

PR*e*P

Value Chain Climate Resilience

A GUIDE TO MANAGING CLIMATE IMPACTS
IN COMPANIES AND COMMUNITIES



This guide has been developed by companies and organizations engaged in the Partnership for Resilience and Environmental Preparedness (PREP) — a pilot partnership formed to address the risks and opportunities that climate change impacts pose to businesses and the communities on which they depend. One of the primary goals of PREP is to engage and inform good practice in companies as it relates to building climate resilience in partnership with communities. This guidance has been developed on behalf of the following PREP member companies:



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Executive Summary

The climate is changing and impacts on businesses and communities are already being felt. Rising temperatures, changing rainfall patterns, and more severe weather events are being observed. Nine out of ten companies have suffered weather-related impacts in the past three years, and most have seen an intensification of such impacts. Meanwhile, communities on which businesses depend for their supplies, workforce, sales, and more are also being affected. A change in climate will lead to a changing business environment and changing community relationships.

There are many benefits associated with taking a “value chain approach” to climate resilience because climate change affects companies beyond corporate fence lines and national borders, and presents important opportunities for lifecycle thinking and creative collaborations. Within this approach, special focus is given to local communities and the natural environment because of their essential roles within business value chains. Community risks are business risks because communities provide key resources to companies, as well as a “social license to operate.” Though rarely quantified, ecosystems provide natural goods and services of considerable economic value to businesses, such as flood protection and water treatment.

This guide introduces the Business ADAPT (analyze, develop, assess, prioritize, and tackle) tool. The tool follows a step-by-step climate resilience framework inspired by existing good practice risk management models. Many businesses will benefit from using the Business ADAPT tool, including businesses with these characteristics:

- Have long-lived fixed assets
- Use utility and infrastructure networks
- Secure natural resources
- Create extensive supply/distribution networks
- Require finance and investment

Snapshot of the business value chain

Support resources and business environment



Access to finance



Policy environment



Stakeholder expectations

Primary activities beyond business fencelines



Community and ecosystem resilience



Raw materials sourcing



Distribution



Sales

Primary activities within business fencelines



Assets and infrastructure



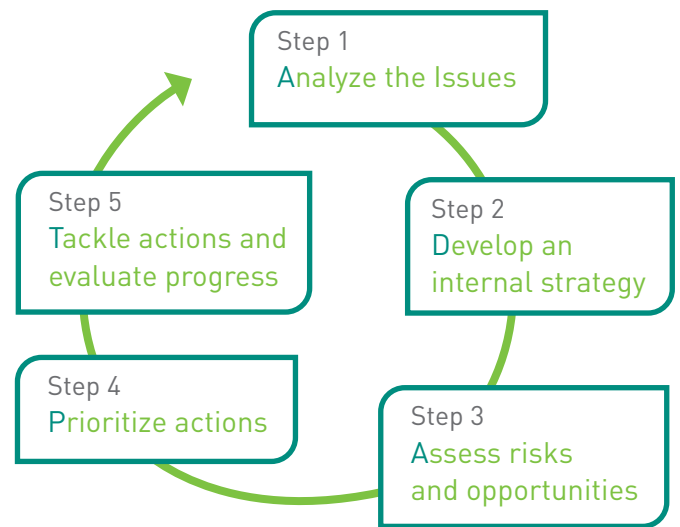
Production

Business ADAPT provides additional questions for three business sectors with significant climate change challenges: Food, Beverage, and Agriculture; Water and Energy Utilities; and General Manufacturing.

Business ADAPT aims to help company executives and senior managers gain a better understanding of climate-related risks throughout their value chains, identify where emerging market opportunities exist, take into account community needs, and develop plans that are integrated throughout the enterprise and receive the support of communities and civil society. Furthermore, the guide will help the financial services and insurance sectors understand how to engage with the companies they invest in or insure to manage risk, maximize returns, and minimize future losses. Importantly, Business ADAPT is a living tool with the potential to evolve and incorporate new knowledge, examples, resources, and methods as they emerge.

Corporate climate resilience is a relatively new field, yet good examples of multinational and medium-sized companies taking action to manage the implications of a changing climate do exist. Readers will find many illustrative examples of climate resilience in action in this report.

Business ADAPT: five-step guide to building climate resilience



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Climate Lexicon

Adaptation*	Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation.
Adaptive capacity	Ability of an organization or a system to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with consequences.
Climate	Average weather over a period of time.
Climate change	Refers to any change in climate over time, whether due to natural variability or as a result of human activity.
Climate risk	Denotes the result of the interaction of physically defined hazards with the properties of the exposed systems [i.e., their sensitivity or social vulnerability]. Risk can also be considered as the combination of an event, its likelihood, and its consequences. ¹
Climate risk management	The implementation of strategies to avoid unacceptable consequences. In the context of climate change, adaptation and mitigation are the two broad categories of action that might be taken to avoid unacceptable consequences. ²
Climate variability	Refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability) or to variations in natural or anthropogenic external forcing (external variability).
Ecosystem services	Ecological processes or functions having monetary or nonmonetary value to individuals or society at large. There are supporting services, such as productivity or biodiversity maintenance; provisioning services, such as food, fiber, or fish; regulating services, such as atmospheric cooling or carbon sequestration; and cultural services, such as tourism. ³
Mitigation	An anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases.
Resilience	The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change. ⁴
Value chain	A connected series of organizations, resources, and knowledge streams involved in the creation and delivery of value to end customers. ⁵
Vulnerability	The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

* All definitions are adapted from the "Glossary of Terms" from the IPCC Third Assessment Report (2001), (<http://www.ipcc.ch/pdf/glossary/tar-ipcc-terms-en.pdf>), unless otherwise noted.

