



The Business Case for Responsible Corporate Adaptation: Strengthening Private Sector and Community Resilience.

A Caring for Climate Report

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Adaptation

Community Resilience SUSTAINABLE DEVELOPMENT
INNOVATION OPPORTUNITIES

THE BUSINESS CASE FOR RESPONSIBLE CORPORATE ADAPTATION: Strengthening Private Sector and Community Resilience

A Caring for Climate Report

CLIMATE ACTION
COLLABORATION Strategy **Learning**
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The CEO Water Mandate



A Caring for Climate Report by the United Nations Global Compact (UN Global Compact), the secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Environment Programme (UNEP), in cooperation with UNEP DTU Partnership, CDP, CEO Water Mandate, Four Twenty Seven, Oxfam, Rainforest Alliance, ARISE (through PwC), University of Notre Dame (ND-GAIN) and World Resources Institute (WRI).

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Foreword

The outcomes and the implementation of the 2015 Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change will likely influence the future of our planet and the lives of generations to come. Yet even as leaders decide and act on ambitious emission reduction measures, the reality of unavoidable climate change impacts has already set in and will continue to grow.

The private sector plays a key role in reducing global greenhouse gas emissions and has made significant progress in mitigating its carbon footprint. While corporate measures to prepare and adapt to climate change impacts are just as critical, they are not yet as widespread.

Responsible corporate adaptation encompasses the strategies, actions and partnerships through which businesses adapt to climate impacts and at the same time create shared resilience benefits for the communities and ecosystems where they operate. Climate change impacts will be felt disproportionately in communities that lack the resources and infrastructure to effectively prepare for and adjust to these impacts. When companies take action to support and empower the communities they depend on, they will also reap the benefits.

This report is an invitation for companies to become leaders in advancing social, environmental and economic resilience through responsible corporate adaptation. Developed

by Caring for Climate — a joint initiative of the UN Global Compact, UNEP and UNFCCC secretariat — together with partners, this report shares lessons learned and provides actionable guidance for both public and private sector leaders. It highlights how companies can adapt to climate change, and how to address the most pressing challenges that stymie private sector progress.

The report's recommendations will also be useful to businesses as they actively engage in advancing the Sustainable Development Goals (SDGs), adopted by the United Nations General Assembly in September 2015 with the aim of eliminating poverty, overcoming inequality and addressing environmental degradation across the globe. The SDGs are an example of ambitious targets arrived at through inclusive multi-stakeholder engagement and broad consensus. They will play a key role in shaping local adaptation activities to meet global climate goals.

It is our hope that by raising awareness and increasing knowledge about responsible corporate adaptation, we can help companies and communities effectively partner to advance the SDGs while realizing critical local resilience benefits.

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BOX 1: How Were the Case Studies in This Publication Selected?

In summer 2015, Caring for Climate and UN Global Compact participants were invited to share their company's leading practices, services or solutions for anticipating and adapting to climate change impacts. Companies submitted their case studies through a publicly accessible online form produced by the editorial group responsible for the drafting of the publication. The editorial group comprised the UN Global Compact, UNEP and UNEP-FI, UNFCCC, UNEP DTU Partnership, CDP, the CEO Water Mandate (through the Pacific Institute), Oxfam, Rainforest Alliance, ARISE (through PwC), University of Notre Dame (through the Notre Dame Global Adaptation Index) and the World Resources Institute. The consulting firm Four Twenty Seven was hired to support the selection process and to draft the publication in collaboration with the editorial group. Twenty-five examples of adaptation practices were received and evaluated by the editorial group on the basis of the following criteria: relevance impact on business operations and local communities; potential for scalability and replicability; partnerships approach; innovative dimensions; and geographic and sectoral distribution. Seventeen of the submissions were selected, summarized and presented in this report. The information presented that specifically relates to the companies named in this publication is based on information provided by the companies themselves and their own assessment of the impact of their activities, unless otherwise referenced.

Introduction: A New Paradigm for Corporate Climate Action

Every day, the reality of climate change is more present and visible. From record-setting heat waves, hurricanes and typhoons to fast-rising ocean temperature to fast-melting sea ice, the need to anticipate, prepare and adapt to climate change has never been as clear. Businesses have a key role to play in supporting social, ecological and economic resilience to climate change impacts and a responsibility to protect their value chain and serve their customers.

To date, climate action in the private sector has been largely focused on reducing greenhouse gas emissions within corporate operations and associated with purchased energy, and through the development and deployment of low-carbon and resource-efficient technologies and services. While carbon management remains a crucial pillar of corporate climate action, implementing measures to anticipate for and adapt to climate impacts must also become a core component of an effective strategy for reducing and managing the risks of climate change.¹

Climate Change is a Business Risk

Climate change can affect businesses and their value chain in many ways, directly and through indirect or systemic impacts. Business risks from climate change include (see also Caring for Climate 2011):²

- Increasing water scarcity and changes in the availability of natural resources.
- Physical impacts of extreme weather events and sea-level rise on utilities and infrastructure.
- Energy or commodity price volatility.
- Changing demand for consumer and intermediary goods and services.
- Health issues affecting workers and consumers (e.g., due to heat waves or the expansion of infectious diseases).
- Regulatory uncertainty as governments prepare to cope with climate impacts (e.g., new water regulations and changes to zoning laws due to expanding flood zones).
- Reputational consequences for companies that are seen as failing to support their community in case of a disaster.

The 2015 edition of the Global Risks report published by the World Economic Forum identifies failure to adapt to climate change as one of the top ten global risks both in terms of impact and likelihood.³ Conversely, acknowledging that risks can be turned into opportunities, cost-efficient adaptation to climate change is one of the top business opportunities identified by the Global Opportunity Report 2015.⁴

Company disclosures on climate risk and opportunities also show that climate change is increasingly recognized as being relevant to business activities. In 2015, 407 Global 500 companies disclosed a total of 1016 physical risks to CDP, with changes in temperature extremes, tropical cyclones, and changes in precipitation extremes and droughts accounting for almost half of all reported risks (see Appendix 1 for a detailed overview of reported risks).⁵

Climate Change Brings New Opportunities

Corporate adaptation offers many business opportunities and benefits, such as a reduction of costs incurred from disasters, enhanced liability management, employee protection, increased market shares through new products and services, and access to new financing streams. In addition, companies that address community vulnerabilities in their adaptation strategies can make important contributions to local community resilience. This "responsible" corporate adaptation, focused on creating shared value and enhancing community livelihoods, is the most robust approach to mitigating climate risks and capitalizing on business opportunities.

Adapting responsibly to climate change can also constitute a significant business contribution to the implementation of the Sustainable Development Goals (SDGs), in particular, but not limited to, Goal 13: "Taking urgent action to combat climate change and its impacts."¹⁵ This goal explicitly lists strengthening of resilience and adaptive capacity to climate-related hazards and natural disasters as its first target.

BOX 2: The Economic Cost of Climate Change

Numerous studies show that climate change will not only have huge social and environmental impacts, but also major financial consequences in the form of loss and damage. The estimated costs of climate change are dependent on the projected future climate change scenario and its impacts. Costs are also difficult to determine due to uncertainty about future policies addressing climate mitigation and adaptation, and due to the methodological difficulty of assigning a monetary value to climate change-related loss of lives, cultural heritage and ecosystem services, among others. The Intergovernmental Panel on Climate Change (IPCC) found the impacts of 2°C of warming would account for up to 2 per cent of global GDP over the 21st century.⁶ A study supported by the International Finance Corporation (IFC) estimates the cumulative economic costs of damages to the physical environment, health and food security is in the range of USD 70-180 billion annually in 2030.⁷ More recently, a study from Stanford University and the University of California projected that global incomes could decline 23 per cent by 2100 relative to a world without climate change.⁸ All these analyses show that impacts and costs will not be distributed evenly across regions, countries, populations and sectors. Developing countries and low-income populations across the globe – often the ones that have contributed the least to global warming – show greater vulnerability, limited capacity to bear the costs, and as a result will be disproportionately impacted.

Adapting to climate change also brings about costs, although over time these costs will be dwarfed by the cost of loss and damages. IPCC estimates the cost of adapting to an approximately 2°C warmer world by 2050 at USD 70-100 billion a year, while the UNEP Adaptation Gap Report (2014) found that previous cost assessments were likely to be an underestimate, and estimated costs are likely to be twice that, USD 150-300 billion a year through 2030, and potentially triple or quadruple that amount beyond 2050.^{9,10} Aggressive, timely reduction of greenhouse gases is the safest way to bring adaptation costs down, but early investment in adaptation for the unavoidable impacts of climate change is also critical to keeping costs down.

By all accounts, investment in climate adaptation is far from the level required to meet developing countries' needs. The World Resources Institute estimated current commitments towards climate finance and needs for adaptation at USD 26 billion in 2013, indicating that investments need to grow by a factor of four to meet anticipated needs.¹¹

At the UN climate change conference of 2009, developed countries committed to support developing countries to mobilize USD 100 billion a year by 2020 for climate action, including adaptation, in developing countries.¹² In this context, investments mobilized by developed countries so far have reached USD 52 billion in 2013 and 62 billion in 2014 – about 16-23 per cent of these investments went to adaptation activities. Private sector finance contributed about a quarter of these funds (through co-financing of public projects) at large, with 10 per cent of private funds dedicated to adaptation projects.^{13,14}

This gap is a powerful reminder of the need of further governmental action and of the important role that the private sector has to play to achieve the scale needed to transition to low-carbon, climate-resilient economies.

BOX 3: The Sustainable Development Goals (SDGs) and the 2030 Agenda for Sustainable Development

In September 2015, the United Nations General Assembly adopted the 2030 Agenda for Sustainable Development, along with a set of Sustainable Development Goals (SDGs) aiming to eliminate poverty, overcome inequality and tackle environmental degradation in all countries.¹⁶

The SDGs build on the work of their predecessors, the Millennium Development Goals (MDGs), but unlike the MDGs, the private sector was involved in the process of developing the global development agenda. The private sector contributed through various avenues, including participating in a High-level Panel convened by the UN Secretary-General Ban Ki-moon in 2012, which advised on the global development framework,¹⁷ and through surveys, consultations and discussions supported by the UN Global Compact.¹⁸ The SDGs thus offer a new path for business involvement, as well as much greater visibility of the role played by the private sector.

Businesses are eager to be involved: according to a recent consultant survey that received responses from almost 1,000 businesses, 71 per cent of businesses declared that they are already planning how they will engage with the SDGs.¹⁹ The UN Global Compact, together with the Global Reporting Initiative and the World Business Council for Sustainable Development, has developed the SDG Compass, a guide outlining concrete ways for business to engage.²⁰

Responsible Corporate Adaptation in Practice

This report presents a diverse set of corporate adaptation projects from around the world, where companies aligned their interests with those of critical community stakeholders in their value chain and developed projects that increase their company's resilience in conjunction with that of the community.

Caring for Climate has previously published analyses of the strategic opportunities for companies to promote sustainable development through adaptation, as well as examples of corporate adaptation actions that support community resilience and help advance the UN agenda for sustainable development. Yet empirical evidence and understanding of what makes on-the-ground adaptation projects successful is still limited.

With this new publication, Caring for Climate compiles and showcases a wide range of corporate and public-private adaptation practices in different sectors and regions in order to:

- Raise awareness about the benefits of implementing climate risk assessments, and inform companies about subsequent

adaptation activities that can be taken to mitigate those risks.

- Inspire other companies, regardless of size and geography, to implement private adaptation strategies and activities that also contribute to increasing societal resilience and meeting the SDGs.
- Highlight opportunities for policymakers to address the barriers that may hinder corporate adaptation activities.

Chapter 1 discusses the definition and benefits of responsible corporate adaptation. The case studies featured in this report show that companies engage in corporate adaptation to achieve one or several business benefits: improving their operations and competitiveness; protecting their value chain; leveraging new business opportunities; and strengthening their corporate brand. The studies illustrate how community vulnerability to climate change risks can be factored into analysis and decision-making processes and highlight the projects' business and community benefits, ranging from increased sales to reduction in greenhouse gas emissions.

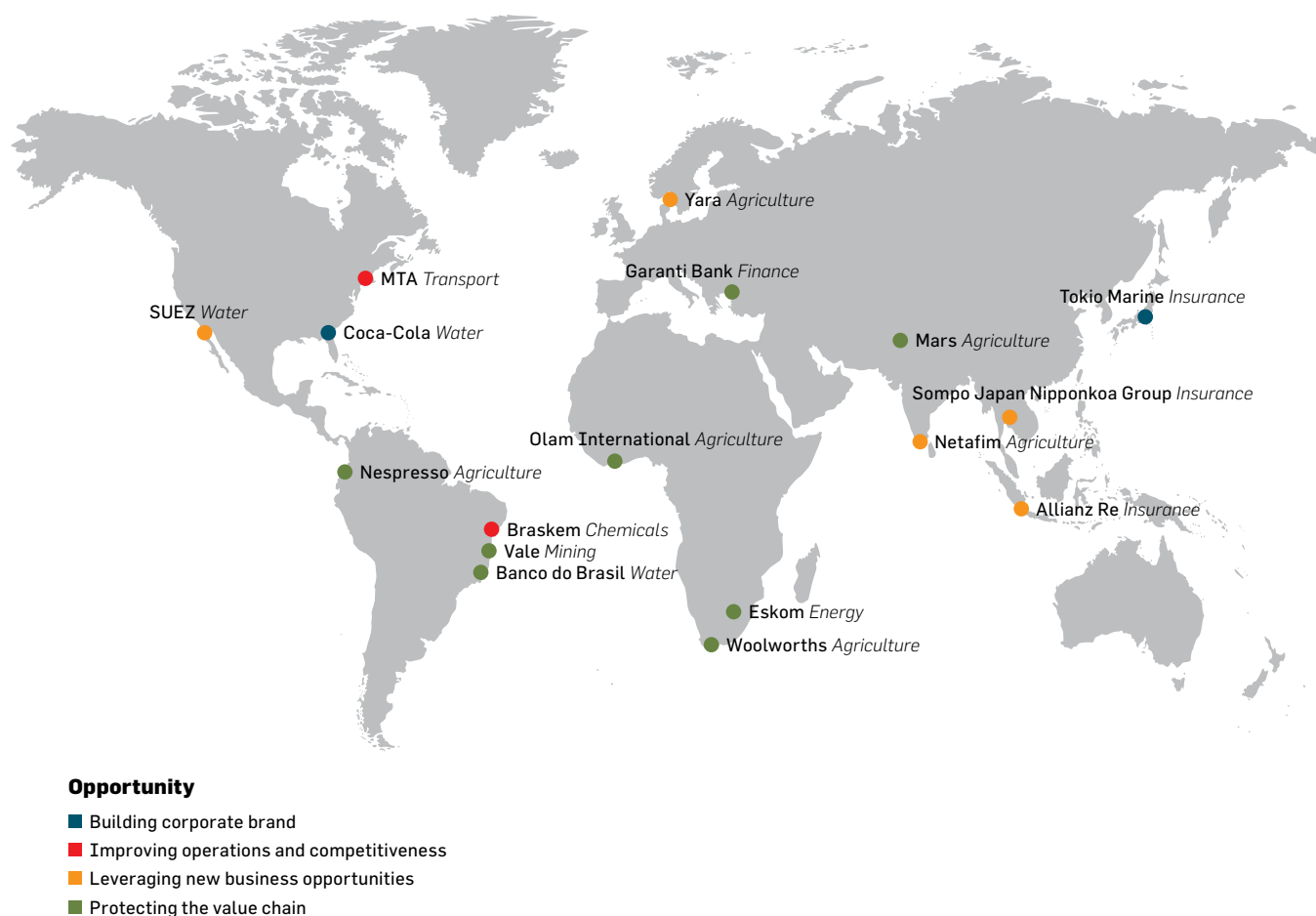
Chapter 2 builds on recent literature and the collection of case studies featured in this report to identify barriers to corporate adaptation, and highlights how the companies profiled overcame those barriers. The key barriers identified include information gaps and risk uncertainty, the challenges in integrating short-term and long-term planning, the lack of incentives, challenges in accessing financing, and policy, regulatory and socio-cultural barriers.

Chapter 3 presents a compilation of 17 case studies of responsible corporate adaptation. The projects span several sectors

and regions of the world (see map), and incorporate diverse solutions to an equally diverse set of climate risks. Each case study examines a specific climate risk threatening the company's operations, and explores the innovative process undertaken to address related concerns.

Finally, Chapter 4 closes on recommendations for business leaders and policymakers on how to accelerate responsible corporate adaptation, strengthen collaboration and incentivize the development of adaptation solutions.

FIGURE 1: MAP OF CORPORATE ADAPTATION PROJECTS PROFILED IN THIS REPORT



The projects were selected by Caring for Climate (see Textbox) to highlight current best practices, corporate drivers for climate adaptation investment, as well as needs of businesses and the challenges they face implementing adaptation actions. They are meant to inspire action by providing concrete examples and identifying successful strategies.

BOX 4: Climate Change Adaptation Under the UN Framework Convention on Climate Change – How Business Can Engage

The UN Framework Convention on Climate Change (UNFCCC) was established in 1992 to limit average global temperature increase and the resulting climate change, and to cope with its impact. Today, almost all governments are Parties to this Convention. One of the main working areas of the UNFCCC is strengthening climate resilience. To this end, the UNFCCC set up several adaptation-related institutions and programmes, as well as institutions and funds to help channel financial, technological and capacity building support to adaptation. Many of them present engagement opportunities for the private sector, for instance:

- The UNFCCC encourages all countries to embark on a process to formulate and implement National Adaptation Plans (NAPs). The Adaptation Committee and the Least Developed Countries Expert Group are the main UNFCCC institutions that support governments in these efforts. NAPs offer opportunities to identify specific climate risks relevant to local contexts and industrial sectors, integrate the expertise and solutions of businesses and other stakeholders and develop collaborative actions to strengthen community resilience. The Adaptation Committee plans to foster greater collaboration with the private sector and other relevant stakeholders and will also contribute to increase understanding of climate change risks to supply chains.²¹
- The Green Climate Fund (GCF) was established in recent years as one of the main mechanisms under the UNFCCC to fund mitigation and adaptation projects in developing countries. Through its Private Sector Facility, the Fund also targets international businesses and capital markets and uses innovative tools and concessional funding to promote private sector investment in low-emission and climate-resilient development by "de-risking" investments, creating large-scale investment opportunities, supporting new climate-related technologies, and building capacity among different groups.²²
- Additionally, under the Private Sector Initiative of the Nairobi work programme, businesses can submit case studies on innovative activities for adaptation to climate change.²³

Chapter 1: The Business Benefits of Adapting Responsibly to Climate Change

Companies are increasingly recognizing climate change as a critical factor for business continuity and competitiveness. For companies with large, complex and geographically dispersed value chains, climate risk is now becoming integrated into enterprise risk management. Yet the nature of climate impacts, which create both long-term stressors and near-term shocks with regional and global impacts, call for a broader approach that integrates community resilience as a core component of corporate adaptation responses.

Companies depend upon the health and resilience of the communities in which they operate, source materials and sell their products. Corporate adaptation strategies that do not coordinate with public adaptation efforts or acknowledge the vulnerabilities of these communities are incomplete and will not ensure business continuity. This chapter provides a conceptual framework and concrete examples of responsible corporate adaptation that highlight incentives, opportunities and key benefits for companies who think beyond the fence of their own business.

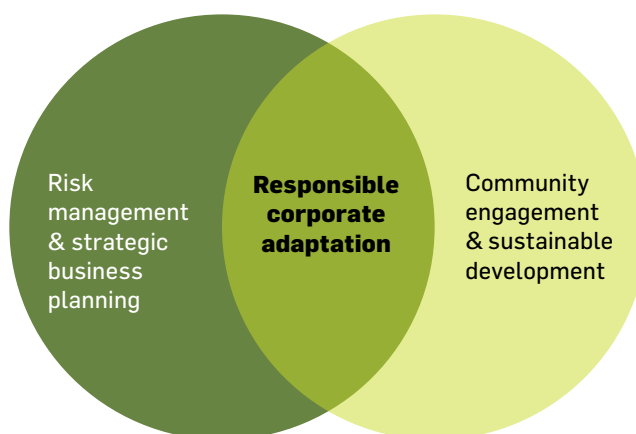
What is Responsible Corporate Adaptation?

Corporate adaptation encompasses the set of actions companies can take on to determine their risk exposure, identify opportunities and build resilience to climate change. The IPCC defines climate change adaptation for human systems as “the process of adjustment to actual or expected climate and its effects, in order to moderate or avoid harm or exploit beneficial opportunities”. Resilience is further defined as “the capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation”.²⁴

Adaptation often involves activities companies already pursue, such as business continuity planning or water and energy efficiency efforts, but may also require companies go beyond current activities and consider strategic shifts. Responsible corporate adaptation requires that those shifts and activities consider not only corporate benefits but also how best to mitigate and address climate risk in the communities in which a company operates.

In private corporations, risk management typically describes “the process of identifying, quantifying, and managing the risks that an organization faces. (...) Risk management involves identifying the types of risk exposure within the company, measuring those potential risks, proposing means to hedge, insure or mitigate some of the risks, and estimating the impact of various risks on the future earnings of the company”.²⁵ Corporate adaptation shares common roots with risk management, but also permeates many other activities of the business, including strategic planning, sales and marketing, human resources and corporate social responsibility.

FIGURE 2: WHAT IS RESPONSIBLE CORPORATE ADAPTATION?



Corporate strategies to mitigate climate risk vary greatly, reflecting not only the diversity of risks and impacts, but also the complexity of the task at hand and the lack of guidance or standardized approaches to corporate adaptation. This diversity is also reflected in the case studies featured in this report, with projects ranging from supplier engagement and water efficiency to infrastructure retrofitting and new bank loan policies.

BOX 5: Preventing Maladaptation

Individual company efforts to prepare for climate impacts and mitigate risk may at times have involuntary or unforeseen negative impacts. This is known as maladaptation – “actions that may lead to increased risk of adverse climate-related outcomes, increased vulnerability to climate change, or diminished welfare, now or in the future”.²⁶ Causes of maladaptation range from ignorance and lack of foresight to disregard for causing direct harm. For example, flood-proofing an industrial park without proper coordination with local authorities could increase the exposure of a neighbouring community to flood risk. Drilling a well for new water may draw on the same overused underground water sources that the community depends on. Common pitfalls and maladaptive actions include:²⁷

- Increasing greenhouse gas emissions.
- Disproportionately burdening the most vulnerable populations.
- Projects with high opportunity costs.

