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Bonizella Biagini^a & Alan Miller^{a b}

^a Climate Change Adaptation Strategy and Operations , Global Environment Facility , Mail Stop: P4-400, 1818 H Street, NW, Washington , DC , 20433 , USA

^b International Finance Corporation , 2121 Pennsylvania Ave. , NW, Washington , DC , 20433 , USA

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REVIEW ARTICLE

Engaging the private sector in adaptation to climate change in developing countries: importance, status, and challenges

Bonizella Biagini^{a*} and Alan Miller^{a,b}

^aClimate Change Adaptation Strategy and Operations, Global Environment Facility, Mail Stop: P4-400, 1818 H Street, NW, Washington, DC 20433, USA; ^bInternational Finance Corporation, 2121 Pennsylvania Ave., NW, Washington, DC 20433, USA

In developing countries there is a need for the private sector to be more engaged in identifying climate change risks, response measures, and adaptation, and to prioritize these more highly. The importance of the role of the private sector is evident from lessons drawn from the increasing amount of empirical experience on adaptation projects supported by climate funds: successful private sector engagement in adaptation will catalyse greater investment in reducing vulnerability; this in turn will accelerate the replication of climate-resilient technologies and services in core development sectors, especially in developing countries where investment in long-lived infrastructure is growing rapidly. Private sector companies should integrate adaptation into their strategies and investments for their own economic interest, as well as for their clients' interest and for the interests of the countries in which they operate. Unfortunately, private sector efforts on adaptation are not widely understood or seen as good business practice, and generally face several obstacles. Public policy should incentivize such investments by communicating risks, offering incentives for resilience enhancing measures, and where necessary by putting in place regulation to avoid shifting risks onto the public. Stronger public–private partnerships will also help to enhance climate resilience, and at the same time create business opportunities. Private firms will develop many of the products and services that will enable lower cost and more effective responses to climate change, which can be the basis for growing businesses. Ultimately, a paradigm shift is required for business to fully integrate the value associated with managing climate risks.

Keywords: adaptation; climate change; climate risks; development; developing countries; insurance; least developed countries

Introduction

With the growing expectation of more rapid increases in global temperature and predictions of more frequent and severe extreme weather events, there is an urgent need to engage the private sector in efforts to improve adaptation to climate change. Climate change is already disproportionately affecting the economically disadvantaged and slowing development (WB WDR, 2010), a disparity which is likely to increase as global warming exceeds tolerable levels and climate change accelerates. In the industrialized countries, extreme weather events are already a business risk, and awareness of climate change appears to be increasing. In contrast, in developing countries, engaging the business community has been given much less emphasis and remains unusual. The authors aim to bring empirical data and operational experience to the often theoretical discussion of adaptation, based on direct experience in managing concrete adaptation projects in developing countries, through several adaptation funds, including the Least Developed Countries Fund (LDCF), the Special Climate Change Fund (SCCF), and the Adaptation Fund and Pilot Program on Climate

Resilience (PPCR). For this purpose, this article includes an analysis of an adaptation project portfolio currently under implementation that provides some concrete examples of barriers, challenges, and opportunities for private sector engagement in adaptation.

As adaptation measures reduce climate vulnerability, they increase 'climate resilience' and long-term sustainability for the future. This preventive approach, originally adopted by the Global Environment Facility (GEF)-managed LDCF and SCCF (GEF/C.24/12, 2004 and GEF/C.28/18, 2006), and subsequently adopted by other adaptation-related funds, differs from that of conventional disaster relief programmes, which are developed to lessen the economic and social consequences of extreme events after the fact. The role of the private sector in adaptation will be significant to provide both necessary services to understand climate risks in a better manner and the technologies and business models that will make current and future investments climate resilient. Successful private sector engagement in adaptation will catalyse greater and more frequent investments, which could lower the costs and

*Corresponding author. Email: bbiagini@thegef.org

accelerate the replication of climate-resilient technologies and approaches in core development sectors, especially in developing countries. Consequently, climate change may present an opportunity to engage private sector investors in countries with small economies that would not typically attract these kinds of interventions.

The private sector should be an active partner in and, in many instances, the dominant source of efforts to adapt to climate change. Several actions are essential for the private sector to become more fully engaged and effective in responding to climate change in developing countries. First, increase greater awareness about the significance of climate change; second, include the private sector in national and international adaptation efforts; and third, engage the private sector in developing products and services that can reduce the costs and effects of climate change. While a general discussion of these issues is available in the literature (see, e.g. Atteridge, 2011; Schalatek & Nakhooda, 2013; Buchner, Falconer, Hervé-Mignucci, & Trabacchi, 2012; Venugopal & Srivastava, 2012), this paper promotes specific business planning, operational practices, and new product development of the private sector that can reduce the economic and human effect of extreme weather events and other climate effects in developing countries.