Introduction: The Business Case for Climate Resilience

Corporate Value at Risk

Recent extreme weather hazards have had severe financial consequences across the world.⁶ The 2011 flood in Thailand was the insurance industry's highest ever recorded flood loss event, and over 14,500 companies reliant on Thai suppliers suffered business disruptions worldwide.⁷ Overall, 2011 was a costly year for the insurance industry, with more than \$60 billion worth of weather-related insured losses globally. The same year, Texas suffered a record drought, which cost the agricultural sector at least \$7.6 billion and led to rising cotton prices, cutting earnings for a number of clothing manufacturers.⁸ The 2010 heat wave in Russia, which triggered severe wildfires, shaved off approximately one percent of the country's GDP that year, representing a total loss of around \$15 billion.⁹

“if we're not ready, we're in trouble.”

The rise in record-breaking weather hazards suggests that the world is already experiencing climate change. While climate variability and extreme weather events are driven by multiple causes, observations of increases in some climate extremes, such as warm days and nights globally and intense rainfall regionally, have been linked to climate change.¹⁰ Overall, man-made climate change is likely increasing the probability of weather disasters by as much as 80 percent.¹¹

The climate is changing and impacts on businesses, as well as the communities they work in and depend upon, are already being felt.¹² Rising temperatures, changing rainfall patterns, and more severe weather events are being observed across the world. Nine out of ten companies have suffered weather-re-

lated impacts in the past three years, and most have seen an intensification of such impacts.¹³

A changing climate will lead to a changing business environment. Recognizing the problem, identifying the risks, and responding with adaptation measures can help businesses minimize their risks and build resilience. The time to act is now. In the words of the CEO of Cinergy Corporation, “If we're not ready, we're in trouble.”

Emerging Business Opportunities

Addressing the uncertainties created by a changing climate requires robust risk management strategies. Adaptation need not be laborious or expensive, and there will be “low-hanging fruit,” opportunities to increase resilience through low-risk and low-cost measures. Responding to the effects of a changing climate will also provide opportunities for climate-resilient products and services and new markets. There are already many examples of businesses embracing such opportunities. Financial leaders are developing innovative climate-insurance products for communities at increased risk of weather-related natural disasters (see Swiss Re case study on page 20), engineers are working on more-resilient construction materials and design standards (see EBA Engineering example on page 4), ICT (information, communications, and technology) companies are starting to offer equipment and smart networks to monitor and manage climate-related impacts (see Earth Networks case study on page 4), and new technologies are being developed and deployed to address increased water stress (see Levi Strauss & Co. case study on page 18). Companies that have engaged early on with government on climate change impacts are positively influencing policy and developing new services. The economic possibilities for innovative, forward-looking companies are extensive.

Businesses face increasing pressure from stakeholders to address climate risks.

Studies signal that there will be increasing investment opportunities for climate resilience in the next two decades. In 2007, the UN Framework Convention on Climate Change estimated that \$11 billion and \$14 billion worth of additional investments will be required by 2030 to cope with climate impacts in the agriculture and water supply sectors respectively, with demand for infrastructural investments as high as \$130 billion annually.¹⁴ More recent economic estimates suggest that these sums underestimate the high and growing needs for climate resilience investments.^{15,16}

The role of the private sector in adaptation is a topic of debate at international climate change negotiations and within national governments. The 2009 Copenhagen Accord sets the goal of developed countries mobilizing \$100 billion a year by 2020 to finance mitigation and adaptation investments in developing countries, with the private sector targeted to make a significant contribution. The Green Climate Fund, launched at Conference of the Parties 17 in Durban in late 2011, includes a built-in facility to finance private-sector climate resilience activities.

Stakeholder Drivers for Investing in Climate Resilience

Businesses face increasing pressure from stakeholders to address climate risks. These pressures come from several fronts.

Insurers. Studies by Swiss Re and other reinsurers show that weather-related loss claims are increasing. Worldwide insured losses alone, which averaged \$5.1 billion between 1970 and 1989, have risen in the last two decades to an average of \$27 billion annually.¹⁸ In 2009, the US National Association of Insurance Commissioners asked state regulators to administer an Insurer Climate Risk Disclosure Survey to assess

how climate risk enters into their risk management practices and investment plans. Insurance commissioners in California, New York, and Washington State have made this survey compulsory.¹⁹ In the first voluntary reporting period, over 75 percent of insurers said they anticipate increased natural hazards.²⁰ Insurers report that with continued losses and growing regulatory pressures, the affordability and availability of insurance for businesses are likely to decline in the next few years.