An important step companies can take to avoid maladaptive actions is to coordinate with local public agencies and community stakeholders to learn about their sustainable development priorities, particularly public adaptation planning efforts, and how these can be reinforced by their own operations.

Solutions that are derived from a responsible approach to corporate adaptation may bring multiple co-benefits, such as the development of new products and services that serve shifting community needs and address dwindling resources. Responsible corporate adaptation puts particular emphasis on how companies’ efforts can and should help communities and support public sector-led adaptation as well, taking into account the fact that climate impacts will only increase interdependencies between business, government and civil society.

In this context, responsible corporate adaptation can also help advance societal priorities articulated through the SDGs. Apart from Goal 13, which centers on climate change, other SDGs, such as those focusing on water, agriculture, health, biodiversity and resilient infrastructure, can be supported through responsible corporate adaptation. Companies that help advance public sector-led adaptation and the SDGs protect and promote their own competitive advantage by being resource-efficient and socially inclusive.²⁸

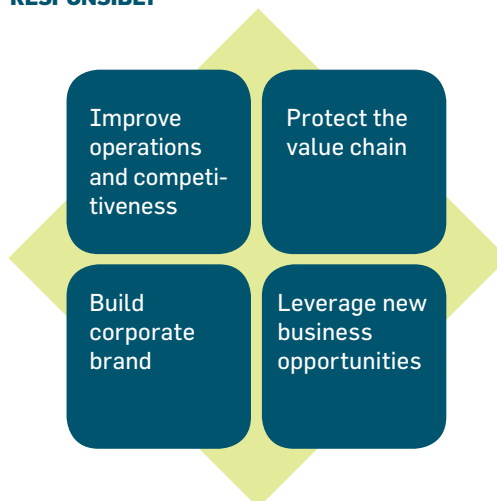
The Benefits of Responsible Corporate Adaptation

The case studies featured in this report show that companies engage in corporate adaptation to achieve one or several business benefits: improve their competitiveness; protect their value chain; leverage new business opportunities; and strengthen their corporate brand.

Consistent with findings from previous Caring for Climate reports, the case studies highlight companies that treat community well-being “as a goal that must be incorporated into the company’s mainline growth strategy and everyday business decision-making”.²⁹ This report’s case studies emphasize that responsible corporate adaptation must, by definition, consider the risks and vulnerabilities of the communities in which they operate in order to be sustainable and successful.

Projects featured in this report show that companies’ corporate adaptation efforts can benefit communities in different ways. Companies invest directly in the communities upon which they depend — their suppliers, customers and employees — as well as in the infrastructure that serve these communities. Others invest in the ecosystems that provide critical services for their business and the economic well-being of the region. Finally, many share their knowledge of climate risks and offer their sectoral expertise — a cost-effective way to raise awareness and support local resilience efforts (see Figure 4).

FIGURE 3: BUSINESS BENEFITS OF ADAPTING RESPONSIBLY



Improving Operations and Competitiveness

Corporate adaptation projects can improve business operations and competitiveness in two ways: they can increase efficiency, thus reducing operational costs, and they can support business continuity and risk management, thus bolstering the long-term viability of the enterprise.

In the featured case studies, Brazilian-based petrochemical company, Braskem, implemented an industrial water reuse programme in drought-prone regions to improve

FIGURE 4: HOW BUSINESS CAN SUPPORT COMMUNITY RESILIENCE



efficiency and reduce consumption of water. By improving efficiency, the company reduced its net water use (and associated costs) and ensured water scarcity would not disrupt its operations. Another Brazilian company, Vale, implemented a short-term forecasting programme to monitor and issue weather warnings to prepare its port facility for extreme weather. The programme improved the company's resilience and provided it with a strategic advantage over other ports by improving its capacity to take preventative actions in case of extreme weather events.

In New York, the Metropolitan Transportation Authority (MTA) reacted to major losses following Hurricane Sandy in 2012 by implementing a sea-level rise adaptation programme to ensure continuity of operations in the face of future climate impacts. The practical steps the organization took to prevent business interruptions, such as the hardening of electrical sub-stations and improvement to the pumping system, also reduced the transit authority's vulnerability to less severe but more frequent occurrences of heavy rains or winter storms. These measures complemented preventative steps the MTA had taken before Superstorm Sandy reached New York, such as moving the roll-

ing stock (subway cars) to higher grounds and shutting down the subway in advance of the storm, all of which helped prevent greater damages and facilitated the post-event repair efforts.

Protecting the Value Chain

Companies are critically dependent on their broader value chain to be able to operate and succeed. Case studies featured in this report illustrate how companies have invested in the communities on which they depend — their suppliers, customers and employees. Olam International, a global agricultural commodity company, rolled out a project to support climate-smart cocoa agriculture in Ghana. The project helped educate small farmers on sustainable agriculture practices, created new revenues through alternative crops and strengthen collaboration and governance at the community level, all of which benefited farmers, improved crop resilience to changes in climate and enhanced supply reliability for the company. Woolworths is helping South African fruit and vegetable producers, sup-

pliers and retailers understand local climate risk and implement environmentally sound, climate-smart agricultural practices. Similarly, Mars developed a large-scale programme for farmers in Punjab, Pakistan, to improve basmati rice production practices and reduce water consumption while providing significant co-benefits for stakeholders. The project blends water savings with better farming practices for the joint benefit of the company, its suppliers and the water supply in this climate-vulnerable region.

Companies profiled in this report understand that they rely on commodities sourced from dwindling natural resources and threatened ecosystem services. Preserving these natural resources is critical to their long-term ability to do business. Garanti Bank was the first commercial bank in Turkey to implement a thorough approach to manage climate and environmental risks and to advance climate adaptation for the financial sector. Its internal policies are assessed and graded according to their sensitivity to climate impacts, risks due to location and their possible social and environmental impacts. In Guatemala and Colombia, Nespresso is building resilient coffee ecosystems by investing in agroforestry. The coffee company has determined agroforestry is an efficient investment to increase the resilience of its coffee supply chain while positively impacting natural capital and creating additional economic value from each hectare of coffee farmland.

Case studies included in this report further illustrate the interdependence between companies and the communities where they operate and deliver their services. Eskom, the South African public electrical utility, serves 95 per cent of all South African electrical usage, and its comprehensive climate-vulnerability and risk mitigation plan was critical to the community. Similarly, MTA's core mission is to provide reliable and efficient transportation to people in the area of New York. Finally, Vale's forecasting programme was made avail-

able to surrounding communities to support local resilience so that the company's employees could more easily get to work. For these organizations, investing in infrastructure resilience is critical to their mission and at the same time provides an important benefit to the communities they serve.

Leveraging New Business Opportunities

Understanding, planning for and responding to climate change impacts calls for tremendous technical and social innovation. Identifying climate risks can also create business opportunities that arise in connection with adaptation interventions.³⁰ Companies can play an important role in driving technology development and offering new products and services.

We featured a number of examples in our case studies, such as Israeli company Netafim, which introduced a new rice cultivation strategy to decrease water use. The system increases savings for farmers while securing the company's business operations in a drought-prone region and sensitive sector. The company's drip irrigation nutrient system became a new business opportunity to cater to a growing market need driven by resource constraints. Japanese insurance company, Sompo Japan Nipponkoa Group, developed a "Weather Index Insurance" programme to protect against climate change-induced crop damage. The company identified critical data needs and, with its partners, is working to increase access and improve weather data infrastructure so that this innovative insurance product can be replicated in other countries in Southeast Asia.

Private sector actors can help serve the adaptation needs identified by countries to the benefit of both parties, as some of the areas of private sector activity and investment coincide with sectors most vulnerable to climate change, such as agriculture, water

resources management, energy and coastal zone management.^{31,32} This is the case for water services company SUEZ, which provides solutions for adapting to the impacts of climate change that affect the availability and quality of water resources. The case study discusses how the company was able to develop, over time, a viable, large-scale water reuse programme in Southern California, a region highly prone to drought, and provides for adaptation solutions aimed at increasing the climate resilience of its clients' operations and the communities it operates in.

Another example of alignment between public and private interest is provided by the Allianz Re case study. The reinsurance company engaged in a multi-stakeholder partnership to utilize remote-sensing technology to increase its underwriting accuracy to help Southeast Asian rice farmers secure their crop. The programme aims to reduce vulnerability of Asian small-holder farmers engaged in rice production while enabling Allianz Re to support the development of new crop insurance products and increasing the insurability of Asian agricultural markets.

The private sector can support the public sector in developing adaptation strategies, such as establishing and managing early warning or climate observation systems, and can provide alternative, lower-cost models that improve efficiency, innovation and technological services. This was the case with Yara, a provider of fertilizer and industrial agricultural solutions based in Norway. The company identified key business opportunities for developing tools and services that helped growers switch to agricultural processes that conserve water and enable continued productivity in water-stressed areas.

Building Corporate Brand

Reputational benefits are a powerful driver for corporate social responsibility, and investing in company and community resilience is yet another way companies show that they value social welfare and are good corporate citizens. Banco do Brasil created the Agua Brasil Programme to coordinate and fund actions focused on sustainable agriculture and water conservation. This innovative cross-sector partnership aims to leverage opportunities arising from the sustainable management of seven micro-watersheds and finance sustainable agriculture to support local economies.

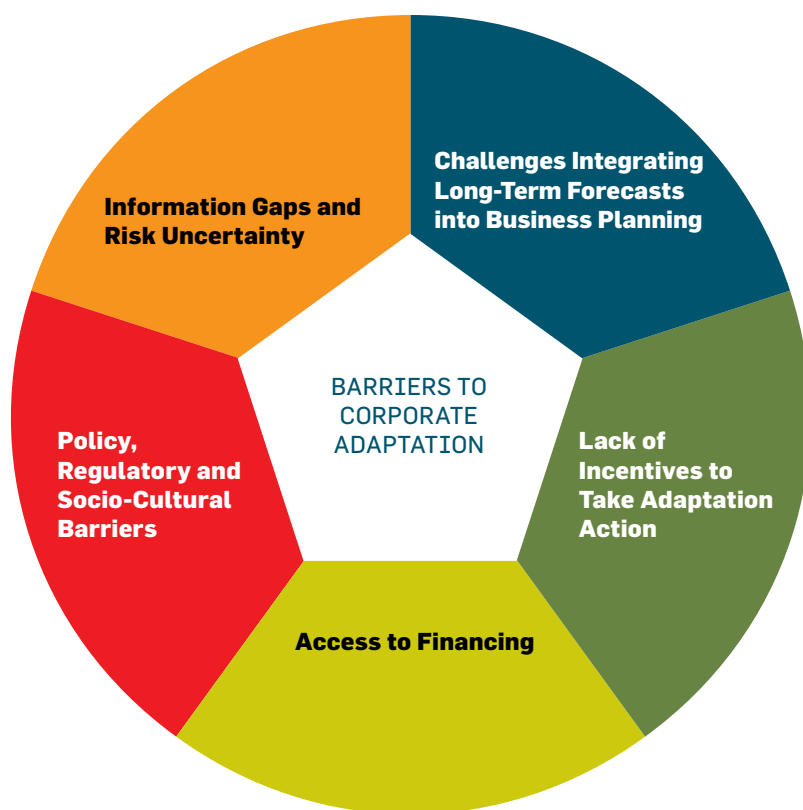
While all the companies profiled in this report naturally understand the value of being identified as a leader and "early adopter", a few case studies had reputational benefits as a core driver for the project featured. Japanese insurance company, Tokio Marine, built awareness raising and corporate responsibility into its Green Gift Project, which invited customers to shift away from paper to online policies, and reinvested the savings from reduced paper use into a mangrove planting programme in Southeast Asia with multiple social and environmental benefits, including greater resilience to floods and storm surges.

Conversely, companies are well aware that protecting their own interest to the detriment of, or without regard for, community needs can threaten their social license to operate and be just as disruptive for business as an intense storm. Coca-Cola highlights its interest in seeking shared value as a main business strategy. The programme featured here sheds light on how this company aims to return more than 100 per cent of the water used in its finished beverages back to the communities where it operates. To do so, it has built an internal incentive structure and governance system that anchors long-term watershed health and community well-being as integral to bottling plant performance and corporate growth.

Chapter 2: Overcoming Barriers to Corporate Adaptation

While the business case for responsible corporate adaptation is clear for the companies featured in this report and others around the world, many other companies do not properly acknowledge or understand climate risks, or have not yet taken significant action to address them. This chapter identifies main barriers to responsible corporate adaptation and provides examples from the corporate case studies on how to overcome them.

FIGURE 5: BARRIERS TO CORPORATE ADAPTATION



Information Gaps and Risk Uncertainty

Lack of Awareness: Many businesses—small- and medium-sized enterprises (SMEs) and multinational corporations—are just beginning to understand how climate change will impact them. Risks to global supply chains are a major motivator for companies to address adaptation issues, but awareness of supply chain risks varies greatly between different global geographies.³³

Difficulty Accessing and Using Climate Data: Accessing and understanding climate data is a critical challenge for most organizations.^{34,35} Businesses often find that data is hard to locate and access, lacks context and relevance or is not at the needed temporal and spatial scale. They may also simply find it challenging to navigate the complexity and multiplicity of existing data sources.^{36,37} The lack of data specific to a company's value chain prevents an accurate assessment of risks and associated costs, thus impeding risk mitigation response.

Uncertainty around Nature, Timing and Magnitude of Impacts: Assessing climate risk involves uncertainty about the extent, frequency and nature of climate change impacts across countries and sectors. Therefore, implementing strategic changes to adapt to climate change carries risks in that the strategy is dependent upon the severity of expected climate impacts. This risk can deter companies from following new opportunities or even further research on opportunities.^{38,39} In 2015, over 15 per cent of all Global 500 companies disclosing to CDP specifically mentioned “uncertainty around the nature of physical climate risks” as a business risk.⁴⁰

Additionally, there are risks associated with the strategic decision to depart from business-as-usual and develop new or diversified products or services — especially as significant adaptation investments will need to be made in vulnerable communities in developing countries.⁴¹

Lack of Guidance: Companies often find they lack clear guidance and information on the type of private sector interventions needed to reduce climate vulnerabilities — in contrast with carbon accounting and

management, or risk management, for which industry and sector-specific guidance are available.^{42,43} Internal climate champions lack role models and benchmarks to support the business case, identify effective business adaptation actions and delineate a clear path towards success.

Overcoming Information Gaps and Uncertainty

The companies included in this report that faced challenges around information gaps and risk uncertainty successfully overcame these challenges by partnering with relevant public institutions or research organizations. Eskom and Braskem collaborated with national or regional authorities to gain greater access and understanding of data, which they supplemented with their own expertise and knowledge of their company's exposure. Coca-Cola relied on many non-profit research institutes over the years, which helped build internal capacity on water risk, and in turn supported the development of a publicly accessible tool to assess water risk. Netafim and MTA relied on academic partnerships to advance research on a specific topic of interest, such as a particular crop or the climate vulnerabilities of a specific region. Gaining a greater understanding of risk was critical to establishing their adaptation strategy, even with limited external guidance. SUEZ started with a small wastewater reuse project, but expanded the scope and capability of the project through multiple iterations as water scarcity became a greater concern in California.

Challenges Integrating Long-Term Forecasts into Business Planning

Climate Change Perceived as a Long-Term Risk: Surveys point to a deep divide between businesses that have experienced climate change impacts and see it as a current problem, and those — the vast majority — who perceive climate change as a long-term problem only (5 years or more).⁴⁴ Companies do not always recognize the potential short-term impacts from climate change (1-5 years), reflecting the limitation of climate science in its ability to forecast impacts over the short-term. Many companies' planning horizons (outside

of the infrastructure sector), range from one quarter to 5 years and in consequence, many companies and investors see no reason to take long-term climate risks into consideration in short-term investment planning.

Adaptation Perceived as Distant Benefits:

Many adaptation measures require investment now, but the benefits may not be realized until 20 or 30 years out. For many businesses, short-term costs and impacts on cash flows may be more important considerations than long-term benefits.⁴⁵ Businesses do not always understand that the adverse impacts of climate change can intensify over time, and the costs to cope with them can increase if no effective adaptation action is taken. Adaptation action usually pays off and estimations show that “up to 65 per cent of the increase in the projected losses due to climate change could be averted cost-effectively through adaptation investment”.⁴⁶

Overcoming Short-Termism

Our case studies illustrate various strategies that can help overcome short-termism. Six companies come from the agricultural sector, and three from the water sector — these companies were diligent in using impacts they have already experienced to garner internal and external support for corporate response. MTA turned post-Hurricane Sandy recovery into an opportunity to adapt and be better prepared for future events. Vale developed a risk assessment tool that serves their current needs in understanding short-term risks of extreme weather events, while also enhancing their long-term preparedness. Olam and Mars touted the immediate environmental and economic co-benefits of their projects, which undoubtedly helped secure support and funding. Garanti Bank saw a clear business case in implementing environmental and water efficiency requirements to minimize the environmental risks and impacts of the projects that they choose to finance. Such sustainable projects are more resilient in the event of a drought, which can prevent the risk of future loan default if water scarcity worsens.

Lack of Incentives to Take Adaptation Action

Difficulty Measuring and Quantifying

Benefits of Corporate Adaptation: Appropriate tools to calculate the return on investment from long-term adaptation measures do not yet exist. Quantifying and monetizing the economic return from operating in a more resilient community is particularly challenging.

Lack of Incentives in Companies' Performance Management Systems:

Few companies have assigned resilience performance responsibility and targets to their teams and management. Internal champions often undertake corporate adaptation efforts without a clear mandate or support from their leadership. Sustainability directors are not always equipped or empowered to address risk management issues, often a responsibility of other divisions within a larger company, and risk officers can get blindsided by a lack of awareness or accessible information on climate risk.⁴⁷

Lack of Incentive for Corporations to

Take Action: Companies that take action to prepare for climate change are not always rewarded for their efforts — for instance, insurance rates often do not price in climate risk exposure, and therefore do not reward businesses that have taken steps to reduce their exposure or mitigate the risk.⁴⁸ Similarly, many investors may value quarterly returns over long-term resilience investments.⁴⁹ Companies may also take on undue risk by assuming that others (e.g., the government) will bail them out if they get in trouble — a problem known as moral hazard.

Lack of Incentive to Invest in Public Goods:

Some critical actions fall outside the fence, beyond the company's direct purview. These include the infrastructure that companies rely upon, such as roads, communications infrastructure or clean water.⁵⁰ Companies may have limited incentive to step in and invest in a public good for which they are not directly responsible.

Conflicting Incentives to Publicize Corporate Adaptation Efforts:

The visible level of activity may understate the actual level of activity. Actions to improve the management of climate risks may occur as part of standard risk management or planning processes without being explicitly labeled as adaptation. Many of the benefits are private and the messages sometimes complex, which give it less potential to improve the company's reputation than, for instance, carbon management. In addition, information on climate risk can be a source of competitive advantage.⁵¹

Overcoming Lack of Incentives

The case studies featured in this report provide examples of how these incentive barriers can be overcome. Woolworths was able to make the connection between its recent losses of an estimated USD \$2 million in sales due to extreme weather affecting some of their fresh fruit suppliers to generate support and funding for its project. Garanti Bank's loan policy builds incentives by providing access to credit for projects that are water efficient while discriminating against projects that do not comply with their environmental policy. Education can also be key to understanding benefits of adaptation measures: Sompo Japan Nipponkoa Group found that low-income populations' limited finance and insurance literacy was a barrier to access to micro insurance for large swaths of the population. To remedy this barrier, the company has been promoting financial inclusion and providing opportunities to increase low-income communities' knowledge about insurance. For Banco do Brasil, breaking the programme in smaller steps helped overcome resistance from local agents and address challenges in monitoring and evaluation.

Access to Financing

Poor Access to Capital for Long-Term Resilience Projects:

There is a range of financial instruments available to companies to address the uncertainty and transfer the risks of extreme weather events, but often poor access to credit to implement resilience measures and market opportunities. This is particularly the case for preventive risk management measures and adaptation investments with a longer-return horizon.⁵² Some companies report that it is easier for them to send blankets, diapers and water after a catastrophe as part of their corporate social responsibility initiatives than to get their Chief Financial Officers to invest in resilience projects that have an uncertain probability and undetermined internal rate of return.⁵³ A recent report from the Climate Policy Initiative provided further insights into constraints on private investments, detailed in the textbox below.⁵⁴

Poor Access to Capital for Small Businesses:

Access to finance for SMEs is a problem globally, and access to finance is disproportionately difficult for smaller firms in the least developed countries.^{55,56} This lack of available finance makes SMEs even more vulnerable to climate change, and adds to the challenge of showing the return on investment for resilience projects larger companies also face.

Public Finance Slow to Trickle Down:

Public finance is seen as key to addressing adaptation, especially for projects that provide public goods. Yet commitments on climate finance are slow to turn into funding on the ground, and many resilience projects go unfunded. There is an emerging market

for raising finance from the private sector, but knowledge gaps, perceived and real market fragmentation, and uncertainty on the part of both the corporate entity and the financial institution mean that often credit is not forthcoming or requested.

BOX 6: Emerging Solutions to Drive Private Investment in Climate Resilience

Recent work by the UNEP Finance Initiative and The Climate Policy Initiative finds that adaptation investments are constrained due to uncertainty of investment returns, limited access to finance or overall risk aversion. The findings below are based on reports produced by these institutions:⁵⁷

1. Revenue risks and uncertainty of investment returns limit private sector adaptation finance. A limited track record on adaptation projects returns decreases investors' confidence in their ability to accurately determine future revenues. Similarly many adaptation investments are driven by potential future savings, which adds another layer of uncertainty between potential and realized savings. Ultimately, the difficulty lies in the ability to monetise the adaptation benefits into cash flows against which a financial institution will be willing to lend.
2. Limited access to finance and/or lack of capital. One aspect of this funding issue relates to the fact that businesses would typically have their operating capital locked-up in activities related to their day-to-day operations, thus their ability to finance projects outside of their expertise is limited and dependent on external financing. If adaptation cannot be mainstreamed in on-going projects, financing will depend on the ability to access loans at acceptable, competitive rates.
3. Long payback period: Another issue related to adaptation investment is concerned with the typical long duration of the project cash flow, and thus the need to source long-term capital. The limited availability of debt is a major barrier to investing in long climate-resilient measures, especially for balance-sheet constrained SMEs.
4. Risk aversion due to high-perceived risks is a major challenge in the investment process, when deciding whether to allocate capital in climate-resiliency projects. The absence of or limited access to risk mitigation mechanisms, such as risk guarantees or weather insurance, is in effect the investment barrier.

