies in India's water-stressed regions as a water-saving technique. The company viewed drip irrigation as an important tool to alleviate poverty in these areas and reduce the use of groundwater. However, despite the failing irrigation infrastructure in several regions, farmers are not willing to invest in new technologies such as drip irrigation. This is because of the widespread use of small-scale water pumps that run on subsidized energy. Farmers have little incentive to invest in expensive equipment to save water, even though the low cost of operating pumps, coupled with poorly defined groundwater rights, has led to an unsustainable increase in the use of groundwater.

Jain experienced another constraint on the introduction of drip irrigation. Although the government subsidized investment in drip irrigation by 50–90 percent, payments from the government to Jain for equipment already sold were very slow to arrive. This put an enormous strain on Jain's working capital. In 2012, Jain invested in its own non-banking finance company (NBFC) in an effort to provide credit to the agriculture sector. The NBFC will lend to farmers so that Jain gets the full price at sale. The farmer then assigns the subsidy to the NBFC. The NBFC will take some pressure off Jain's balance sheet, and Jain will be able to pass the benefits of lower working capital loans to farmers. Jain hopes that this will alleviate the financial strain that is slowing down sales.[22]

Policy and Regulation

Given limited information and financial and technical capacity, government institutions can play an important role in encouraging adaptation practices, incentivizing investments, and communicating information and knowledge to local businesses. However, in many developing countries, national and local government institutions struggle with formulating and implementing policies for climate change adaptation. While many governments have committed to climate change adaptation as part of their development strategies, private sector engagement is limited in sectoral planning and budgeting at the national and sub-national levels. MSEs, in particular, are absent from these exercises.

Uncoordinated and unclear inter-sectoral policies can frustrate adaptation efforts by the private sector. For example, pricing subsidies for water can result in low costs to the consumer but high costs to society. This often leads to wasteful use, especially in the agriculture sector, depletion of the resource, and potential loss of livelihoods in the event of extreme weather changes. For example, in India, a combination of water policies, energy subsidies, and non-payment of subsidies by the government made it difficult for a large private enterprise in India to introduce and scale up a water-saving adaptation option. Jain Irrigation Systems brought to market its drip irrigation technology, but found it difficult to become profitable in drought-stricken areas of India because farmers were paying very low prices for water. They did not see the benefit in investing in drip irrigation technologies (see Box 9).

Other examples of government policies that can hinder investment in adaptation are policies that mandate specific land uses, which can limit possibilities for crop diversification (Knox et al. 2010). In the Philippines, there are various examples of indirect and direct subsidies that increase the vulnerability of people, including subsidies that promote development in high-risk areas or conversion of forests or watersheds to other uses (IBRD 2013). Identifying and removing policies that have negative consequences can change incentives on both the supply and demand sides of adaptation technologies and increase the financial attractiveness of adaptation activities (Kato 2014).

The presence of counter-productive policies that discourage adaptation can thus be an obstacle to business investment (IFC and EBRD 2013). Without a clear national adaptation policy that describes the government's intentions and activities for the long term, there can be uncertainty over legal and regulatory implications as well as uncertainty about investment incentives. However, national and sub-national governments and institutions are themselves often hindered by lack of technical and financial capacity to mainstream climate risks in policies, regulations, and investment decisions.

Social Dimensions of Adaptation

Adaptation to climate change is a process influenced by more than just financial and technological development. Class, gender, and culture also play a large role when deciding whether to implement one adaptation option rather than another. Although often overlooked, the social context can be a significant barrier to adoption of new technologies and production methods. Adaptation is often viewed as a behavioral change that will alleviate climate impacts or open new windows of opportunity (Nielsen and Reesberg 2010). Because people's decisions are influenced by social factors, such as gender, class, or race, the adaptive capacity of individuals varies considerably.

In the 2014 *World Disasters Report*, the authors analyze complex issues of culture and how they can hinder disaster preparedness. The report provides numerous examples of how culture affects risk perception and risk management and proves to be a significant barrier to adapting to climate change. Another study, by Davidson et al. (2003), suggests that women tend to have a higher risk perception than men and would be more likely to invest in adaptation. Social barriers can range from believing that uncertainty is too great to take action now to institutional and social discriminations within certain groups (Jones 2010).

BOX 10 | NAMIBIA: CONSERVATION AGRICULTURE METHODS
TASHIYA'S STORY[23]

Fukuile Tashiya's neighbors laughed when they first saw her farmland, ripped up like an "elephant's playground." "Can you even grow plants in these big holes?" they teased. Tashiya's small plot had deep furrows next to dark heaps of freshly dug earth, running across the length of the plot. Her plot was converted as part of a government technical assistance initiative, supported by UNDP with financing from the Special Climate Change Fund. The project showed farmers how to plow, weed, plant, and use fertilizer in a hundred demonstration plots across Namibia. Namibia, the driest sub-Saharan country, struggles with water scarcity. The intervention applied conservation agriculture techniques to produce a better yield while saving both water and labor.

"Instead of just planting the crops on top like we always do, last year I sowed my mahangu [pearl millet] in these lines and the result was great," Tashiya explains. "My yield was much better and the size of the grain was big compared to other plots [where traditional practices were applied]."

Because social and cultural factors determine how people respond to climate change, they translate directly into how business decisions are made in MSEs (Jones and Boyd 2011). Factors such as socioeconomic status, age, gender, and culture have a profound influence on the outcome of a decision-making process (Nielsen and Reenberg 2010; Jewitt and Baker 2012). Some MSEs might be skeptical about adopting new ideas because of innate cultural or societal factors affecting their choices.

Owners of MSEs do not usually make adaptation decisions in isolation; departure from tradition is difficult. For example, in Namibia, a farmer was teased for adopting new farming techniques never before seen in the community (see Box 10). Over time, the new techniques could catch on as the rest of the community witnesses their success. An example from Cambodia shows how cultural attitudes and habits are surmountable through a collaborative approach that offers participants first-hand experience of the advantages of adaptation (see Box 11). Overcoming social and cultural barriers requires a good understanding of MSE dynamics in communities and requires long-term investment in private sector engagement. For this purpose, it helps for the public sector to engage business owners and community members as participants early on, share information with the public in an accessible way, and conduct demonstrations so participants can see the benefits of adaptation for themselves.

Summary

Enterprises need to become more resilient, through better management of their climate risks and harnessing new opportunities that arise as a result of climate change. However, they face numerous barriers that vary with location and economic sector. Many business owners in developing countries, especially those at the MSE scale, lack the capacity and resources to assess climate risks affecting their business. Even when climate risks are known, MSEs often lack the tools and training to assess available adaptation options best suited to their context, such as climate-proofing existing operations, or diverging to another business model. Often, risks lead to high financing costs and adaptation options are more costly than the MSE can afford, creating an additional barrier. In other cases, MSEs lack the technical capacity to implement an adaptation option. Some countries lack coordinated policies and regulations that could enable adaptation, making it more costly or disadvantageous to invest in adaptation. Finally, social behaviors based on cultural and socioeconomic factors can hinder the adoption of new technologies and processes.

BOX 11 | CAMBODIA: CHANGING ATTITUDES

In Cambodia, a critical success factor in assisting farmers in Preah Vihear and Kratié provinces to adopt adaptation measures was to change existing attitudes and preconceptions. Initially it was difficult to convince farmers to participate in the intervention, which provided general in-class awareness-raising and capacity-building exercises related to climate-resilient agriculture, home-gardening support, participation in water-user committees, and the use of resilient rice varieties.

According to UNDP staff working in the region, poorer farmers—lacking financial buffers and social safety nets—were inclined to be more risk averse. This often led to suboptimal decisions, which resulted in less variable but minimum return. Women commonly lacked the confidence to seek support for implementing new projects in which other villagers were engaged, because they felt they lacked knowledge and experience. The project staff persisted in trying to persuade them that the intervention presented a "life improvement opportunity."[24] As noted in the Terminal Evaluation, "culture and habits are not easily modified, and there was a risk of non-acceptance of the new facilities by the local communities."[25]

The intervention was ultimately successful, firstly, because it engaged beneficiaries in a dialogue from its inception. Using video materials, the project team facilitated discussions of perceptions related to climate risks and encouraged farmers to articulate their experiences with changing weather patterns, their expectations, the barriers to adaptation, and how they could improve their situation. The second tactic for persuasion was using "demonstrations" as learning sites from the beginning of the project. Demonstrations of new technologies recorded the expenses and incomes of trial users, and calculated the monetary benefits; by tangibly showing the costs and benefits, the project could convince farmers to adopt these technologies.[26]

The positive business case for adaptation persuaded farmers that improving irrigation capacity is one intervention that not only helps to insure the business against climate risks in the future, but also increases agricultural yields and efficiency. Such a no-regrets approach makes sense in the primarily rural economy of Cambodia, where building climate resilience among MSEs in the agriculture sector contributes substantially to the resilience of the most vulnerable communities.

In fact, the benefits of the initiative went beyond eventual recognition that new methods were required to manage the uncertainties associated with rainfall patterns. Communities who benefited from the irrigation system went on to form collectives to manage the improved system. This allowed them to start realizing a number of co-benefits immediately. Most prominent among them was the resale of saved water to neighboring villagers, thereby establishing a revenue stream to maintain the enhanced water-management system. Some communities also invested in extending the water system to connect each of the houses to running water. Others invested in biogas digesters to convert excess farm waste (the result of improved productivity) to energy that could be distributed to households. Thus, health benefits (cleaner air associated with indoor cooking), and time savings (from not having to walk long distances to fetch water) also emerged as results of the initial intervention aimed at agricultural practices.

INTERVENTIONS TO CATALYZE PRIVATE SECTOR ENGAGEMENT

This section describes a number of successful interventions based on case studies and a review of climate change and development literature. The content will be most useful to policymakers who are interested in implementing similar efforts to catalyze private sector investment in their respective countries.

The section outlines six types of interventions:

- Business-relevant climate information and risk analysis
- Technical assistance and training
- Government policies that enable investments in adaptation
- Market and business development
- Partnerships and cooperatives
- Financial instruments

The section is far from providing a blueprint; it offers key ideas, considerations, and examples that will require further elaboration and planning depending on the country's specific context.

Table 1 provides an overview, linking each of the barriers described in the previous section to a selection of potential interventions. To catalyze MSE adaptation in their own countries or regions, policymakers should choose the interventions that best address the barriers in a given sector. In reality, policy interventions always encounter a complex set of challenges, and effective solutions will usually involve a variety of policy instruments targeting a variety of objectives.

Business-Relevant Climate Information and Risk Analysis

MSEs could benefit from targeted information on climate science and what it means to the business that they focus on, in terms of associated risks and

Table 1 | **Interventions addressing barriers to MSE investment in adaptation**

	INTERVENTIONS				
	Business-relevant climate information and risk analysis	**Technical assistance and training**	**Government policies**		
			Laws and policies	Public utility pricing	Subsidies and tax relief
Lack of climate knowledge and risk assessment	✓	✓	✓	✓	✓
Weak evaluation and selection of cost-effective adaptation measures	✓	✓			✓
Limited technical capacity to implement adaptation measures		✓			
Limited financial capacity to implement adaptation measures					✓
Policy and regulation that hinder adaptation	✓		✓		
Social dimensions that hinder adaptation	✓	✓	✓	✓	

impacts (as well as opportunities), and analytical tools to help determine what interventions would strengthen their resilience. Governments can also invest in cost-benefit analyses for adaptation based on sectors; this might involve support for analytical work valuing ecosystem services, which are often excluded from traditional cost-benefit analysis.

Since MSEs typically have few resources to invest in researching and understanding specific climate risks to their business, the public sector, with the necessary assistance from donors, NGOs, and international organizations, can facilitate the generation and dissemination of climate change modeling and risk and impact information related specifically to that particular business area.

For short-term horizons and extreme events, MSEs and communities alike would benefit from early warning systems that deliver current information on impending serious weather or natural disasters. This would allow MSEs to prepare as much as possible before a severe event occurs. Similarly, meteorological services could provide similar services to MSEs, alerting them of upcoming weather so they can properly prepare and make well-informed decisions. Much of this information should be developed by the public sector, essentially as a public good, but other services might require public-private partnerships or might be fully private in nature. The information should be in a business-friendly format and actionable.