Investors. Investor interest in climate risk management has sharply risen in recent years, as seen in high-profile initiatives calling for improved disclosure (see Calvert Investments example on page 5). The Carbon Disclosure Project (CDP), Investor Network on Climate Risk, and Institutional Investors Group on Climate Change, together with their global counterparts, act on behalf of investors, with trillions of dollars of investments to engage directly with companies on climate risk. Similarly, the number of shareholder resolutions filed with public companies in the US on



Example

EBA Engineering (Canada)

Warming in the Arctic is affecting sea ice, snow cover, ice sheets, lake levels, river flow, permafrost conditions, and local topography. This will translate into risks for new and existing infrastructure and opportunities for natural resource exploitation. EBA developed innovative engineering methodologies and technical solutions to manage climate variability and long-term changes. For example, EBA developed a technique to build frozen-core dams out of permafrost. Part of the engineering challenge consisted of ensuring that the permafrost foundation would remain frozen over the asset lifetime. To achieve robust design standards, EBA refined its ground thermal analysis to incorporate the most recent warming observations, knowledge of climate variability, and long-term warming projections. EBA has also done considerable work to improve the design and construction of winter roads. By optimizing engineering practices, EBA's engineers made it possible to increase truck loads on ice roads, while coping with increased warming and reduced ice cover.¹⁷

climate resilience grew considerably between 2009 and 2011.²¹ More investors are starting to consider climate resilience as part of their strategic asset allocation.²²

Banks. Barclays, Standard Chartered, the European Bank for Reconstruction and Development, the International Financial Corporation (IFC), and other banks have begun mandating that climate risk and resilience be included in the feasibility and environmental and social impact studies they require before making investment decisions (see Barclays example below).²³ Discussions are also underway to bring climate resilience into international good practice standards for banking.²⁴

Regulators. Public companies in the US and Canada must disclose the material risks associated with a changing climate, according to Securities Exchange Commission and Canadian Securities Administrators guidance. The UK government requires statutory undertakers, such as utilities, to report on their plans to address climate risks. Beyond such requirements, company directors could be in breach of their duty to act in the interests of their shareholders if they fail to address the reasonably foreseeable impacts of climate change.

Registered professionals. All professionals, including, for example, accountants, engineers, and lawyers, have a duty of care to their clients and are required to meet codes of professional conduct. Many professional institutions around the world are providing guidance to their members on the impacts of a changing climate. Professionally qualified advisors must act with due diligence in their work and ensure they have the knowledge and expertise to act in the



Example
Barclays (UK)

As a commercial bank, Barclays acknowledges that addressing climate change risks and opportunities is relevant to the assessments of business relationships and transactions. Barclays Environmental Risk Management produced a report investigating the credit risk impacts of climate change for five key sectors known to be vulnerable and identifying risk management actions. Barclays also commissioned a comprehensive overview of the economic impacts of current and future climate variability in Africa.²⁸



Example
Calvert Investments (US)

Calvert Investments is actively involved with groups of investors and asset managers who have recognized the potential risks of a changing climate and are taking action to improve the resilience of investment decisions over the long term.²⁵ In the past three years, Calvert Investments has engaged with some of the companies in its asset portfolio on climate resilience considerations and also purposefully invested in companies providing solutions to climate risks. It led on a number of shareholder resolutions submitted to food and beverage, energy, and retail companies, bringing up the issue of materiality of climate risk issues, in line with SEC guidance.²⁶ While the outcome of these resolutions is not yet known, they could be effective drivers for improved climate risk management by companies that lag behind their peers in this area.²⁷

best interests of their clients and employers on climate risk management.²⁹

National and local governments. National, regional, and municipal strategies and action plans on climate resilience are being developed worldwide. There are great opportunities for companies who work with government organizations to manage their own risks, align their climate resilience plans, and identify opportunities for businesses to develop adaptation solutions for governments. Working with governments provides an important mechanism for businesses to build relationships with communities.

Civil society organizations (CSOs). Appeals by CSOs encouraging companies to strengthen community and environmental adaptive capacity reveal the needs of communities and ecosystems.³⁰ They also include useful information and examples of socially- and environmentally responsible climate resilience practices. Companies will find they will be under increasing pressure from CSOs to take into account the changing climate and how it affects their business and their relationships with communities (see Barrick Gold Corp. example on page 6).

Business customers. Many companies receive questions from investors, regulators, or CSOs on cli-

mate risks and management strategies across their value chain. In turn, they often direct these questions towards their suppliers or distributors. The CDP Supply Chain initiative provides an example of such business-to-business transfer of climate resilience considerations.

A Call for Action

A new business imperative is emerging. Reducing greenhouse gas (GHG) emissions continues to be critical to avoid unmanageable climate change, but businesses must also build their resilience to unavoidable and ongoing climate change by managing climate-related impacts that threaten their value chains, while planning for nascent market opportunities. Most of the changes expected over the next 30 to 40 years are already unavoidable due to past emissions.³¹ This report asks companies to plan for the now unavoidable impacts, in addition to taking action to reduce GHG emissions. By bringing climate change into their risk

A new business imperative is emerging.

calculations, companies can reduce costs, strengthen contingency plans, and capitalize on business opportunities, building resilience in business and communities alike.

“Value Chain Climate Resilience: A Guide to Managing Climate Impacts in Companies and Communities” includes a business primer on good practice climate resilience and the practical guide to action, Business ADAPT, both of which help company executives and senior managers build their knowledge about how to manage business risks and opportunities associated with climate change.



Example

Barrick Gold Corp. (US)

Barrick Gold Corporation’s mine in Pascua-Lama on the Argentina/Chile border has received considerable attention from community groups and government in relation to its potential impacts on local water resources.³² The mine is currently under construction, and production is planned to commence in 2013 with an estimated operational life of more than 25 years.³³ It is located high in the Andes in an area where glaciers providing drinking and irrigation water to downstream communities have been receding for years. Community groups opposed to the mine are concerned that mine exploitation would speed up glacial melting because of black dust deposition, divert considerable water, and pollute water sources. Furthermore, in 2010 the Argentine Parliament passed a law aimed at protecting glaciers, which ordered a national inventory of the country’s glaciers and is said to have the potential to threaten the Pascua-Lama project.³⁴ Barrick Gold has sought dialogue with government and communities on these issues, but strong concerns remain.