A further objective of this paper is to highlight the need for much more focused and detailed analysis of opportunities for private investments in climate resilience consistent with good business practice and to understand the substantial barriers that currently impede such measures.

Importance of engaging the private sector in developing country climate change efforts

Engaging the private sector as a partner in recognizing and adapting to climate change in developing countries is essential for multiple reasons: to mobilize financial resources and technical capacity, leverage the efforts of governments, engage civil society and community efforts, and develop innovative climate services and adaptation technologies. Private entities dominate many decisions key to adaptation (e.g. the location and design of roads, buildings, and other infrastructure investments, which are often minimally regulated by codes); agricultural research (e.g. to develop more drought-resistant seeds); water management infrastructure and technologies; the commitment of financing, most of which will necessarily have to come from private sources; the development of adaptive technologies in all development sectors; and the development and dissemination of adaptation products and services.

The private sector *should* engage in adapting to climate risks because financial effects related to floods, droughts, hurricanes, high temperatures, and other weather-related disasters have risen steadily due to climate change. (The degree to which they *will* engage depends on

numerous factors which influence business decisions as discussed below.) The number and financial consequences of extreme weather events have risen dramatically in frequency and severity in recent years with losses from weather-related events exceeding \$1 trillion between 1980 and 2011 in North America alone (Munich Re, 2012). Losses from extreme weather events are increasingly a factor in corporate balance sheets as indicated by a recent review of 'Physical Risks from Climate Change: A Guide for Companies and Investors on Disclosure and Management of *Climate Impacts*' (Ceres, 2012):

- More than 160 companies in Thailand's textile industry were harmed by the 2011 floods, stopping about a quarter of the country's garment production.
- Agribusiness and food company Bunge reported a \$56 million quarterly loss in its sugar and bioenergy segments, driven primarily by droughts in 2010 in its main growing areas.
- Electric power company Constellation Energy experienced reduced quarterly earnings of about \$0.16 per share due to the record-setting 2011 heat wave in Texas that forced it to buy incremental power at peak prices.

Insurance company Munich Re received claims worth more than \$350 million from the 2010–2011 Australian floods, contributing to a 38 percent quarterly profit decline. A single extreme weather incident, such as floods in Thailand in December 2011, can reduce a country's GDP by several percent, eliminate tens of thousands of jobs, and disrupt global supply chains for manufacturing products from cars to computers (World Bank GFDRR, 2012).

The indirect effect of extreme weather events can also dramatically affect business. For example, ports may suffer from disruptions in the transport of goods due to floods even if protected themselves (IFC, 2011a, 2011b, 2011c). A more subtle, but even more dramatic example is the connection between commercial business and extended droughts in several wheat-growing regions, resulting in shortages, a rapid rise in prices, food riots and civil unrest (Technology Review, 2011).

Private initiatives are not a substitute for governmental adaptation efforts, and indeed, the former are very dependent on the latter for information, supportive policies and regulation, and other support. Some elements of climate change adaptation are primarily or even exclusively government functions and are likely to remain so, particularly the provision of basic weather and climate information, design, and implementation of risk management policies (e.g. building codes, land use restrictions, and insurance regulations), and disaster planning and preparedness. A focus on private action has been also perceived as politically contentious insofar as seen as a means of shifting responsibility otherwise appropriately born by

governments. The United Framework Convention on Climate Change (UNFCCC) includes several articles and subsequent decisions related to adaptation that assign obligations to governments. Yet, even at this early stage of implementing adaptation measures, potential private sector contributions have been identified in all these fields, and in the climate negotiations, public officials have repeatedly emphasized the importance of involving the private sector. This will be especially important in order to fulfil the financial pledges made to support the Green Climate Fund, a new financial mechanism being created as part of the decision to mobilize and channel additional funds to climate finance (Green Climate Fund website www.gcfund.net).

From a development perspective, it is noteworthy that some of the largest areas for private sector activity and investments coincide with sectors such as infrastructure, agriculture, water resources management, energy, and coastal zone management that are most vulnerable to climate change (Oxfam, Calvert Investments, Ceres, 2012), as detailed in Table 1.