Overcoming Financing Barriers

The case studies profiled in this report show a wide range of strategies used to fund climate projects — though not all were as successful as hoped. Most companies profiled drew from their own resources because the business case was strong enough to proceed — Eskom had a strong risk management business case, while Nespresso, Coca-Cola and Mars embedded their projects in their corporate social responsibility programmes. Others turned to public finance: MTA and Woolworths relied on government funding for some or all of the project, and Netafim leveraged government funding for research and development and then proceeded to commercialize the new technology. Allianz Re brought funds from development aid agencies to support the programme implementation. A few of the presented models show potentially innovative approaches: Braskem reached out to other businesses in the region in order to build a coalition and pool resources to support the infrastructure investment that benefited all. Olam attempted to make its project sustainable by fetching a premium for its climate-smart cocoa, though the market proved unwilling to bear the premium cost. Finally, Tokio Marine's Green Gift Project generated a revenue stream from its paperless programme that it reinvested into mangrove plantations.

Policy, Regulatory and Socio-Cultural Barriers

Conflicting Policies and Regulations: The existing regulatory environment may not always support private adaptation efforts. Previously established policy goals may lead to maladaptive actions, and regulations may prevent companies from taking necessary adaptive measures. Moreover, differing national and local policies and regulations across regions can hamper replication of successful adaptation approaches from one country to another. Lastly, guidance is lacking to understand how the private sector can engage effectively to support public adaptation efforts.

Socio-Cultural Barriers to Adaptation:

Social barriers to adaptation refer to the “cognitive and normative restrictions that prevent individuals or groups from seeking the most appropriate forms of adaptation”.⁵⁸ Social barriers include beliefs, cultural norms, traditions, institutional inequalities and discrimination and lack of institutional flexibility.⁵⁹ For companies, this can translate as the belief that the uncertainty of climate impacts is too great to warrant taking action in spite of well-established science, or a company culture that discourages change and innovation and an unwillingness to adopt new practices. Social barriers may also hinder the adoption of new practices in a community.

Overcoming Policy, Regulatory and Socio-Cultural Barriers

Companies that undertook adaptation efforts reported experiencing policy and socio-cultural barriers both internally and in the project implementation. Olam stressed that, in the country where its featured adaptation practice takes place, the government's target for increased cocoa production may be conflicting with its national goal to reduce deforestation, thus potentially weakening efforts on the ground to change farming practices. Yara noted that its efforts to commercialize efficient irrigation technology would benefit from policy incentives to facilitate the dissemination and adoption of their technology.

Education is often key to overcoming socio-cultural barriers. Sampo Japan Nipponkoa Group embedded financial education and outreach in its insurance programme. Nespresso, Mars and Netafim mentioned the challenge associated with encouraging farmers to adopt new farming practices, and how weak institutions compounded the challenge - all found that partnerships with local community organizations and farmer cooperative were critical in overcoming barriers and supporting cultural change.

Chapter 3: Case Studies – Responsible Corporate Adaptation in Practice

Overview of Case Studies

COMPANY	CASE STUDY TITLE	SECTOR	COUNTRY	SUMMARY
Allianz Re	Increasing Food Security in Asia through Satellite-Based Information and Insurance	<i>Insurance and Financial Services</i>	Bangladesh, Cambodia, India, Indonesia, Philippines, Thailand, Vietnam	Allianz Re engaged in a multi-stakeholder partnership to utilize remote-sensing technology to increase its underwriting accuracy and to help Southeast Asian rice farmers secure their crop.
Banco do Brasil	Financing Sustainable Agriculture for Sustainable Local Economies	<i>Finance/Banking</i>	Brazil	Banco do Brasil develops an innovative cross-sector partnership to turn challenges into opportunities in seven micro-watersheds.
Braskem	Industrial Water Reuse as Part of the Business Climate Strategy: A Financial and Social Win-Win	<i>Chemicals</i>	Brazil	Brazilian-based petrochemical company Braskem implemented an industrial water reuse programme in a drought-prone region to improve efficiency and reduce consumption of the scarce resource.
Coca-Cola	Global Water Stewardship and Conservation	<i>Food and Beverage</i>	Global	Coca-Cola's comprehensive efforts aim to return 100 per cent of the water used in its finished beverages and manufacturing process to nature and communities.
Eskom	Integrated Risk and Resilience Management Procedure for Adaptation to Climate Change Planning	<i>Energy</i>	South Africa	Eskom, the South African public electric utility, established an internal framework to identify climate vulnerabilities to infrastructure, develop strategies to mitigate risk and implement its climate change adaptation plan.

COMPANY	CASE STUDY TITLE	SECTOR	COUNTRY	SUMMARY
Garanti Bank	Climate-Sensitive Business Policies to Mitigate Water Risk and Ensure Financial Performance	<i>Finance/ Banking</i>	Turkey	Garanti Bank is turning climate risk into business opportunity through the development.
Mars	Sustainable Rice Farming in Pakistan	<i>Food and Beverage</i>	Pakistan	Mars developed a large-scale programme for basmati farmers in Punjab, Pakistan, to improve rice production practices and reduce water consumption while providing significant co-benefits for stakeholders.
MTA	Responding to Hurricane Sandy	<i>Transport</i>	United States	New York City's Metropolitan Transportation Authority (MTA) reacted to major losses following Hurricane Sandy by implementing a sea-level rise adaptation programme to ensure continuity of operations during future flood events.
Nespresso	Resilient Landscapes for Sustainable Farming and Livelihoods	<i>Agriculture</i>	Guatemala and Colombia	Building upon ten years of experience in sustainable coffee agriculture, Nespresso is amplifying its actions by investing in agroforestry, a climate adaptation solution for producers.
Netafim	Advancing Drip Irrigation Practices in Rice Production in India	<i>Agriculture</i>	India	Netafim has introduced a new rice cultivation strategy to decrease water use, increase savings for farmers and secure its own business operations for a sensitive sector in a drought-prone region.
Olam	Supporting Ghanaian Farmers with the World's First Climate Smart Cocoa	<i>Agriculture</i>	Ghana	Olam International and the Rainforest Alliance developed a project breaking the link between cocoa production and deforestation while increasing resilience of farming landscapes.

COMPANY	CASE STUDY TITLE	SECTOR	COUNTRY	SUMMARY
Sompo Japan Nipponkoa Group	Weather Index Insurance to Enhance Resilience of Agriculture in Developing Countries	<i>Insurance and Financial Services</i>	Thailand	Japanese insurance company Sompo Japan Nipponkoa Group developed a new product to help provide smallholder farmers in Thailand with insurance policies to reduce their climate risks.
SUEZ	Circular Water Economy – Beyond adaptation, a way to secure and renew water resources.	<i>Water</i>	United States	Beginning in the mid-1990s, SUEZ and its subsidiary, United Water, undertook a wastewater reuse project in water scarce Southern California, and have continued to regularly develop its capabilities over the years.
Tokio Marine	Protecting natural resources and building local resilience to natural disasters.	<i>Insurance and Finance Services</i>	Asia	Tokio Marine Group is raising awareness about climate change risk and investing in stronger communities through biodiversity preservation.
Vale	Nowcasting system for harbor operations in Brazil.	<i>Mining, Infrastructure</i>	South America	In partnership with the state Government of Espírito Santo, Brazilian-based mining company Vale implemented a short-term forecasting programme to monitor and issue weather warnings to prepare its port facility for extreme weather.
Woolworths	Improving the climate resilience of South African fruit and vegetable farmers.	<i>Agriculture</i>	South Africa	Woolworths is helping South African fruit and vegetable producers, suppliers and retailers understand local climate risk and implement environmentally sound, climate-smart agricultural practices.
Yara	Tackling food security, water scarcity and climate change.	<i>Agriculture</i>	Global	Norwegian company, Yara, has developed new tools to address global water scarcity from the ground up.

Increasing Food Security in Asia through Satellite-Based Information and Insurance

Allianz Re engaged in a multi-stakeholder partnership to utilize remote-sensing technology to increase its underwriting accuracy and to help Southeast Asian rice farmers secure their crop.

A Global Reinsurance Firm Focuses on the Vulnerable Rice Production Market of Southeast Asia

In coming decades, rice growers in Asia will become increasingly exposed to frequent and severe natural catastrophes due to climate change. As a result, rice producers are seeking protection against these risks to ensure that they can overcome the financial and yield losses associated with a natural disaster, losses which can endanger their credit worthiness. Timely and accurate information on rice production (e.g., crop area, crop growth and expected losses due to disasters) is critical to rice-growing and -consuming nations.

In an effort to provide security for Asian rice farmers, who produce more than 90 per cent of the world's rice supply, Allianz

Global Reinsurance (hereafter referred to as Allianz Re) became a founding partner of the Remote sensing-based Information and Insurance for Crops in Emerging economies (RIICE). This multi-stakeholder partnership (see Partners and Stakeholders textbox) aims to provide governments and NGOs with better information on rice crop growth to support the development of more robust food security policies in addition to new and enhanced crop insurance programmes in Southeast Asia.

Increasing Understanding of Rice Production and Developing Insurance Solutions

The RIICE programme's primary objective is to reduce vulnerability of Asian smallholder

Allianz Global Reinsurance, or Allianz Re, is the reinsurance division of the Allianz Group, a financial services company headquartered in Munich, Germany, which specializes in insurance and asset management in more than 70 countries worldwide. Allianz Re works to protect its clients from financial losses, meet regulatory requirements and help keep them competitive by offering expertise in underwriting and risk management. Allianz Re is one of the major agriculture reinsurers globally, with focus areas in crop, livestock, aquaculture, and forestry reinsurance.

farmers engaged in rice production. This is achieved in two ways:

1. Increase the information on rice growth areas and expected yields to help governments, agricultural intermediaries and relief organizations better manage domestic rice production and distribution, both during the normal growing cycle as well as after natural catastrophes have struck.
2. Provide access to insurance solutions for governments, agricultural intermediaries (such as cooperative or rural banks) and individual rural farmers to alleviate the financial effects on farmers that stem from natural catastrophes such as flood and drought — the major causes for crop destruction in Asia.

Effectively, RIICE aims to provide governments and NGOs with better information on rice crop growth to help establish more robust food security policies and to develop new and enhance existing crop insurance programmes in Southeast Asia.

To achieve the task of increasing the information of rice growth areas and expected yields, the programme partners use radar images to determine how much rice grows in each area, each season, ultimately arriving at a total national yield estimate. Based on this, Allianz Re is better able to develop appropriate insurance products for farmers. Govern-

ments can also be alerted of possible shortfalls in rice yields, allowing them to make adequate provisions to respond to potential food shortages.

One of the RIICE programme partners, Sarmap, maps and monitors the geographies of the rice growing areas of the seven South-east Asian target countries using high resolution imagery. Using satellite technology, they are able to determine how crops are developing. The International Rice Research Institute (IRRI) and local partners then perform tests on the ground to calibrate the satellite observations and use them, along with weather, crop management and soil information, to develop a remote sensing driven crop growth model to estimate actual rice yields. Historical weather data is combined with this remote sensing information and the method for estimating actual rice yields to generate rice yield forecasts. Allianz Re uses this data to develop insurance solutions for farmers.

RIICE scans the earth surface in Southeast Asia using radar-based remote sensing technology. By analyzing time series, it is able to determine the extent of rice cropping, monitor rice growth, estimate, to a certain degree, biomass and identify crop damages and losses caused by droughts and floods. The data captured by the satellites is processed by Sarmap and then translated into readable maps. The subsequent yield forecasts form the basis for insurance companies to monitor crop losses in a transparent and reliable manner, allowing crop insurance to become viable for rice smallholders.

A More Informed Government, More Confident Farmer Population

The outputs from the programme can help governments institute an insurance mechanism that reduces the vulnerability of rice smallholders from natural catastrophes. Through this insurance mechanism, governments transfer their farmers' risks to the insurance sector, allowing them to unblock funds which can be put to more productive uses, rather than being held as a contingency in government accounts.

In addition, this programme is expected to help increase rice production in the long run due to better access to credit and information about the actual growth status of observed rice crops and the forecasted yields as well as about damages and forecasted losses of rice crops. Crop insurance is often made as an indispensable condition to obtain an agricultural loan by a rural bank. Agricultural credit in turn will spur investment into higher-yielding crops sorts.

The RIICE programme has been running from 2012 through 2015, and is planned to be implemented in Bangladesh, Cambodia, India, Indonesia, Philippines, Thailand and Vietnam. It has already used satellite images to monitor rice-growing areas in 13 test sites.

Developing Strategies to Strengthen the Crop Insurance Markets

While the project is still in its early stages, having only been rolled out at 13 test sites, Allianz Re has found some barriers to implementation, mostly with respect to the sensitivity of data. Furthermore, the interdisciplinary character of the project makes it challenging for the partner countries to divide responsibilities among the various relevant ministries, such as agriculture, finance and defense.

In the long term, the project sponsors hope that the information generated by the initiative will be used to support better decision-making, targeting of resources, crop insurance and disaster mitigation and response systems in both the public and private sectors. For Allianz Re, this new technology will support the development of new crop insurance markets. For existing crop insurance markets, the technology, if fully adopted, would be a technological upgrade and lead to more accurate underwriting, increasing the insurability of Asian agricultural markets.

Partners & Stakeholder Engagement

Allianz Re has four key partners for the RIICE programme. The German Development Agency (GIZ), jointly with Allianz Re develops aggregator networks and trains them to understand micro-insurance products. The Swiss Agency for Development and Cooperation is the key donor of the programme and organizes the knowledge management of the programme. The International Rice Research Institute (IRRI) calibrates and validates the rice yield forecasts and coordinates scientific regional partners. Sarmap provides customized earth observations based products and services; radar images are provided by the European Space Agency. Allianz Re itself is tasked with development of insurance solutions based on the data provided by Sarmap and IRRI.

“Smallholder farmers face financial risks from natural catastrophes that can be transferred to the formal insurance market. Financial actors can provide reliable and unbiased tools to calculate insurance premiums and evaluate the losses.”

—Amer Ahmed, CEO, Allianz Re

Financing Sustainable Agriculture for Sustainable Local Economies

Banco do Brasil develops an innovative cross-sector partnership to turn challenges into opportunities in seven micro-watersheds

Identifying the Conventional Agricultural Practices that Compound the Impacts of Climate Change

Banco do Brasil S.A. is the largest financial institution in Latin America in assets, totaling over R\$ 1.4 trillion. Banco do Brasil has approximately 111,000 employees and more than 61 million clients in 24 countries. In 2014, it recorded a net income of approximately R\$11.2 billion and held 21 per cent of Brazilian credit market share, according to Brazilian Financial System (SFN). Banco do Brasil is a private company controlled by the government and is therefore part public and part private with the Brazilian federal government as the largest shareholder.

The Agua Brasil programme is a public private partnership that evolved out of growing concern over water scarcity and its complex impacts on the agricultural sector in Brazil. Banco do Brasil conducted an initial assessment to determine climate change vulnerabilities within key watershed areas, and found that conventional agricultural activities and processes, as well as a lack of knowledge regarding sustainable alternatives, intensify the impacts of climate change in these areas. These conventional processes include: inadequate soil conservation practices;

minimal cattle management coupled with no soil and water conservation practices; raising cattle on degraded pastures; limited knowledge of livestock production best practices; poorly maintained roads facilitating erosion; violations of water-use restrictions during dry season; low productivity of organic fruit farming; and lack of the social, economic and environmental co-benefits of livestock production best practices.

A New Strategic Partnership to Mitigate Risks and Support Sustainable Water Use

To address these issues, the Agua Brasil programme was created in 2010 to coordinate and fund actions aimed at fostering the development and the dissemination of sustainable rural production practices and techniques and at improving water quality of watersheds and the reduction and mitigation of the water footprint. Since that time, nearly USD \$7 million [R \$18 million] has been invested in the programme.

The Agua Brasil programme was conceived by Banco do Brasil and developed in partnership with the Banco do Brasil Foundation (a civic sector institution created by the bank that makes social investments), the

Banco do Brasil S.A. is the largest financial institution in Latin America in assets, totaling over R\$ 1.4 trillion. Banco do Brasil has approximately 111,000 employees and more than 61 million clients in 24 countries. In 2014, it recorded a net income of approximately R\$11.2 billion and held 21 per cent of Brazilian credit market share, according to Brazilian Financial System (SFN). Banco do Brasil is a private company controlled by the government and is therefore part public and part private with the Brazilian federal government as the largest shareholder.

National Water Agency, and WWF-Brasil. The programme took place in seven pilot micro-watersheds⁶⁰ and focused on the following key activities:

- Development of micro-watershed management models, with territorial planning and social participation;
- Environmental monitoring of the biogeographic domains, water planning units, and the selected micro-watersheds;
- Development of sustainable agricultural projects in the selected micro-watershed with the goal of replicating these models locally, regionally and nationally;
- Training watershed management organizations, with committees or management bodies for each watershed; and
- Implementation of a field project model comprising sustainable agricultural practices, cost reduction and environmental compliance, as well as business plans that support markets for more resilient agricultural practices.

One of the primary goals for the Agua Brasil programme was that by June 2015, 70 per cent of the farmers in the micro-watersheds would be informed of preferred sustainable production and water and soil conservation practices, and that 30 per cent would adopt these practices. Programme performance was monitored and evaluated and presentations for each location were delivered, highlighting the impacts achieved as well as outstanding cases and individuals. Considering a target audience of 1,656 farmers in 7 micro-watersheds, the results calculated in June 2015 show that 64 per cent of targeted farmers have implemented sustainable practices outlined through the programme and 85 per cent were informed about these practices.

Widespread Benefits for Participating Communities

Promoting the adoption of agricultural production practices that improve soil conservation, the supply and quality of water resources and the recovery of riparian forests, each contribute to making the micro-watersheds more resilient to extreme weather events. The company reported that the multiple and diverse activities set forth by the Agua Brasil programme ensure water and food security for surrounding communities and gener-

ate collective economic and environmental benefits for the watersheds.

Specifically, the retention basins implemented in the micro-watersheds have reduced erosion by 60 per cent as they increase water infiltration, reinforcing groundwater recharge, and ease the effects of drought by replenishing the water table and keeping a greater volume of water in the watershed. Additional reported benefits include the income associated with Payment for Environmental Services (PES) that enables farmers participating in the programme to receive between USD \$29 and \$48 [R\$ 75 and \$ 125] per hectare per year when adopting and maintaining sustainable practices for water conservation. In the micro-watershed Cançã Moinho, 41 participating farmers receive this monetary incentive, with existing contracts in place through the end of 2015. In Xapuri, a town located in the state of Acre, the use of rotational grazing techniques led to a decrease in soil erosion and an improvement in productivity from 1.2 to 3 animals per hectare, increasing producer's income locally.

Challenges and Plans for Replication

The experience of the Agua Brasil programme shows that it is possible to reconcile productive activity and conservation through the adoption of sustainable practices, enabled and incentivized through the use of economic instruments. The Agua Brasil programme also highlights the need for more collaboration across sectors to support the adoption of environmentally and economically sustainable agricultural practices. Developing this type of strategic collaboration remains challenging, but also presents a key opportunity for financial organizations to play a leadership role by sharing lessons learned and working to identify new partners and opportunities.

At the time of the design of the Agua Brasil programme, Banco do Brasil and its partners considered implementing the programme activities in a total of 14 watersheds. However, due to difficulties related to labor qualification, delays in the local institutional articulation process, lack of monitoring of environmental conditions by local environmental agencies, and resistance of local agents to implement the new production practices, the programme

Partners and stakeholder engagement

The Agua Brasil programme is a public private partnership between the Banco do Brasil Foundation, the National Water Agency (ANA), and WWF-Brazil. In addition, programme activities have enabled the engagement of the local community, as well as 95 partners including universities, companies, local governments and watershed committees. Financial support for the programme is provided by both Banco do Brasil and their Foundation. The National Water Agency (ANA) provides technical advisory support, while WWF-Brazil is responsible for the implementation and monitoring of the programme activities at the local level.



area was revised to focus efforts on seven “full-cycle” micro-watersheds. Those micro-watersheds characterized as “partial-cycle” watersheds — consisting only of diagnosis but no field actions — were left for a possible second phase of the programme. The actions developed and the solutions implemented in the first phase of the partnership of the Agua Brasil programme proved to be applicable to other watersheds with similar characteristics. Therefore, Banco do Brasil and its partners expect that the model can be replicated in other locations in the future, leading to an increase in total environmental and economic benefits.

“Innovative partnerships among business, government and civil society can provide relevant solutions for climate adaptation and sustainable development and create economic opportunities, especially for low-income communities.”

—Osmar Fernandes Dias, Vice President and Member of the Executive Board, Banco do Brasil

Industrial Water Reuse as Part of the Business Climate Strategy: A Financial and Social Win-Win

Brazilian-based petrochemical company **Braskem** implemented an industrial water reuse programme in a drought-prone region to improve efficiency and reduce consumption of the scarce resource.

Water Scarcity Compromising Business Operations

Braskem is a petrochemical S.A. corporation with more than 8,000 employees across the globe. With headquarters in São Paulo, Brazil, the company also operates heavily in Bahia and Rio de Janeiro. Braskem is the largest petrochemical company in Latin America, and one of the largest producers of biopolymers, petrochemical products and resin worldwide.

For Braskem, a Brazilian petrochemical company, climate change-induced droughts and subsequent water scarcity pose a significant threat to business operations. Using the climate scenarios developed by the Brazilian National Institute for Space Research (INPE) and the Intergovernmental Panel on Climate Change (IPCC), the company assessed that the expected increase in the frequency of droughts in several regions across Brazil would negatively impact its local operations. Among the drought-related risks identified

by the company were business interruption due to lack of water and increased costs associated with obtaining water. Uncertainty concerning future changes in legislation regarding water collection was also identified as a concern that could further limit the company's capacity to operate.

As part of the company's broader strategy to cope with climate change risks, Braskem had already implemented industrial water recycling projects in the Brazilian states of Bahia and São Paulo, the latter being the largest in South America.