Example

Muelles el Bosque (Colombia)

All seaports will be affected by climate change. A survey by Stanford scientists shows that sea-level rise is of great concern to US seaports. After assessing climate vulnerability, Muelles El Bosque (MEB), a Colombian seaport in the bay of Cartagena, found that sea-level rise could cost between three and seven percent of its earnings by 2030.³⁵ These findings motivated MEB’s president to announce a \$10 million investment plan to protect the port against future flood risk.

A Value Chain Approach to Building Climate Resilience

Key Business Risks and Opportunities

Most businesses recognize the threats of a changing climate and extreme weather events, yet few have started building climate resilience. In a recent survey, 90 percent of companies worldwide agree that they faced climate-related impacts in the past three years, but only 30 percent are actively responding to those threats.³⁶ In the financial services industry, 80 percent of firms agree that direct risks, such as credit losses, will grow in the future, but many do not feel “sufficiently informed” to take action.³⁷ Corporate climate resilience remains a very new area with much work to be done.

...90 percent of companies worldwide agree that they faced climate-related impacts in the past three years, but only 30 percent are actively responding to those threats.

All businesses, irrespective of size, location, products, and services, depend on weather and climate. Changing weather and climatic conditions can affect the supply of raw materials, interrupt transport and logistics, damage infrastructure and physical assets, reduce revenues, and create other direct and indirect impacts (see Muelles El Bosque example on page 6 and Earth Networks case study on page 14). A changing climate will also provide new and enhanced market opportunities by influencing demand for products and services. Already, some of these risks and opportunities are being felt worldwide, particularly in sectors such as Food, Beverage, and Agriculture; Water and Energy Utilities; and General Manufacturing. This report offers real examples of such considerations in these sectors throughout the text.

Though each business will be affected by a changing climate differently, there are a number of common concerns for businesses with long and complex supply and distribution networks or long-lived fixed assets, or those businesses under high scrutiny by regulators, finance, CSOs, and the media. These are summarized in Figure 1.

Businesses’ success depends on the prosperity of local communities and ecosystems...

Climate Risk Management and the Triple Bottom Line

Businesses are not islands – their success depends on the prosperity of local communities and ecosystems and other vital components of their value chains. Local communities provide key resources to companies: customer base, workforce, essential supplies, and social



Example Anglian Water (UK)

After a risk assessment, Anglian Water in the UK recognized that some of its water supply networks were vulnerable to climate change and increased extreme-weather events. The company identified vulnerable population groups relying on one single water source for 70 percent of their needs. The company committed \$62 million (£40 million) to reduce risk and increase the resilience of its water supply to these communities by creating emergency supply reservoirs with extensive standby capacity, as well as by managing demand from other parts of the regional water network to ensure sufficient backup.³⁸

Figure 1. Business value chain with examples of climate change risks and opportunities



license to operate. Similarly, ecosystems provide natural goods and services of considerable economic worth to businesses, such as flood protection or water treatment, which are rarely quantified.³⁹ Actions aimed at improving community or ecosystem resilience to climate impacts can trigger an additional set of business benefits in the form of increased business stability, improved reputation, or new markets (see Entergy case study on page 5 and The Body Shop example below).

The corporate world is beginning to understand the importance of managing each pillar of the triple bottom line

The corporate world is beginning to understand the importance of managing each pillar of the triple bottom line (planet, people, profit).⁴⁰ Failing to manage climate impacts while taking account of communities and ecosystems can have implications for the triple bottom line. For instance:

- Climate change could affect companies’ environmental and social performance. Action is required to improve a company’s social and environmental performance (see Starbucks case

study on page 19 and EDF example below);

- Poorly planned adaptation by companies could have negative consequences on local communities and the environment;
- The adaptation plans of communities could hold material considerations for businesses;⁴²
- Communities often also hold local data and information that is critical to help companies undertake climate risk assessments (see Green Mountain Coffee Roasters case study on page 16);⁴³ and
- In a changing climate, obtaining and maintaining a social license to operate or a positive corporate reputation is increasingly difficult; companies that do not factor climate resilience considerations into their corporate social responsibility strategies (CSR) could suffer setbacks (see Barrick Gold Corp. example on page 6).

The Business ADAPT guide included in this report questions prompting company executives and senior managers to consider whether the key community stakeholders or ecosystems they rely upon are vulnerable to the impacts of a changing climate, and whether there are “win-win” solutions for managing climate risks while creating benefits for the company as well as for communities and the environment (see Anglian Water example on page 7 and Tolko example on page 10).