Table 1 | **Interventions addressing barriers to MSE investment in adaptation (continued)**

	INTERVENTIONS					
	Market and business development		**Partnerships and cooperatives**		**Financial instruments**	
	Demand-driven products and services	Public spending on infrastructure	Business partnerships and cooperatives	Public-private partnerships	Risk transfer instruments	Risk-compensating instruments
Lack of climate knowledge and risk assessment			✓			
Weak evaluation and selection of cost-effective adaptation measures	✓	✓	✓			
Limited technical capacity to implement adaptation measures			✓	✓		
Limited financial capacity to implement adaptation measures	✓	✓	✓	✓	✓	✓
Policy and regulation that hinder adaptation	✓	✓		✓	✓	✓
Social dimensions that hinder adaptation	✓					

BOX 12 | CAMBODIA: CLIMATE INFORMATION SYSTEMS

An intervention in Cambodia established a community-based early warning system on flooding and drought events. Volunteers received technical and logistical support and were given information on weather events to disseminate across 52 villages. Approximately 11,073 households (representing 55.5 percent of the target households) received timely weather forecasts that enabled them to cope with events such as severe floods. The commune of Bos Leav, Kratié province, which is highly sensitive to extreme weather events, used the early warning system most often. In response to the new information, farmers changed their farming practices, for example, by adjusting planting dates, preparing, and replacing late-mature rice varieties with varieties that can be harvested more frequently throughout the year to better fit with seasonal changes and protect yields from the effects of extreme weather events."[27]

"Introduction of different crops such as pigeon pea and cassava is good because these are drought tolerant and can survive without fertilizers and yield a good harvest. But people are not used to these crops. There is need to popularize them to deal with hunger."

–Daniel Maringa, Manager,
Chiredzi Research Station

Risk analyses undertaken to benefit MSEs should be quantified wherever possible to make clear the costs and benefits of investing in different adaptation options (Turpie et al. 2014).

- Governments, development partners, and other groups can disseminate climate change information through educational programs, the media, demonstration projects, skill-development trainings, and by publicizing opportunities for adaptation projects. Even access to the most basic weather information through word-of-mouth, radios, or cellphones can have life-changing impacts on certain communities.
- In Cambodia, small farmers were unaware of impending extreme weather events such as severe floods. The information gap was successfully addressed through a community-based system, whereby volunteers disseminated weather-event information to villages. The new information channel has had direct, positive effects on farming practices (See Box 12).

Technical Assistance and Training

The public sector should support information sharing, research and development, and skill-building through demonstrations and trainings about adaptation options. Capacity building on the use of climate-related information and tools to incorporate risks in planning, budgeting, and implementation of measures is critical to engaging MSEs in adaptation. Business development and management skills are also necessary to encourage MSEs to invest in new business opportunities and commercialize climate-friendly products and services. MSEs will also benefit from entrepreneurship development and trainings that teach them how to access new technologies and commercialization techniques, develop their technical and practical skills, and improve their market networking.

Technical assistance and training can be implemented through regular, in-depth consultations, awareness raising, and events involving the business community in vulnerable regions. Technical assistance should ensure that training is accessible equitably to MSEs and to the

communities in which they operate; in particular, gender considerations and local knowledge should be taken into account. Technical training programs to build specific adaptation skills should not try to replace traditional knowledge but should harness and support further development of traditional knowledge in support of adaptation objectives (Nyong et al. 2007; Swiderska et al. 2011).

Technical assistance and training is of particular importance in the agriculture sector, as tools to enable income and crop diversification. The poorest households tend to have less diverse incomes; many depend on one agricultural crop as their sole source of income. This increases income volatility and exposure to climate change. In response, the public sector can provide support for development of risk-management guidance and tools. In Nicaragua, a successful intervention by UNDP worked with MSEs to implement "best horticultural and agro-forestry practices," including water management practices, soil erosion controls, and new crop varieties (see Annex 4). In Cambodia, farmer field schools were used to raise the technical capacity of local farming families (see Annex 2).

- The public sector can use media resources to share best practices on adaptation. Resources include agricultural programs and local and community media channels, which can disseminate technical information in relevant and engaging formats and share best practices to help scale up those that have been successful. These media resources can act as a powerful incentive for behavioral change and for MSEs to invest in new practices. In Tanzania, the BBC aired adaptation programming for MSEs in agri-dependent communities to create awareness of climate change and encourage people to invest in new resilient agricultural practices (see Box 13).
- The public sector can partner with NGOs, the private sector, or international organizations to organize events that showcase the most effective adaptation technologies available to MSEs in specific vulnerable sectors and geographical locations. Such initiatives can provide training opportunities around these technologies and, potentially, financial mechanisms to facilitate their deployment.

BOX 13 | TANZANIA: RADIO PROGRAMS FOR RESILIENCE

BBC Media Action is partnering with radio stations in the Monogoro and Dodma regions in Tanzania to help increase people's resilience to climate change. Mentors broadcast talks on training, program management, and planning and discuss topics such as climate-smart agricultural practices. Weekly discussion programs connect listeners with experts in the field and community. The broadcasts are well established, and the BBC's research shows that many people have taken action as a result of listening in. One woman from the Dodoma region says, "I have been able to learn what to cultivate when there is scant rainfall, and what to cultivate when the rains are heavy." Another significant outcome of these radio programs is that people are now demanding support from the government on these resilience issues (BBC Media Action 2014).

- Governments can forge partnerships with other stakeholders who can provide training and support to MSEs adapting to climate change, such as research and academic groups, technical colleges, field-based NGOs, chambers of commerce, and larger businesses working in the sector in question.
- Agricultural extension services can serve as a model for transferring technology and know-how to MSEs in other sectors.

Government Policies

Laws and Policies

Governments should consider integrated planning across various ministries to implement adaptation plans that conserve resources, improve productivity, and strengthen the resilience of communities. Integrated planning can be effectively formulated in the National Adaptation Plans (NAPs) being developed under the UNFCCC. Successful implementation of these plans would assess the country's vulnerabilities, and it would mainstream climate change risks and adaptation in development planning. According to the UNFCCC LDC Expert Group (2012), it would "facilitate the integration of

BOX 14 | RWANDA: MAKING CLIMATE ADAPTATION A NATIONAL PRIORITY

In October 2011, the Government of Rwanda released its National Strategy for Climate Change and Low Carbon Development, outlining existing and future efforts to tackle climate change through a holistic approach. It incorporates all of the country's climate change development projects and policies in one document, providing a long-term strategy for the nation to combat climate change. Through this initiative, Rwanda is attempting to create sustainable economic growth while building resilience to climate change. The strategy has three main objectives: (1) to guide national policy and planning in an integrated way; (2) to mainstream climate change into all sectors of the economy; (3) to position Rwanda favorably in terms of access to international funding for climate resilience and low-carbon development (UNDESA, Sustainable Development Knowledge Platform, 2014).

climate change adaptation, in a coherent manner, into relevant new and existing policies, programs, and activities, in particular development planning processes and strategies within all relevant sectors and at different levels."

National governments should involve multiple sectors in adaptation planning to ensure inclusive progress and development. As one example, Rwanda launched a national climate change strategy that incorporates energy security, sustainable land use, water resource management, and health and disaster risk reduction to create sustainable economic growth (see Box 14). Because sectors are interlinked in many ways, establishing a national plan provides a practical way to help avoid the effects of one sectoral policy creating negative impacts on another sector. A national plan or strategy should also aim to include all sectors that are vulnerable to climate change.

Many possibilities exist in the realm of enabling policies (incentives and compliance measures) to motivate MSEs to undertake investment in climate resilience and business development. Regulatory and fiscal incentives can stimulate risk reduction among private sector actors, especially when combined with climate information and capacity building.

- Governments can set goals, require actions, and provide incentives to encourage MSEs to take part in climate adaptation. These can include emissions targets to encourage a shift from carbon-intensive fossil fuels to less carbon-intensive fossil fuels or renewables, or tax breaks for the adoption of water-saving technologies. National standards, combined with incentive structures, can have a positive effect at the local level. For example, governments can provide tax incentives to promote more efficient building standards or zoning regulations that are more climate resilient.
- Governments can implement policies that protect or restore ecosystem services. Coastal development regulations can motivate long-term planning and risk management in the tourism sector. When property rights are not clearly defined, land reform to establish or recognize clear land rights, including customary rights, and recognition of titles for men and women alike, would contribute to a more open business environment. Land reform can also promote investment in long-term sustainability (Deininger et al. 2003) and stimulate investment in adaptation.

Public Utility Pricing

In most countries, public utilities govern critical resources, such as energy and water, to regulate prices and avoid possible market failures. In many countries, utility prices are heavily subsidized, which tends to encourage high and wasteful levels of consumption, especially among the rich (Clements 2013). During extreme weather events, people who have not invested in adaptation will experience a shock to their regular livelihoods if energy or water services are interrupted, or if prices are suddenly raised. Proper pricing can influence MSEs to increase efficiency and reduce their vulnerability to climate-sensitive resources such as water and energy.

Many governments provide huge subsidies for water use, especially in the agriculture sector. Although this is a politically sensitive issue in many countries, there can be no doubt that this policy distorts the price signal that would otherwise drive farmers to invest in conservation measures as water becomes increasingly scarce. Programs that focus on efficient drip irrigation, for example, are not viable when water is heavily subsidized (IFC and EBRD 2013). If prices are allowed to rise,

water access for the poor can be safeguarded by increasing block pricing (charging increasingly higher amounts for larger consumption units) when water prices increase above certain thresholds. Additional measures are still needed to help MSEs overcome the effects of rainfall variability and drought but correct pricing at least sends a signal to users that water should be used wisely (Savenije and van der Zaag 2002). In the case of Honduras, water pricing is embedded in national legislation, making this type of reform difficult (see Box 15).

- Governments sometimes provide large subsidies for electricity, largely to assist low-income households. The negative side effect of improper pricing is that it discourages business owners from investing in new ways to reduce electricity use. As energy use increases, and as extreme weather events threaten energy sources and electricity infrastructure, it will be beneficial for MSEs to invest in alternative sources of energy that should eventually be cheaper. Gradually increasing electricity pricing can stimulate investment in energy-saving technologies, while strengthening resilience as a co-benefit. It can also redirect the budget for subsidies to programs that help MSEs and poor communities adapt to climate change. However, until the cost of alternative energy sources is comparable to fossil-based options, these adjustments will not easily be made. Interventions to raise electricity prices will need to be paired with other policies, such as targeted cash transfers to the poor, to offset adverse social impacts.

Subsidies and Tax Relief

Through national legislation, subsidies and tax relief are tools that can stimulate MSEs to invest in risk reduction or emerging opportunities. Where risks cannot be directly mitigated, such interventions can increase the return on an investment, making it financially viable. Countries can offer subsidies for research and development of adaptation options, environmental protection, energy efficiency, and renewable energy. This type of intervention can be instrumental in the early stages of catalyzing MSE investment in adaptation and supporting market demand for climate-friendly technologies. However, investment in adaptation should not be dependent on these subsidies over the long term, and they should gradually be phased out.

BOX 15 | HONDURAS: PROPOSED WATER PRICING REFORMS

In Honduras' capital, Tegucigalpa, high water demand is straining available water sources. Climate change will likely exacerbate water scarcity in the area. The urban poor have the least secure access to public water. To address water demand, the government has proposed politically sensitive reforms to water pricing in the city. The suggested reforms incorporate climate change risks into the price of water, while protecting access to water for the most vulnerable populations. These reforms are still working their way through the political system. Despite the apparent availability of political will and the pricing reforms recently passed by President Lobo's administration,[28] it has proved difficult to amend the methods of water use allocation and pricing. The issues are particularly complex and difficult, because they require negotiations with multiple stakeholders and vested interest groups in key economic sectors.[29]

Governments can use tax relief to assist the most vulnerable and resource-constrained sectors with adaptation. For example, an information campaign could be followed by tailored tax breaks to those MSEs that invest in adaptation. The agriculture sector might benefit from tax credits to grow new climate-resilient crops or invest in irrigation systems. The public sector can also offer tax breaks to stimulate research for new adaptation goods and services (Ingirige et al. 2008). However, many developing countries have large informal sectors and weak tax collection systems; in these cases, implementing tax breaks would not benefit MSEs. There would also be the risk of further undermining an already small tax base.

- The United States government implemented agricultural policies that provide subsidies for protection of soil and water resources to preserve and expand ecosystem services. This improves the quality of the surface water and the soil to help with agricultural production, while also supporting wildlife (Antle 2010).

Market and Business Development

Businesses need market demand to support the production of goods and services that help society adapt. They also need physical infrastructure to access markets, in the form of energy systems, transport links, and telecommunications. To fully benefit from the market at large, many MSEs need additional support. Empowering these businesses would allow them to increase their revenue, invest in adaptation, and provide goods and services that help communities adapt.