Addressing Climate Change-Related Water Risks through Partnerships

Braskem began to address their climate change risks by first assessing climate-related vulnerabilities, impacts and associated physical, regulatory and reputational risks, with the help of specialized consulting firms and think tanks. This process also included the

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identification of risks and opportunities for the suppliers. Braskem and their partners used climate data and projections developed by INPE and IPCC through the year 2040, and prioritized adaptation activities based on their potential to reduce risk and capitalize on opportunities, their financial cost, and their environmental impact.

Braskem is now forming public private partnerships with other local companies to develop the infrastructure needed to create large-scale water reuse facilities. In Bahia, the project combined the reuse of industrial wastewater with the reuse of rainwater, reducing the need for water collection. The water reuse project initiated in São Paulo, called Aquapolo, aimed to obtain water from industrial reuse, using advanced treatment of domestic sewage.

Aquapolo, for which Braskem entered a public private partnership with Sabesp and Odebrecht Ambiental, and represents an investment of approximately USD \$95 million, is now considered the largest recycled water project for industrial use in the South America. This facility was designed specifically for the most water intensive industries in São Paulo, and has a capacity of 1000 liters per second, a 17 km water pipeline and 3.6 km of distribution networks.

Operational Continuity and Increased Water Security for the Entire Region

The industrial water recycling projects focused on guaranteeing long-term continuity of operations, and obtaining reputational benefits by investing in solutions that increase the amount of water available to the community in water-scarce areas.

Braskem reported the Aquapolo water reuse project in São Paulo significantly increased the amount of water reused for industrial purposes in the area, and therefore contributed to water security for the entire region. Braskem operations alone consume 65 per cent of the capacity at the Aquapolo site. The company reused 8.8 billion liters of water in 2014, reducing its net water use by the equivalent of the annual consumption of 240 thousand people.

Additionally, the water reuse activities return higher quality water than the input, reducing the need for cleaning of cooling equipment and chemicals for water treatment.

Braskem has developed a water reuse indicator to monitor the development of water reuse practices across the company as a whole. The company intends to use this indicator as a means of tracking the success of various projects, particularly at facilities which were identified in the climate risk studies as being most critical to overall company operations and most vulnerable to drought impacts.

Linking Climate Adaptation Plans to Public Policies and Identifying New Business Opportunities

From Braskem's perspective, the effectiveness of corporate adaptation activities can be increased if they are embedded in public climate adaptation plans that provide incentives and highlight the environmental, social and economic opportunities for climate

“Our industrial water reuse projects in drought-prone regions not only help ensure our operational continuity, they also strengthen our corporate reputation in the communities where we operate.”

—Marcelo Lyra do Amaral,
Head of Institutional Relations and
Sustainable Development and Member of the
Executive Management, Braskem



Partners and stakeholder engagement

In São Paulo, the Aquapolo project was driven through a public private partnership between Odebrecht Ambiental and Sabesp, with whom Braskem shares the water reuse facility.

Braskem worked with several research organizations to conduct their climate risk assessment including the Brazilian National Institute for Space Research (INPE) and Fundação Getulio Vargas (FGV), a Brazilian think tank. FGV also assisted in developing the larger adaptation plan for Braskem's operations.

action, such as the reuse of industrial water. These plans can also help identify how to produce and make available relevant climate data. One of the major difficulties the company encountered when trying to assess risks and design adaptation activities was a lack of publicly available data on how climate change would impact their sector specifically, and thus their own business operations.

Braskem's climate change adaptation plan is just the beginning of the company's work assessing and understanding risk and implementing action. As one of the next steps, the company has identified the need to support capacity building and better communication with relevant stakeholders in order to enable

them to consider all opportunities and climate risks in the management of their business. It has also identified various opportunities for new innovation and technologies, including utilizing more sustainable sources and less carbon-intensive products. Specifically, it found a need to develop a reuse project with a smaller footprint so as to be more widely scalable and replicable. Going forward, Braskem's analysis for projects will be directed to regions with high potential water stress.

Global Water Stewardship and Conservation

Coca-Cola's comprehensive efforts aim to return 100 per cent of the water used in its finished beverages and manufacturing process to nature and communities.

The Challenges of Managing Water Resources

Coca-Cola is the world's largest beverage company and includes 500 brands and over 3,600 products. Eighteen of the company's top 20 brands generate more than USD \$1 billion in annual retail sales.

Water is a limited resource facing unprecedented challenges from overexploitation, increasing demand for food and other consumer and industrial products whose manufacturing processes require water, increasing pollution, poor management and the effects of climate change in many parts of the world. Water is a main ingredient in nearly all Coca-Cola products, and is vital to the production of the agricultural ingredients and manufacturing process on which the company relies. It also is critical to the prosperity of the communities where the company operates and sells its products. As the demand for water continues to increase around the world, and as locally available water becomes scarcer and the quality of available water deteriorates, Coca-Cola will face continued challenges with water.

As a global business with operations in 207 countries and territories, in any given year Coca-Cola has a number of facilities

in areas experiencing a variety of different types of water stress, including water scarcity, water quality or infrastructure issues. As a result, the company has developed its water stewardship activities to work closely with the community and other water users to evaluate and monitor source water availability to account for the impact of the company's water use. The company also requires its nearly 900 system-wide plants to comprehensively evaluate local source water vulnerabilities and risk. These plants also have plans in place to address the risks identified, and are actively implementing their plans in cooperation with the local community.

Replenishing 100 Per Cent of Extracted Water

Coca-Cola set a goal in 2007 to "give back" an amount of water equivalent to what they use in their beverages and their production by 2020. The company has also been increasing water use efficiency in its plants, and returning water to watersheds and municipalities through comprehensive wastewater

Coca-Cola is the world's largest beverage company and includes 500 brands and over 3,600 products. Eighteen of the company's top 20 brands generate more than USD \$1 billion in annual retail sales.



treatment in all of its plants globally — a \$1 billion investment for the company over the past decade.

To achieve this water stewardship goal, Coca-Cola is focused on the following three areas:

- Improving water-use efficiency by 25 per cent by 2020 (baseline 2010), building upon its original 20 per cent improvement by 2012 (baseline 2004) already achieved;
- Treating all wastewater from manufacturing processes; and
- Replenishing water used in finished beverages through the support of healthy watersheds and community water programmes (the “sustainable balance target”), such as reforestation in Mexico, aquifer recharge in India and river basin conservation on the Yangtze.

Once Coca-Cola achieves this goal, they intend to keep adding and maintaining projects to keep replenishing at the 100 per cent level as their volume continues to grow.

Partners and stakeholder engagement

Coca-Cola has engaged in extended partnerships with a number of respected third parties and NGOs to responsibly manage their water programmes and replenishment projects. These organizations include; the World Wildlife Fund (WWF), the United States Agency for International Development (USAID), the United Nations Development Programme (UNDP), UN-HABITAT, the Nature Conservancy, Water For People, Water and Sanitation for the Urban Poor and the Global Environment and Technology Foundation (GETF).

Reducing Costs and Ensuring the Economic Sustainability of Projects

Coca-Cola’s system-wide water efficiency has improved for 12 straight years — from 2004 to 2012, water efficiency increased 21.4 per cent, which avoided approximately USD \$600 million in costs. Achieving the 2020 goal is projected to avoid a further \$1.2 billion in costs.

The company’s water stewardship strategy also creates important incentives for plant managers. The first incentive is to improve water use efficiency and to reduce the amount of water used in the plant that is not physically part of the manufactured products, so that the “sustainable balance target” is lessened. Second, quantifying the benefits of community water partnerships in volume incentivizes project partners to ensure these water stewardships projects remain in service. This also ensures the partners can continue to count the annual project benefits as a balance to consumptive use, which further incentivizes local investment and capacity building.

Consumed Water is Returned to the Communities

Based on the Coca-Cola’s global water replenishment projects to date, the company is balancing the equivalent of an estimated 94 per cent of the water used in its finished beverages based on 2014 sales volume through local community projects. Since 2004, the company has replenished an estimated 153.6

billion liters of water back to communities and nature globally through 209 community water projects in more than 61 countries.

Coca-Cola returned globally approximately 126.7 billion liters of water used in its manufacturing processes back to communities and nature through treated wastewater in 2014. According to Coca-Cola, these combined efforts put it on track to be the first global food and beverage company to replenish the equivalent amount of water it uses back to communities and nature by the end of 2015. While the company has more than 500 community water projects, of those, approximately 300 are focused on water infrastructure, policy, sanitation or education programmes. Those types of projects fulfill a significant need, but do not provide direct water benefits and thus are not counted in this calculation.

An Evolving Corporate Sustainability Culture

Social and environmental water-related risks to industry are growing, industrial water rights are often not clear and the ability to increase water use may be uncertain in many geographies. Balancing consumptive use through strategically designed community water partnerships strengthens the sustainability of water sources for all users as well as the enterprise's social license to the water it needs. Furthermore, when evaluated in the context of the redefined business case framed by risk management, productivity and sustainability performance, the strategy and approach create the opportunity for industry to draw the connection more clearly between corporate water stewardship, the water challenges facing society, business and the environment with the mainline growth strategy of the enterprise. The quantification of project benefits employs standard engineering, social science and watershed management equations and tools in common use globally by trained professionals.

As this holistic approach has evolved, employees, from company leaders to plant managers, have had to adjust their attitudes and approach towards water issues. Those changes have been possible by gaining a greater understanding of the importance of responding to water issues outside the plant's walls. Coca-Cola's water stewardship activities have enabled the company to better understand that water

is not only critical to operations but also to the communities where they operate and distribute products. Without enough clean water, the company's production, markets and overall business will be affected.

Equipped with this new understanding, Coca-Cola embraced a new strategic direction into watershed protection, sustainable communities, education, awareness and water policy, and has been operating under such for more than a decade. Plant and senior managers have realized that when approaching water issues beyond the internal, normal day-to-day technical work (e.g., efficiency, quality, storm water and wastewater), cross-functional teams are essential. To that end, the company has integrated government affairs, communications and community relations into these efforts, as well as associates with expertise in forming and cultivating partnerships. This cross-functional collaboration has helped the success of the projects, providing the well-rounded understanding and capabilities needed to positively contribute to the communities where these efforts are taking place.

“We believe effective management of the world’s water resources is one of the issues that will shape and define the 21st century. Already, many of our projects around the world are helping communities mitigate and adapt to various water stresses. It’s a responsibility that we take seriously as a water user and we’re committed to continuing to do our part to protect and steward water for the next generation.”

*—Muhtar Kent, Chairman and CEO,
The Coca-Cola Company*

Integrated Risk and Resilience Management Procedure for Climate Adaptation Planning

Eskom, the South African public electricity utility, established an internal framework to identify climate vulnerabilities to infrastructure, develop strategies to mitigate risk, and implement its climate change adaptation plan.

A Nationwide Electricity Utility Exposed to a Wide Spectrum of Climate Risks

Eskom, South Africa's main public electricity utility, has a substantial amount of infrastructure across the country that is exposed to the effects of extreme weather and climate variability, including seasonal shifts and projected long-term climate change. Impacts the utility has already experienced include: turbine load losses as less energy is generated due to high temperatures, overvoltage surges on power lines from lightning, high winds leading to line failure, corrosion of lines from high humidity and temperature, and flooding causing sinkholes and sweeping away infrastructure.

To address the many concerns brought about by extreme weather and climate change, Eskom is in the process of implementing its "Integrated Risk and Resilience Management Process for Adaptation to

Eskom is a South African public electricity utility with 41,000 employees and headquarters in Sunninghill, South Africa. Producing approximately 95 per cent of the electricity used in the country and 45 per cent of the electricity used in all of Africa, Eskom's operations extend from electricity generation to transmission, utilizing both renewable and non-renewable technologies and energy sources.

Climate Change Procedure". This framework helps each of the company's divisions identify their facilities and operations most vulnerable to extreme weather events, assess other climate change related risks and subsequently develop a strategy to anticipate and adapt to the impacts of climate change.

A Strategic Step-by-Step Guide to Identify Risks and Appropriate Response

Eskom's climate adaptation procedure was designed to guide its own practitioners and to ensure all climate-related opportunities and risks are managed throughout the electrical utility in an integrated and effective way.

The "Integrated Risk and Resilience Management Process for Adaptation to Climate Change Procedure", (the Procedure) establishes six clear steps to develop adaptation plans and strategies:

1. Outline project boundary: geographical scope of vulnerable areas within the business area;
2. Outline weather or climate-related variables and the associated impacts within the identified vulnerable areas, including identifying a history of significant storms that has affected the area and business;
3. Formulate weather variables and define vulnerable areas in the context of integrated risk and resilience management;
4. Identify and outline activities, treatment plans and tasks already being undertaken or currently in place to address the risks;
5. Identify and review strategies, standards, plans, and procedures within the areas of the business where management of the identified climate risks is already reflected and/or where there is still an opportunity to integrate climate risks; and
6. Define an adaptation plan for the business area in terms of current activities to be undertaken, including future studies and information required to inform adaptation to climate change activities.

Eskom's Climate Change and Sustainable Development Department (Centre of Excellence) guides the implementation of the Procedure and supplies all information on the modelling of future climate change impacts. The Procedure allows the utility to assess and understand potential future impacts for the identified vulnerable areas, and to ensure appropriate definition of current and future response plans and controls.

An Organization-Wide Climate Approach that Yields Organization-Wide Benefits

While implementing the steps outlined above, Eskom noted several beneficial outcomes. As climate change stresses electrical production in many ways, the diverse portfolio of Eskom's adaptation actions will work to provide energy assurance even in the most extreme weather events thereby assuring the continuity of its operations. Additionally, by strengthening the resilience of the electrical grid, upon which 95 per cent of all South African electrical usage depends, the company has also improved and protected its reputation. Finally, the integration of climate-related risks, including disasters, as part of integrated risk and resilience procedures within Eskom, improves its management processes overall.

Partners and stakeholder engagement

Eskom's climate adaptation strategy primarily involves an internal assessment of climate risks and vulnerabilities and requires coordination with many stakeholders within the organization including specialists and managers designated to execute this initiative. Outside of the organization, Eskom sought guidance on policy from the Department of Environmental Affairs (DEA), South Africa, of which Eskom is a steering committee member on the National Technical Working Group on Climate Change Adaptation.

To better understand the climate science used to identify risks, Eskom partnered with several research institutions, including: University of Kwa-Zulu Natal, University of Cape Town and Council for Scientific and Industrial Research (CSIR). The utility says it also learned of adaptation planning and integration best practices, implications of climate change policy directives, and national disaster management initiatives by partnering with the South African National Business Initiative (NBI).



A Replicable and Iterative Strategy to Consistently Reduce Climate Impacts Over Time

While Eskom has gained multiple benefits by implementing their adaptation procedure, it also encountered several barriers to action. These included uncertainties associated with climate science, especially with downscaled models, and with the prioritization of weather/climate risks especially when forecasted over the long-term. Eskom's ability to build institutional support for these activities was hindered by global uncertainties in the climate science and a lack of resources to undertake baseline studies or determine climate risks. As a result, the company identified a need for a consensus to be reached on projections of climate change impacts (through common approaches such as statistical downscaling) at local, regional and national levels.

Eskom has also developed a process for monitoring and evaluating the success of their climate adaptation actions, as well as an iterative management process for continuing to identify, improve, and report business risks related to climate change. In this context, each proposed weather and/or climate integrated risk management activity will be monitored in terms of timelines, budgets and all related resources required for its successful implementation.

The Procedure was developed specifically for Eskom and is now built into their adaptation framework with the intention to make it replicable in all geographic areas across the company. Regardless of location, the process remains the same, but inputs and outputs differ based on vulnerability assessments and adaptive capacities that exist. As such, this adaptation plan can be re-applied over time, and can continue to evolve as understanding of climate impacts and technologies improve.

Climate-Sensitive Business Policies to Mitigate Water Risk and Ensure Financial Performance

Garanti Bank is turning climate risk into business opportunity through the development of loan policies that favor climate-conscious projects to encourage more sustainable investing.

A Holistic Approach to Mitigate Downstream Risks

Climate change impacts create new concerns for lenders and financial institutions. Extreme weather events, such as severe storms or floods, can not only damage retail banking facilities, but also impact vulnerable sectors dependent on stable weather patterns, such as agriculture. This can potentially lead to income loss and affect the ability of customers to repay loans. Garanti Bank believes that the main water-related risks their company is exposed to lie in downstream impacts arising from financing activities.

To help minimize and manage water, climate, environmental and social risks that may affect potential customers, as well as to reduce the water footprint of projects that it finances, Garanti Bank established its Environmental Impact Assessment Process (the Process) which encompasses both their

Environmental and Social Loan Policies (the Policies) and the Environmental and Social Impact Assessment Model (the Model). The Policies guide the extension of all loans at Garanti Bank varying from consumer loans to project finance activities, without applying any limits. In addition, the bank applies the Model to large-scale projects that are defined as greenfield and brownfield investments with an investment value of more than USD \$20 million. Putting the Process into place has positioned Garanti Bank as the first commercial bank in Turkey to implement a thorough approach to manage climate and environmental risks and to advance climate adaptation for the financial sector. It ensures that projects are assessed and graded according to their sensitivity to climate change, risks due to location and their potential social and environmental impacts.

T. Garanti Bank A. S. is an integrated financial services group headquartered in Turkey that operates in every segment of the banking sector including corporate, commercial, SME, payment systems, retail, private and investment banking, together with its subsidiaries in pension and life insurance, leasing, factoring, brokerage, and asset management. It has subsidiaries in the Netherlands, Russia and Romania.

Smart Loan Policies to Mitigate Climate Change Impacts

Funding criteria for the Policies are focused on avoiding negative impacts on water quality or quantity at the location where the project is to take place. As a result of these policies, the bank does not finance any projects or activities in wetland zones as defined by the RAMSAR Convention.⁶¹ Furthermore, if the project location is found to be in close proximity to sensitive wetlands or protected areas, relocation of the project may be requested prior to financing. Any project may be rejected for failing to meet the criteria outlined in the Policies.

Garanti Bank sees the occasional rejection of loan requests as a normal corollary of its policy, and believes that avoiding these high-risk projects will improve its long-term business performance. Projects that do not comply with the requirements set out in the Policies run the risk of not being financially sustainable and can lead to a default. Therefore, the bank not only assesses and evaluates projects prior to granting loans, it also closely monitors the implementation, together with partners, of the Policies throughout the repayment period for the loan. In 2014, all loan requests were subjected to the Policies regardless of the loan type and size. As a result, six loan requests were directly rejected due to non-compliance, without further assessment. Furthermore, 29 project site visits were conducted to monitor ongoing compliance and corrective actions were requested from the borrowers where necessary.

Turning Risk into New Product Opportunities

In the first quarter of 2015, as part of its sustainability strategy to facilitate investments to manage risks like drought, Garanti Bank developed their “Agricultural Irrigation Systems Loans” programme. By offering these loans, the bank is supporting the establishment and automation of sustainable irrigation systems, where water is distributed by drip, sprinkler and micro sprinkler irrigation. Following the launch of this new financial product, one of Turkey’s largest solar-powered irrigation systems was financed by Garanti Bank in 2015, with 800 m2 solar panels and 65 kWh installed power, enabling sustainable irrigation

Partners and stakeholder engagement

Garanti Bank engages a diverse range of stakeholders when identifying and assessing risks and works with these partners to inform, educate and better understand the potential challenges and benefits of each adaptation activity implemented. Stakeholders include civil society, public authorities, communities, investors, suppliers and employees.

practices and crop diversity for 450 decares (approximately 45 ha) of agricultural land. In addition to providing local environmental benefits, the project increased the farmers’ energy security, which also increased their economic security as the crop yield used to be significantly impacted by frequent blackouts.

Addressing Challenges and Integrating Resilience throughout Bank Operations and Subsidiaries

According to the company, Garanti Bank’s Policies have provided a useful framework to help customers integrate climate considerations into their own decision-making process. For example, as a result of the Policies, one of the bank’s borrowers was able to identify the expected climate change-related impacts on the internal rate of return for a proposed hydropower plant project. Given these results, Garanti Bank advised the borrower to conduct further assessments to better understand potential risks to the project. The borrower worked with two universities to conduct additional assessments and found that the water flow in the river basin would fall 15 per cent in 2030, resulting in a 14.5 per cent reduction in electricity production due to reduced precipitation. Accordingly, the borrower ultimately decided to move forward with a geothermal plant rather than the hydropower plant project to increase the financial return on their investment.

In another project, in order to protect the continuity of a riverbed ecosystem within a project site, an additional investment was made to collect cooling water from the sea rather than the riverbed, following Garanti Bank’s environmental assessment. A desalination plant, which was not originally



“Banks that successfully manage climate change risks will not only be in a position to minimize costs but will also benefit from various opportunities such as being able to address changing customer profile expectations and meeting the financing needs of “green” investments. For this reason, we believe that climate change is a strategic issue that merits full integration with all business processes and decision making mechanisms.”

—Fuat Erbil, CEO, Garanti Bank

planned by the borrower, was built upon Garanti Bank’s request. Consequently, the riverbed ecosystem was protected and the local community continued to have access to sufficient water for irrigation purposes.

The primary challenges Garanti Bank faced when implementing the Policies were its clients’ initial negative reactions due to new and more rigorous processes being put in place, as well as a lack of awareness about the near and long-term benefits of such policies. These reactions also fueled competition concerns due to the fact that other similarly situated banks do not have similar policies in

place. To raise awareness and understanding about the business case of the Policies and the resilience benefits they provide, Garanti Bank delivers annual trainings to its clients, other financial institutions, employees and top management. Following its pilot completion in Turkey, the bank now plans to replicate the Process and the implementation of the Policies and the Model in its subsidiaries in Romania, Russia and the Netherlands.

Sustainable Rice Farming in Pakistan

Mars developed a large-scale programme for basmati farmers in Punjab, Pakistan, to improve rice production practices and reduce water consumption while providing significant co-benefits for stakeholders

Critical Water Insecurity Threatens Mars' Rice Supply

Rice production is highly water intensive, and in regions like Punjab, Pakistan, the production of basmati rice is subject to water availability restrictions that can impact product yield, quality, food safety, and farmer income. Mars (specifically the Mars Foods division) sources its Basmati rice, a key ingredient for one of their product lines, from the water scarce Punjab region. Several other risks that impact farmers' ability to supply good quality rice are present in the Punjab region including incorrect use of pesticides and fertilizers, and low levels of rice seed purity. This, in turn, impacts the quality of Mars' products sourced from this area.