Example The Body Shop (UK)

The Body Shop in the UK purchases essential raw materials for the production of its cosmetics products, such as sesame or tea tree, from suppliers who have contracts with Community Fair Trade producers. Some of these primary producers have been severely affected by climate-related stresses, putting stress on the long-term relationships between these suppliers and The Body Shop. The company sees climate risk as one of the issues it can engage with its suppliers and fair trade producers to protect livelihoods. For example, The Body Shop is involved in initiatives to develop climate insurance schemes. In the mid- to long-term, such measures are also expected to reinforce The Body Shop’s security of supply.⁴¹



Example EDF (France)

Extremely high summer temperatures in France during 2003 forced EDF to shut down six thermal power plants and reduce production from around 60 of its nuclear reactors due to regulatory constraints on the maximum temperatures of water discharges. Though exceptional exemptions were granted to a few generators, overall production was reduced by 15,000 MW approximately, and total costs and revenue losses amounted to \$375 million (€300 million). In response, EDF adopted a climate change adaptation plan that provides integrated mechanisms for identifying risks, increasing energy supply, and modulating demand. This framework helped the company face another heat wave in 2006.^{44, 45}

Benefits of a Value Chain Approach to Climate Resilience

The “climate challenge” for businesses is complex: impacts will vary by sector and location and depend on the underlying sensitivity of a company to extreme weather and climate trends. What’s more, today’s businesses are connected to global value chains, which are increasingly vertically integrated and intertwined.⁴⁶ These value chains often encompass multiple countries, a large number of individual organizations, an extensive transport network, and a large workforce.⁴⁷ This makes it difficult for a business to assess the materiality of climate change impacts as they will be felt directly and indirectly throughout its value chain, as shown in Figure 1.

Companies spend approximately \$1 trillion a year managing risks across their value chain.⁴⁸ Value chain management can be useful to manage climate risks, since the approach goes beyond corporate fencelines, country boundaries, and across traditional divisions between public and private goods and services.⁴⁹ For example, by considering how suppliers, communities, and governments add value to a company, a value chain approach to climate resilience provides a favorable framework with which to understand business risks from climate change to a company’s product supply, community engagement, and government relations.

The specific strengths of the value chain approach are that it enables companies to perform the following:

- Analyze vulnerability to climate for each link and identify hotspots for risk across the whole value chain (see National Grid example on the right).
- Assess risk for each link individually, taking into account how different impacts can have a compounded effect (see Hydro-Québec case study on page 17).
- Identify opportunities for new markets to help communities adapt (see Swiss Re case study on page 20).
- Identify opportunities to build climate resilience across the whole value chain and appraise the full lifecycle economic benefit-to-cost ratio.
- Implement climate resilience actions in partnership with those who can mutually benefit from them.

There are many published resources available that which explain the threats of climate change and their implications for business.⁵⁰ However, few follow a systematic value chain approach and associated guidance, informed by existing examples of companies working on climate resilience. Few companies have begun to assess and respond to climate impacts, but there are nonetheless noteworthy examples of climate resilience in action, from which much can be learned. This report builds upon those examples to help guide corporate leaders in building their firms’ climate resilience.



Example

Tolko (Canada)

A major mountain pine beetle outbreak in British Columbia, Canada, due to unusually hot and dry summers and mild winters, destroyed more than 700 million cubic meters of pine trees. This represented more than 50 percent of the province’s commercially viable pine trees. Recognizing that climate change could be a threat to timber production, Tolko accepted to chair the Timber Supply Area team of the Kamloops Future Forest Strategy (KFFS), an initiative involving government, First Nations, academics, and industry representatives. The Strategy suggests adaptation actions to address climate-derived ecological and forest management sensitivities for the Kamloops Timber Supply Area, and Tolko started implementing some of those to build resilience.⁵¹



Example

National Grid (UK)

National Grid was required by law to present a climate change risk assessment and adaptation report to the UK’s Department for Energy, Flood, and Rural Affairs. The National Grid Electricity Transmission Climate Change Adaptation Report shows the result of this enterprise-wide work. Though National Grid’s assessment found that much of their infrastructure was resilient and that there was little need to adjust network or asset design standards, it identified key areas where risks could exist and further work is needed, such modeling flood risk at the substation level and projecting impacts of increased equipment thermal ratings.⁵²

Challenges to Overcome for Building Climate Resilience in Value Chains

The impetus to assess climate change risks, recognize opportunities, and increase resilience is clear. But corporate climate adaptation is a new field. Companies taking the road towards climate resilience are likely to face some common difficulties, some of which are discussed in this section. Those businesses that spot and address these challenges early on are the best poised for success. This section proposes ways forward.

I don't have access to climate-related data at the right scale or in the right format.

Operational decision making requires high-resolution data at appropriate spatial and temporal scales. Available climate model outputs and derived data may not provide the level of data that would ideally be required (e.g., the spatial resolution may be too coarse). Obtaining higher resolution data requires additional processing (through statistical downscaling), which can be time consuming and costly and may not provide a firm basis on which to make a decision. Furthermore, in many cases businesses need derived climate-related information, such as heating degree days or 100-year return periods, which are not directly available from climate models but can be derived from statistical analysis. This perceived lack of access to useable data can lead to a “wait-and-see” attitude.

Those businesses that spot and address these challenges early on are the best poised for success.

However, there are good examples of businesses overcoming climate data challenges.⁵³ For example, some companies make the best possible use of available data. While global climate model projections are limited by their low resolution, they do characterize the envelope of future climate-related changes and, coupled with an analysis of past climate variability, can inform climate resilience actions. When this is not enough, businesses can work with climate research centers to develop high-resolution climate change projections (see the Hydro Quebec case study on page 17).

Imperfect data is not an excuse for inaction. Stakeholders expect businesses to anticipate future impacts on their value chains, and relying on historic data only for decision making is no longer enough.

Stakeholders expect businesses to anticipate future impacts on their value chains...

Future climate change is too uncertain to justify expenditure.