Demand-Driven Products and Services

An adaptation marketplace is emerging for goods and services targeted at businesses as well as consumers (Fry 2013). MSEs need support to assess, access, and develop the goods and services that will be most profitable in a changing climate. With capacity and/or financial support from public and private stakeholders, MSEs can produce or offer what people want, from services that boost resilience to certified products. Support can encompass funding for research and development, pilots to demonstrate business value and stimulate market demand, development of market linkages across the value chain, and scale-up through larger investments. Access to finance and risk management instruments can ease the burdens of upfront investments and uncertainties related to adaptation measures.

> "When one does not have a market, it is difficult to grow more crops. But if you know there will be a market, you grow more knowing you will be able to sell. We need the money to take children to school and buy some other goodies."
>
> **–Farmer interviewed**
> in Chiredzi, Zimbabwe

For example, the Alliance for a Green Revolution in Africa (AGRA) supported a project in Kenya to provide mixed seed packets for poor farmers to diversify their crops at low costs. The aim was to encourage these MSEs to adopt more resilient farming practices, boost yields, and reduce the risk of crop failure. The public sector can provide incentives for agricultural MSEs to switch to these types of seeds by stimulating market demand, scaling up the distribution of the seeds, providing demonstrations of the benefits for businesses, and possibly offering initial subsidies to reduce the costs of implementation.

Following a UNDP-supported intervention in Tajikistan, the government introduced packaging, certification, and labeling standards to help improve the market appeal of local and adaptive produce (see Box 16).

- MSEs would benefit from receiving support with entrepreneurship development and from learning how to meet market demand for adaptation; how to gain access to financiers, businesses, and value chains; and how to build a sustainable and resilient business.
- Governments can implement regulations and fiscal policies that stimulate business diversification to mitigate economic shocks caused by climate change. Policymakers can try to correct market failures that hinder access to certain markets through tariffs, quotas, subsidies, price floors, etc. These instruments need to be designed and implemented with care.
- It is important for the public sector to encourage demand for new goods and services by offering financial incentives and information about opportunities. Opening access to

BOX 16 | TAJIKISTAN: SUPPORTING AGRIBUSINESS TO GROW RESILIENT SEEDS
ISMAIL FAIZOV'S STORY[30]

Ismail Faizov tends a farm at high altitude in the mountainous Dashtijum Jamoat of Tajikistan. The region is rich in a diverse selection of indigenous fruits and legumes, which have become naturally resilient to drought and cold weather, diseases, and other environmental stresses. However, until the intervention, Faizov did not cultivate these traditional species. Like most other Tajik farmers, his business focused on imported cultivars. These imported crops did not fare well in Tajikistan's changing climate, and Faivoz struggled to support his family.

The intervention sought to help local farmers, such as Faizov, make use of the genetic material of climate-resilient Tajik species. A project expert helped Faizov to establish a 1.5 ha nursery of local fruit species that were well adapted to the particular climatic and geographical conditions of his land, including elevation. Because of the adaptive abilities of the new seedlings, Faizov's nursery became highly productive and, because he had a market for his goods, highly profitable as well. He was able to scale up reproduction and distribution of the seedling varieties. The intervention assisted Faizov with expanding his business, by offering finance for the creation of an orchard where nine species of well-adapted fruit trees were planted; by assisting with the labeling and certification of grown seedlings; and by supporting Faizov in selling his seedlings at local fairs in his district and in neighboring Afghanistan. The initial efforts of the intervention would not have resulted in success if Faizov had not been able to sell his seedlings. Fortunately, Faizov's certified seedlings gained popularity at the fairs, and Faizov established a reputation as a manufacturer of sustainable, well-adapted crop genetic material. He has since reinvested his profits in the construction of a café and shop where he plans to sell products from his garden. To guarantee the quality of his fruits, he intends to take out a micro-loan to fund a workshop for constructing solar dryers. Solar dryers are used to dry various types of foods, such as grain, corn, and rice.

markets for adaptive goods and services is one of the biggest factors affecting scaling up or replication of an intervention.[31]

- Consumer and community engagement is critical to dissemination and adoption of new products and services. Engagement can be facilitated through surveys, focus groups, demonstrations, or community campaigns.

Public Spending on Infrastructure

Public spending on the development of physical and market infrastructure encourages further adaptation, through diversification, economic growth, sustainability, trade, and attraction of additional foreign investment.

Governments can finance or seek finance to strengthen existing physical infrastructure, energy access, and communication services. The better the infrastructure, including roads, rail, water, and electricity, the more easily MSEs will be able to grow and support themselves to invest in adaptation. Access to water is a major priority in climates where seasonal variability and extreme weather is increasingly prevalent due to climate change. Cambodia, for example, successfully implemented an irrigation scheme benefiting many MSEs with external funding to cover the upfront costs (see Box 17).

- The government, with the financial support of donors or international organizations, can invest in resilient transport, electricity, communication, sanitation, and water systems, among other infrastructure. These projects would be part of larger national adaptation plans that would benefit society as a whole.
- There is opportunity for public-private partnerships to attract large-scale investments in infrastructure supporting adaptation, as part of economic development planning and investment (see below).

BOX 17 | CAMBODIA: COVERING THE UPFRONT COSTS OF IRRIGATION

The intervention in Cambodia determined that it would be cost-effective to rehabilitate irrigation schemes in two farming communities to assist local agribusinesses with a reliable water source through the dry seasons. While the irrigation schemes required an investment of US $235,000 (including auxiliary elements such as water gates, spillway, concrete lining, pumping stations, and culverts), the costs were outweighed by the benefits to the 2,000 households in the Bos Leav and Teuk Krahom communes. Two medium-sized systems covered an area of over 733 ha, more than doubling the original area of irrigated land. The farmers in these areas now harvest rice twice yearly. The farmers are also able to save time and reduce the amount of fuel needed to pump water. Despite this progress, the sustainability of the irrigation systems is in doubt, because they require relatively high fees to maintain. To avoid the need for ongoing external support, the intervention (in Phase 2) is exploring whether it would be viable to implement a group fee-collection system, in user groups of 100 farmers, to maintain irrigation equipment.

Partnerships and Cooperatives

A cost-effective way for MSEs to overcome their limited resources is to collaborate with other businesses or public entities to form partnerships and cooperatives in a similar sector or region, pool resources and funding, and self-insure against economic and weather-related shocks.

Business Partnerships and Cooperatives

MSEs can partner with other businesses, NGOs, or communities to benefit from local and sectoral knowledge, better understanding of targeted consumers, improved dissemination and delivery of their goods and services, co-financing, and risk sharing. They can also partner with much larger multinational corporations.

BOX 18 | COOK ISLANDS: INDUSTRY STANDARDS ON CLIMATE RESILIENCE IN TOURISM

With rising sea levels, more frequent dry spells, and more extreme weather events, the low-lying Cook Islands are particularly exposed to climate change and will need to invest intensively in adaptation. Although tourism is a major industry, it has, until recently, been slow to build its resilience to the likely challenges ahead. The Cook Islands Tourism Corporation (CITC) has expressed interest in making climate adaptation "part of their accreditation criteria for tourism accommodation" in some parts of Pa Enua.[32] With the assistance of UNDP, the CITC has proposed to carry out a consultation, training, and mentoring program to "improve and enhance the accreditation standards including environmentally sustainable best business practices for tourism industry operators on Aitutaki, Atiu, Mauke, Mitiaro and Mangaia."[33] The CITC intends to develop industry standards on environmental and sustainable business, including climate resilience, in addition to the existing minimum standards for tour operators operators developed in 2013. It has yet to be seen whether these new standards will be implementable and serve to improve the climate resilience of tourism in the Cook Islands.

Governments can promote collaborations and partnerships among MSEs and agribusinesses with larger stakeholders. There is an opportunity for high-impact collaboration between local suppliers and large multinational retailers at the top of the supply chain. Multinational corporations (MNCs) stand to gain, or at least reduce their own climate-risk burden, from building adaptive capacity in the value chain made up of MSEs. Working with small, climate-sensitive suppliers and other local businesses in these ways will strengthen both MSEs and the MNC in the long term. IFAD established the Adaptation for Smallholder Agriculture Programme (ASAP), which provides climate finance directly to smallholder farmers and also places a strong emphasis on partnership building (IFAD 2013). In the Cook Islands, the tourism industry, supported by UNDP, led its businesses to form a well-organized and well-respected industry group to develop industry guidelines and standards on climate adaptation and help businesses to implement them (see Box 18).

- Agricultural cooperatives can help MSEs to access credit, relief, subsidies, and technical knowledge, and they can provide them with outlets to sell their products. They can also facilitate credit to individual MSEs from various financial institutions such as banks and microfinance institutions by providing guarantees. Some even have devised their own credit mechanisms to ensure that MSEs pay back the money they have borrowed (FAO 2012).
- Governments can provide information about, and promote collaborations and partnerships with, other stakeholders. For example, local or international NGOs can work alongside local MSEs to develop adaptation plans.
- The public sector, with the assistance of NGOs and other partners, can offer trainings, tax credits for start-up cooperatives, or direct assistance by partnering with MSEs.

Public-Private Partnerships

Public-private partnerships (PPPs) allow for complementary cooperation between the public and private sectors (Public Private Partnerships in Developing Countries, 2013). Generally, governments do not have the capacity to innovate or fully understand the needs of the market, while small businesses lack the reach to scale up ideas. In most cases, larger private sector players provide innovation and finance to implement government projects. CSOs may also get involved to ensure accountable financial practices and implementation of projects (Asian Tiger Capital Partners 2010). In Africa, UNDP initiated an intervention to establish partnerships between different private sector entities and meteorology departments to disseminate climate information to rural households engaged in agriculture production (see Box 19).

- PPPs can be used in infrastructure projects, where the public sector contracts projects with private sector companies to build climate-resilient infrastructure.
- MSEs could work under government contract to complete various adaptation projects and communities would benefit from employment opportunities, income, and on-the-job training.

BOX 19 | AFRICA: REGIONAL CLIMATE INFORMATION AND EARLY WARNING SYSTEMS PROJECT

Recognizing the need for access to climate information to enable adaptation, UNDP is supporting efforts in a number of countries to introduce early warning systems that inform households and planners of extreme weather events. Assistance is currently being provided to 10 countries in Africa (Benin, Burkina Faso, Ethiopia, Liberia, Malawi, São Tome and Principe, Sierra Leone, Tanzania, Uganda, and Zambia). Part of the initiative involves building partnerships with the telecommunications sector to "establish effective and sustainable funding streams that can be used for the maintenance of [Early Warning System] infrastructure."[34] Although the intervention is still in its early stages, the targeted governments plan to develop PPPs for both the operation and maintenance of the early warning systems. Among the options currently being explored is support for the development of weather index-based insurance products. Another involves engaging mobile phone companies to disseminate climate information packages through SMS. With the help of PPPs, multiple actors are benefiting, including the government, private businesses, and households receiving the new weather information.[35]

Financial Instruments

Governments can improve the risk-reward profile of an investment in order to catalyze finance from investors, whether from the public or private sector. Depending on the type of risk, there are a number of instruments that can be used.

The most common instrument is a ***de-risking instrument***. This is any kind of policy instrument that creates a more enabling investment environment by addressing underlying barriers that create investment risk in the form of uncertainty or cost.

Risk transfer instruments shift risk from the private to the public sector. Examples might be insurance products or loans from financial institutions backed by a government guarantee. Sometimes these are referred to as "non-grant instruments" or instruments with reflows.

Risk compensation instruments offer investors a higher financial return through grants, seed capital, and other instruments that provide benefits for innovation and investments in adaptation. These are sometime called "direct financial incentives" or "on-granting."

Risk Transfer Instruments

MSEs in vulnerable communities usually take on significant risk, environmental, technological, or economic, making it difficult for financial institutions to provide loans or insurance coverage. The public sector, with the assistance of international donors or large financial institutions, can initiate policies that provide insurance products that transfer risk to another entity and make private financial interventions possible.

Guarantees

Financial assistance need not be in "hard cash" but can take the form of public sector guarantees over cash exposure, which involve less public money pledged upfront and encourage greater involvement from the private sector. A guarantee can be on climate bond coupons, such that a better rating justifies a lower rate. Guarantees can also be on the return of a direct adaptation investment or loan. Guarantees benefit a private financial institution because it receives the backing of the public sector in the event of a default, but it can also benefit the MSE if it cannot repay its debt. Guarantees help reduce the risk taken on by the private sector, allowing for investments that would otherwise have been deemed too risky or uncertain.