In the poorest countries, agriculture and small farms typically constitute the largest share of employment and GDP (World Bank, 2013). Climate change adaptation in these sectors is therefore closely linked to the resilience of private entities.

Current status of private sector awareness and adaptation efforts

A recent Organisation for Economic Cooperation and Development (OECD) survey suggests that private sector awareness of climate risks is increasing, but that only a minority of respondent businesses have conducted risk assessments and fewer still have evaluated adaptation options (Agrawala et al., 2011; see also Acclimatise, 2009). While suggesting that governments may be able to promote greater private sector awareness and response, the OECD report also confirms the reality that there is still much to be learned about the status of private sector adaptation, and strategies to make it more effective.

Legal requirements and investor expectations are beginning to promote, and in some cases, mandate disclosure of climate risks based on their potential financial effect. In the U.S., the Securities and Exchange Commission (SEC), the agency responsible for regulation of securities trading, issued guidelines in January 2010 that explain how climate change risks should be addressed in the context of rules for mandatory financial filings required of publicly traded companies (Shorter, 2012). These requirements, however, are of limited relevance so far for companies primarily doing business in developing countries. There is some evidence that shareholders are increasingly asking for climate risk disclosure by filing resolutions, while these rarely pass, they can influence

management policy to avoid reputational risks and to address concerns by socially conscious investors (Bloomberg, 2013).

Independent of legal requirements, large institutional investors have come together to ask for corporations to disclose climate change-related activities through the Carbon Disclosure Project (CDP), another NGO. CDP prepares a questionnaire circulated to the S&P 500. While response is voluntary, the backing of 551 signatory investors collectively representing \$71 trillion of assets gives it some weight (www.cdp.org). A weakness of the CDP survey is that it appears to be sufficient simply to show awareness of an issue without necessarily committing to do anything about it, or stating a very general intent to take action.

Barriers to increasing private sector adaptation efforts in developing countries

Businesses are accustomed to uncertainty in many forms, including actions by competitors, changing customer preferences, and shifts in government policies. Climate variability has long been an important uncertainty for business planning. Farmers have had to prepare for droughts and floods since biblical times. Utilities plan their operations around the hottest summer demands. Preparing for hurricanes is a fact of life in the Caribbean. The challenge in anticipating climate change arguably differs quantitatively because risks of climate change are higher as demonstrated by the higher frequency and intensity of climate-related events and the economic losses that are derived from them. It also differs qualitatively because a better knowledge of the risk will allow more planned and specific prevention measures. Business planning has typically been defined by financial time horizons and spatial scales much smaller than can be obtained from current climate science and models (Connell, Miller, & Stenek, 2009). Climate change also can present qualitatively different risks from those business has faced in the past insofar as droughts, storms, and winds become much more severe than ever before.

From a private sector perspective, the perception is that while climate change is occurring on a global scale and may already be responsible for the recent increase in extreme weather events, much of the risk is in some seemingly remote future several decades hence and beyond timeframes relevant for investment purposes. In contrast with mitigation in the form of energy efficiency improvements, which can immediately reduce costs and contribute to profitability, most efforts to improve climate resilience take the form of risk avoidance and only generate a return if and when an extreme event occurs. Adaptation measures are necessarily specific to time and location; adaptive measures in one location may be useless or even inappropriate in another time and place, for example, buildings may have to be periodically relocated if sea level rise continues, and switching to more heat-resistant seed types

Table 1. Risks of climate change for key development sectors.

Sector	Direct effects/risks	Indirect effects/risks
Agriculture, food and beverage	<ul style="list-style-type: none"> • Higher temperatures, drought, flooding reduce production • Food processing effects due to temperature and water availability • Food safety issues 	<ul style="list-style-type: none"> • Volatile commodity prices • Competing demands for water • Community conflicts • Interference with transport in and out
Hydropower and steam turbines	<ul style="list-style-type: none"> • Water availability • Cooling water • Thermal efficiency • Flooding of reservoirs • Accelerated evaporation 	<ul style="list-style-type: none"> • Competing demands for water • Increased demand • Lower reliability reduces power value
Ports and shipping	<ul style="list-style-type: none"> • Sea level rise, coastal flooding • Increased storm intensity • Berthing difficulties • Low water restrictions 	<ul style="list-style-type: none"> • Primary goods disrupted by climate (e.g. crops) • Access disrupted (e.g. roads flooded) • Polar melting creates competitive routes • Increase insurance cost
Mining	<ul style="list-style-type: none"> • Water availability • Flooding • Tailing pond ruptures 	<ul style="list-style-type: none"> • Power restrictions lead to reduced production • Warm winter melting restricts transport • Shipping restrictions • Community conflicts
Tourism	<ul style="list-style-type: none"> • Hurricanes and tropical storm disruptions • Sea level rise effects on coastal locations 	<ul style="list-style-type: none"> • Travel disruptions • Perceived risk • Water availability • Change in seasonality
Disaster preparedness	<ul style="list-style-type: none"> • More frequent extreme weather events 	<ul style="list-style-type: none"> • More severe development effect • Increase in recovery time