It is difficult to justify making adjustments or investments today to increase resilience to future that may or may not materialize, especially in cases where climate science and associated risks are not well understood. However, climate change is not just a future risk: recent climate observations include warmer temperatures, sea-level rise, and more extreme weather, and reports of impacts on businesses from these changes are already numerous. Improvements in climate-change science are also increasing the level of confidence attached to predictions, including increases in temperature.

Risk management and entrepreneurship are critical to business success. Despite the complexity of the

underlying science, climate change is ultimately like any other risk or opportunity. Even with imperfect information, risk-based decision making is possible and necessary. Risk management tools are already essential parts of the corporate toolbox and can be build upon to assess climate risks and improve resilience.⁵⁴

Building climate resilience is the role of government.

Governments have taken the lead in financing climate adaptation. This is because government traditionally has had responsibility for providing or managing public goods and services that may not be associated with the returns on investment the private sector often seeks, yet are essential for economic prosperity and human development. These include many long-lived fixed or natural assets (e.g., essential infrastructure) and social services (e.g., disaster risk management systems and projects).

Businesses that do nothing to support communities in coping with climate change are exposed to additional risks.

Yet businesses also have a fundamental role and interest in avoiding or reducing the impacts of a changing climate. For instance, many businesses own and manage critical assets and infrastructure and depend on local communities or the natural environment for essential goods or services. Businesses, just like individuals, are also subject to the rule of law; in cases where the impacts of climate change have the potential to harm, failing to act can be considered negligent. Furthermore, CSOs and multilateral organizations are promoting a business model of climate resilience, whereby the private sector can play a key role in supporting resilient economies and communities, especially in developing countries, where government capacities and resources are often limited.⁵⁵ Finally, businesses can gain from the provision of greater public-sector financing towards cli-

mate resilience, and a number of companies are already advocating for such financing.⁵⁶

Building climate resilience poses great challenges that demand innovative partnerships. There are many areas where opportunities for collaboration among governments, businesses (including small and medium-size enterprises), and local communities exist: coastal protection, promotion of workers' health and safety, disaster prevention, etc.⁵⁷ By working hand in hand with public authorities on those climate risk issues that have business implications, companies can achieve better results. What's more, partnering with the public sector can be an effective strategy for companies to build resilience in areas of their value chain that they don't have control over, such as critical transportation networks.

I don't understand how I can build business resilience to climate change by working with communities.

Private sector leaders are increasingly recognizing that community risks are business risks. Companies not only rely on communities to source employees and access essential supplies, but also to sell their products and services and expand their market shares.

Businesses that do nothing to support communities in coping with climate change are exposed to additional risks. If companies are perceived – rightly or wrongly – to cause or aggravate some of the impacts of climate change, they could lose their social license to operate. Another risk comes from local instability, triggered by extreme weather events or reduced performance of the local economy due to a warmer climate. Including community climate concerns within a business climate risk management process helps identify risks and solutions outside of the business fence-line, laying the groundwork for resilient communities and a favorable business environment.⁵⁸

Companies are increasingly finding ways to connect with local communities in areas that are part of business value chains. Local and community-based, national and international nongovernmental organizations (NGOs) can assist in providing those linkages and helping to assess climate impacts in those communities and the implications for business/community relationships.



CASE STUDIES OF CLIMATE RESILIENCE IN ACTION

This section offers examples of corporate climate resilience in action across different segments of business value chains. There is much to be learned from examples of companies that are beginning to build climate resilience by assessing the risks and opportunities associated with a changing climate, identifying and implementing measures to build resilience, and engaging communities and government.

CLIMATE RESILIENCE IN ACTION

Earth Networks

Earth Networks provides industry and government entities worldwide with information and tools for weather-related decision making, operating the world's largest weather-observation and lightning-detection networks.

Introduction

Governments, industry, and communities in developing countries are seeking ways to build their resilience to increasing environmental threats. Current weather, climate, and environmental observation infrastructures within these areas are typically sparse and unconnected, providing little information for responding to severe weather events and for risk management and planning associated with climate-related weather changes.

Earth Networks is partnering with NGO's, multilateral organizations, governments, and enterprises to facilitate improved weather and climate monitoring infrastructures in developing countries to help build climate resiliency and sustainability in communities that will extend throughout business value chains.

Actions to Build Resilience

The Earth Networks Climate Change Adaptation Program (CCAP) provides a framework for the infusion of weather and climate observation, prediction, and alerting technology that can be rapidly deployed, is easy to maintain, and is simple to use. The CCAP provides tools such as PulseRad, an affordable radar alternative, forecasting instruments, and early warning systems for advanced alerting of severe weather and flooding events via basic mobile phone delivery.

Real-time weather forecasting information can be utilized for improved agricultural planning and operations, as well as throughout the value chain for situational assessment and operational planning, including production forecasting, asset protection and management, risk planning and management, and logistics etc.

Outcomes

In agriculture, farmers are using real-time Earth Networks weather information to make agronomic decisions. Canadian wheat farmers, for instance, are utilizing weather information from solar-powered weather stations located on large operations to gauge variables such as humidity, rainfall, and wind speed and direction before making decisions related to irrigation, fertilization and spraying, and pest and disease modeling, as well as planting and harvesting. Additionally, historical weather information and weather event information is also used for crop-yield predictions.

In utilities, weather information on a local scale is used to power atmospheric models relative to lightning, icing, galloping, vibration, and other conditions - all critical to utility operations. Predicting the impact of weather events such as lightning and storms, high winds, and heat waves on the distribution grid enables operational decision making for risk and outage management. Additionally, real-time weather information is critical in deployment of crews for restoration efforts. Historical weather information is also valuable in post-storm analyses and damage assessments.