MSEs should seek insurance coverage for climate risks, such as crop micro-insurance, catastrophe insurance, and risk pools. As a regulator, provider, or insurer of last resort, the public sector can influence the development of private insurance products by providing guarantees or working with other international institutions to conduct pilot projects that could then be scaled up. Public intervention might be necessary, for example, to reduce premium levels for flood insurance if flood protection is built. The public sector, with the help of international institutions, can also provide capital capacity to insure against risks that are unfamiliar to the private sector insurance industry. In addition, the insurance premium might be paid partially by public funding. Governments may also pool their risks. Box 20 describes how African countries pool drought risks under one organization.

- Insurance and financial companies are identifying business opportunities in meeting the need for insurance solutions related to climate change. The public sector can help MSEs to access these products, thereby enhancing private sector engagement in adaptation measures. Munich Re is an insurance company working in this sector, providing insurance products to developing countries. The company is looking at how to manage disaster risk and innovate on risk transfer solutions.
- Microfinance institutions are starting to provide micro-insurance products, although there are significant challenges to the infant industry. It is difficult to offer products that provide adequate services at a price that low-income households are willing to pay (Ruchismita 2009).

Risk-Compensating Instruments

Private investment in adaptation still usually needs some catalytic public sector support. Instruments used include public loans, grants, seed capital, and investments.

Public Loans

Government loans provide finance to MSEs to invest in adaptation. The public sector can guarantee some of the risk involved and encourage financial institutions to offer loans with reasonable

BOX 20 | INNOVATIVE RISK FINANCING THROUGH THE AFRICAN RISK CAPACITY

The African Risk Capacity (ARC) was established as a specialized agency of the African Union. Its specific purpose is to shift risks from governments to the ARC, an organization that can pool and handle risk management more efficiently.

ARC uses satellite weather surveillance software—Africa Risk View (ARV). ARV brings together information from existing rainfall-based early warning models with data on vulnerable populations and forms a standardized approach to estimate food insecurity response costs across the continent. Information on weather data, such as rainfall estimates and information about crops, is used to estimate how many people have been affected by drought or lack of rainfall. Using a cost per person, ARC then calculates the likely response costs.

Members of the ARC risk pool receive a payout when the estimated costs response crosses a certain threshold. Countries receive the payment within two to four weeks of the end of the rainy season so that early intervention programs targeting vulnerable populations can begin within 120 days of the beginning of the dry season. This is usually the time at which farmers start depleting their assets after a drought.

The ARC addresses a major gap in insurance management on the African continent because it allows households and MSEs to remain solvent during times of crisis. This supports long-term resilience because it ensures that gains made in strengthening resilience are not lost during a particularly bad year. It also reduces the reliance of governments on emergency aid and provides a dedicated contingency to scale up safety nets. Risk facilities like ARC provide governments with the opportunity to pool risks that affect the region and to lower individual insurance costs.

Sources:
http://www.wri.org/blog/2013/10/qa-african-risk-capacity-how-innovative-financing-models-can-build-climate-change
http://www.africanriskcapacity.org/about/how-arc-works

interest rates. Commercial banks will work with MSEs to determine which instrument is best, based on initial capital, earnings, and future gains. Governments, multilateral development banks, and climate funds can provide debt financing to commercial banks for on-lending for specific types of activities. Many of the Pilot Program for Climate Resilience (PPCR) private sector projects have an on-lending component that also contributes to building the capacity of financial institutions in terms of working with the MSE segment, as well as evaluating adaptation investments (Trabacchi and Stadelmann 2013).

In countries where financial markets are more developed, the public sector can work with banks to offer other types of tools including mezzanine financing, conditional loans, or convertible loans. Mezzanine financing can be structured as debt or preferred stock and is a claim on a company's assets slightly more senior than common stock. While conditional loans are loans with conditions set by the lender, a convertible loan can be converted into an equity position at the lender's discretion.

Grants and Seed Capital

In environments where access to capital is challenging for MSEs, grants and seed capital from the public sector can be effective mechanisms to finance their investments in adaptation. Grants are non-repayable funds—which may be conditional or unconditional—that MSEs could apply for and access in order to invest in adaptation. Grants are important mechanisms to support innovation that would otherwise be too costly to undertake. Because MSEs might be reluctant to invest in adaptation given the uncertainties of climate change and potential paybacks, grants could be an effective mechanism for governments to use to kick-start investments that support resilience. Grants can sometimes build a competitive environment for businesses in the application process, facilitating an environment of innovation and creativity. They could be particularly effective if they are conditional on achieving specific adaptation target impacts.

Seed capital can achieve a similar outcome, because it can help start investments in new innovative ideas that entrepreneurs would otherwise be

reluctant to undertake. It provides financing to the early stage of an investment in a new business, which would otherwise be unable to attract investors because of high transaction costs and heightened risks due to uncertainty (SCAF 2008). In many developing countries, the business environment is not attractive to new ventures. The potential for new business concepts that incorporate climate change adaptation might not be realizable without the support of seed capital.

Investments

The two types of investments most commonly used when investing in MSEs are equity investment and debt investment. Equity investment involves the investor buying an ownership stake in the business, by providing cash, and in return receiving a percentage of profits or losses. A debt investment involves the investor lending money in exchange for interest income and repayment of the principal. There are various other mechanisms that investors can use including angel investing, crowd-funding, peer-to-peer lending, and sustainable banks (WWF 2012).

Most loans, grants, seed capital, and investment projects to date have been implemented by multilateral organizations and supported by governments. Governments can assist or subsidize investment funds that invest in climate-resilient businesses by taking a first-loss position in the capital structure of the fund so that private sector debt investments are protected. Grants can be provided directly in the form of research and development (R&D) support, or they can be provided indirectly through intermediaries as first-loss position in a larger fund or through specialized agencies that manage the funding on behalf of the government.

Endowment funds and revolving funds can also serve to finance grants for MSEs. These are mechanisms to collect donor funding to finance grants for projects and activities selected by fund trustees. The difference between the two is that the former generates income in perpetuity, while the latter relies on ongoing donor funding. The Green Fund is an example of an endowment fund in South Africa. The Green Fund was established by the Department of Environmental Affairs and funded by the Treasury to facilitate investment in initiatives that will support South Africa's transition toward a green economy (that is, a low-carbon, resource-efficient, and climate-resilient growth path). It supports initiatives that would otherwise have been too expensive and time-consuming to implement, such as innovative green projects, climate policy objectives, building an evidence base for expansion of the green economy, and attracting additional resources for green economy development.

The public sector can highlight the investment gap between finance and projects and make financial and international institutions more aware of investment opportunities. There is a need to make potential adaptation projects clearly visible, including those adaptation priorities already articulated by developing countries—in National Adaptation Programmes of Action (NAPAs), for instance. International financial institutions that have experience in financing projects in developing countries can facilitate this process.

- The Pilot Program for Climate Resilience (PPCR)—a fund under the Climate Investment Funds—in Niger has a component that focuses on leveraging private sector finance to build climate resilience of Nigerien agricultural MSEs. It will use grant funding in the first phase to develop the capacity of over 500 Nigerian farmers to operate drip irrigation equipment and to manage loan finance to purchase the equipment (PPCR Niger Irrigation Program 2013).
- In Zimbabwe, UNDP's "Coping with Drought" intervention took the lead on providing seed capital to new farmers, helping to kick-start seed multiplication businesses promoting climate-resilient seeds.
- A form of international finance for development of new products and services can come through Development Impact Bonds (DIBs). DIBs link private investors, non-profit and private companies, governments, and donors to achieve development results. Through this mechanism, investors provide upfront funding for development programs, and are later remunerated by the donors and earn the return if the program achieves agreed-upon outcomes. Although still in its infancy, DIBs have the potential to stimulate investment in private sector adaptation. The Center for Global Development (2013) highlights several case studies of uses of DIB models for issues such as

energy efficiency and SME pipeline generation, models that can also be used for investment in adaptation.

- International funds also provide grants such as the Global Environment Facility (GEF), the Least Developed Countries Fund (LDCF), and the Special Climate Change Fund (SCCF), which are mostly targeted to larger projects and could be used to scale up MSE investments in adaptation.
- The Seed Capital Assistance Facility (SCAF) provides seed capital to entrepreneurs in developing countries to start businesses in clean energy. This facility is implemented by UNDP, the AfDB, and the ADB.
- Governments can work with international organizations to lead matchmaking adaptation opportunities with potential investors. In particular, this includes venture capitalists, angel investors, or social entrepreneurs locally or internationally who have invested in environmental projects and will be open to the level of risk and complexity involved in investing in adaptation projects. For example, the International Development Research Centre (IDRC) suggests establishing an Adaptation Financing Facility (AFF) that promotes adaptation activities by assisting with matchmaking and coordination between funders and projects in Africa (Tippmann et al. 2013).
- The World Bank and UKAid launched "Climate Innovation Centers" (CIC) to create a business hub to boost locally sourced green technologies and offer financing and other services to a growing network of climate innovators and entrepreneurs. CIC initiatives exist or will be launched in Ethiopia, India, Kenya, Morocco, South Africa, and Viet Nam. This is a good example of how development partners and governments can create business incubators to support development of new adaptation products and services tailored to the local market.

Summary

This section describes various policy, strategy, and project interventions that could be used by governments, NGOs, or multilateral development organizations to create a more enabling environment for MSEs to invest in adaptation. Some of the interventions have been implemented, such as those showcased in text boxes, while others are taken from literature reviews. Due to the imprecise definition of adaptation, researchers do not have enough results to recommend one intervention more than another. Much will depend on the national and local context of each intervention. In addition, some interventions might be more successful when paired with others, while others might be more successful alone. Careful analysis of the social, economic, environmental, and climate context of the region in question will be imperative.

PRINCIPLES FOR ENGAGING MSEs IN ADAPTATION

This section provides a summary of the process by which policymakers can seek to develop interventions that will enhance investments in adaptation by MSEs. It outlines a set of six principles that may be used as a guide during the policy formulation process. Every country is unique in its specific circumstances—economic profile, actors, challenges, and opportunities. Accordingly, strengthening business engagement in adaptation might be adopted as a stand-alone policy objective or as part of a larger adaptation policy process, such as the formulation of a national adaptation plan (NAP). It might also constitute an element in efforts to address a specific climate-resilient development objective, such as providing water services or building local seed banks.

Whatever the circumstances, it is hoped that the principles described in this section can be universally applied and prove useful in the policy formulation process (see Figure 6). This section focuses on the principles of stakeholder engagement, sector prioritization, and implementation and scale-up. The principles of identifying drivers and barriers and designing interventions were covered in depth in earlier sections, and are revisited only briefly.

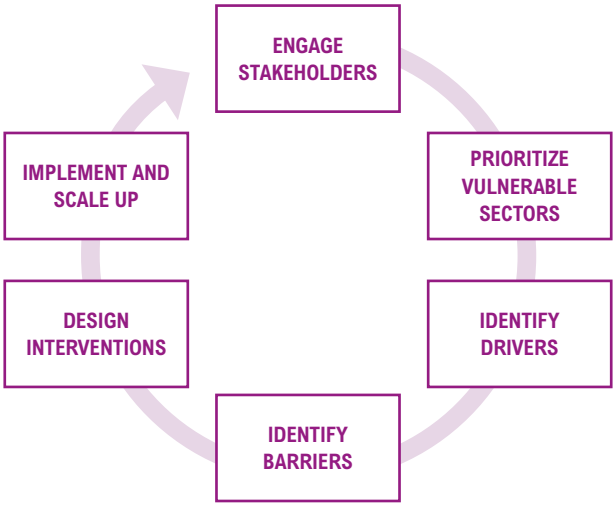
Six Principles for Policy Formulation

- Engage stakeholders
- Prioritize vulnerable sectors
- Identify drivers to invest in adaptation
- Identify barriers preventing investment in adaptation
- Design interventions to catalyze MSE investment in adaptation
- Implement and scale up

1. Engage Stakeholders

Involving relevant stakeholders from the start of the policy process is a prerequisite for effective policymaking. Despite the relevance of private sector actors, an analysis of the NAPA process showed that the private sector was represented in only 43 percent of the NAPA teams (Pauw and Pegels 2013). Cross-sector representatives from MSEs and vulnerable communities need to be involved early on in the policy design process in order for policymakers to understand which sectors to prioritize and the relevant drivers and barriers that will affect the design of effective policy options. Policymakers also need to assess and learn from the knowledge and innovative ideas of MSEs themselves.