can be effective only up to some temperature limit. Most companies also lack the internal knowledge and capacity to evaluate climate science. They need short- to medium-term projections of localized climate effects, commensurate with the scale of business activity, from sources they trust and understand. While major efforts to improve short-term forecasts are ongoing, downscaled, short-term forecasts from multiple climate models presently often disagree with respect to some key variables such as changes in precipitation. This has so far been a strong rationale for inaction and business-as-usual (Hurrell, 2009).

There is also evidence that a consequence of global warming and climate change will be greater climate variability, such that even confidence on conditions during the next decade may not hold for decades thereafter (Hallegatte et al., 2012). Recognizing the problem too openly may also be seen as support for unwelcome regulation (Agrawala et al., 2011). Consequently, surveys show that most businesses perceive consideration of climate risk in their investments and business plans to be unnecessary, technically difficult, and perhaps premature; acknowledging empirical evidence of climate effects and economic losses can be seen as politically sensitive.

In addition to the lack of reliable climate projections at the scale of a business activity, private companies face

several additional obstacles in developing countries. In some countries, access to weather and climate information is limited and tightly controlled by governments and only available for a fee, which can add substantial costs. Companies may also find that they have few short-term options to reduce their risks, or that much of what could be done is within the realm of governments (e.g. improving storm warning systems). When actions have been identified, they may involve trade-offs with short-term profitability (changes in seed varieties), require costly infrastructure (building coastal fortifications), or be difficult to finance.

Misleading but widely held perceptions are that climate change is still unproven and a future rather than current risk, and that adaptation is largely dependent on uncertain model results. There is an erroneous perception among many companies that climate change is primarily an environmental rather than a development issue. The political process, including the climate convention and negotiating process, is notably lacking input from private sector perspectives.

Overcoming the barriers

Several ways have been proposed, and in a few instances implemented, to address some of these barriers. For

certain purposes, the most effective response will be regulatory mandates such as building codes and zoning restrictions which directly address the need for cost-effective improvements in building design and location (see below). Lenders and insurers can reinforce or sometimes substitute for regulation through their requirements, viz, refusing to lend or insure buildings that fail to incorporate climate resilience. Investor awareness could also become a significant positive force – assuming metrics and reporting allowed informed comparison of climate risks (see below).

For some short-term purposes, such as utility planning for summer and winter peak demand, the most effective method currently available is an assessment of short-term trends (e.g. the past decade) used as a proxy into the future (Miller & Stenek, 2012). A more generally applicable approach goes by various labels, among them ‘robust decision-making’ (Lempert et al., 2004). This concept begins with an assessment of financial vulnerabilities and then evaluates the costs and benefits of options to mitigate the risk, based on estimates of the probability that an event may occur within a given timeframe (IFC, 2011a, 2011b, 2011c). For example, a small incremental investment (e.g. increasing the level of a roadbed when building a railroad) may be justified if the probability of extreme flooding due to climate change is one in 20 years but not one in 500 years. Thinking about risks and potential adaptation strategies may also be useful insofar as it informs business management about new risks and opportunities. Companies may also identify needs for greater collaboration with public agencies, for example, warmer temperatures in some regions may lead to a greater incidence in malarial mosquitoes, which public health agencies could help identify and address.

As discussed below, climate finance can be used to demonstrate and foster private sector understanding and adoption of good adaptation practices. In some sectors, particularly agriculture, there is an emerging appreciation that climate resilience can be a source of competitive advantage, for example, through the adoption of crop insurance and more robust seed varieties. As a recent UN report describes, this perception can create new market opportunities, especially in emerging markets (UNISDR, 2013).