LEARN MORE

- [Climate Change Adaptation Program \(Earth Networks 2012\)](#)

CLIMATE RESILIENCE IN ACTION

Entergy

Entergy is an integrated American energy company that produces and distributes electricity to 2.8 million utility customers in four states along the Gulf of Mexico, with 15,000 employees and annual revenues exceeding \$11 billion.

Introduction

Hurricanes Katrina and Rita disrupted Entergy's operations in 2005, costing the company \$2 billion in repair and replacement. Climate change is expected to increase the frequency and severity of hurricanes, as well as accelerate sea-level rise. The Gulf Coast's industry, communities, and ecosystems are vulnerable to these growing climate risks, and cumulative losses are expected to be in excess of \$350 billion by 2030.

Actions to Build Resilience

Entergy partnered with Swiss Re to take a three-phase approach to understand the opportunities and risks of climate change to its assets and the communities it works in. The first phase included a climate study of the Gulf Coast to assess near-and long-term risks to the energy sector and coastal communities and ecosystems. In the second phase they evaluated how climate risks were likely to impact specific assets and areas of operation, helping managers to identify where to build resilience. In the third phase the company reviewed and improved existing plans to reduce the risks of future impacts and capitalize on opportunities. The results motivated the company to engage communities and customers to build awareness and discuss resilience building options.

Outcomes

Entergy is acting on the opportunity to tackle climate risks cooperatively with government and community stakeholders. Upfront costs divided between the private and public sectors will reduce potential losses (see Figure 2) and long-term capital expenditures, while fortifying the company's continuity planning. By operationalizing adaptation strategies, Entergy is simultaneously increasing the resiliency

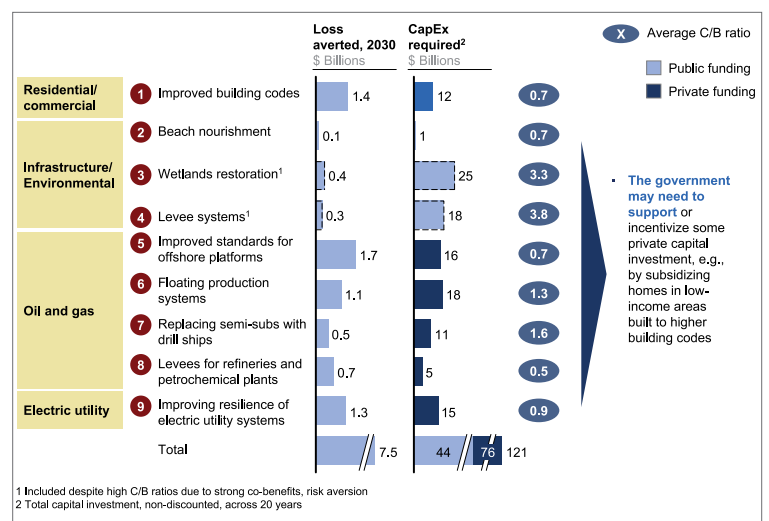
of its operations and the communities it depends upon and laying the foundation for expansion and development along the energy coast. However, the next steps in building resilience involve larger expenditures on more distant time horizons and require further study and directed investment.



LEARN MORE

- "Building a Resilient Energy Gulf Coast: Executive Report" (Entergy 2010)
- "Hurricane Katrina: A Climate Wakeup Call (UNFCCC 2011)"

Figure 2. Immediate measures can save money and help the environment in the long term



Measures can translate into broad near-term actions that are cost effective and will help the economy and environment. From "Building a Resilient Energy Gulf Coast" (Entergy).

CLIMATE RESILIENCE IN ACTION

Green Mountain Coffee Roasters

Started as a small Vermont café in 1981, Green Mountain Coffee Roasters (GMCR) quickly grew and has since gained recognition as a leader in specialty coffee and coffeemakers across its many chains and brands in North America.

Introduction

Coffee crops are highly sensitive to changes in weather, which can decrease both quantity and quality of harvests. Many of the ideal locations for growing coffee are forecast to see increases in temperature that could make growing quality coffee impossible in as soon as 2020. Climate change will disrupt both coffee supply chains and the local communities in Latin America, Africa, and Asia that are dependent on coffee as a primary source of income.

Actions to Build Resilience

GMCR recognizes the threat climate change poses to its supply chain and to the farming communities the company depends upon to supply expertise and high-quality crops. GMCR sees the adaptation of smallholders as essential to the resilience of its business model. In partnership with Catholic Relief Services, GMCR co-commissioned a five-year pilot study called “Coffee Under Pressure” (CUP) in 2009 in Mesoamerica to model the future stability of their coffee-sourcing areas. The report evaluated potential impacts on product quality and harvest quantity, and how such changes would affect both supply chains and local communities.

Outcomes

GMCR engages farmer organizations and other supply chain actors to help assess impacts and prepare adaptation strategies to strengthen the resilience of their supply chain. GMCR will share the results of their work with 7,000 farmers to help them determine their vulnerability and options to build resilience. Where communities can no longer grow coffee, CUP will identify alternative crops suitable under the new climate.



LEARN MORE

- [“Coffee Under Pressure” \(CIAT 2012\)](#)
- [“Climate Change and Coffee” \(CRS 2009\)](#)

CLIMATE RESILIENCE IN ACTION

Hydro-Québec

Hydro-Québec is one of the largest utilities in North America, with a total installed generation capacity of 36,671 MW and the longest transmission system in the US and Canada. More than 90 percent of its generated power comes from hydropower, with 59 hydroelectric generating stations, 26 large reservoirs, and 571 dams.