Figure 6 | **Designing Successful Interventions to Catalyze MSE Investment in Adaptation**



Because climate impacts cut across many sectors, it is important that a broad range of stakeholders is involved in the design and implementation of adaptation policies. For example, a policy to protect land should be devised with the input of multiple sectors such as forestry and agriculture, even if the principal benefiting sector might be tourism. Good coordination across sectors helps to prevent duplication of government effort and is necessary to streamline activities. MSEs can also learn from each other, so horizontal (among businesses) and vertical (among national and sub-national actors) coordination will be worthwhile. It is important to note that engaging stakeholders can be difficult, given that many

Table 2 | **Overview of Private Actors at Global to Local Level**

	PUBLIC SECTOR	PRIVATE SECTOR		CIVIL SOCIETY
Global	International development agencies, international financial institutions	Multinational companies, institutional investors, commercial banks	Agricultural industry and commercial associations	International NGOs
Regional	Regional institutions and trade blocs, international financial institutions	Multinational companies, international financial institutions, institutional investors, commercial banks	Agricultural industry and commercial associations	International NGOs
National	National governments	National companies, banks, insurance companies	Agricultural industry and commercial associations	Domestic NGOs, national agricultural associations, chambers of commerce
Sub-national	Provincial governments	Small- and medium-sized businesses, cooperatives	Agricultural industry and commercial associations	Local NGOs, agricultural groups and community organizations
Local	Local governments	Small- and medium-sized businesses, cooperatives	Agricultural industry and commercial associations	Local NGOs, agricultural groups and community organizations

Source: Becker-Birck et al. 2013.

groups, particularly MSE owners, have business priorities and will be very short of time to travel and attend stakeholder meetings. Some stakeholders might not be interested or willing to engage with the public sector in policy planning. In some cases, it would be useful to use intermediaries such as CSOs and popular media channels.

Private sector organizations exist at many levels and in many affiliations. Table 2 provides an overview of the main categories of private sector actors that could be involved in adaptation discussions.

The public sector, in cooperation with the private sector, can bring these different groups together and ensure good representation. With a good coordination system in place that focuses on sharing information and raising issues, the government can start to identify barriers and bottlenecks and develop sector-specific policies and interventions. Engaging MSEs and the informal economy can be difficult because of the lack of formal channels; it will therefore be vital to engage with CSOs and NGOs who operate in the same communities as MSEs. These organizations are an important channel for reaching MSEs and they can help to ensure that the informal sector is not overlooked.

2. Prioritize Vulnerable Sectors

Every country has a diverse base of economically important sectors. Climate change will affect most economic activities either directly or indirectly. To target indirect risks that affect all sectors, policies might need to be cross-sectoral in order to create a general enabling environment for business growth.

However, in other cases, where direct risks affect a particular sector or industry, policies will need to target that specific industry. Blanket policies that aim to engage "the private sector" are not likely to be effective because the drivers and barriers to successful adaptation differ among sectors and even within a sector. Therefore, when starting the process of designing policies to catalyze MSE engagement, policymakers need to prioritize sectors for engagement. They can do this by engaging stakeholders in public discussions. In some instances, when engagement with stakeholders is especially difficult, it could be useful to use market surveys to identify vulnerable sectors and specific barriers facing the relevant MSEs.

Several other approaches can be used to prioritize sectors, including the use of existing policy frameworks, such as NAPAs, national five-year plans, or other climate strategies.

In cases where the main climate impacts are known but there is no specific ranking of sectors within a national adaptation strategy or vulnerability assessment, policymakers can prioritize sectors based on two factors: (i) the economic importance of different sectors, including importance to livelihoods of vulnerable groups; and (ii) climate sensitivity and adaptive capacity. Economic importance can be determined by the sector's production value and the number of people it employs (IFC and EBRD 2013; PwC 2013). When making this analysis it is important to take into account the importance of a sector for the livelihood and income of different groups, gender considerations, aggregate current and future macroeconomic vulnerability of the country, and different segments of communities that are particularly vulnerable to the impacts of climate change. Sectors might be emphasized because they face impacts in terms of net economic losses if adaptation measures are not implemented.

When there is no detailed information on climate impacts, sector assessments can be made based on expert opinion, in consultation with affected communities and stakeholders, ranking the sectors based on high, medium, and low risk or sensitivity. The outcome of the process will be a list of priority sectors that are highly sensitive to climate impacts, provide an important contribution to the economy, employ a large number of people that are vulnerable to climate change, and/or operate in highly sensitive geographical areas.

3. Identify Drivers to Invest in Adaptation

The report identifies two main drivers that encourage an MSE to invest in adaptation, namely:

- Increasing climate resilience
- Leveraging business opportunities

Although these drivers apply to any business in any sector, it is important to understand the specific combination of factors that drive investment in a particular sector. This will determine whether government intervention is necessary at all and, if it is, how policies and incentives should be chosen and designed.

4. Identify Barriers Preventing Investment in Adaptation

MSEs face many barriers that generally fall into the following categories:

- Lack of awareness and knowledge of climate risks
- Limited availability or knowledge of adaptation options
- Lack of technical capacity to implement
- Lack of financial capacity to implement
- Policy and regulation that hinder adaptation
- Social attitudes toward adaptation

Blanket policies that aim to engage "the private sector" are not likely to be effective because the drivers and barriers to successful adaptation differ among sectors and even within a sector. Therefore, when starting the process of designing policies to catalyze MSE engagement, policymakers need to prioritize sectors for engagement.

Understanding the particular set of barriers faced by MSEs in a particular sector is essential to targeting policy interventions that will reduce or remove those barriers. Creating a common understanding of the most important barriers has to be done in cooperation with stakeholders from the sector through a continuous dialogue.

5. Design Interventions to Catalyze MSE Investment in Adaptation

The public sector should design policies and interventions that create an enabling environment for MSEs to adapt to climate change. This is necessary for successful private sector engagement, and it is an integral part of addressing the barriers facing MSEs. A range of possible interventions have been used to help incentivize adaptation in different contexts:

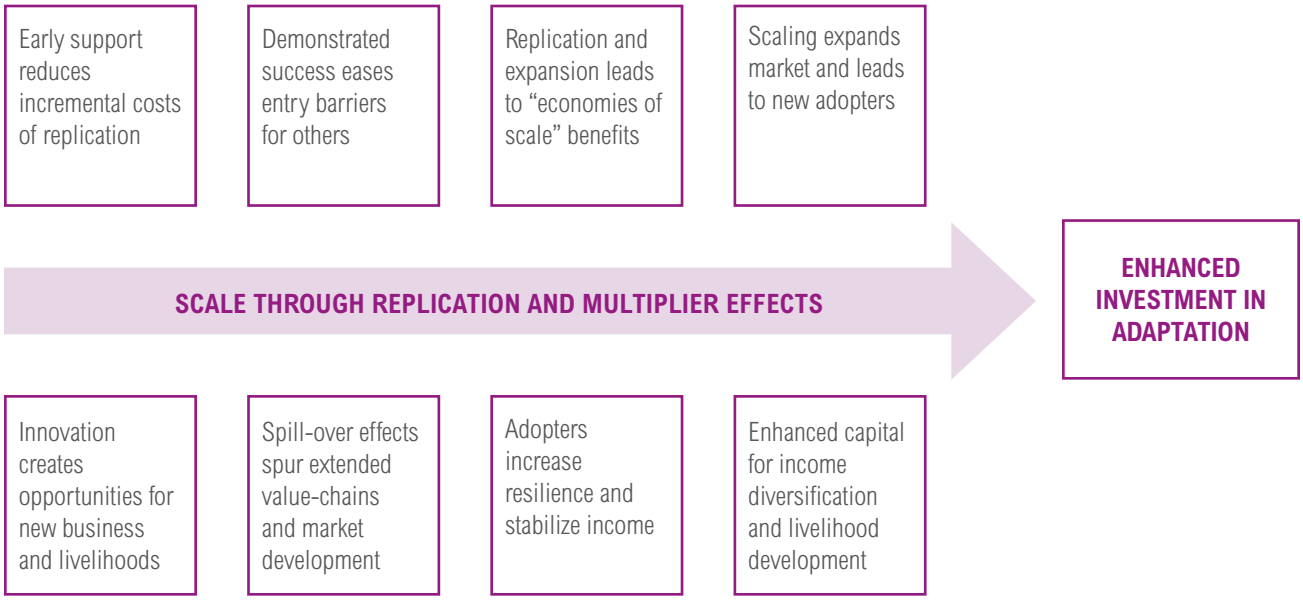
- Business-relevant climate information and risk analysis
- Technical assistance and training
- Government policies
- Market and business development
- Partnerships and cooperatives
- Financial instruments

Cost-benefit analyses might be helpful in determining which intervention to choose, including the use of ecosystem service valuation where appropriate. Based on such analyses, policymakers can more easily assess the cost of each intervention at various scales.

6. Implement and Scale Up

It will take time for the public sector to create an enabling environment in which MSEs are more willing and able to invest in climate change adaptation. If priority is given to efforts to strengthen the resilience of MSEs, the results could be transformative for countries as a whole. Because many of these MSEs operate in vulnerable communities, investing in adaptation will strengthen the resilience of these communities, build strong local economies, and impact the national economy and value chains around the world.

Figure 7 | **Example of Combinations of Replication and Multiplier Effects Leading to Enhanced Private Sector Investment in Adaptation**



The implementation and scale up of these actions will be part of the process of creating sustainable development pathways in developing countries.

Governments, development partners, and NGOs have a major role to play in facilitating adaptation by MSEs. They implement the interventions that can eliminate market and policy failures that prevent MSEs from investing in adaptation. While policymakers are the final decision-makers in the process, they require close partnerships with businesses, NGOs, civil society organizations, and international organizations if they are to be effective. Using targeted interventions, governments can help to safeguard businesses in climate-sensitive sectors, and expand business opportunities in goods and services oriented toward adaptation.

Scaling up transformative investments by MSEs will be achieved through a combination of replication and multiplier effects. For example, to accelerate the process, governments can identify successful pilot interventions and scale them up in other regions, where appropriate (see Figure 7). The report identifies several pathways that governments can use to scale initiatives. Ensuring an open, active dialogue with MSEs on what works and what does not work is essential to understanding whether a chosen approach is successful in addressing a certain barrier. Entrepreneurship and innovation will also play a key role in creating transformative change and scaling up adaptation practices throughout the private sector. Creating sustainable economies will spur competition, partnerships, best practice business techniques, and new business opportunities, while also building resilience in communities. A continuous process of working through the principles outlined in this report should lead to the creation of a sustainable economy in which MSEs have the resources to address climate risks and invest in new opportunities, while also building resilient communities.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CONCLUSIONS: MOVING FORWARD

Building resilient societies requires more than leveraging investment from international donors and multinational corporations. In reality, adaptation starts from the ground up, from MSEs embedded in developing communities that are the key to sustainable development and building resilient nations. More than half the population in developing countries relies on MSEs for a living. Similarly, MSEs contribute significantly to countries' GDP. However, because of the limited capacity of many MSEs, they tend to be the most vulnerable segment of the private sector to climate variability and extreme events. To ensure that developing countries—especially the most vulnerable populations—are resilient to climate change, MSEs themselves need to become more resilient. Part of this change has to come through public support.

Policymakers, development partners, and climate funds need to expand their current focus on leveraging private sector finance to include adaptation incentives that support MSEs. MSEs are at the center of the economies and labor markets of most developing countries; their fate helps to determine the poverty or development of men, women, and children. They are the innovators and entrepreneurs who respond with new ideas based on demand from consumers in a changing climate. The positive impacts of these efforts go beyond the single MSE, or sector, or country. The impacts are widespread for the global community—resilient and innovative MSEs could impact global supply chains, improve ecosystem services, strengthen global markets and support the food supply, even in the face of extreme changes in the climate. The extent of the positive effects of focused government interventions could create a multiplier effect and transform the private sector. Targeting MSEs is essential for building resilient societies that will maintain sustainable development even in the worst-case climate scenarios.

What Developing Country Governments Can Do

Adapting from the Ground Up is designed specifically to help developing country governments engage MSEs in adaptation. The actions it recommends could directly support the resilience of vulnerable communities, build up innovation, and maintain the development path of their countries. To facilitate effective adaptation planning, the UNFCCC established the national adaptation plan process for countries, especially LDCs, to implement in the broader context of sustainable development planning. As such, policymakers can use this process to develop policies, processes, and activities to engage MSEs in their countries' long-term sustainable planning to improve resilience to climate impacts.

However, the guidelines to develop the NAPs thus far focus mostly on the public sector's efforts to adapt to climate change and do not address the private sector as a major contributor to building a resilient nation. This report suggests that the adaptation planning process must be inclusive and transparent and must start with a dialogue between the public and private sectors. As countries begin to formulate their NAPs, policymakers need to involve the private sector, especially MSEs and their investors and regulators, from the beginning. MSEs will need to be educated about climate risks, and about the potential assistance they can receive from public institutions with the support of policymakers.