Successful early efforts to engage the private sector in climate change adaptation

International development organizations have begun to address the link between private investment and adaptation in several ways. First steps in this regard have been achieved through projects and programmes financed by the LDCF and the SCCF, two funds that were established by the Conference of the Parties to the UNFCCC in 2001. These funds, managed by the GEF, were established to finance concrete adaptation actions in developing countries. They currently total about \$900 million of

voluntary contributions from donor countries, and finance adaptation investments mostly through public channels. The LDCF and SCCF operate in cooperation with regional banks and several UN agencies (for a list of all 10 agencies, see www.thegef.org).

An analysis of the LDCF/SCCF-financed project portfolio implemented by the United Nations Development Programme (UNDP) shows that private sector engagement in the portfolio takes place in five ways. Some examples of these five approaches from the GEF UNDP portfolio include:

- *Awareness raising, including potential risks and response measures:* An LDCF project in Cape Verde raised awareness of climate risk, vulnerability, and adaptation in the water sector. Weather and climate data have been made more accessible to both policymakers and the private sector, and investments in water capture, storage, and distribution have been modified to include adaptation measures.
- *Capacity building to train private entities how to manage climate change risks:* In Sierra Leone, the capacity of more than 50 water engineers from the public and private sectors was enhanced by designing and managing climate risks on small-scale water supply systems and maintaining climate-resilient infrastructure. In Guinea-Bissau, a national multi-sectoral committee, including government, development partners, the private sector, academia, and the media, was established to advise on climate change adaptation practices at all levels.
- *Activities that change regulation, policies, and institutional infrastructure:* In Zimbabwe, an SCCF project financed the development and implementation of regulatory and fiscal incentives to stimulate climate risk reduction by the private sector and rural households. In Liberia, regulations were introduced on coastal development activities taking into account climate change considerations.
- *Public-private partnerships and efforts that promote private sector responses to climate change:* In Sierra Leone, the LDCF financed a Public Private Sector Forum focused on policies and the promotion of investment and entrepreneurship for managing climate change risks to water distribution and usage. Affordable climate-resilient community-based water harvesting, storage, and distribution systems were designed, built, and rehabilitated in Freetown, with private sector participation, to withstand projected changes in rainfall patterns and intensity.
- *Entrepreneurship development/encouragement that opens new private sector opportunities for reducing climate vulnerability:* In Samoa, an LDCF project aimed at increasing the resilience of the tourism

sector incorporates climate risks into tourism-related policy processes and investments in coastal areas. In South Africa, an SCCF-financed project supported the development of a fire and insurance programme, including the establishment of a fire and insurance working group with the involvement of the insurance industry. In Tajikistan, an SCCF project supports the commercialization of climate-resilient products through marketing campaign, crop certification, and funding for start-up initiatives and small and medium enterprises by micro-finance institutions and business advisory centers to bring climate resilient products to the market. In Djibouti, an LDCF supported adaptation-oriented micro-finance project supports shade garden-based agro-pastoral enterprises in the Grand and Petit Bara plains.

GEF adaptation initiatives with other partners include an SCCF project in Jordan in collaboration with the International Fund for Agricultural Development utilizing a new irrigation technology that allows water savings of up to 70 percent in drought-prone areas. In Eastern Europe, an SCCF insurance project implemented by the World Bank with locally licensed private insurance companies will enable catastrophe and weather risk insurance policies.

Another source of donor funding for private sector adaptation efforts is the PPCR, one of several funds that comprise the Climate Investment Funds (www.climateinvestmentfunds.org). The Pilot Program began in 2008 and has mobilized about \$1.1 billion to nine countries and two regions chosen for their vulnerability to pilot and demonstrate ways to integrate climate risk and resilience into core development planning.

Several international financial institutions are developing or already applying risk screening tools during their project appraisal. The International Finance Corporation (IFC)'s Performance Standards on Environmental and Social Sustainability, as recently revised, require consideration of climate risks and include guidance on the identification of potential direct and indirect climate-related adverse effects, and definition of monitoring and adaptation measures (WB IEG, 2012). IFC has initiated a process to pilot climate-risk screening tools for its investments in the near future (WBG IEG, 2012). The Asian Development Bank has also reported its efforts to develop and apply a climate-risk screening process to its investments (UNFCCC, 2012).

Actions needed to engage the private sector in developing country adaptation efforts

The process of private sector recognition and response to climate change risks has several levels. Businesses must develop a more detailed assessment of the current and potential effects of climate change, for location and time

horizon relevant to business. Adaptation measures must be identified and implemented, and must include risk prevention, risk awareness, and perceived risk. There are also economic and regulatory barriers that often discourage or even prevent implementing adaptation measures, as discussed above.