To secure its operations in the region, mitigate risks from climate change impacts and increase the availability of quality basmati rice, Mars developed a programme to decrease water usage and improve farming practices for rice farmers in Punjab. Leveraging a partnership with Rice Partners Ltd (RPL), Mars implemented a programme to educate farmers in alternative farming methods designed to not only reduce water use, but also to incorporate productive co-benefits such as reductions in greenhouse gas emissions (GHG) and increases in farmer income.

Promoting Mass Adoption of Best Practices to Secure Upstream Supply

Mars is implementing a wide-scale programme with goals of promoting better farming practices, achieving improvements in water efficiency, reducing greenhouse gas emissions and raising farmer income. It went about accomplishing these goals through the following three-step approach:

1. Design and roll out a programme that focuses on educating farmers about alternative farming practices that require fewer inputs but that produce higher quality and yield outputs. The initial aim was for 500 Rice Partners Ltd. (RPL) farmers to adopt the methods, and through this uptake demonstrate the benefits of these alternative farming practices.

Mars Inc. is a privately held global food manufacturing company with headquarters in Virginia, USA. Employing 75,000 people in 74 countries, Mars operates six business segments. Mars Foods, the segment that is the subject of this case study, operates 11 manufacturing sites with more than 2,000 employees.

2. Once the RPL farmers have adopted and implemented the new farming techniques, Mars plans to engage them to become ambassadors for change, communicating lessons learned and empowering others in their communities to adopt similar practices.
3. Help to drive wide-scale adoption of alternative farming methods through this peer-to-peer outreach to farmers outside of the RPL supported programme.

Mars initiated the project by conducting a baseline assessment of current farming practices in Punjab in conjunction with Rice Partners Ltd., International Rice Research Institute (IRRI) and Helvetas. With this assessment, the food company positioned itself to better understand what opportunities and risks these current farming practices presented. This assessment was evaluated by a third party to gain an independent perspective, and was audited under the Sustainable Rice Platform standards.

Additionally, Mars invested in research into alternative production practices that would allow rice to be produced with less water. Working with the University of California, the University of Arkansas and rice farmers in the Mississippi Delta, Mars supported the experimentation of an innovative farming technique called Alternate Wetting and Drying (AWD), which has been shown to use 30 per cent less water and reduce GHG emissions by up to 90 per cent, all without reducing crop yields. The company plans to incorporate similar methods in Punjab to supplement their primary climate adaptation projects in the area.

Partnering with Local Organizations to Engage the Industry at Large

The expected results of Mars' sustainable rice farming project in Punjab are to achieve a 30 per cent reduction in water use, effectively decreasing the sensitivity of rice production to droughts and other climatological factors. In the long run, the company expects a total saving of 1.5 billion m³ of water. The programme has grown from 31 farmers in 2011 to 425 farmers in 2015, resulting in a 20 per cent improvement in the farmers' net income, cash benefits and a guaranteed

route to market for the rice. In an effort to achieve wide-scale adoption, Mars hopes that by 2018, 15,000 (2 per cent of Basmati farmers) will implement the new techniques, and by 2021, for that number to have grown to 700,000 Basmati farmers.

Mars is also optimistic about the potential co-benefits of this project. This programme is expected to lead to a 50 per cent or greater reduction in greenhouse gases associated with original farming practices and a 30 per cent increase in farmers' net income.

More recently Mars Food became a member of the Sustainable Rice Platform (SRP) to help widen the scope of, and bring additional expertise to, the adaptation programme featured above. The SRP is an industry collaboration aiming to develop a globally applicable set of rice sustainability standards. With the expertise of its partners, including IRRI and Helvetas, Mars has been able to further identify optimal farming practices that focus on water efficiency and income in line with the SRP standard and guidelines. These will initially be implemented by approximately 500 farmers in Pakistan demonstrating the various benefits, including reducing water usage and improving farmers' incomes. Mars is looking to roll out the earnings and embed the SRP standard into all of its rice supply chains. The company's long-term ambition is to drive wide-scale adoption of the SRP standard by effectively inspiring farmers beyond their supply chain to serve as ambassadors for change.

Partners and stakeholder engagement

To date, the key partners in Mars' programme have included Rice Partners Ltd. (RPL), the key supplier in the region; the International Rice Research Institute (IRRI), Helvetas and the SDC, the Sustainable Rice Platform (SRP, an initiative co-convened by the UN Environmental Programme and IRRI), and local authorities like the Punjab Irrigation Department.

Mars also partnered with the University of California and the University of Arkansas to test new practices before implementing them in Punjab.



“Smallholder farmers are the lifeblood of the world's food supply. Supporting these farmers as they strengthen their resilience to climate change not only secures economic opportunities for their families and communities, it helps companies secure their supply chains and continue to provide food for a global population that will soon exceed 10 billion.”

—Grant Reid, CEO, Mars

Capitalizing on Successful Cases to Promote Continued Implementation of Best Practices

The main challenge Mars has faced in implementing its climate adaptation strategy has been ensuring the support from all internal stakeholders. Project directors acknowledged the need to be transparent about the investments required to carry out adaptation activities and to increase internal understanding about the benefits that these entail, both for farmers as well as in the context of the company's supply chain. Nevertheless, the company has found that many farmers are fairly willing to implement new farming methods, and therefore the company hopes that the farmers that have participated so far will help be catalysts for broader change.

Going forward, farmers on each of the farms participating in the programme will track progress in logbooks to identify opportunities or gaps as well as to measure progress generally. SRP performance indicators are being put in place and annual 3rd party audits against the SRP standard are being conducted to monitor progress and ensure credibility in the findings and conclusions.

This programme is now Mars' blueprint for the other rice sourcing regions, prioritizing regions where similar programmes would generate the biggest impact. Mars began implementation in India in 2015, and will look to roll out similar initiatives in Cambodia and Thailand and other countries in coming years.

Responding to Hurricane Sandy

New York City's **Metropolitan Transportation Authority (MTA)** reacted to major losses following Hurricane Sandy by implementing a sea-level rise adaptation programme to ensure continuity of operations during future flood events.

A Subway System Under Water

The Metropolitan Transportation Authority (MTA) operates an expansive system of subways, buses, commuter rail lines, bridges, and vehicular tunnels which are all highly vulnerable to storm surge from coastal storms. The subway system in particular, the largest and most heavily used in the US, is highly exposed to the effects of sea-level rise with a vast majority of its 659 track miles underground.

While New York City's public transportation system is already critically exposed to flooding, this risk will become more pervasive as sea levels continue to rise. This vulnerability was made clear on October 29, 2012, when storm surge from Hurricane Sandy reached 13.8 feet at the southernmost tip of Manhattan, flooding subway lines and ultimately causing USD \$5.1 billion in financial loss to the MTA. The cost incurred from the flooding included USD \$350 million in lost fare and toll revenue and expenses to restore service, and an estimated USD \$4.755 billion in damages to infrastructure.

In the aftermath of Hurricane Sandy, the MTA secured funding, mostly from federal sources, to implement adaptation measures to protect its network against future flood events using fortification measures and enhancements to critical infrastructure. Operating along with city, state and federal agencies, the MTA has developed a strate-

gic plan to identify and reinforce its most vulnerable assets from the projected 11 to 21 inches of sea-level rise by the 2050s.⁶²

Fortifying Infrastructure to Ensure Continuity of Operations

The main motivation behind the MTA's climate adaptation initiative is to protect its network, primarily its subway system, from flood events that are expected to significantly increase in both frequency and intensity in future decades. Between lost revenue from shutdown and the cost of repairs for infrastructure after subways lines are flooded by Hurricane Sandy in 2012, the primary objective of the MTA's adaptation plan was to avoid future disruptions and the crippling effects of service suspension. Therefore, the MTA focused on measures which strengthened infrastructure and protected critical assets from flood waters. Specific actions taken to reduce exposure to flood events included:

- Hardening of vulnerable electrical substations, ventilation equipment, pump rooms, signal rooms, and circuit breaker houses;
- Pumping system improvements and mobile generators at critical tunnel locations;
- Flood mitigation measures such as perimeter protection and drainage improvements at above ground facilities, bus depots, and train yards;

The MTA is a public benefit corporation of the State of New York, whose board is appointed by the Governor of New York State. It is the largest public transportation service in the United States with an annual ridership of 2.7 billion. With 67,445 employees, the MTA operates subways, buses, and commuter rails over a 13,000 square kilometer region in 12 counties in New York and two in Connecticut. The MTA projects a growth of 4 million people in its service areas by 2030.



- Sealing of under river train tubes and vehicular tunnels using deployable flood barriers; and
- Street level flooding measures including sealing of subway egresses, and raising of ventilation grates.

Taking the First Steps: Strategic Evaluation of Key Vulnerabilities

Much of the work that has been completed to date has been a strategic evaluation of the most critical and exposed facilities and how to best equip them to stand up to floods. Specifically, this included identifying critical facilities based on elevation. The MTA worked with consultants and planning organizations to further characterize and study system assets and develop resiliency plans and cost benefit analyses. In association with various research institutions, the MTA also utilized new flood elevation guidelines to ensure that it understands how each facility or asset would be affected by various scenarios.

There are 187 individual projects already completed or underway. Sandy-related funding totals USD\$6.9 billion, of which over 80 per cent is federally based and will be monitored and evaluated by the U.S. Department of Transportation, Federal Transit Administration. The

MTA has committed USD\$2.4 billion in funding to date: USD\$2.1 billion in recovery projects and USD\$277 million in resiliency projects.

Transporting the People of New York

The MTA subway system services 8.7 million riders on an average weekday, and has an annual ridership of 2.7 billion. A majority of these riders are dependent upon the MTA's services for transportation within the city. Service disruptions disproportionately affect the elderly and poorer members of the city who do not have alternative means of transportation readily available to them. By engaging in climate adaptation projects that ensure continuation of services during future storm events, the MTA provides more reliable transportation means to the people most dependent upon it.

Continuing to Evaluate, Strategize and Implement

In order to achieve their goals of preventing service shutdowns and reducing infrastructure repair costs from future flooding events, the MTA realized a need for a strategic approach to identify vulnerable assets. This involved incorporating climate and topo-

Partners and stakeholder engagement

The MTA is a public benefit corporation of the State of New York, and regularly receives funding from New York City, New York State, and the United States Government. The City (the Office of the Mayor and City agencies), the State (the Office of the Governor and State agencies), and the federal government (the U.S. Department of Transportation and the Federal Transit Administration) all informed and monitored the resiliency measures related to this adaptation project. The MTA also engaged other organizations including national and regional planning organizations, local universities (Columbia University, New York University), and collaborated with neighboring transit agencies (Port Authority of NYNJ and New Jersey Transit). These partnerships assisted them in their assessment of: critical facilities, rate and impact of climate change, and adaptation best practices. All adaptation projects were also overseen by the US Department of Transportation and Federal Transit Administration.

graphical data, engineering design practices that consider the effects of climate change, and ensuring the agency has access to accurate information about assets. Specifically, this strategic approach requires:

- Improved asset management which includes system delivery, data architecture and also organizational change management;
- Geospatial analyses and the use of geographic information system (GIS) and mapping technologies;
- Early detection warning systems including weather sensors and tide gages;
- Incorporation of future climate projections into engineering design standards; and
- Financing resiliency efforts through mechanisms such as disaster bonds used for Hurricane Sandy system recovery.

One of the barriers that the MTA has experienced while attempting to secure funding and implement these projects was the misconception by potential funders and other stakeholders that adaptation measures would detract from capital allocated for state-of-good-repair projects, system safety initiatives, and improvements to on-time-performance. While

“When you look at the MTA’s network today, it’s easy to forget that we’re still recovering from Superstorm Sandy. Despite the fact that we’ve fought our way back—working non-stop, day and night—to serve all 5,000 square miles of our network, we still have years just to get back to where we were the day before Sandy struck. And all this work comes on top of another monumental job we’re tackling head-on: fortifying our network to prepare for big storms in the future. Because the fact is, extreme weather events are occurring more frequently, and will continue to occur more frequently.”

*—Thomas F. Prendergast, Chairman and CEO,
Metropolitan Transportation Authority*

a large portion of the secured funding went directly to repair costs to restore service immediately after Hurricane Sandy, the remaining funds were used for adaptation measures which prevent future damages and therefore reduce future disaster recovery costs.

This on-going effort addresses not only coastal climate implications, but also a lack of natural barriers, density of population and built environment, and aging infrastructure of the transportation system. It is ultimately an example of an adaptation strategy which bridges various levels of governance, and engages a wide pool of partners to fund, research, and carry out large scale climate adaptation efforts with multiple, wide-reaching benefits.

Resilient Landscapes for Sustainable Farming and Livelihoods

Building upon ten years of experience in sustainable coffee agriculture, **Nespresso** is amplifying its actions by investing in agroforestry, a climate adaptation solution for producers.

A Coffee Industry Threatened by Diseases, Landslides, and Water Scarcity

Nestlé Nespresso sources coffee beans from regions across the world, many of which are already beginning to experience some of the adverse impacts of climate change. Extreme weather conditions which can lead to increased incidence of disease, landslides and water scarcity are threatening the availability of coffee beans. A 2015 study suggests that due to increasing temperatures driven by climate change, Latin American countries, where the company sources a large share of its coffee, would lose between 15 and 30 per cent of the current area suitable for Arabica coffee bean cultivation by 2050.⁶³

Since 2003, Nespresso, in partnership with the Rainforest Alliance, has been committed to securing both farmers' livelihoods as well as its own supply of sustainable coffee, via the implementation of the company's own coffee sourcing model, the Nespresso AAA Sustainable Quality™ Program. Today, over 80 per cent of the company's coffee supply is sourced from the AAA Program, with more

than 50 per cent of the producers located in Colombia and Guatemala. A dedicated agronomists' network has been promoting sustainable farming practices to mitigate negative environmental impacts, while increasing farm productivity and coffee quality. In 2014, conscious of climate change impacts on landscapes (e.g., landslides, water excess or deficit), the company decided to strengthen its actions to build resilient coffee ecosystems by investing in agroforestry as part of its AAA Program. The case presented here focuses on pilot activities carried out in the Cauca region of Colombia and the Huehuetenango region of Guatemala. Nespresso plans to roll out this approach in all relevant sourcing regions.

Active Stakeholder Engagement to Implement Agroforestry Projects

Nespresso has commissioned Pur Projet to operate the projects in Guatemala and Colombia together with local farmers organizations (ADESC and FNC), as part of its AAA Program.

Nestlé Nespresso is an autonomous globally managed business of the Nestlé Group. With corporate headquarters in Lausanne, Switzerland, Nespresso is present in 62 countries and counts over 10,500 employees worldwide.

Pur Projet is a company that specializes in the development of community ecosystem management projects. Field assessments carried out at the early stage of the process highlighted the key challenges to be addressed in both regions. In Huehuetenango, Guatemala, primary concerns are landslides, coffee rust and drought threats; in Cauca, Colombia key challenges are regeneration of the watershed and degraded pastures.

To address these threats, Nespresso follows this systematic step-wise process:

- Geographical focus areas are selected based on high risk for the company due to community and key local climate change challenges.
- Adaptation needs are assessed and confirmed with AAA Program local stakeholders via the field assessment through which farmers' organizations, local trade partners and public authorities are interviewed to confirm key challenges, discuss the relevance of tree planting for the community and leverage local expertise.
- Project design includes the planning of programme activities and defining the planting models and sources and species of native trees to be planted.
- Recruitment of a dedicated technical team and knowledge transfer on agronomical practices, monitoring and evaluation, sustainable forestry planning and management and timber and fruit supply chains.
- Stakeholder engagement via socialization meetings to present the project and benefits to local farmers. This translates into "farmer recruitment" for the plantation wave and is followed up by farmer training sessions on agroforestry management.
- Organization and implementation of the plantation waves — during this process the plantlets are prepared by local nurseries.

- Monitoring and evaluation (M&E) of the implementation and viability of the plantation waves through assessments of geo-localization of parcels, distribution registration and individual tree survival rate. An incentive is paid on the survival rate basis. The M&E was conducted by the Yale School of Forestry & Environmental Studies in Colombia and by AgroParisTech, from the Paris Institute of Technology, in Guatemala.

Far-Reaching Community and Corporate Benefits

According to the company, agroforestry has proven to be an efficient investment to increase the resilience of its coffee supply chain while positively impacting natural capital and creating additional economic value from each hectare of coffee farmland. The positive impacts on land, biodiversity and water include: erosion prevention and fertility enhancement of soils, increasing the presence of pollinators and biological control, and limitation of water evaporation and the regulation of fresh water availability.

Partners and stakeholder engagement

Pur Projet is in charge of the coordination of the programmes featured in these pages, further roles and responsibilities are shared as follows between the stakeholders:

- Field assessment: Programme operator (Pur Projet).
- Design, training and monitoring: Programme operator (Pur Projet) together with the technical representatives of the local farmers' organizations (FNC, ADESC).
- Plantlets production: Local private nurseries.
- Support for coordination: Nespresso local contacts (AAA Country Managers).
- Support for implementation: Trade partners (Federacion Nacional de los Cafeteros in Colombia, Export café in Guatemala).
- Implementation by farmers groups: AAA farmers in La sierra and las Rosas municipios (Colombia) and AAA farmers from Huehuetenango.
- Long-term monitoring: Local and international universities.

“We are well aware of the climate changes that are already occurring and impacting coffee farmers. Adapting our supply chain and helping farmers increase their resilience are becoming a priority to secure the quality of our products.”

*–Jean-Marc Duvoisin,
CEO, Nestlé Nespresso*

The main economic benefit for the producer is the diversification of income that results from planting fruit trees on land typically reserved only for coffee farming. Timber trees are also expected to create savings for producers at retirement age. More generally, the employment of local technicians and the institutionalization of this knowledge for participating communities are additional, valuable socio-economic programme benefits. The extensive partnerships developed through the AAA Program have also provided Nespresso with a unique network of local champions to sustain and expand the approach in future years. Additionally, this adaptation solution also offers the company an opportunity to reduce its operational carbon footprint while strengthening its supply chain.

Identifying and Addressing Key Challenges to Expand Impact

In 2014, the programme benefitted around 350 AAA producers in Colombia and Guatemala. After one year, programme success is measured via the survival rate of trees,

which, at 80 per cent, is currently very high. Around 1,200 additional farmers are targeted for 2015 as the project expands in Guatemala, Colombia and Ethiopia. A key challenge to this approach includes the necessity of establishing a labor-intensive monitoring process as this requires specific local competence. This is part of the reason that the capacity building of the technical lead, as well as the local farmers, is a critical part of the success of this approach.

Moving forward, it remains a challenge to identify new stakeholders to join the programme, including governmental bodies, and to leverage the effort and the investment at the landscape level. Nespresso plans to explore co-financing models for agroforestry as their experience has proved that this is critical to creating a successful business case and to support replication and scalability.

Advancing Drip Irrigation Practices in Rice Production in India

Netafim has introduced a new rice cultivation strategy to decrease water use, increase savings for farmers and secure its own business operations in a sensitive sector in a drought-prone region.

Addressing Water Scarcity in Farming-Dependent Communities

In the past years and decades, the Indian state of Tamil Nadu has experienced extreme weather events exacerbated by climate change, such as erratic monsoons, prolonged periods of drought, typhoons and flooding. Particularly, decreasing rainfall has led to an overreliance on irrigation for agricultural purposes and an increasing extraction of groundwater reserves for human and industrial consumption. Climate change impacts on water resources, linked with unsustainable consumption patterns, pose serious challenges for the agricultural sector.

In Tamil Nadu, 56 per cent of cropland area is owned by smallholder farmers, who constitute 90 per cent of the agricultural workforce and over 40 per cent of the population is dependent on the agricultural sector. Therefore, climate change impacts on agricultural production and yields can negatively affect food security and exacerbate poverty throughout the state. Adaptation measures that increase the resilience of farmers and protect the dwindling natural resources es-

sential to the region's food production and livelihood generation are needed to support sustainable rural development. Companies that develop solutions that help local farmers grow rice more efficiently not only support climate adaptation efforts, but also create new business opportunities for themselves, as their success is directly tied to that of the farmers'.

Introducing Innovative Technologies to Improve Standard Cultivation Practices

Netafim has developed a comprehensive rice cultivation method that utilizes drip irrigation, eliminating the need to flood cropland for irrigation purposes, therefore reducing water use and improving yields on existing farms. This approach includes direct sowing of rice in the soil, eliminating the need for preparing and manually planting seedlings in a flooded field. It also includes adapting specific varieties, weed control and fertilizers. Several crops can be used for seasonal rotation, providing the farmer with a source of

Netafim, established in 1965 in Israel, offers a range of micro-irrigation, greenhouse and field automation solutions and has over 4,000 employees worldwide, more than 1,000 of them in its division in India.



income all year round. As part of the project, a dedicated agronomist provides frequent technical training and recommendations to individual farmers as per the field condition and crop observations. A technician offers support for monitoring and guiding irrigation and Nutrigation™ (Netafim and Haifa Chemicals' drip irrigation nutrient system) processes. Following the initial trials, a few commercial fields have been installed since 2013. Some components for the new technology, such as solar pumps and special filters, are in development stages.

Discussions about conducting trials for drip irrigation for rice production began in Tamil Nadu in 2009, with trials beginning in 2010. The trials were conducted at three different locations: Tamil Nadu Rice Research Institute in Aduthurai, Tamil Nadu Agricultural University in Coimbatore and the Soil and Water Management Research Centre in Tanjore. Over the next two and a half years, a series of studies were carried out examining different aspects of drip rice production, such as screening appropriate rice varieties, identifying optimal dripline spacing and studying greenhouse gas emissions. Thereafter, the first demonstration was started on

a farmer's 1.2 hectare plot in October 2013, in a village in Tiruppur district. At the same time, in collaboration with the Water Technology Centre at Tamil Nadu Agricultural University in Coimbatore, Netafim organized the three-day "International Research Conference on Drip Fertigation in Rice." Thereafter, six additional demonstrations were conducted across Tamil Nadu, covering an area of 12 hectares. As part of the trials, farmers were trained in all technical aspects of growing rice using drip irrigation such as dripline selection, varietal selection, herbicide and nematicide application, field preparation, water and fertilizer use.

Partners and stakeholder engagement

Netafim worked closely with the Tamil Nadu Agricultural University (TNAU), one of the organizations implementing the Tamil Nadu Irrigated Agriculture Modernization and Water-Bodies Restoration and Management (IAMWARM) Project. The project was monitored and supported by the World Bank, and Netafim plans to approach NGOs to address issues around watershed management and agriculture.