In addition to engaging in a dialogue with the private sector, developing country governments should actively engage with other players who can assist them in implementing these interventions. For example, they should work with multilateral development banks and NGOs with the capacity to provide support and knowledge. They should also engage with multinational corporations, financial institutions, and investors to engage the MSEs in their countries. Linking the public sector with these other stakeholders will bridge a knowledge, resource, and finance gap. Responsibility should also be delegated to the city and local levels, where public officials have more direct contact with MSEs. Civil society organizations can also be used to reach local community groups who might be hesitant to engage with large and unfamiliar institutions.

What Multilateral and Bilateral Partners Can Do

Providing financial and technical support for national activities is the most direct way that multilateral and bilateral partners can support this process. Donor institutions can also act as knowledge banks and facilitate the transfer of information about successful business practices, initiatives, and pilots to other appropriate contexts. Additionally, bilateral partners can support the process of catalyzing engagement in adaptation by ensuring market access for products developed by MSEs in developing countries. For instance, countries can include specific arrangements for vulnerable or priority sectors in least developed countries in their trade agreements. Encouraging trade from these sectors will spur more growth, and therefore, a stronger economic foundation from which to invest in adaptation. Bilateral donors can also work with their own companies that operate in developing countries and provide financial incentives for them to invest in building resilience of small-scale suppliers in their supply chains. Lastly, multilateral and bilateral partners can serve as communicators to inform the global community about the multiplier effect of investing in MSEs for climate change adaptation.

What Special Climate Funds Can Do

Climate funds, such as the Green Climate Fund, can play a catalyzing role by ensuring that they direct funding to programs for MSEs. Climate funds can also act as matchmaker and clearing house for private sector adaptation ideas. The challenge is ensuring that MSEs benefit from the expertise and network support that climate funds can offer. Engaging NGOs can facilitate this process because they can act as an intermediary between global funds and MSEs in vulnerable areas. Climate funds can support and complement national efforts by creating regional or national networks to help MSEs develop product ideas into bankable projects, support capacity development for implementation, and link businesses to possible investors.

What Large Private Sector Actors Can Do

Companies and investors can support MSEs in the supply chain by providing financing and technical assistance to strengthen their resilience to climate change. Financial institutions can also contribute by providing MSEs in low-income countries with better access to finance for adaptation efforts. There is a range of possible measures that the private sector can employ to strengthen MSE resilience because private sector financial resources are relatively more flexible than those of the public sector. Forming strong partnerships between public and private actors could effectively scale up adaptation efforts, given proper planning, implementation, and monitoring.

Closing

As with catalyzing investments in mitigation, catalyzing investment in adaptation will take time. Addressing the barriers facing MSEs will require leadership and a long-term vision. Disseminating useful information and technical assistance on climate change, adaptation, and cost-effective investments will require time and support from governments, development partners, and NGOs. Although some of the interventions proposed in this report will require relatively large investments, with careful planning and engaged stakeholders, institutions, and partners, successful efforts to engage MSEs and raise their levels of investment in adaptation will have far-reaching effects. With an understanding of the potential benefits of increased MSE resilience, it is clear that these interventions can create a sustainable path to more resilient societies. Because impacts of climate change will only become more severe, providing support to MSEs is urgent. Changes in the world's climate are now inevitable and severe weather events are bound to occur. The lives of vulnerable men, women, and children are at stake.

ANNEX 1. CASE STUDY: **ZIMBABWE**

PROJECT: "Coping with Drought and Climate Change in Zimbabwe."

OBJECTIVE: Develop and pilot a range of effective coping mechanisms for reducing the vulnerability to drought shocks of farmers and pastoralists, particularly women and children, in Chiredzi district.

LOCATION: Chiredzi district

DURATION: May 2008–September 2012

IMPLEMENTED BY: The Zimbabwean government's Environmental Management Agency, with support from UNDP

FUNDED BY: Special Climate Change Fund (SCCF)—Global Environment Facility (GEF)

TOTAL FUNDING: US $983,000

BENEFICIARIES: Farmers and pastoralists (micro/small agribusinesses)

RELEVANT INTERVENTIONS

- Farmer field schools promoting diversified crop mix, soil moisture and nutrient management, and mixed production business models
- Testing the resilience of different crop varieties to demonstrate the benefits of a crop mix
- Assisting farmers to start new enterprises or diversify their business (for example, adding livestock)

POSITIVE RESULTS

- 3,000 farmers in total engaged in adaptation activities and climate-resilient livelihoods
- New agricultural knowledge introduced to over 600 farmers through farmer field schools
- Increased agricultural productivity and resilience in times of drought; 40 percent of farmers in the pilot area adopt a climate-resilient crop mix
- Decrease of more than 20 percent in dependence on rain-fed agriculture as the sole source of livelihoods
- Mixed production model including a livestock component adopted by nearly 40 percent of farmers; other income-generating activities introduced in 280 households

Community resilience to climate change in the drought-prone region of Chiredzi, in southern Zimbabwe, requires livelihood development, especially in the agropastoral sector. Building productive, local businesses is crucial for both climate adaptation and poverty reduction. UNDP's intervention showed farmers and pastoralists in the Chiredzi district how to make their MSEs more resilient and profitable. The intervention introduced adaptation measures to develop agricultural resilience to climate variability and drought events, and to shift Zimbabwe's agribusiness from a maize-based economy toward more diversified agriculture.[36] Relevant activities include:

- Organizing farmer field schools, where over 600 farmers were exposed to:
  - Diversified crop mix, including sorghum, pearl millet, cowpeas, groundnuts, and drought-tolerant maize varieties[37]
  - Experimentation with soil moisture management techniques (for example, tied ridges, deep plow-tied furrows, rainwater basins, and flat land preparation) and training on soil nutrient management
  - Livestock farming practices (for example, conservation techniques and adding value to livestock fodder) and market linkages[38]
- Encouraging farmers to grow more resilient crop varieties by procuring improved and resilient seeds, consistent with market demands, and supporting seed multipliers
- Establishing more effective natural resources management as a livelihood development strategy, with a focus on the wildlife farming, safari hunting, and ecotourism industries
- Assisting local farmers and pastoralists to start new businesses, such as aquaculture and crocodile farming
- Supporting community gardens with small-scale irrigation schemes[39]

The project was implemented by the Zimbabwean government, through its Environmental Management Agency, with support from UNDP. UNDP provided oversight and quality assurance. The intervention engaged a range of stakeholders, from farmers to local authorities and agricultural research institutions. For example, the project drew on expertise from the Chiredzi Research Station, which conducts research and offers technology support for farmers in semi-arid regions, and the Makaoli Research Station, which focuses on livestock agriculture. Another major player was the Department of Agricultural, Technical and Extension Services. Extension workers were posted at the village level and kept in daily contact

Table A1 | **Adaptation Interventions for MSEs in Zimbabwe**

BARRIER	INTERVENTION	CHANGE	OUTCOME AND IMPACT
Access to markets: No ready market for some climate-resilient crops and livestock options	Could not improve value chain for all adaptive crops within the project timeframe; focused on supporting those with market potential, such as red sorghum	Partnerships with private sector enhanced value chain	Diversification of agribusiness due to the intervention's pilot projects to stimulate products with ready markets, for example, red sorghum, fish, and livestock
Skills: Lack of technical capacity to use adaptation technologies	Farmer field schools introduced farmers to new adaptation technologies and techniques	Farmers extended their agricultural knowledge and skills	Diversification of crops, improved soil moisture management, and more resilient mixed production models
Information: Lack of information channels to rural areas limiting weather forecast information	Installation of eight weather stations and the development of a customized rainfall forecasting system	Farmers able to plan for climate variability and extreme events	Improved crop cycle planning, drought preparedness, and changed farming practices to protect yields from low-rainfall seasons
Finance: Limited access to finance for investing in adaptation	No direct financial assistance was provided. The only financial support was purchase of high-quality, certified seeds for the crop mix	Demonstrated potential for stronger agribusinesses through use of crop mix	Farmers continued to use a crop mix to diversify and expand their businesses
Institutions: Government policy does not prioritize climate adaptation (does not promote crops with adaptive capacity)	Conducted technical studies (for example, climate risk analyses) for national institutions.[40] Worked with officials to implement other project activities (for example, crop diversification)	Improved knowledge base and capacity of national institutions for climate adaptation. Demonstrated policy-oriented approaches to agropastoral adaptation as a model for policy at the national level	Policy direction and institutional framework are still under development;[41] but the project experience (increased adoption of adaptation measures and increase in agricultural productivity) is likely to contribute to national climate change policy and strategy

with farmers. Local government structures were also important, including district council and local-level leadership. The cooperation of the government ensured a sense of country ownership of the intervention.

The project enabled income generation by providing knowledge, technical skills, and, in some cases, equipment for adaptation such as crop mixes. The farmer field schools were particularly effective at building the capacity of local agribusinesses and persuading farmers to adopt more adaptive business practices. For example, the field schools demonstrated how farmers could get a better harvest during the low-rainfall season by using a crop mix.

The main barrier that remains is access to markets. The case of Zimbabwe demonstrates the importance of opening up access to markets to catalyze business growth. A ready market for selling goods is necessary to incentivize farmers to grow a crop surplus. While this is not an issue for the livestock industry, which is subject to high demand, the lack of an accessible market is a deterrent for growing alternative crops such as cassava. Both the government and broader private sector currently support crops with low adaptive capacities, including maize; instead, they need to join together to develop the value chain and stimulate investment in more resilient crop varieties.

ANNEX 2. CASE STUDY: **CAMBODIA**

PROJECT: "Promoting Climate-Resilient Water Management and Agricultural Practices in Rural Cambodia"

OBJECTIVE: Reduce the vulnerability of Cambodia's agriculture sector to climate-induced changes in water resources availability

LOCATION: Preah Vihear and Kratié (Kracheh) provinces

DURATION: September 2009–November 2013

IMPLEMENTED BY: The Government of Cambodia, Ministry of Agriculture, Forestry and Fisheries, with support from UNDP

FUNDED BY: Least Developed Countries Fund (LDCF)—Global Environment Facility (GEF); UNDP

TOTAL FUNDING: US $3,090,350

BENEFICIARIES: Farmers (micro/small agribusinesses)

RELEVANT INTERVENTIONS

- Irrigation schemes, rainwater catchment and conservation technologies to reduce agricultural dependence on rainfall
- Seed purification to produce resilient rice varieties
- Community-based climate information system to assist farmers with planning for climate hazards

POSITIVE RESULTS

- Increased agricultural productivity with adoption of adaptation technologies including six scientifically improved, resilient rice varieties
- Improved water use efficiency. 1,470 households (30 percent of total in the target areas) benefit from 62 pump wells, three community ponds, 41 rain water harvesting containers, 10 solar pumps
- Irrigation schemes allowed farmers to grow an additional 355 hectares of rice during the rain-delayed period, benefiting 2,000 households
- 11,073 households in 52 villages, representing 55.5 percent of the target households, received timely information on weather forecasts to cope with events such as severe floods
- Changes in farmers' knowledge and attitudes to adaptation was observed following the environmental education and training programs

As a country with high exposure and high sensitivity to climate change, Cambodia needs to develop its adaptive capacity, especially in the agriculture sector. Maintaining steady access to water for agriculture is becoming increasingly difficult with climate variability, droughts, and flood events. UNDP's intervention in rural Cambodia drew attention to the need to protect the agriculture sector from the adverse impacts of climate change, with a focus on water management. The intervention targeted individual smallholders and family farms, which comprise the majority of private sector activity in Cambodia's rural communities. The project engaged 3,600 households, most of which were involved in some form of agricultural enterprise as their primary source of livelihood. The majority of beneficiaries were small-scale farmers, including sole proprietors and family-run farms. Small- and medium-sized local companies were also engaged, including irrigation firms and companies that process rice meal for local and international markets from the grains supplied by farmers. The intervention was instigated in two provinces, Preah Vihear and Kratié, "selected for their high vulnerability as well as for differences in agro-ecological and socio-economic circumstances."[42]

1. To improve resilience in agriculture, the project worked with farmers to:

- Introduce improved cultivars and test resilient rice varieties
- Conduct rice seed purification and apply the System of Rice Intensification (SRI)
- Train farmers in diversified agriculture skills such as raising livestock and vegetable gardening

2. To improve water management in agriculture, the project sought to:

- Build irrigation systems to insulate against droughts. Each irrigation scheme benefits multiple households, organized into water user groups
- Improve water-control infrastructure, including rainwater tanks, community ponds, wells, and solar water pumps, to mitigate flood damage

Funded by the LDCF and UNDP, the project was implemented by the Cambodian government, including the Ministry of Agriculture, Forestry and Fisheries (MAFF) and Communes (local administration), working closely with UNDP's country office in Cambodia. Some measures were undertaken in partnership with the International Fund for Agricultural Development (IFAD).