Specifically, there are three primary actions that are required for the private sector to become more fully engaged and effective in responding to climate change in developing countries: increase awareness about the significance of climate change and the need for responses to it, include the private sector in national and international adaptation efforts, and engage the private sector in developing products and services to reduce costs and effects of climate change.

Increase awareness about the significance of climate change

As stated earlier, a recent OECD survey suggests that only a minority of respondent businesses have conducted risk assessments and fewer still have evaluated adaptation options. Private sector awareness of the need to respond to climate change must start with increased awareness of its significance, potential risks, and necessary response measures. Private companies must realize that climate change is happening, and its consequences may affect them.

An OECD study (Agrawala et al., 2011) found that companies are aware of gradual and extreme changes in weather events threatened by climate change, but tend to focus more on extreme events rather than gradual changes. They are not fully aware of potential reputational and litigation risks to their businesses. The level of awareness of the potential effects of climate change on companies and their operations greatly varies. While most companies surveyed recognized current and future risks that climate change may pose to their operations, fewer engaged in supplementary activities related to awareness.

The study also found that the levels of engagement of companies at the national and international level appeared to depend on the level of engagement of the public sector, and the public attention given to adaptation to climate change. The private sector may also be influenced by approaches or guidelines suggested by national adaptation strategies or National Adaptation Programmes of Action (NAPAs).

Private sector initiatives to raise climate change awareness may be influenced by input and assistance from international organizations and partnerships. Partnerships with international organizations can help encourage private sector engagement in climate change and adaptation. For example, the United Nations Environment Programme's Finance Initiative Climate Change Working Group has coordinated several financial organizations to promote their engagement in adaptation to climate change, and has

worked to understand the climate information requirements of companies in the financial sector as part of their adaptation strategies.

Include the private sector in national and international adaptation efforts

There are multiple ways in which governments can facilitate private sector adaptation efforts to the benefit of the larger public through provision of information, adoption of sensible regulations, and creation of appropriate economic incentives. This topic was explored and supported at a recent OECD workshop bringing together public and private sector representatives (OECD, 2012c).

One of the most immediate and developmentally important opportunities is related to upgrading and achieving financial sustainability for weather and climate services in developing countries, particularly the poorest and most vulnerable. These agencies often view weather information as a valuable commodity to be protected and sold, which not only limits public access to timely data for farming and other business purposes but also typically creates a lose–lose result: the agency generates very little revenue, and cannot maintain even minimal services. Public–private partnerships that help manage and disseminate climate information could help enable countries to share the rights to weather data and the responsibilities for its management. One option is shared revenue arrangements in which private weather systems maintain systems, help identify customers (e.g. from utilities and other companies with weather information needs), and share some revenue with the appropriate agency. The ultimate goal of such arrangements is to ensure that weather and climate networks are maintained with the highest degree of reliability for the general public and institutional end-users, while reducing the total cost for the developing country.

For example, IFC and the European Bank for Reconstruction and Development are working with the government of Turkey on ways in which such arrangements could support greater private sector awareness and preparedness for climate change. In collaboration with Turkey's Ministry of Environment and Urbanization and the Union of Chambers and Commodity Exchanges of Turkey, these organizations will manage a year-long market study designed to give the private sector new tools to help anticipate and respond to the effects of climate change. The initiative will work with large and small Turkish businesses to address needs for achieving climate resilience in the private sector (IFC and EBRD, 2011).

As estimates of the financial needs for adapting to climate change rise, the need to identify additional sources of financing also points to the much larger financial resources under private control. There are several reasons to focus on private sector financing of adaptation. One is

the need to identify additional sources of funds to complement and enhance the effectiveness of donor funding. The UNFCCC Green Climate Fund noted above commits donor nations to mobilize \$100 billion a year in 'new and additional' resources for climate change mitigation and adaptation by 2020 from a combination of public and private sources (UNFCCC, 2011). Obtaining this amount from traditional commitments of bilateral and multilateral aid is very unlikely and other sources will need to be found (OECD, 2012a).

Attracting private investment to climate change mitigation and adaptation has thus become part of the discussion of 'resource mobilization,' one of the primary issues within the climate convention. A closely related issue is the potential for private sector access to climate finance as limited public funds could be used to reduce risks and leverage much greater private investment in climate projects (IFC, 2011a, 2011b, 2011c). The Green Climate Fund provides for a Private Sector Facility, although almost entirely without definition (WRI, 2012).