A Technology-Based Adaptation Practice with Far-Reaching Co-Benefits

Thus far, the drip irrigation and Nutrigration projects have shown water savings of 40 to 50 per cent during the crop growth duration, as compared to flood irrigation, according to Netafim. Increase in yields through this approach range from 30 to 50 per cent. There has also been a savings of 25 per cent in fertilizer use due to the implementation of the Nutrigration process.

As the next step, demonstration plots spanning 75-100 hectares in three villages have been planned, where the total beneficiaries would include 150-200 farmers. The project has been technically supported by the Tamil Nadu Agricultural University under its research initiatives, which includes monitoring through regular biometric observations. Additional financial support is expected from the government.

The income of participating farmers has substantially increased due to rotation with other cash crops in the region. Moreover, the field trials indicate that there can be an approximately 36 per cent reduction in CO₂ equivalent emissions with drip irrigated rice as compared to transplanted rice during the crop growth duration. According to the company, other benefits include improved food security for the region, reduction in water waste and improvement in the economic security of

participating farmers. There is also potential to replicate the implementation of the Nutrigration system in other countries where smallholder farmers may face similar challenges.

A Need to Raise Awareness about New, More Resilient Cultivation Methods and Practices

Netafim found that one of the primary challenges of implementing its Nutrigration system was raising awareness and understanding among farmers about the benefits of changing current farming practices and of planting rice crop varieties that may have been less familiar, yet less vulnerable to climate change. Support from public authorities to provide incentives for smallholder farmers could significantly help in promoting the use of sustainable agricultural practices and technologies, including drip irrigation systems for rice plantations. Going forward, Netafim plans to continue organizing seminars, field visits and other knowledge sharing dissemination platforms with select drip farmers, extension farmers, decision makers and other stakeholders to raise awareness about the potential benefits of increasing resilience for smallholder farmers through improved, more sustainable cultivation methods.

“Business can provide smart irrigation solutions that allow smallholder farmers, particularly in developing countries, to grow more with less. This will help them to adapt to climate change and improve their livelihoods.”

—Ran Maidan, President & CEO, Netafim

Supporting Ghanaian Farmers with the World's First Climate-Smart Cocoa

Olam International and the Rainforest Alliance developed a project breaking the link between cocoa production and deforestation while increasing resilience of farming landscapes

Stressed Cocoa Production in Ghana

Climate change predictions for cocoa growing regions in Ghana indicate that cocoa trees are susceptible to changes in the seasonal distribution and total volume of rainfall, which could ultimately lead to an increase in pests, diseases and forest fires. To offset the shortfall in yield and quality, cocoa producers may be compelled to expand the range of production, amplify deforestation, or shift to other forms of agriculture altogether.

Through a standard risk assessment, agrifood company Olam International found that climate change threatened not only their operations, but also the communities upon which they relied. As climate change advances, the company discovered that their suppliers ability to dependably produce cocoa would be reduced, which would concurrently exacerbate deforestation. Realizing that the company's typical producer support programme was unable to address climate change and other resource risks, Olam sought

a partnership with the Rainforest Alliance, focusing on breaking the link between cocoa production and deforestation and increasing resilience of farming landscapes.

Best Practices to Build Supply Chain Reliability and Implement Sustainable Land Use Management Techniques

Olam and the Rainforest Alliance developed a project centered on sustainable cocoa growing practices that conserves biodiversity, increases productivity, provides greater long-term stability to all value chain participants and increases the income of smallholder farmers. Set in Ghana's Juabeso-Bia region, Olam made commitments to source climate-smart cocoa, connecting to the company's supply network and consumer base and engaging thousands of farmers. Olam also agreed to pay premium prices for the certified cocoa and, more importantly, offered predictable market access, building reliability in the supply chain to

Olam International is a leading agri-business operating in 65 countries, supplying food and industrial raw materials to over 13,800 customers worldwide. Its team of 23,000 employees has built a leadership position in many businesses including cocoa, coffee, cashew, rice and cotton.

help support climate finance. The project also focused on laying the foundations for REDD+ projects, which could ultimately create an additional source of finance through the sale of carbon credits.

The project revolved around five key activities:

1. Promoting best practices in climate-smart cocoa management through the training of approximately 2,000 farmers from 34 communities in sustainable cocoa production following the Sustainable Agriculture Network (SAN) standards. These trainings help farmers understand how to build more resilient farming systems and be better prepared to adapt to the impacts of climate change.
2. Mapping deforestation and land use trends. The Rainforest Alliance provided technological inputs (e.g., GPS, remote sensing, tablets), technical training and capacity building inputs for community members to contribute to mapping and monitoring deforestation and land use trends for the region.
3. Facilitating the development of alternative livelihood activities. The project provided training on best practices in beekeeping and grass cutter rearing, as well as financing to support start-up costs associated with these activities.
4. Developing a forest carbon project (REDD+). The project restored forest areas through the provision of native tree seedlings and protected and restored forests in the target communities. The project provided education to farmers and students on climate change and REDD+.

The project also developed a Project Design Document (PDD) in line with the Climate & Community Carbon Standard, which demonstrates the net positive GHG benefits of the project.

5. Increasing payment for cocoa by creating market linkages. Olam invested in branding and marketing to generate interest in SAN-certified and climate-smart cocoa, and supported financially the project by paying higher premium for cocoa.

Climate-Smart Practices Secure Olam's Operations and Fortify Local Farming Systems

According to the company, Olam's project had several key outcomes that directly benefited the company and its operations in Juabeso-Bia. Namely, the project resulted in mitigation of operational risks and reduced vulnerability to climate change within the cocoa supply chain in Ghana, as evidenced by an uptake of climate-smart practices (SAN Certification). So far, more than 6,000 hectares of land achieved SAN certification (SAN certification reduces deforestation and promotes tree planting and conservation of existing forest cover and other natural habitats). An estimated 80 per cent of residents in 34 communities have greater awareness on REDD+ issues, processes and forest carbon standards as a result of this project.

Partners and stakeholder engagement

Pursuing private-sector collaboration to ensure a market-driven approach was a top priority for the project. In addition to donor support from the United States Agency for International Development, the Norwegian Agency for Development Cooperation, and Ashden Trust, Olam International provided funds to Rainforest Alliance for technical assistance aimed at achieving SAN certification for cocoa as the basis of a REDD+ project.

The project also led to an expansion into climate-smart commodities markets and recognition as leader in sustainability, providing Olam with reputational gains as they became the first company to bring climate-smart cocoa to the market. Furthermore, this pilot project was also used as a learning exercise for experiences and lessons that can be applied to efforts to improve the company's programmes globally.

The benefits of the programme extend beyond Olam itself. The communities in which the company operates the programme now have an improved ability to understand and adapt to climate change and develop more resilient farming systems. In addition, increased prices for cocoa and development of alternative livelihood activities helps create economic resilience in the face of climate change. Finally, the project lays the foundations for community engagement in REDD through increased forest restoration, on-farm carbon storage and technical development of a Project Design Document (PDD).

Barriers to Implementing Market-Supported Climate Resilience Projects

While this project was not commercially viable and relied heavily on donors, it was an important foray into market-based climate resilience projects. However, project participants found customer demand for climate smart cocoa to be low and were not able to secure the premium necessary to cover the costs of the programme, which is currently a barrier to scaling up. The project also highlighted the lack of internal organizational capacity on the part of the communities that had to be addressed for the project to be successful. Challenges associated with transforming long-standing behaviors and beliefs were a key obstacle in implementing the project on the ground.

Overall, the landscape approach in Juabeso-Bia established a business case for private-sector investment to generate significant co-benefits. Interventions implemented by the Rainforest Alliance and Olam have assisted in increasing farm productivity and in adapting production systems to be more sustainable and to leverage REDD+ opportunities going forward.

Weather Index Insurance to Enhance Resilience of Agriculture in Developing Countries

Japanese insurance company **Sompo Japan Nipponkoa Group** developed a new product to help provide smallholder farmers in Thailand with insurance policies to reduce their climate risks.

Pivoting the Insurance Industry to Capitalize on the Opportunities Arising from Climate Change

The property and casualty (P&C) insurance industry is highly affected by the increase of extreme weather and natural disasters exacerbated by climate change. For instance, more frequent or severe natural disasters would increase the number of insurance payments made to affected clients, which would subsequently lead to insurance providers raising their premiums. In the long-term, this could stress the insurance system as clients may not necessarily be able to cope with the unstable situation.

On the other hand, climate change also offers the insurance industry the opportunity to capitalize upon potential benefits by developing adjusted products and services which support stakeholders anticipating for and adapting to climate change. Sompo Japan Nipponkoa Group has identified, in the context of its internal risk management, the provision of services that best help stakeholders adapt to the impacts of climate change. Business strate-

gies are also informed by the company's climate change adaptation strategy, which helps highlight the opportunities that emerge for the insurance industry from climate change.

A New Weather Index Insurance Programme to Reduce Climate Risks and Improve Living Standards of Farmers

In countries with agricultural sectors that are highly sensitive and exposed to the impacts of climate change, farmers have shown a growing interest in financial services that help them reduce economic losses caused by extreme weather events. These financial instruments are not yet widely available in developing countries. One of the financial products developed by Sompo Japan Nipponkoa Group to help small-holder rice farmers strengthen their climate resilience is "Weather Index Insurance", which aims to cover revenue losses from crop damage caused by climate events such as drought. This type of financial instrument and insurance product is

Sompo Japan Nipponkoa Holdings, Inc. employs approximately 50,000 people worldwide, operating in 210 cities across 32 countries. With headquarters in Tokyo, Japan, Sompo Japan Nipponkoa Holdings operates in four businesses: domestic P&C insurance, domestic life insurance, overseas insurance, and financial and other services. Their primary insurance arm, Sompo Japan Nipponkoa Insurance, the focus of this case study, has over 27,000 employees and more than 64,000 sales agencies.

specifically designed to provide compensation or insurance payments when weather indices (like temperature or rainfall) reach certain predetermined levels.⁶⁴

The motivation to develop the Weather Index Insurance programme was Sompo Japan Nipponkoa Group's participation in Japan Bank for International Cooperation's (JBIC) 2007 "Study on Market-Based Adaptation - Weather Index Insurance". The study concluded that Weather Index Insurance is among the most effective and economically beneficial adaptation strategies for the insurance industry. This is because it is simple for customers to understand the insurance product, as it relies on an index regarding meteorological data, and is easy for the insurance company to payout insurance without complex surveys. Sompo Japan Nipponkoa Group decided to start offering Weather Index Insurance as part of a pilot project in the northeastern part of Thailand, a region selected because of its high vulnerability to drought, large low-income population and availability of weather data for which to develop the insurance product. In this region, farmers take bank loans to make the needed investments in farming equipment and seeds, and usually pay them off with income generated by the next harvest. Weather Index Insurance provides a significant safety net to farmers, as Sompo Japan Nipponkoa Group covers 10 per cent of the insured loan principal depending on the timing and severity of the drought.

The company has been operating its Weather Index Insurance programme since 2010. In its first year, the insurance was provided to 1,158 rice farmers in Northeastern Thailand. By 2014, about 10,000 farmers had bought this financial service.

A More Resilient and Informed Community

Weather Index Insurance not only helps secure the livelihood of low-income farmers vulnerable to climate change, it also provides valuable learning opportunities for the communities in which it is implemented. Sompo Japan Nipponkoa Group found that low-income populations often have limited finance and insurance literacy. As the company has been introducing its services, and providing access to micro-insurance for large swaths of

the population, it has also been increasing low-income communities' knowledge about insurance and accounting, therefore contributing to their financial empowerment.

Building upon Lessons Learned and Developing New Approaches to Help Scale-up the Weather Index Insurance Programme

Through the first five years of the programme, Sompo Japan Nipponkoa Group found availability of adequate meteorological stations and infrastructure to collect weather data to be a key barrier in developing Weather Index Insurance products. As a result, in 2015, in Myanmar and several other countries where the company plans to introduce this product, the company began to work with the Remote Sensing Technology Center of Japan (RESTEC) to use satellite data to improve the quality and availability of weather information in order to accelerate product development.

The company also acknowledged that collaboration with the public sector was needed in order to successfully sell a financial product like Weather Index Insurance in low-income areas vulnerable to climate change. For Sompo Japan Nipponkoa Group, working with Thailand's Bank for Agriculture and Agricultural Cooperatives (BAAC), a state-owned bank widely trusted by Thai farmers, provides important collaboration and continuous dialog, which leads to new channels and develops strong partnerships. Additionally, Sompo Japan Nipponkoa Group will work with local authorities, financial institutions and agricultural organizations to increase low-income farmers' awareness about the benefits of insurance and improve their understanding of policies and products.

Sompo Japan Nipponkoa Group will continue working to make their programme commercially sustainable in the long run. Although current premiums have been calculated with a focus on continuous provision of coverage, they haven't been designed to recover the initial cost of developing the product. Nevertheless, the fact that current subscribers account for a small amount of loan borrowers in northeast Thailand leaves room for growth.

After its implementation in Thailand, Sompo Japan Nipponkoa Group began to implement the Weather Index Insurance pro-



Partners and Stakeholder Engagement

Sompo Japan Nipponkoa Group had several key partners for this project. Thailand's Bank for Agriculture and Agricultural Cooperatives (BAAC), a state-owned bank with a well-regarded reputation in the local farmer community, sold the product in a bundle with loans they distributed.

The Thai Meteorological Department and Japan's National Institute for Agro-Environmental Sciences (NIAES) helped provide access to weather data and helped Sompo Japan Nipponkoa Group understand the impact of climate change on the agricultural sector. The Remote Sensing Technology Center of Japan (RESTEC) is now providing satellite data to further help inform the Weather Index Insurance product.

gramme in other countries in Southeast Asia. In December 2014, the Group announced the successful development of Weather Index Insurance for rice and sesame farmers in the central arid region of Myanmar. Going forward, they will continue working with local governments, insurance companies and other partners in other countries throughout Southeast Asia to expand this service. In 2014, Sompo Japan Nipponkoa Group launched "Typhoon Guard Insurance", a type of Weather Index Insurance, for agricultural producers in the Philippines. The company aims to provide Weather Index Insurance to 30,000 farmers in Southeast Asia by 2025.

"Our objective is to contribute to make the society sustainable by providing solutions to social strata vulnerable to risk while attaining sustainable growth for our Group."

—Kengo Sakurada, President and Group CEO,
Sompo Japan Nipponkoa Holdings

Circular Water Economy – Beyond Adaptation, A Way to Secure and Renew Water Resources

SUEZ's wastewater reuse project ensured continued community benefits in the face of unprecedented drought conditions in Southern California

Southern California Drought Driving Wastewater Reuse Initiatives

The greater Los Angeles in Southern California, United States, is highly vulnerable to the effects of climate change, particularly with respect to long-term, recurring drought. Over the course of the last two decades, the region's major water supplies have dwindled. The Colorado River has been reduced to a trickle in places and the Sierra Nevada snowpack has become increasingly unreliable. Decreasing water availability combined with rapid population growth has led to increasing concern over water scarcity throughout the region.

To address these risks, SUEZ collaborated with the West Basin Municipal Water District (WBMWD), a public agency which provides drinking and recycled water to a 185-square mile service area in southwest Los Angeles County. Together, they launched their first

major treated wastewater reuse project in 1995, which, according to the company, still serves as a state-of-the art example of climate adaptation and specifically water recycling in drought prone regions. Since then, as drought conditions have intensified and climate change has come to the forefront as a preeminent concern for Southern California water managers, the benefits of SUEZ's water reuse have become progressively more significant.

SUEZ S.A. employs 80,990 people worldwide, 50,880 of whom work directly in the water business. SUEZ focuses on water treatment and waste management. With headquarters in Paris, France, SUEZ develops or manages water production facilities, desalination plants and waste water treatment plants in countries across the globe.

Achieving Ambitious Water Reliability Objectives

In undertaking the West Basin water reuse project, SUEZ hoped to address two of the major water-related issues in the region: the problem of water scarcity and the dependency on imported drinking water. Specifically, they sought to:

- Provide a safe and reliable water supply for WBMWD;
- Reconstitute groundwater levels and avoid salt water intrusion; and
- Reduce the amount of effluents released in the natural environment.

Ultimately, SUEZ aims to increase the use of recycled water over 2002 levels by at least one million acre-feet per year by 2020, and by at least two million by 2030. The WBMWD's Water Reliability 2020 programme also aims to reduce reliance on imported water in the coastal area around Los Angeles to 33 per cent by 2020 from an initial 80 per cent.

To achieve these goals, SUEZ engaged with the West Basin Municipal Water District. Their flagship initiative is centered at the Edward C. Little Water Recycling Facility in Carson, California, 13 miles south of downtown Los Angeles. Although WBMWD owns the facility, SUEZ has been tasked with maintaining and operating the facility. Among many of the services SUEZ provides to the WBMWD as part of their contractual agreement, one of the most significant is asset management. This process involves inventorying all assets, identifying the life of the assets based on established industry estimates and assisting WBMWD with preparing a capital budget based on estimates. In essence, the process sets up a system to make continuous improvements to the water reuse project to ensure its continued development and effectiveness over time.

Reducing Water Imports and Engaging the Community

To date, the project has preserved more than 140 billion gallons of potable water, successfully easing demand on a scarce water supply and preventing approximately 50 tons of solid waste from being discharged into the Santa Monica Bay every day. The water reuse project led to a reduction of the amount of imported water, dropping the portion from 80 per cent to 60 per cent from 1990 to 2015.

Partners and Stakeholder Engagement

SUEZ worked closely with the West Basin Municipal Water District to carry out this project. SUEZ operates the Edward C. Little Water Recycling Facility, providing maintenance services through the employment of 55 full-time employees at the site; the West Basin Municipal Water District owns the facility, and prepares the capital budget for operations and delivers the reused water to the end-use customers.

The West Basin project is the only water recycling facility in the world able to produce five different qualities of water for a variety of uses: irrigation water, cooling tower water, low-pressure boiler feed water, high-pressure boiler feed water and ground water replenishment water. This capability augments the number of uses for the treated wastewater and increases the number of customers who can utilize the end product.

The project serves 300 recycled water customers. SUEZ and WBMWD also promote water conservation and reuse in the Los Angeles region through outreach and education programs. Whether through curricula directed towards 3rd-12th grade students, the annual "Water Harvest Festival" held at the Edward C. Little facility or support of other Southern California water conservation initiatives, this project seeks to improve water use practices in the community at large.

Identifying and Addressing Challenges

Several unforeseen problems have arisen during the course of this project. For instance, water conservation efforts in the Los Angeles area, when combined with process changes at an upstream wastewater treatment plant, resulted in elevated ammonia concentrations in the influent water at the Edward C. Little Water Recycling facility. This led to a higher demand for maintenance of the water recycling equipment. In response, SUEZ modified the systems by working with various stakeholders and suppliers to increase the water production and quality and decrease maintenance costs of the facility.

Public acceptance is another barrier which SUEZ has had to overcome while implementing this project. Whether the water being reused will come in direct human contact (e.g. drinking or bathing water) or will be used for agro-industry, SUEZ has found public percep-



“The days of the unrestrained consumption of resources are over. It is my belief that we are at the dawn of a revolution which will have to be industrial and ecological, local and global, individual and collaborative. I call it the Resource Revolution. Responsible corporate adaptation will contribute to it”.

—Jean-Louis Chaussade, CEO, SUEZ

tion to be a major obstacle when developing water reuse initiatives. Several actions that may be taken to foster public acceptance include: increased communication of the benefits of water reuse; publication of the relevant scientific work on the feasibility of effective water reuse programmes; certification for laboratories doing analytical work; and use of uniform terminology and definitions associated with water reclamation and reuse.

An Iterative Process for a Successful Water Conservation Programme

The West Basin facility has completed four expansions to date, each of which raises the capacity of their water reuse system. The most recent, completed in mid-2013, allows the WBMWD to use 100 per cent recycled water in at their West Coast Basin Seawater Barrier. A feasibility study has also been conducted, with the goal of expanding the Carson Regional Wa-

ter Recycling Facility using the same approach and lessons learned from the West Basin project. The project also recently completed the installation of a 60,000 square foot solar power generating system at the Edward C. Little Water Recycling Facility. The installed solar panels account for up to 10 per cent of the facility's power demands, leading to a reduction of 356 tons of carbon dioxide (CO₂e) annually.

Although the outset of this project had very broad and ambitious goals to improve the overall water reliability of Southern California, the initiative started small and has continued to evolve over the years. What was initially a single water reuse facility has expanded to include several satellite locations and a demonstration desalination facility. SUEZ's system of monitoring and evaluating progress and conducting continuous research and development has allowed the West Basin project to evolve into a viable, large-scale water reuse programme in a highly drought prone and water scarce region.

Protecting Natural Resources and Building Local Resilience to Natural Disasters

Tokio Marine Group is raising awareness about climate change risk and investing in stronger communities through biodiversity preservation.

Simple but Effective: Mangrove Planting as a Risk-Reduction Strategy

The insurance industry is greatly impacted by extreme weather events and disasters exacerbated by climate change, as they affect the variability of insurance claim payments. In Japan, for instance, increased coastal hazards, including typhoons, heavy rains, storm surges and other natural disasters could lead to a sharp rise in reinsurance and insurance premiums. Other countries in the region, many of them with less developed infrastructure and capacity to better cope with the risks of climate change, will be affected as well. To anticipate climate change impacts, Tokio Marine Group companies are developing products and services that enable communities to mitigate risk and adapt to climate change, reduce natural disaster

damage, preserve biodiversity and contribute to the development of local economies. In a total of nine Asian countries, the company is promoting one adaptation activity recognized by the Intergovernmental Panel on Climate Change (IPCC) as being particularly cost-effective for many communities: mangrove planting.⁶⁵ Restoration of mangrove forests contribute to increase climate resilience as they help absorb the impact of coastal storms, among other benefits.

Tokio Marine Group is an insurance group that consists of Tokio Marine Holdings as a holding company and group companies located worldwide. Founded in 1879, Tokio Marine engages in a wide range of businesses including life and non-life insurance along with financial and non-financial businesses.

A Project to Build Resilience and Promote Environmental Stewardship

In 2009, Tokio Marine initiated the Green Gift Project, which includes a mangrove planting programme, with the aim of:

- Protecting ecosystems and people from natural disasters;
- Mitigating greenhouse gas emissions by absorbing and stabilizing carbon dioxide in mangroves planted;
- Preserving biological diversity through planting mangroves; and
- Expanding economic growth and employment in local communities.