Over its four-year lifespan, the intervention achieved nearly all of its objectives (Phase 1). The activities in Preah Vihear and Kratié increased agricultural resilience by introducing improved water management practices, resilient seed varieties, and an improved climate

Table A2 | **Adaptation Interventions for MSEs in Cambodia**

BARRIER	INTERVENTION	CHANGE	OUTCOME AND IMPACT
Attitudes: Local attitudes, resistance to new farming methods	Demonstrations of benefits (cost and time savings) of using adaptation technologies	Farmers more willing to invest in adaptation technologies	Farmers engaged in adaptation. Hearing of their success, other farmers have expressed interest in the new technologies, such as resilient rice seeds
Skills: Lack of technical capacity to use adaptation technologies	Trainings on effective water management	Farmers able to use solar water pumps and irrigation systems	Use of water catchment and irrigation systems has reduced dependency on rainfall, and increased agricultural resilience to climate events such as droughts and floods; it has also increased the availability of water for drinking and home gardens
Finance: Limited access to finance for investing in adaptation	Grants and subsidies for adaptation measures in agriculture and water	Farmers have access to more resilient rice seed, irrigation, and water-catchment options	With financial assistance, farmers have adopted new agricultural and water conservation practices—improving their agricultural productivity and resilience to climate events
Institutions: Weak institutional framework on adaptation in agriculture and water management; for example, no national water plan	Contributed to revisions of agricultural and water policy, and worked with government to implement the intervention in communities	Government gained a sense of ownership over the project;[43] capacity-building among government officials; greater awareness of adaptation issues	Climate change priorities included in national strategies and policies; provincial development plans in place incorporating climate risks; Commune Councils better understand and take into account adaptation in local policy; government committed to assisting with project implementation in Phase 2
Information: Lack of weather forecast information	Provision of new community-based climate information system on flooding and drought events	Farmers able to prepare themselves to cope with expected hazards	Farmers have changed farming practices, for example, storing water, seeds, preparing soil, replacing late-maturing rice varieties with early-maturing varieties; thus protecting yields from the effects of extreme weather events

information system. Before the intervention, farmers relied heavily on rainfall and did not have the knowledge or tools to implement effective water management. By supporting farmers to adopt adaptation measures, such as irrigation and water conservation tanks, the intervention has improved both the resilience and productivity of local agribusiness. Based on the success of Phase 1, it is now due to be scaled up and replicated in two other Communes, benefiting an additional 1,900 households (Phase 2).[44]

The Cambodian case demonstrates the importance of presenting the business case for adaptation to persuade farmers to change their practices. Farmers' attitudes and habits posed a major barrier to adaptation. Without addressing their resistance to change, there was the risk that new technologies introduced would not be used after the pilot phase was completed. The intervention has had success in transforming agribusinesses, having shown farmers how adaptation measures will improve yields or prevent yield losses during harsh or dry seasons. The measures introduced in the target area are now being replicated in other parts of the country and show strong signs of sustainability.

ANNEX 3 – CASE STUDY: **TAJIKISTAN**

PROJECT: "Sustaining Agricultural Biodiversity in the Face of Climate Change in Tajikistan"

OBJECTIVE: Embed globally significant agro-biodiversity conservation and climate adaptation in agricultural and rural development policies and practices at national and local levels in Tajikistan

LOCATION: Four pilot areas (Zeravshan, Rasht, Baljuvan, and Shurobad), within seven districts (Aini, Penjikent, Tajikabad, Nurobod, Khovaling, Baljuvan, and Shurobad)

DURATION: July 2009–February 2015

IMPLEMENTED BY: The National Biodiversity and Biosafety Center (NBBC) under the purview of the Tajikistan government's Committee for Environmental Protection, with support from UNDP

FUNDED BY: Strategic Priority on Adaptation (SPA)—Global Environment Facility (GEF)

TOTAL FUNDING: US $2,025,000

BENEFICIARIES: Farmers (micro/small agribusinesses)

RELEVANT INTERVENTIONS

- Skills and knowledge to increase farm productivity and food security using climate-resilient agro-biodiversity-friendly practices, including the diversification of crops
- Education on financial management
- Provision of micro-credit schemes
- Trainings on using equipment such as solar dryers

POSITIVE RESULTS

- Produced more resilient and profitable agribusinesses; average income of farmers increased by 40 percent
- Greater access to finance; through micro-finance facilities, 170 households have expanded their home gardens, now covering 250 hectares in total, and established agro-processing shops
- Brought new agricultural knowledge to 3,300 participating farmers, through practical trainings and workshops on adaptation issues

Building climate resilience in Tajikistan requires an understanding of the broad landscape of private agricultural enterprises, including family farms in the informal sector. The intervention targeted micro and small enterprises in the most vulnerable communities as beneficiaries and has helped to grow these agribusinesses through skills training, capacity building, and providing access to finance. The government's cooperation in the project has helped to create an enabling environment for climate-resilient agribusiness by introducing certification and labeling standards for agro-biodiversity-friendly products, which immediately increased their market value.

The establishment of micro-loan schemes has rapidly advanced local farmers' investment in adaptation options such as different crop species and technologies. Before the intervention, access to finance was a major barrier; stories of farmers with intractable debt problems deterred others from taking loans to make investments that would improve their business. The intervention has addressed this fear by conducting trainings on financial skills to show farmers how to avoid debt issues and by spreading success stories of farmers who had profited from investing in adaptation.

UNDP's intervention in Tajikistan addresses the loss of agro-biodiversity while promoting climate-resilient agriculture. The beneficiaries of this intervention are approximately 3,300 local farmers and households with subsistence gardens in the target areas. The intervention enables farmers to expand their agro-enterprises and to better adapt to climate risks through the conservation and use of agro-biodiversity. By strengthening and diversifying the agriculture sector, it also helps MSEs to generate alternative sources of income to offset the negative impacts and shocks of climate change.[45]

The intervention has three aspects:

1. **Changing policy at the national and local level** to incorporate principles of agro-biodiversity conservation and climate adaptation and working at an institutional level to create an enabling environment for agribusinesses, for example, by encouraging the government to simplify certification procedures
2. **Testing modeling using a homologue approach,**[46] which predicts climate conditions and its impacts on agro-biodiversity at sites with a higher altitude, based on current conditions in homologous sites matched in terms of soil and climate, and thereby helps to predict how crops will respond to climate impacts in the long term

Table A3 | **Adaptation Interventions for MSEs in Tajikistan**

BARRIER	INTERVENTION	CHANGE	OUTCOME AND IMPACT
Finance: Limited access to credit; debt issues	Helped with establishment of micro-credit facilities (intervention was partially funded by grants and partially by these loan schemes)	Farmers have access to cheap, available finance to invest in more resilient crops and methods	Farmers have diversified their produce and expanded their business into new markets; by using micro-loans, farmers feel more ownership and responsibility over their business; due to their success, the loan schemes are continuing after termination
Technical capacity: Lack of traditional farming knowledge and skills beyond cotton production	Hydrologists, agronomists, other specialists engaged to give advice to farmers; Jamoat Resource Centers have made up-to-date agricultural information readily accessible[47]	Farmers have extended their agricultural knowledge	Crop diversification, focusing on propagation of climate-resilient traditional species
Attitudes: Local attitudes and risk aversion to new farming practices	Demonstrated economic benefits of transitioning to new methods of farming	Farmers persuaded to try different methods. Intervention also changed attitudes of local authorities, who had favored only annual crops	Farmers more willing to experiment with new adaptation techniques and technologies; however, persistence is required to change farming attitudes in the long term; at an institutional level, local governmental policies and practices now promote diversified crops[48]

3. Working with farmers to improve agricultural resilience and expand agro-biodiversity enterprises

The most relevant activities conducted in the intervention include:

- Promoting the use of climate-resilient, local crop species through local-level authorities, other farmers, resource centers, and the media (for example, project experts published informational brochures and articles in newspapers)
- Building farmers' agricultural knowledge of a broader range of species (such as fruits) and technical capacity to grow them by, for example, hosting demonstrations to show farmers how to use solar dryers, and conducting study tours for farmers across the country
- Increasing the value of local agro-biodiversity products through proper packaging, marketing, state-regulated certification and standardization of seedlings, and promotions at national and local trade fairs
- Expanding access to markets, for example, connecting farmers to supermarkets in the capital and establishing contracts for the wholesale supply of seedlings
- Providing farmers with access to micro-loans for agro-biodiversity enterprises, as well as training in financial skills
- Creating a "knowledge hub" by supporting a nationwide network of more than 100 small, community-based organizations called Jamoat Resource Centers (JRCs). These JRCs provide various agricultural extension services, for example, renting equipment, information about weather, information on fairs for selling produce, information about market prices for different goods in capital and global markets, and help with online marketing

The project was implemented by The National Biodiversity and Biosafety Center, with support from UNDP. Apart from the homologue modeling, the intervention has been successful in achieving its objectives. A mid-term evaluation was finalized in December 2012, confirming that the project had satisfactory progress on most outcomes.[49] The intervention has a strong likelihood of post-grant sustainability, particularly because the micro-loans schemes established by the intervention are due to continue and are gradually being repaid. The success of the project is now spreading, with replication of some initiatives in other parts of the country.

ANNEX 4 – CASE STUDY: **NICARAGUA**

PROJECT: "Reduction of Risks and Vulnerability Caused by and Due to Flooding and Droughts in the Estero Real River Watershed"

OBJECTIVE: Reduce the risks of drought and flooding caused by climate change and variability in the semi-arid area of the Estero Real River Watershed

LOCATION: Eight micro-watersheds in the upper part of the Villanueva River sub-watershed, comprising 29 communities within three municipalities (El Sauce, Achuapa, and Villanueva)

DURATION: March 2011–June 2015

IMPLEMENTED BY: Nicaraguan Ministry of Environment and Natural Resources, with support from UNDP

FUNDED BY: Adaptation Fund (AF)—Global Environment Facility (GEF)

TOTAL FUNDING: US $5.07 million

BENEFICIARIES: Farmers (micro/small agribusinesses) and households

RELEVANT INTERVENTIONS: Improving climate resilience, food security, and water security through interventions targeting smallholder farmers in micro-watersheds, including:

- Developing Farm Agro-ecological Transformation Plans (FATPs) for farmers to promote a transition to climate-resilient and agro-ecological practices
- Investing in water infrastructure
- Improving the efficiency of water use in production processes

POSITIVE RESULTS TO DATE

- Private sector engaged in provision of rainwater collection and storage facilities to 100 family farms. By the end of 2014, construction of 880 water storage structures in the target micro-watersheds was completed
- Farm families trained in water management and use, including irrigation systems
- Two irrigation systems built, benefiting 118 households
- Of 1,005 families living in the target area, 920 were assisted to develop FATPs for their family farms; 840 (more than double the baseline) are in the process of being implemented[50]

This intervention targeted two watersheds in northern Nicaragua, in the Estero Real River Watershed and the River Villanueva, where 65 percent of Nicaragua's population lives. The watersheds on which they depend are increasingly vulnerable to climate variability, including the risks of droughts and floods. The agriculture sector imposes significant pressure on Nicaragua's vulnerable water system. Crop irrigation alone accounts for nearly 75 percent of water resource use. In the absence of effective water management, the rate of water extraction has exceeded groundwater recharge rates. Livelihoods for smallholder farmers in Nicaragua are increasingly vulnerable to extreme weather; high levels of rural poverty prevent investment in adaptation measures.

Despite these challenges, the policy and institutional framework in Nicaragua has been supportive of strengthening the resilience of the water sector. The government's recent national adaptation strategy and new water laws have facilitated progress on adaptation, and the government has since been collaborating effectively with UNDP to implement the intervention.