Engage the private sector in developing products and services to reduce costs and effects of climate change

The increasing awareness of climate risks represents a business opportunity to develop products and services to increase climate resilience. Many of the needs identified in the NAPAs and other analyses of climate risks and adaptation priorities in developing countries are for products and services that could be provided in the most efficient and sustainable way through cooperation with the private sector. The private sector role may vary from sector to sector and country to country and could take many different forms, from simply serving as a provider of technology to working in partnership with governments to the assumption of primary responsibility for delivery of adaptation services.

One of the highest priorities identified in the NAPAs and other national adaptation plans is the development of regional weather and climate networks for real-time observation, local-level forecasting, and dissemination of information. At a time when climate change is threatening the most vulnerable communities, this infrastructure is essential in helping the most vulnerable countries anticipate and communicate early warnings for severe weather events, improve food security and agricultural production, and manage scarce and dwindling water resources in a better manner. A viable opportunity for private sector involvement includes the deployment of a network of automated surface weather and climate observation points, which can be used to provide critical weather information necessary for early warning of severe weather.

The availability of low-cost, high-quality cellular phone service and remotely communicated weather information is making it possible to provide earlier warnings

of storms and extreme weather events. This is possible due to large investments and transfer of technology by private firms, even in many poor countries and remote regions. Climate observation and forecasting, when combined with tailored applications for industries and the public, can be used at the national level to enhance agricultural production, water resource management, and renewable energy. The GEF LDCF Council approved a \$50 million grant for 11 projects in May 2012 to deploy such systems in least developed countries. These projects are designed in a flexible manner to allow different options to access, process, and disseminate climate data. One option is to establish public–private partnerships to enable local private companies to share the rights to the data and the responsibility for their management (Least Developed Countries Fund (LDCF) | Global Environment Facility, www.thegef.org/LDCF).

In addition to the deployment of systems to collect climate information, there is considerable potential for tailoring the existing smart phone and mobile phone markets, which are rapidly growing in developing countries, for real-time communication on extreme weather events (OECD, 2012b). The mobile phone market highlights the potential for private sector-led investments that ‘leap frog’ technologies and provide better services at lower cost than those developed previously.

Arguably a current major omission is the absence of any focused international effort to define and promote technologies of specific benefit for enhancing climate resilience. Many relevant products are appearing in the market such as technologies for desalination, buildings resistant to high winds, and seeds with greater tolerance for droughts and high temperatures. However, these products are being developed in response to current market demand with little if any expectation of their added value in meeting greater future needs; the return on investment remains too uncertain to justify private risk-taking. One exception may be the research programme of the Consultative Group on International Agricultural Research (CGIAR), which includes climate change as an explicit factor guiding some of its research agenda (CGIAR, 2013).

A major issue will be the availability of funding for new adaptation technologies. Support for new climate mitigation technologies has a mixed record, with few initial successes in the GEF programme for commercialization of early-stage clean energy technologies (Miller, 2007). The Clean Technology Fund, part of the Climate Investment Funds, a multi-donor, multilateral trust fund, allows for subsidized loans to private companies attempting to commercialize new energy technologies. The guidelines for concessional funding (near zero interest credits with a grant element of 75 percent) under the Pilot Program for Climate Resilience refer to funding for ‘innovation and dissemination of drought tolerant crop varieties,’ use of biotechnology, and more generally ‘the additional costs

associated with being among the first players to implement a project in a given sector, under new regulations or work through unprecedented systems’ (Climate Investment Funds, 2011).

Increasing interest in insurance products

Assessments of the response of the insurance industry to date have largely found that very few insurers are actively engaged in promoting awareness of climate risks, much less helping to promote risk-reducing behaviors (Ceres, 2013). Nevertheless, there is considerable interest in the potential for insurance products as part of adaptation strategy for several reasons (McHale & Leurig, 2012). One is the potential to mitigate the damages and consequences of climate change by compensating victims. Major natural disasters can lower GDP and set back development by several years; speedy injection of resources through insurance and other sources can accelerate recovery (World Bank, 2010). A second is the role of insurance products in communicating risk, either as a condition for coverage (e.g. by dictating storm-resistant construction) or by differential premiums reflecting the higher probability of damages in some locations or activities. A few insurance and reinsurance companies such as Munich Re are also noteworthy for their research and information efforts on risk management, while others have become important sources of information on increasing losses due to climate events and the need for efforts to mitigate climate change. In general, however, the industry has yet to become an aggressive advocate for action to minimize climate risks (Porter, 2013).