The Green Gift Project is based on the concept of undertaking eco activities. Under this project, when a customer chooses Web-based insurance contracts (clauses) on the company's website rather than a paper-based contract in brochure form, Tokio Marine donates funds (corresponding to a portion of the value of paper resources conserved) to non-profit organizations to support mangrove planting in the region, including in India, Bangladesh and Vietnam. Aside from mangrove planting, the project has expanded its scope to promote local environmental protection activities in Japan since 2013. In fiscal 2014, the number of customers taking advantage of the web policy option was approximately 9.7 million, representing a reduction in paper usage of approximately 2,520 tons.

Realizing the Economic and Environmental Co-Benefits of Mangrove Planting Activities

In addition to the environmental and cost benefits associated with paper reduction, Tokio Marine's support of mangrove planting improved their brand recognition in all nine of the countries where the mangrove planting activities are taking place.

The Green Gift Project also has several key direct and indirect community benefits, which include:

- Increase in community resilience for at least 500,000 people against tsunamis, storm surges and other natural disasters due to strengthened mangrove forests that stabilize the shoreline and control erosion.
- Approximately 110,000 tons of carbon dioxide were stored in mangroves planted by Tokio Marine-supported NGOs in 2014.
- Producers, traders and consumers who rely on the nearby and offshore commercial and artisanal fisheries depend upon the health of mangrove breeding and nursery habitats. Mangrove rehabilitation improved economic security for the 1.25 million people dependent on mangrove fisheries as a primary source of income and/or employment and for the 250,000 people employed in mangrove fisheries-related primary production activities.
- Water quality regulation through prevention of saltwater intrusion, wastewater processing and sedimentation trapping.

“By joining forces with civil society, local governments, academia, policymakers and other insurance agents, we aim to continue our mangrove planting project for 100 years to strengthen climate resilience and help protect our planet and its inhabitants.”

*—Tsuyoshi Nagano, President and CEO,
Tokio Marine & Nichido Fire Insurance Co., Ltd.*

- Additionally, within the communities where the mangrove planting and rehabilitation took place, mangrove ecosystems are relied on as a domestic energy source (firewood), building material, source of natural medicines and dyes, livestock fodder and even as a source for food.

In total, the 8,405 hectares of mangroves planted by Tokio Marine's initiative generated ecosystem services worth USD \$338.8 million over the period 1999-2013, according to the company.

Expanding Public Awareness of Green Gift Project Initiatives

Through the implementation of the Green Gift Project, Tokio Marine gained an understanding of the need for policymakers to enable and incentivize biological diversity preservation and disaster risk reduction through local community development activities. The Green Gift Project also highlighted the need to raise public awareness on the importance of coastal wetland and mangrove protection for disaster risk reduction.

In order to assist existing and prospective Tokio Marine customers in gaining a better understanding of the goals and benefits of the project, the company publically reports on the mangrove planting activities, and provides updates on the growth of planted saplings and the total volume of CO₂ absorbed through planting.⁶⁶ Tokio Marine also conducts mangrove planting tours and other environmental awareness raising activities in the local communities where the planting takes place.

Partners and stakeholder engagement

In addition to the policyholders who support the Green Gift Project through selecting paperless policies, the mangrove planting activities involve the following partners:

- Mangrove planting NGOs
 - » Action for Mangrove Reforestation (ACTMANG)
 - » Organization for Industrial, Spiritual and Cultural Advancement-International (OISCA)
 - » International Society for Mangrove Ecosystems (ISME)
- Local governments and communities in the mangrove planting sites.

Nowcasting System for Harbor Operations in Brazil

In partnership with state Government of Espírito Santo, Brazilian-based mining company **Vale** implemented a short-term forecasting programme to monitor and issue weather warnings to prepare its port facility for extreme weather.

Extreme Weather Events Threatening Brazilian Port Operations

Port facilities located in coastal zones, such as the Vale operated Tubarão port in the state of Espírito Santo, Brazil, are particularly vulnerable to extreme weather events and natural hazards exacerbated by climate change. Vale, the largest mining company in South America, has experienced some of these hazards in recent years at the Tubarão port, which covers 18 square kilometers, services about 77 vessels a month and handles iron ore and pellets, coal, grain, fertilizers and bulk liquids. These extreme weather and climate-related events include intense storms and strong winds, such as those that, in 2010, caused two ship unloaders to give way, resulting in a shutdown of Tubarão port operations.

To increase the security of its port operations, Vale invested more than USD \$18.6 million in the Capixaba Hydrometeorological Monitoring Center (CCMH) in partnership with the Government of Espírito Santo, as part of the state government's Adaptation

Program. Data from the CCMH is used for forecasting and nowcasting (forecasts for the next 30 minutes to 3 hours), which consolidates climate information and helps issue meteorological warnings, enabling Vale to closely monitor weather conditions. Information produced from the CCMH is used not only by Vale for all its operations in the state, but also by the local government to prepare for extreme weather events.

Vale is a Brazilian-based metals and mining company, and also operates in the logistics and energy sectors. With 206,000 employees worldwide, Vale ranks as one of the largest mining companies in the world, particularly in the production of iron ore, pellets and nickel.

Developing a State-of-the-Art Weather Forecast and Alert System

As part of its global corporate risk management policy, Vale annually evaluates climate and weather-related risks and opportunities, including financial and regulatory ones, based on their estimated likelihood to occur and their actual or expected impact on the company's operations. As a result of these assessments, the company decided to invest in the CCMH in order to create and disseminate more accurate climate and weather information and forecasts, and thus improve the company's capacity to take preventative actions in the event of extreme weather conditions at the Tubarão complex.

The CCMH, which employs 15 people, includes a climate monitoring system with multiple capabilities including:

- Long-range radar (out to 240km);
- 25 automatic weather stations installed throughout the state that measure temperature, pressure, rainfall, wind speed and direction, integrated into a system of satellites for uninterrupted operation; and
- Mathematical processing of climate variables performed by a supercluster computer, one of the most powerful in the Southern Hemisphere.

Monitoring Storms and Taking Preventative Action

Weather data from the CCMH is operated by the Operational Control Center (CCO), which is the control unit in charge of forecasting and nowcasting. The CCO monitors and consolidates forecast results and issues meteorological warnings that are crucial to Vale's Tubarão complex and to the state government to prepare for extreme weather events. Monitoring takes place 24 hours a day, 365 days a year, and the information provided shows forecasts in intervals as short as 3 hours for 5 days in advance. This enables warnings 30 minutes to three hours in advance of extreme events across the entire state.

The project has enhanced Vale's ability to monitor risks arising from climate change, and specifically to better forecast and understand tropical cyclones, strong storms, and

strong winds. According to the company, this has improved the ability of Vale's Tubarão complex to appropriately discharge, handle and load or unload material, or to have vessels berth or unberth and move to the safest location, improving reliability of operations.

Citizen Protection

The CCMH is one of the initiatives within the Climate Change Adaptation Program of the state of Espírito Santo, which was launched in 2013. Vale helped to improve the overall capabilities of the Operational Control Center (CCO), which allows the state government's Civil Defense department to mitigate high impact weather events in all 78 cities across the state. This department found that in 2013 alone, 26 people were killed by natural disasters, while 60,000 were dislodged, and total reconstruction costs exceeded R\$650 million [USD \$289 million].^{67,68} Additionally, droughts caused nearly R\$1.5 billion [USD\$667 million] in agriculture losses and threatened the water supply of Vitória, the state capital.^{69,70}

Partners and Stakeholder Engagement

Vale's primary partner in this project was the state government of Espírito Santo, through the state's Environmental, Agricultural, and Civil Defense departments. Vale also engaged and sponsored a series of studies to understand risks posed by climate change to both the mining industry and the local region of Southeast Brazil. Organizations Vale partnered with for this research included: the LABHIDRO, from the Institute of Astronomy, Geophysics and Atmospheric Sciences (IAG);

The International Council on Mining and Metals (ICMM) for a report on industry climate adaptation approaches; and the Brazilian Business Council for Sustainable Development for a study on adaptation and vulnerability in the Brazilian electric sector. Vale also actively participated in meetings with government and business organizations to develop a Brazilian National Adaptation Plan.



With the CCMH and CCO in place, the government is not only able to issue warnings before an extreme weather event occurs, but they are also able to better understand the long-term local impacts of climate change and can take appropriate action to plan for their consequences.

Public Private Partnerships as a Means of Reducing Extreme Weather Risk

One of the main barriers Vale faced in the development of their adaptation strategy was a limited amount of data necessary to compose a comprehensive cost-benefit analysis of adaptation actions. Vale also found a need for more streamlined and qualitative information on the likely climate change impacts their regions of operation will be facing. While all public private partnerships have to be tailored

to specific local realities, Vale believes that this is a replicable project for various regions around the world and in other sectors, including mining, transportation, aviation, paper, chemical and heavy industry.

Overall, this is an example of a successfully developed and implemented climate adaptation action through a public private partnership. Vale operated in direct cooperation with the state government, and together developed a weather forecasting programme that directly benefits both parties. By considering a range of partners and encouraging dialogue among relevant stakeholders, the company effectively mitigated risk from short-term extreme weather events made more intense by climate change for their port operations.

Improving the Climate Resilience of South African Fruit and Vegetable Farmers

Woolworths is helping South African fruit and vegetable producers, suppliers and retailers understand local climate risk and implement environmentally sound, climate-smart agricultural practices.

Drought Conditions Threatening South African Agricultural Production

Climate change, particularly drought conditions (decreases in precipitation and increases in temperature), poses a significant threat to South African fruit and vegetable production. The projected increase in the occurrence of hot growing days and severity and frequency of extreme weather events will have negative impacts on agricultural production. Woolworths, a retail group with a significant stake in the agriculture sector, has a large, and increasing, percentage of its profits derived from fresh fruit and vegetable sales. In the short term, extreme weather events can cause significant damage to fresh produce through pest outbreaks or weather-related damage. As an example of potential financial implications of these risks, in 2014 Woolworths lost an estimated USD \$2 million in sales due to extreme weather affecting some of their fresh fruit suppliers.

Over the longer term, climatic shifts related to temperature and precipitation will mean that some farming operations will become less productive, or possibly have to

be moved out of South Africa entirely. This will, in turn, affect Woolworths' ability to provide consistent, high-quality and affordable produce to customers.

Understanding Vulnerabilities and Sharing Best Adaptation Practices in the Farming Industry

Woolworths is collaborating with WWF-South Africa, Marks & Spencer and the British High Commission to better understand, proactively respond to, and communicate the climate change risks and adaptation opportunities in the South African fruit and vegetable sector.

The on-going project, which falls under Woolworths' larger agriculture sustainability programme, is set in the South African regions of the Western Cape and Limpopo and has four components:

1. Understanding Climate Science in a Local Context. Prior to this project, Woolworths, Marks & Spencer and their growers struggled to find locally relevant, scientifically-grounded climate predictions for the South African fruit and vegetable sector. To address this challenge, WWF-

Woolworths Holdings Limited is a South Africa-based retail group offering clothing, food, homeware, and financial services under its private label brand.

With over 41,000 employees globally, the Cape Town headquartered corporation emphasizes sustainability practices through its "Good Business Journey", focusing on eight key objectives: ethical trade, transformation, social development, energy, water, waste, sustainable farming and health, and wellness.

South Africa has been conducting in-depth interviews with the climate experts and key stakeholders in the climate change and agriculture space in South Africa. These interviews will culminate in a summary report that collates the latest climate change science projections for key South African fruit and vegetable commodities.

2. Practical Climate Adaptation for Farmers.

Woolworths is currently collecting data for case studies of farmers' climate adaptation practices that are both financially sound and practical to implement. These case studies will inform Woolworths and Marks & Spencer's approach to encouraging climate-smart agricultural practices in their fruit and vegetable supply chain. Woolworths will use the case study results to help inform their "Farming for the Future" programme, a partnership-based approach which engages all fresh produce suppliers on environmentally sound farming practices. The best practices generated from the case studies are critical for composing recommendations to farmers moving forward.

3. Government Dialogue. Given the critical role of the public sector in climate change adaptation, the project also engages South Africa's Department of Science and Technology (DST) and the Department of Agriculture, Forestry and Fisheries (DAFF). The DST will use the results from the case studies and interviews as input to inform an economic model to simulate farm level adaptation opportunities at a national scale. This project was discussed in depth at a roundtable on agriculture adaptation opportunities with key government officials in preparation for the UN climate change conference taking place in November and December in Paris (COP21). WWF-South Africa will organize a roundtable and create a

policy brief summarizing key conclusions.

4. Further Commercial Outreach. Woolworths will share the localized climate scenarios and best practices with other South African suppliers, exporters and retailers in a pre-competitive conversation about climate change adaptation strategies in the agricultural sector, again facilitated by WWF-South Africa and working through existing retail sector bodies.

A More Resilient Agricultural Value Chain for South Africa

Woolworths expects this project to improve their understanding of climate predictions and climate risks in their fresh produce supply chain, and to increase their ability to help producers adapt to climate change through appropriate climate-smart agricultural practices. The findings from this project will allow the Farming for the Future programme to better assist farmers in improving economic and environmental viability in the face of increasing climate variability.

In the short run, the project will harness the experience of South African and UK retailers in strengthening the capacity of both retailers and food producers throughout the country to adapt to climate change. Over time, Woolworths aims to help make the entire South African agricultural value chain more resilient, effectively increasing the resilience of their company to future climate risks.

The community at large, namely producers, will benefit from the practical recommendations that come out of the case studies to improve their resiliency to climate-related shocks. A more stable and resilient farming system will have positive impacts for the 640,000 farm workers and their communities that rely on a strong agriculture sector.

Partners and stakeholder engagement

Woolworths has collaborated with WWF-South Africa, Marks & Spencer and the British High Commission to carry out their adaptation project. In the process, they have also worked with South Africa's Department of Science and Technology and the University of Cape Town and Stanford University. The British High Commission provided co-funding for the project. WWF-South Africa will lead the data collection and synthesis process, and Woolworths and Marks & Spencer will implement recommendations with their suppliers. The Department of Science and Technology will provide economic modeling expertise to translate climate scenarios into policy-relevant findings.



Woolworths also hopes that by sharing best practices with other retailers, suppliers and exporters, the project will ensure that climate adaptation best practices are disseminated beyond partner organizations' borders.

Replicating a Successful Project throughout the Sector and throughout the Region

To better understand climate change adaptation opportunities for their suppliers, adequate internal capacities within companies are needed. Through its collaboration with the British High Commission, the teams at Woolworths and Marks & Spencer were able to build the needed expertise and resources to start implementing rigorous climate-related studies and assessments, document risks and opportunities for their supply chains and establish collaborations with appropriate partners.

This project has the potential to be scaled up through replication in other parts of the country due to close collaboration with the South African government. From the outset, one of the goals of the project was to provide climate information and agricultural best practices that were relevant to all fresh produce growers in South Africa. Due to the similarity in climate in a number of nearby countries, there is potential to utilize these recommendations throughout the region.

“Climate change is likely to increase water stress. We have a responsibility to work with our suppliers and other partners to drive water efficiency and good waste water management across our value chain.”

—Grant O'Brien, CEO, Woolworths Limited

This project design may also be of interest to other organizations that have limited climate projections regarding risks to their specific crops and location. The impetus for this project was to provide all stakeholders with better localized climate scenarios and adaptation best practices, as this information was not readily available in the South African fresh produce sector. By collaborating across the private, government and non-profit sectors, this project is able to utilize the strengths of each partner involved.

Tackling Food Security, Water Scarcity and Climate Change

Norwegian company, **Yara**, has developed new tools to address global water scarcity from the ground up.

Improving Agricultural Water Use and Contributing to Climate Smart Agriculture

Agriculture currently accounts for about 70 per cent of global freshwater use and increasingly competes with industrial and household water demands. Many regions of the world already face severe water scarcity, and climate change is expected to further accelerate it.

Meeting a growing global population's increasing demand for food will require an increase of agricultural productivity, which would further tax agricultural water requirements. Among the ways to make the food supply sustainable, an increase in agricultural productivity has to go hand in hand with improvements in agricultural water use efficiency. According to a report by the 2030 Water Resource Group, water withdrawals for agriculture were about 3,100 billion m³ in 2009.⁷¹ Without any increase in water use efficiency, withdrawals for agriculture are estimated to reach 4,500 billion m³ by 2030. The existing sustainable global supply of water is calculated to be about 4,200 billion m³. This means that by 2030, in a business-as-usual scenario, agriculture alone, without taking

into account the growing water demand for industry and households, would require more fresh water than what is available.

This is the context leading Yara to prepare a strategy to adapt to the impacts of climate change on water availability that can contribute to a Climate Smart Agriculture (CSA) approach for the countries in which they operate, such as Tanzania with the Green Growth Corridor and the Climate Compatible Agriculture initiative. CSA is an approach originally developed by the Food and Agriculture Organization that advances the technical, policy and investment conditions needed to achieve sustainable agricultural development for food security in the face of climate change.⁷²

Attentive Monitoring of Water Use to Improve Efficiency

As a first step to develop its adaptation strategy, Yara started assessing the water footprint of its own operations. It also launched research projects to understand the impact of balanced crop nutrition on crop water use. The objective was to develop innovative

Yara International ASA employs approximately 12,000 people and is headquartered in Oslo, Norway. Yara is the world's largest producer of ammonia, nitrates and NPKs, providing the foundation of Yara's fertilizer and industrial agricultural solutions.

solutions for fertilizer and water management under conditions of water scarcity. The company's water scarcity adaptation strategy focuses on water stewardship efforts by improving water use in fertilizer and agricultural production, as well as by advising growers on best practices for water management in irrigation and fertigation (a process in which nutrients are mixed into the irrigation water).

To improve efficiency in fertilizer production, Yara monitors and reports on water use during production of its own fertilizer products. The company calculates water footprints for the production of fertilizers and for selected agricultural crops in order to detect hotspots of water use or water pollution and identify opportunities for improvements.

Yara's strategy for increasing sustainability of agricultural crop production has led them to develop tools and services to support growers employing best fertilizer management, which in turn improves crop water use efficiency. These tools and services include:

- Publications with crop-specific nutrition information;
- Crop sensors to adjust nutrient and water applications to crop needs;
- Software for nutrient planning including on-farm organic nutrients and fertigation management; and
- Lab-services to detect nutrient deficiencies in soil and plant material.

Yara supports efficient irrigation technologies (such as drip irrigation), and has launched intensive research to develop recommendations of how to best combine water and nutrient management in fertigation systems. Fertigation systems provide the most precise and targeted application of nutrients, delivering both the highest water and nutrient use efficiency in crop production.

Local Involvement to Better Address Water Scarcity Concerns

Yara has identified business opportunities in developing tools and services to support growers in switching to agricultural management practices that conserve water and enable continued productivity in water-stressed areas. These management practices support farmers from all sizes, including smallholders, by increasing nutrient use efficiency and yield, while reducing negative impacts on the environment. It enables farmers to produce more food per unit of land, while safeguarding their soils, all of which provide valuable benefits to the growers' larger communities.

As a member of the Alliance on Climate Smart Agriculture, Yara contributes to the creation of an enabling environment for adaptation, mitigation and enhanced resilience by working with a network of key stakeholders from the public and private sectors.

Partners and stakeholder engagement

In addition to working with the food industry to disseminate knowledge about sustainable agricultural practices and running Crop Clinics to advise growers on increasing yields through nutrient management and water efficiency, Yara also participates in the following partnerships:

- **Water Footprint Network:** Yara has contributed to the "grey-water" accounting methodology (the calculation of nutrient losses from agricultural fields to bodies of water) to improve water footprinting methodologies.
- **WIRE (Water and Irrigated agriculture Resilient Europe):** This networking platform supports development and use of innovative tools that promote more sustainable water management and increased return on agricultural investments.
- **Baltic Sea engagement:** The EU flagship project Baltic Deal aims to reduce nutrient discharge to the Baltic Sea through a network of demonstration farms.
- **CEO Water Mandate:** This unique public-private initiative launched by the UNGC is designed to assist companies in the development, implementation, and disclosure of water sustainability policies and practices.



“We are committed to exploring new knowledge and innovations to improve water and nutrient use in agriculture and support farmers in their climate adaptation and mitigation efforts.”

—Svein Tore Holsether, President and CEO, Yara

Advancing Climate Smart Agriculture

Yara supports growers' transition to CSA practices, which enable the production of more crops on the same land with less environmental impact. Yara has outlined the following key lessons learned:

- It is important to get the support of local stakeholders in order to reach a large number of growers, in particular smallholder farmers, to facilitate knowledge transfer. This can be done through extension services where agronomic knowledge on crop nutrition and best agricultural practices are shared. Farmers' entrepreneurship skills (farm management and marketing) are invaluable as well.
- Crop nutrition solutions and adaptation strategies to water scarcity must take into account local specificities of the crop, soil

and climatic conditions. To achieve impact on a larger scale, agricultural services and technologies are required that allow for replicability, which at the same time can be tailored to local needs and challenges.

- To adapt to water scarcity exacerbated by climate change, Yara recommends that policymakers develop incentives and policies that support more efficient irrigation technology in combination with improved extension services.

These lessons learned are also applicable to advancing climate adaptation in general. Yara notes that a holistic assessment of climate risks and opportunities is necessary prior to developing solutions to one climate risk in particular, such as water scarcity, in order to optimize co-benefits and incentivize investment in climate solutions.

Chapter 4: Accelerating Responsible Corporate Adaptation – Recommendations for Business Leaders and Policymakers

The projects featured in this report show that the private sector's understanding of climate risks has improved in recent years, and that a number of companies are finding ways to adapt responsibly to climate change. Yet many other companies are still learning to tackle the complex challenges arising from a changing climate and developing strategies to identify adaptation opportunities that benefit both their business and communities. The lessons learned from these case studies point us towards the most important, and most challenging, components of a successful adaptation process.

For business leaders, identifying climate risks and opportunities requires commitment and resources, but it is a necessary step to lay robust foundations for the success of their companies. Responsible corporate adaptation, one that also strengthens community resilience, varies dramatically from one company to another and is most successful when it is integrated into a company's business strategy and builds on sector expertise and corporate culture. Collaboration is crucial — every practice featured in this report benefitted from partners who brought their unique knowledge and networks to bear. Partnerships also helped companies disseminate the benefits and lessons learned from responsible corporate adaptation to a wider set of stakeholders, thus generating knowledge contributing to building economic and community resilience.