UNDP's intervention in Nicaragua targets over 1,000 families living on family farms in the pilot area. Applying the principle of subsidiarity, the intervention focuses on eight watersheds, as the "lowest practical socio-political and landscape level" at which policies can be implemented.[51] The intervention works closely with smallholder farmers to develop long-term "Farm Transformation Plans." The objective is to promote agro-ecological and climate-resilient farming practices, including better water management, while increasing the productivity and profitability of the agro-enterprises. The transformation plans specifically promote agro-silvopastoral systems[52] to help poor farmers increase income opportunities by making use of all four seasons and increasing production on small landholdings of one to two hectares. Partnering with farmers, the plans are "collaborative efforts that are tailored to each farm's soil and slope and the capacity and interests of the family."[53]

The intervention has so far achieved positive results in enhancing the resilience of small agricultural businesses and improving water security by:

- Developing Farm Agro-Ecological Transformation Plans (FATPs) for farmers that help to prevent soil erosion and promote healthy soil. Farmers were given training on organizing themselves, expanding and diversifying their agribusinesses, and implementing agro-silvopastoral systems
- Making investments in infrastructure for storing and using rain and surface water, to help both farms and households to meet their water needs

Table A4 | **Adaptation Interventions for MSEs in Nicaragua**

BARRIER	INTERVENTION	CHANGE	OUTCOME AND IMPACT
Information: Farmers poorly informed about climate change impacts and adaptation needs	Through the FATP process, farmers were informed of the benefits of diversification for soil and crop productivity	Behavioral change among farmers during FATP collaborations	Shift from crop monoculture to crop diversification
Technical skills: Farmers lacking in technical skills needed for using new adaptation technologies	Intervention attempted to train farmers on implementation of agro-silvopastoral systems. However, according to the mid-term evaluation, the awareness-raising activities are not the "most effective way to share knowledge to all protagonists, including those that have not had the privilege of acquiring technical skills"[54]	Target farmers have learned new technical skills through trainings and workshops	Farmers have the skills to effectively implement agro-silvopastoral and agroforestry systems, use organic fertilizer (lombrihumus), use communal irrigation systems, and construct water-harvesting methods
Finance: Farmers have limited access to credit for investing in new technologies	Intervention did not directly address this barrier, although funding was provided for activities in the target areas	None; there is still no formal credit or banking system that caters to MSEs because most of them do not have bank guarantees	None
Social attitudes: Farmers attached to tradition and fear experimentation with new practices	The intervention demonstrated and thereby gradually familiarized farmers with new adaptation methods and technologies	Farmers have had more opportunities to experiment and thus reduced their fears	New adaptation methods and technologies adopted

- Improving the efficiency of water use in all production processes, by increasing infiltration, strengthening soil structure, and stabilizing slopes

The intervention was supported by UNDP and executed by the Ministry of Environment and Natural Resources (MARENA) but highly decentralized to the rural areas. Because it was important in the Nicaraguan context, the intervention placed particular emphasis on directly involving beneficiaries, who were redesignated as "protagonists," in implementation.

A mid-term evaluation was published in April 2014, confirming that the project had made satisfactory progress on most outcomes. From the information available, it appears that post-grant financial sustainability will be an issue, unless the government commits to providing ongoing support to the agro-ecological transformation plans. In any case, the intervention is likely to have a lasting impact on farmers' attitudes and governmental policies, which have both become gradually more sensitive to adaptation needs.

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ENDNOTES

1. See blog post: "Costs of Climate Adaptation Explained in 4 Infographics." World Resources Institute. April 23, 2015. http://www.wri.org/blog/2015/04/costs-climate-adaptationexplained-4-infographics

2. These case studies were supported by UNDP with financing from the Global Environment Facility, including Least Developed Countries Fund, Special Climate Change Fund and Strategic Priority on Adaptation, as well as the Kyoto Protocol's Adaptation Fund.

3. United Nations. 2015. "Transforming Our World." Available at: https://sustainabledevelopment.un.org/content/documents/7891TRANSFORMING%20OUR%20WORLD.pdf

4. Economies each have their own definitions of micro and small businesses (Kushnir, 2010). In this report, the authors chose enterprises with 50 and fewer employees, following the IFC's definition.

5. There is, however, a gray area around the exact size of enterprises to be encompassed in this category because many medium-sized enterprises could face similar barriers. Therefore, while the focus is on MSEs, the discussions in this report will be relevant to some medium sized enterprises as well.

6. "Adaptive capacity" is defined here as the ability of a community, household, or individual to adjust and readjust as weather conditions shift and new climate change information emerges (Dixit et al. 2012).

7. Business Facilities Feature Story: Thailand—Nuanced Nation, One-Stop Shop: http://businessfacilities.com/2013/07/featurestory-thailand-nuanced-nation-one-stop-shop/

8. Annual project report 2011 – Promoting Climate-Resilient Water Management and Agricultural Practices in Rural Cambodia (NAPA Follow-Up).

9. See, for example, the Community Based Disaster Preparedness project by the Dhaka Ahsiania Mission and Concern Universal in Bangladesh: http://www.preventionweb.net/english/professional/publications/v.php?id=8749

10. For example, SABMiller, see: http://www.nbcnews.com/business/economy/beer-insurance-businesses-bet-climatechange-n124781 and Guinness, see Sanni et al. 2009.

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13. Their research focused on small firms in the United States but there is evidence that their findings also apply to firms in emerging markets. See, for example: Maquieira et al. 2012; Brijlal and Quesda 2009.

14. Interview with Dr. Leonard Unganai, project manager for Coping with Drought and Climate Change in Zimbabwe. http://www.dewpoint.org.uk/Asset%20Library/ICID18/24-UNGANAI_et_al_ICID+18.pdf.

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17. UNDP, Adaptation Learning Mechanism, Building Climate Resilient Rural Communities in Zimbabwe (2012), accessed June 10, 2014, http://www.undp-alm.org/projects/sccfclimate-resilient-zimbabwe.

18. Project periodic reports—realized thanks to M&E (Monitoring and Evaluation) and regular field visits.

19. Biagini and Miller, 2013. "Engaging the private sector in adaptation to climate change in developing countries: Importance, Status, and Challenges".

20. "Adapting to Climate Change through the Improvement of Traditional Crops and Livestock Farming in Namibia"

21. Project periodic reports—realized thanks to M&E (Monitoring and Evaluation) and regular field visits.

22. Based on "Case in point: How countries' water policies affect multinationals" Washington Post. Accessed on 16 June 2014 and personal communication with Professor Debaere.

23. Servaas van den Bosch. "At first they laughed at me." http://www.met.gov.na/Documents/At%20first%20they%20laughed%20at%20me%20by%20Servaas%20van%20den%20Bosch.pdf.

24. Interview with Yusuke Taishi, Regional Technical Advisor, UNDP.

25. Terminal Evaluation for "Promoting Climate-Resilient Water Management and Agricultural Practices in Rural Cambodia" p. 20.

26. Interview with Pinreak Suos, National Technical Advisor, UNDP.

27. Terminal Evaluation for "Promoting Climate-Resilient Water Management and Agricultural Practices in Rural Cambodia" p. 8.

28. Honduras, Project Document "Addressing Climate Change Risks on Water Resources in Honduras: Increased Systemic Resilience and Reduced Vulnerability of the Urban Poor", p.39. http://www.hn.undp.org/content/dam/honduras/docs/proyectos/PRODOC_FIRMADO_FA.pdf

29. Honduras, Project Document "Addressing Climate Change Risks on Water Resources in Honduras: Increased Systemic Resilience and Reduced Vulnerability of the Urban Poor", p.39. http://www.hn.undp.org/content/dam/honduras/docs/proyectos/PRODOC_FIRMADO_FA.pdfDraft project brief by Nargizakhon Usmanova, Programme Analyst, UNDP, with insights from the project manager, Professor Neimatullo Safarov.

30. Draft project brief by Nargizakhon Usmanova, Programme Analyst, UNDP, with insights from the project manager, Professor Neimatullo Safarov.

31. Interview with Jessica Troni, UNDP International Technical Advisor.

32. Final Q2 Report April-June 2013 "Strengthening the Resilience of Our Islands and Our Communities to Climate Change Programme", Cook Islands, p.5. http://www.mfem.gov.ck/docs/AMD/Development%20Programmes/SRIC/April%20-%20June%202013%20Report.pdf

33. This is the final report on the "Assessment to Update the Indicators, Baseline and Project Targets for the Strategic Results Framework (SRF) of the UNDP Adaptation Fund Programme "Strengthening the Resilience of our Islands and our Communities to Climate Change (SRIC-CC)" Cook Islands" p. 23.

34. Global project "Weather and Climate Observation Networks (WCON) and Early Warning Systems (EWS) for Development (WCON-EWS)", Project Document, October 2013 version, p.37.

35. See UNDP-GEF, Climate Information and Early Warning Systems in Africa, http://ews-undp.blogspot.com/, last updated 21 May 2013.

36. Terminal Evaluation for "Coping with Drought and Climate Change in Zimbabwe" p. 47.

37. Terminal Evaluation for "Coping with Drought and Climate Change in Zimbabwe" p. 32.

38. Interview with Dr. Leonard Unganai, project manager for Coping with Drought and Climate Change in Zimbabwe.

39. Terminal Evaluation for "Coping with Drought and Climate Change in Zimbabwe" p. 33.

40. Terminal Evaluation for "Coping with Drought and Climate Change in Zimbabwe" p. 29.

41. Terminal Evaluation for "Coping with Drought and Climate Change in Zimbabwe" p. 48.

42. Project Implementation Report 2013 for "Promoting Climate-Resilient Water Management and Agricultural Practices in Rural Cambodia" p. 1.

43. Terminal Evaluation for "Promoting Climate-Resilient Water Management and Agricultural Practices in Rural Cambodia" p. 39.

44. Interview with Pinreak Suos, National Technical Advisor, UNDP.

45. Project Implementation Report 2014 for "Sustaining Agricultural Biodiversity in the Face of Climate Change in Tajikistan."

46. This approach relies on pairing sites, based on predictions from GCMs, showing that temperatures in the project pilot areas will have increased by 3ºC in 2050. The adiabatic lapse rate is 6ºC per 1,000 m, which means that climatic conditions at a given site today will prevail in 2050 at a homologous site that is 500 m higher in altitude. Using this approach, sites having substantial agro-biodiversity were identified by the project and matched in terms of soils and climate to homologous sites located at altitudes 500 m higher: MTE 8.

47. Interview with Nargizakhon Usmanova, Programme Analyst, UNDP, with insights from the project manager, Professor Neimatullo Safarov.

48. Interview with Nargizakhon Usmanova, Programme Analyst, UNDP, with insights from the project manager, Professor Neimatullo Safarov.

49. Mid-Term Evaluation for "Sustaining Agricultural Biodiversity in the Face of Climate Change in Tajikistan."

50. Mid-Term Evaluation for "Reduction of Risks and Vulnerability Caused by and Due to Flooding and Droughts in the Estero Real River Watershed" p. 28.

51. Mid-Term Evaluation for "Reduction of Risks and Vulnerability Caused by and Due to Flooding and Droughts in the Estero Real River Watershed" p. 9.

52. Agro-silvopastoral systems are land-use systems involving the combination of forestry, crop farming, and livestock businesses at the same site: see, for example, Russo, R.O. 1996. "Agrosilvopastoral systems: a practical approach toward sustainable agriculture." 7 (4) Journal of Sustainable Agriculture 7 (4): 5-17.

53. "Empowering the Poor in a Changing Climate, Experience from UNDP Supported initiatives on Adaptation" p. 27.

54. Mid-Term Evaluation for "Reduction of Risks and Vulnerability Caused by and Due to Flooding and Droughts in the Estero Real River Watershed" p. 24.

ABBREVIATIONS AND ACRONYMS

AFF	Adaptation Financing Facility
AGRA	Alliance for a Green Revolution in Africa
CARDI	Cambodian Agricultural Research and Development Institute
CDP	Carbon Disclosure Project
CIC	Climate Innovation Centers
CITC	Cook Islands Tourism Corporation
CTI	Climate Technology Initiative
CWRF	Clean Water Revolving Fund
DBSA	Development Bank of South Africa
DEA	Department of Environmental Affairs
EBRD	European Bank for Reconstruction and Development
ECB	European Central Bank
EIF	Environmental Investment Fund
FAO	Food and Agriculture Organization of the United Nations
FATP	Farm Agro-ecological Transformation Plan
GDP	Gross Domestic Product
GEF	Global Environment Facility
IDRC	International Development Research Centre
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IPCC	Intergovernmental Panel on Climate Change
LDC	Least Developed Countries
LDCF	Least Developed Countries Fund
MNC	Multinational Corporation
MSE	Micro and Small Enterprise
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NBBC	National Biodiversity and Biosafety Center
NGO	Non-governmental organization
OECD	Organisation for Economic Co-operation and Development
OFAT	On-Farm Adaptive Trial
PPCR	Pilot Program for Climate Resilience
PPP	Public-Private Partnership
R&D	Research and Development
SCCF	Special Climate Change Fund
SPA	Strategic Priority on Adaptation
SRI	System of Rice Intensification
UKCIP	United Kingdom Climate Impacts Programme
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WRI	World Resources Institute
WWF	World Wildlife Fund

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We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.

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