There are several major challenges in planning on conventional private insurance products in their current form playing a major role in adaptation efforts (McHale & Leurig, 2012). The most fundamental problem is the limited status of property insurance in developing countries generally and for low income populations more specifically.

In China, for example, only 3 percent of properties are insured against earthquake and 5 percent against typhoons and floods (UNISDR, 2013). Most insurance today is issued annually, and thus provides little certainty against risks into the future; premiums can and do rise in response when risks change and sometimes are no longer insurable. The industry has also proven to be adept at transfer of some of the largest risks to governments and avoiding potential major losses. As a New York Times analysis recently concluded,

Like farmers, who are largely protected from the ravages of climate change by government-financed crop insurance, insurers also have less to fear than it might at first appear. The federal government covers flood insurance, among the riskiest kind in this time of crazy weather. And insurers

can raise premiums or even drop coverage to adjust to higher risks. Indeed, despite Sandy and drought, property and casualty insurance in the United States was more profitable in 2012 than in 2011, according to the Property Casualty Insurers Association of America. (Porter, 2013)

Climate change presents a fundamental challenge for insurance companies because the essential requirement for issuing insurance is confidence in the ability to estimate and hedge against risk; because climate change changes the risks of extreme (and therefore costly) events, insurance – at least privately issued – will necessarily become more expensive and less available.

Insurance and reinsurance companies may have opportunities to offer new products to address newly recognized risks, such as weather-indexed insurance, policies which pay automatically upon defined weather events and eliminate any discretionary judgements (Hazell et al., 2010). Many other innovative insurance concepts for small farmer risks have been proposed (Oxfam, 2012). The GEF SCCF portfolio includes a few early examples of insurance programmes in Eastern Europe and in the Philippines. The Southeastern Europe and Caucasus Catastrophe Risk Insurance Facility, for example, was established to enable Europa Re, a catastrophe and weather-risk reinsurance facility, to develop new weather risk insurance and reinsurance products; automate insurance underwriting, pricing and claims settlement processes for such products; and increase public awareness of weather risk in participating countries.

This field is expected to expand significantly in the future based on the demand and appropriateness of different insurance packages. Innovative public–private partnerships, as well as more cost-effective hydro-meteorological monitoring, are already making insurance products more accessible for the most vulnerable people. As in the case of disaster prevention as opposed to disaster recovery, the amount of resources spent on insurance will prevent much larger costs to be paid at a later stage. However, insurance is often very limited in many developing country markets, especially for the poorest and most vulnerable, and many of the model programmes to date have been subsidized by donors and governments.

Conclusion

Engaging the business community in climate change risk, response, and adaptation needs to be a much higher priority in developing countries. Private sector companies should integrate adaptation into their strategies and investments for several reasons:

- First, for *their* economic interest. Many of their investments in development sectors are at risk; therefore, integrating adaptation planning and measures will make their investments and returns less risky and ultimately more profitable.

- Second, but equally important, for their *clients'* interest. Without adaptation measures, most development investments in vulnerable countries are not sustainable. In addition to the economic argument, the ethical imperative for sustainable investment and business practice must also be considered.
- Third, to support the interests of their *countries* of operation. The private sector must become an active partner in adaptation efforts in developing countries as they can bolster governments, help define and complement effective public adaptation measures, and build public and international support through their influence. Although there is an emerging business voice, it needs to be more vocal and effective.

There are several opportunities that companies should take advantage of through early actions on climate change adaptation and climate resilience:

- Developing the tools and methods for risk assessment and risk management is already relatively advanced but rarely practiced. It needs to be recognized and promoted by investors, and become standard or expected in business planning.
- Stronger public–private partnerships will be an important vehicle to enhance climate resilience and at the same time, create business opportunities, as is the case with the collection and use of climate data and deployment of early warning system technologies.
- Private firms will develop many of the products and services that will enable lower costs and more effective responses to climate change and can be the basis for growing, profitable businesses.

In closing, a robust involvement of the private sector in managing climate risks in developing countries will bring resilience to vulnerable communities as well as systematic long-term sustainability to private investments. Ultimately, what is required is no less than a paradigm shift in business thinking towards natural disasters – as a recent UN report termed it, from ‘shared risk’ to ‘shared value’:

Embedding disaster risk management in business processes is increasingly seen as a key to resilience, competitiveness and sustainability - **a business survival kit** in an increasingly unpredictable world. (UNISDR, 2013)

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