For policymakers, understanding the greatest barriers and challenges companies encounter — and the business opportunities that may arise — can help unlock and leverage private sector knowledge and resources in support of public adaptation efforts. Policymakers can play a key role in ensuring companies align their corporate interests with socially-beneficial goals, e.g., by addressing water scarcity or vulnerability to extreme weather events, and encouraging innovation as presented in this report. They can engage businesses transparently in the design and implementation of adaptation

FIGURE 6: RECOMMENDATIONS FOR BUSINESS LEADERS



plans and adopt coherent regulations and incentives that allow for long-term planning and promote corporate climate action.

The following recommendations are informed by the 17 case studies and build on Caring for Climate's previous reports by outlining key activities that both companies and policymakers can implement to advance responsible corporate adaptation and build community resilience.

Recommendations for Business Leaders

Identify Critical Climate Risks and Uncover Opportunities

Understanding what aspects of a company's value chain are most at risk and where opportunities for new markets might lie is the first step to building a comprehensive corporate adaptation strategy and prioritizing

near-term actions. Companies can conduct comprehensive risk assessments for their global operations to identify vulnerabilities and relative risk from climate change impacts. By first understanding how climate change will impact their own value chain, forward-thinking companies can assess how best to coordinate their own responses with the communities in which they operate.

Recommended activities:

- Research how climate change will impact your assets, supply chain, employees, customers and the communities where you operate. Useful resources include government and academic publications, community vulnerability assessments and local NGOs, as well as tools like those developed by Caring for Climate partners (see box 6).
- For potential risk hotspots or where infrastructure and long-lived assets are involved, utilize climate data to understand probabilities of an event occurring. Monetize risk and expected losses to help quantify the return on investment (ROI) of possible adaptation responses.
- Apply traditional risk management techniques such as scenario planning (business war games) and Monte-Carlo analysis to deal with uncertainty and enable risk mitigation and strategy development.

BOX 7: Conducting a Climate Risk Assessment – Tools of the Trade

Tools are available to support companies' efforts to understand how climate change may impact them. Publicly-available tools developed by Caring for Climate partners include:

Tool Name	Description	Link
CEO Water Mandate – The Water Stewardship Toolbox	The Water Stewardship Toolbox is a collection of guidance documents, discussion papers, online tools, and other resources that can help a company build its water stewardship practice. It is designed around the Water Stewardship Progression, which illustrates the activities water stewards conduct ideally.	ceowatermandate.org/toolbox/discover-next-steps
ND-GAIN – ND GAIN Country Index	The ND-GAIN Country Index summarizes a country's vulnerability to climate change and other global challenges in combination with its readiness to improve resilience.	index.gain.org
SDG Compass	The SDG Compass provides guidance for companies on how they can align their strategies as well as measure and manage their contribution to the realization of the SDGs.	sdgcompass.org
WRI – Aqueduct Global Flood Analyzer	The Aqueduct Global Flood Analyzer is a web-based interactive platform that measures river flood impacts by urban damage, affected GDP, and affected population at the country, state, and river basin scale across the globe.	www.wri.org/resources/maps/aqueduct-global-flood-analyzer
WRI – Aqueduct Water Risk Atlas	Aqueduct's global water risk mapping tool helps companies, investors, governments and other users understand where and how water risks and opportunities are emerging worldwide.	www.wri.org/our-work/project/aqueduct

Determine your Company's Climate Adaptation Strategy

Adaptation to climate change impacts can take many forms and “success” may be hard to define or to measure. In order to effectively increase climate resilience, companies need to define relevant adaptation goals, integrate them into existing risk management processes and sustainability priorities and align them with core business strategies. Like any other successful business goal, adaptation goals should help define near-term actions while enabling ongoing monitoring and assessment to ensure that long-term goals are achieved.

Recommended Activities:

- Identify existing strategic frameworks that can help integrate climate adaptation goals into your company's core business planning and management processes. Consider partnerships with governments, other corporations and NGOs that align with your overall adaptation goals and will help coordinate internal adaptation work with other external community resilience efforts.
- Raise awareness with key stakeholder groups and build support for action internally and externally. Organize trainings and educational outreach activities that clearly communicate your company's risk assessment results, adaptation goals, the associated benefits and the resources needed to achieve them.
- Develop strategies and options to minimize risk of potential business disruption and adaptation actions for residual risk (risk that cannot be avoided) that reflects your company's risk tolerance. Invest in adaptive efforts to address critical vulnerabilities of your company and that of the communities upon which it depends.
- Use the SDG Compass (see Box 7) as a guide to align your climate and business strategies with community goals using common indicators and a shared set of priorities.⁷³

BOX 8: Climate Adaptation and the Specific Challenges of SMEs

The companies that submitted the case studies featured in this report are large corporations with extensive human and financial resources dedicated to sustainability, risk management and climate resilience. However, the majority of the population in the developing world relies on micro and small businesses for their livelihoods - nearly 60 per cent of employment in developing countries relies on small businesses. Hence ensuring SMEs become more resilient to future climate impacts is critical to community and economic resilience.

SMEs do not necessarily have these kinds of resources or the same incentives as large companies do to plan for the long term, and identifying the right response to climate change and implementing adaptive strategies can be more challenging. SMEs are also more vulnerable – business interruption due to a single extreme weather event can put them out of business, and they are less likely than larger companies to have basic business continuity measures in place.

While understanding climate risk and vulnerabilities can be less complex for small businesses with fewer locations and a smaller value chain, government action is critical in raising awareness of climate vulnerabilities among local businesses. Public authorities can strengthen SME climate preparedness and enhance collective resilience by providing information easily accessible and digestible, and guidance tailored to the needs and resources of SMEs.

Larger corporations can also play a critical role in enhancing the resilience of small businesses within their value chain, e.g., by investing in their small suppliers and supporting small agricultural operations, as shown in some case studies in this report. These case studies detail how actions by larger enterprises strengthen their value chain, benefiting communities through increased economic and environmental security.

Develop Strategic Partnerships Focused on Shared Value Creation

With comprehensive risk assessments and goals and strategies in place, companies can engage in strategic partnerships to build resilience. Case studies presented in this report show corporate adaptation efforts are most successful when companies engage in partnerships to understand community and sector-specific vulnerabilities, and rely on local stakeholders for guidance and implementation.

The potential benefits of public-private partnerships to advance responsible adaptation range from enabling new financing opportunities to raising awareness about risks from climate change and identifying business opportunities that build resilience and increase local economic security. Partnerships enable the construction of knowledge networks and dialogues, as well as support and access to guidance, training and tools to help advance adaptation implementation efforts.⁷⁴ Given the urgency of common risks and the lack of sufficient public funding to mitigate these risks, partnerships are essential to create space for innovation and opportunities for progress.

Recommended Activities:

- Partner with research institutions to identify data and information gaps and support efforts that will enable you to advance your adaptation goals.
- Establish a process to avoid maladaptive or duplicative risk reduction efforts by working with local partners to understand and coordinate with public adaptation activities.
- Identify critical stakeholders and create forums for discussions to share corporate adaptation goals and understand community needs and concerns. Engage in public-private partnerships focused on developing solutions for shared challenges that must be addressed together with the communities in which you operate.

Report on Progress and Increase Transparency

Reporting to stakeholders in a transparent and public manner is fundamental for companies committed to sustainability. Similarly, measurement, management and disclosure of climate change risk intelligence is an increasingly important aspect of standard business practice. Investors are increasingly looking for information from businesses on the materiality of sustainability and climate change risk, and are starting to incorporate environmental, social and governance (ESG) factors into valuation processes. Also, consumers, local communities and civil society organizations are demanding more transparency by business regarding how they are addressing risks arising from climate change.⁷⁵ Lastly, knowledge sharing is instrumental to social progress and the identification of best practices.

Recommended Activities:

- Provide regular and accessible information for local stakeholders on company efforts and engage with community or industry associations to raise awareness about climate risk, share best practices and develop strategies to engage policymakers on key issues.
- Report publicly and regularly on your company's approach to identifying climate risks and opportunities, integrating climate considerations into your strategies and operations and supporting community resilience. Reporting frameworks from the UN Global Compact, CDP, the Global Reporting Initiative and the International Integrated Reporting Council provide guidance and benchmarks on how to communicate your climate risk management processes.
- Drawing on these more detailed reports, report material, relevant and useful climate adaptation risks and opportunities alongside other business risks in your mainstream annual reports to shareholders and/or regulators. Rely on best practice frameworks for climate risk disclosures (e.g., those produced by the Climate Disclosure Standards Board or the International Integrated Reporting Council) to help ensure that stakeholders have access to consistent reports about risk and opportunity from comparable companies. The reported data should be assured by a third party using a recognized assurance standard.

Recommendations for Policymakers

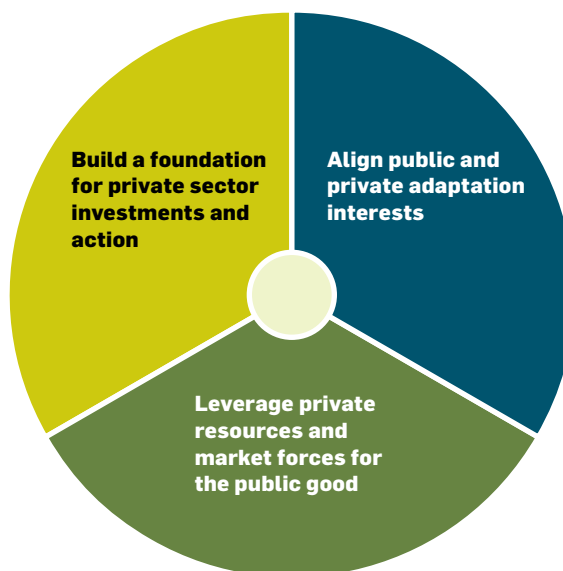
Build a Foundation for Private Sector Investments and Action

Creating an enabling environment is fundamental to private sector adaptation.^{76,77,78} Governments that understand and communicate the business case for corporate adaptation and can identify clear roles and responsibilities for the private sector in national adaptation planning and implementation will be able to better leverage private sector resources. Key to making this case is the ability to provide businesses with the information and tools they need to make investments that support climate resilience in vulnerable communities. Local officials can highlight risks to public infrastructure that local business operations depend on to incentivize cross-sector collaboration to develop solutions. Policymakers should keep in mind variances in decision-making processes for businesses (e.g., much shorter planning time horizons) and work to identify common, near-term risks from climate impacts as well as concrete actions to mitigate those risks.

Recommended Activities:

- Generate and provide local risk and climate change impact information, including cost-benefit analysis, in a format and at a scale that relevant stakeholders, including companies, can use to inform their adaptation analysis and actions.
- Develop common language and reference concepts:⁷⁹ using a shared terminology helps identify opportunities for partnerships and common interests between different stakeholders. Include concepts that adequately reflect how companies are approaching adaptation (e.g., many companies will not distinguish between adaptation activities and initiatives to improve energy efficiency or address resource scarcity).
- Mainstream climate change considerations into planning processes and regulations, e.g., building and infrastructure standards to increase resilience.
- Communicate about resilience efforts and adaptation plans to help inform and attract investors.

FIGURE 7: RECOMMENDATIONS FOR POLICYMAKERS



Align Public and Private Adaptation Interests

Governments should encourage the replication of leading practices to build climate resilience by disseminating successful examples of responsible corporate adaptation activities in their communities. Specifically, local officials should assess community vulnerabilities and needs and outline roles that local businesses could play in addressing these issues while advancing their own corporate adaptation strategies. This type of locally focused gap analysis should discourage maladaptive efforts and prevent private companies from contributing to increased vulnerability through precautionary measures that secure scarce resources for themselves.⁸⁰

Recommended Activities:

- Identify and address policies, codes and regulations that create barriers or inhibit private sector action to build resilience.
- Ensure agencies leading the public adaptation planning process are equipped with the necessary resources to actively engage business stakeholders and leverage private sector expertise.
- Involve private sector stakeholders in the development of adaptation strategies and plans to address pressing climate change adaptation priorities, such as water security, agriculture and disaster risk reduction.
- Develop policy and regulatory frameworks to guide responsible corporate adaptation practices, and work with local business associations to promote systematic information sharing.

Leverage Private Resources and Market Forces for the Public Good

Governments that can demonstrate long-term policy and finance commitments to adaptation through legislation, support for adaptation planning processes and the creation of appropriate institutions will send clear market signals that help to reduce uncertainty and to incentivize both investment and engagement by the private sector. The 2011 Caring for Climate report on adaptation stated that, “the quality of the overall investment environment will also affect adaptation”.⁸¹ Governments can draw upon private sector organizations already engaged with adaptation to create new channels for private sector participation, thus encouraging responsible corporate engagement in climate policy at the national level.^{82,83}

Recommended Activities:

- Develop incentives and opportunities for private sector stakeholders to “match” public funds for mutually beneficial adaptation initiatives.
- Develop strategies for leveraging and mobilizing private sector expertise and resources in building climate resilience and develop sector-specific solutions.
- Stimulate the market for adaptation through financial and risk reduction incentives and address market failures in building climate resilience.⁸⁴
- Consider providing financial incentives and opportunities to stimulate the uptake of climate-resilient technologies and services, such as subsidies for sustainable agricultural equipment, resilient design competitions,⁸⁵ micro-insurance for smallholder farmers, co-financing for research and development of new products and services or preferential tariffs for sustainably-sourced products.

Annex 1: What Companies Reported in 2015 on Climate Risks and Opportunities

CDP conducts annual surveys of Global 500 companies to evaluate their climate- and environmental-related business practices. The questions related to risks and opportunities provide insight into how companies around the world are addressing and thinking about shifts in climate and extreme weather.

Risks

In 2015, a total of 1,016 physical risks were reported to CDP by 406 Global 500 companies, with changes in temperature and precipitation extremes, tropical cyclones and droughts accounting for almost half of all reported risks.

One area of business-related climate risk that is increasingly prominent among companies is the effect of extreme weather events on corporate supply chains. For example, the 2011 floods in Thailand had an estimated USD 46.5 billion worldwide impact, 71 percent of which was borne by the electronics and automotive sectors.⁸⁶ CDP's 2015 data shows that almost 20 percent of all physical risks reported by Global 500 companies are indirect risks threatening their supply chains.

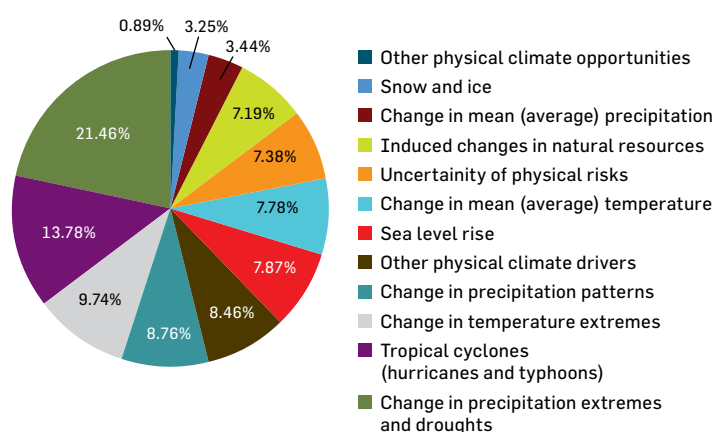
Forty percent of companies that report to CDP recognize the immediate or short-term impacts of climate change (0-3 years), while a third of companies don't expect these risks to materialize before 6 years or more (Figure 8).

Another risk which companies must increasingly consider is regulation. Some countries have explicit regulation which requires companies to disclose information about climate risk, while many other countries require that companies report risk that is material and relevant to their business operations.

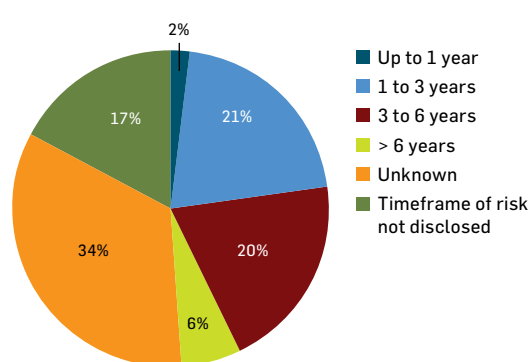
Opportunities

In 2015, 285 Global 500 companies disclosed business opportunities related to climate-driven physical changes through CDP. Half of the respondents anticipated that opportunities would materialize within 3 years. Over 60 percent of the reported opportunities relate either to increased demand for existing products or services, or to the generation of new products or business services.

Companies take a wide diversity of measures in response to climate risk. These actions include research and monitoring, supplier diversification and training, business continuity plans, and product redesign.⁸⁷



Distribution of 1,016 physical risks reported to CDP by Global 500 companies in 2015



Anticipated timeframe of climate-related physical risks reported to investors via CDP by Global 500 companies in 2015

Annex 2: Disaster Risk Management and Safe-Guarding Investments and Operations

Disaster Risk Management (DRM) is defined as the processes for designing, implementing, and evaluating strategies, policies, and measures to improve the understanding of disaster risk, foster disaster risk reduction and transfer, and promote continuous improvement in disaster preparedness, response, and recovery practices, with the explicit purpose of increasing human security, well-being, quality of life, and sustainable development.⁸⁸

Countries and cities in all regions compete to attract foreign direct investment using the same mix of objective advantages, including low labor costs, access to export markets, subsidized infrastructure, and intangible soft values such as quality of life and recreational opportunities. However, as underlined in UNISDR's 2013 Global Assessment Report on Disaster Risk Reduction (GAR13),⁸⁹ the level of disaster risk in those locations is rarely made explicit to investors and is often disregarded in the public investment that creates the necessary infrastructure or in the private investment that follows. Investment decisions rarely take hazard exposure into account, or otherwise they excessively discount disaster risk due to the potential for short-term returns. As a consequence, large volumes of capital continue to flow into hazard-prone areas, leading to significant increases in the value of exposed economic assets. Disasters can directly hinder and limit performance and inhibit competitiveness, making it harder for businesses to recoup their losses and recover in the long run. Additionally, with the globalization of supply and value chains, the loss

of one link in the chain can have widespread ramifications at the global and regional level, with climatic shocks and disasters creating a ripple effect well beyond the initial source.

Working together to reduce disaster risk, a report published by UNISDR and PwC as part of the ARISE initiative highlights the many economic benefits from private sector involvement in disaster risk reduction, and identifies best practices and opportunities for businesses to support DRM.⁹⁰

GAR15 found that the business case for stronger DRM is threefold: it reduces uncertainty and strengthens confidence, it opens the door to cost savings, and it provides an avenue for value creation. However, despite this, the majority of businesses only address disaster risk in accordance with their business continuity planning, without taking the necessary steps to incorporate risk information into their investment decisions or disclosing disaster and risk related costs publically.⁹¹

The Sendai Framework for Disaster Risk Reduction, adopted in March 2015, emphasizes the critical role for private sector and provides concrete guidance: "non-state stakeholders play an important role as enablers in providing support to States. (...) Their commitment, goodwill, knowledge, experience and resources will be required."⁹²

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A report by Caring for Climate with support from partners



United Nations
Global Compact

About the United Nations Global Compact

The United Nations Global Compact is a call to companies everywhere to voluntarily align their operations and strategies with ten universally accepted principles in the areas of human rights, labour, environment and anti-corruption, and to take action in support of UN goals and issues. The UN Global Compact is a leadership platform for the development, implementation and disclosure of responsible corporate policies and practices. Launched in 2000, it is the largest corporate sustainability initiative in the world, with over 8,000 companies and 4,000 non-business signatories based in 160 countries. www.unglobalcompact.org



About the United Nations Environment Programme

The United Nations Environment Programme (UNEP) is the voice for the environment in the United Nations system. It is an advocate, educator, catalyst and facilitator, promoting the wise use of the planet's natural assets for sustainable development. The mission of UNEP is to provide leadership and encourage partnership in caring for the environment by inspiring, informing and enabling nations and peoples to improve their quality of life without compromising that of future generations. The Division of Technology, Economics (DTIE) is the division within UNEP responsible for working with business and industry. With its longstanding activities in the areas of green economy, climate change, resource efficiency, harmful substances and hazardous waste, finance and corporate responsibility, it provides solutions to policy makers and helps change the business environment by offering platforms for dialogue and co-operation, innovative policy options, pilot projects and creative market mechanisms. <http://www.unep.org/>



About the United Nations Framework Convention on Climate Change

About the UNFCCC With 196 Parties, the United Nations Framework Convention on Climate Change (UNFCCC) has near universal membership and is the parent treaty of the 1997 Kyoto Protocol. The Kyoto Protocol has been ratified by 192 of the UNFCCC Parties. For the first commitment period of the Kyoto Protocol, 37 States, consisting of highly industrialized countries and countries undergoing the process of transition to a market economy, have legally binding emission limitation and reduction commitments. In Doha in 2012, the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol adopted an amendment to the Kyoto Protocol, which establishes the second commitment period under the Protocol. The ultimate objective of both treaties is to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system. <http://www.unfccc.int>

Caring for Climate



About Caring for Climate

Launched by the UN Secretary-General Ban Ki-moon in 2007, "Caring for Climate" is the UN Global Compact and UN Environment Programme's initiative aimed at advancing the role of business in addressing climate change. It provides a framework for business leaders to advance practical solutions and help shape public policy as well as public attitudes. Chief executive officers who support the statement are prepared to set goals, develop and expand strategies and practices, and to publicly disclose emissions as part of their existing disclosure commitment within the UN Global Compact framework. Caring for Climate is endorsed by nearly 450 companies from over 60 countries. For more information see: www.caringforclimate.org

The Ten Principles of the United Nations Global Compact

HUMAN RIGHTS

- Principle 1 Businesses should support and respect the protection of internationally proclaimed human rights; and
- Principle 2 make sure that they are not complicit in human rights abuses.

LABOUR

- Principle 3 Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining;
- Principle 4 the elimination of all forms of forced and compulsory labour;
- Principle 5 the effective abolition of child labour; and
- Principle 6 the elimination of discrimination in respect of employment and occupation.

ENVIRONMENT

- Principle 7 Businesses should support a precautionary approach to environmental challenges;
- Principle 8 undertake initiatives to promote greater environmental responsibility; and
- Principle 9 encourage the development and diffusion of environmentally friendly technologies.

ANTI-CORRUPTION

- Principle 10 Businesses should work against corruption in all its forms, including extortion and bribery.