Introduction

A series of adverse weather conditions (particularly the 1996 flooding of Saguenay-Lac-Saint-Jean and the 1998 ice storm) demonstrated the high costs of extreme events on Hydro-Québec's infrastructure, with economic effects for the whole province. The 1998 ice storm cost the utility \$705 million (CAD \$725 million) in damages, catching the utility's attention to the risks extreme weather events pose.

Actions to Build Resilience

An internal technical committee at Hydro-Québec reviewed its transmission design standards after the ice storm. Their recommendations led to nearly \$973 million (CAD \$1 billion) being spent over the following ten years to increase maximum ice and hourly wind loads, as well as cumulative ice/wind loads, in addition to installing special pylons at standard intervals to avoid cascades of falling pylons during high ice load events. Hydro-Québec also developed a research program in 2002 to improve knowledge of climate change, business impacts, and adaptation solutions in both the mid to long term, so that the risks could be managed and opportunities exploited. They produced an extensive set of future runoff projections for each of the watersheds where the company has hydropower facilities and developed their projections in a range of climate scenarios.

Outcomes

In addition to ongoing efforts to increase the resilience of their infrastructure, the utility is planning to spend \$195 million (CAD \$200 million) by 2012 on improving the electricity system interconnection between the Canadian provinces of Québec and Ontario and on anti-icing equipment, which will help to reduce vulnerability to future extreme winter weather events. Hydro-Québec is working with some of the small, largely indigenous communities located in northern Québec to reduce the local impacts of hydroelectric projects, create jobs, and improve communities' access to energy and infrastructure.



LEARN MORE

• "Facing the Elements" (NRTEE 2012)



CLIMATE RESILIENCE IN ACTION

Levi Strauss & Co.

Levi Strauss & Co. is one of the world's largest brand-name apparel marketers, with sales in more than 110 countries and sourcing in more than 30 countries.

Introduction

Recognizing the impact a changing climate has on agricultural production and on the communities in which its products are manufactured, Levi Strauss & Co. is pushing for pioneering strategies to protect water as a natural resource in apparel manufacturing and strengthen cotton sustainability and resilience. It is also educating consumers about more environmentally sustainable clothing care.

Actions to Build Resilience

Levi Strauss & Co. participates in the Better Cotton Initiative (BCI), which seeks to change the way cotton is grown around the world, positively impacting the environment and supporting 300 million people engaged in cotton farming globally. In partnership with Levi Strauss & Co. and other global brands, BCI works with local organizations on the ground to teach cotton farmers simple farming techniques that increase productivity and profits while reducing chemical and pesticide use and the amount of water used throughout the growing season, such as planting border crops and setting up irrigation systems.

From cotton farming to fabric production and product finishing, the apparel industry relies on an abundance of water to make its products. In 2011, the Levi's® brand launched the Water<Less™ collection, which reduces the water used in the product finishing process.

Consumers can also reduce the climate change impact of their jeans by up to 50 percent by washing them in cold water and line drying. With this in mind, the company launched a consumer education program called "Care for Our Planet" that educates consumers about what they can do to save water and energy after they buy a pair of Levi's® jeans.

Outcomes

In the fall 2011 product line, more than two million pairs of Levi's® and Denizen™ jeans contained a blend of Better Cotton. This spring, Levi Strauss & Co. proudly made more than 13 million Water<Less™ products in the Americas, Europe, and Asia and saved over 45 million gallons (172 million liters) of water.



LEARN MORE

- "[Levi's Water<Less](#)" (Levi Strauss & Co. 2012)
- "[CEO Water Mandate: Communication on Progress](#)" (Levi Strauss & Co., 2011)
- "[Levi's Water<Less Case Study](#)" (UNFCCC 2011)

CLIMATE RESILIENCE IN ACTION

Starbucks

Starbucks is the largest coffeehouse company in the world, sourcing arabica beans from farms in Latin America, Africa, and Asia for its more than 17,000 retail stores spread across 55 countries.

Introduction

Recognizing that the supply of its signature product is contingent upon the crops of thousands of coffee farmers around the world, in 2002 Starbucks designed and implemented the Coffee and Farmer Equity (C.A.F.E.) Practices to ensure its suppliers would continue to provide high-quality coffee that is socially responsible and environmentally sustainable. Adoption of these standards is rapidly developing and on track for 100 percent compliance by 2015.

Actions to Build Resilience

In partnership with Conservation International (CI), Starbucks has used the standards to promote environmental leadership among its coffee growers. Farmers can demonstrate such leadership through efforts to conserve water resources, soil resources, biological diversity, and overall ecosystem functions.

Some specific C.A.F.E. criteria contribute to building resilience in the face of climate change. For instance, maintaining a coffee shade canopy cover can help cope with rising temperatures and increased extreme heat, and minimizing irrigation and conserving processing water can help prepare for a possible future with scarcer water resources and possibly higher ecosystem and community water needs.

In order to ensure continuous improvement, Starbucks has established Farmer Support Centers in Costa Rica and Rwanda to provide local and regional farmers with the resources and expertise that help lower the cost of production, reduce fungus infections, improve coffee quality and increase the yield of premium coffees.

The Starbucks Farmer Loans program is an alternative for co-ops that cannot access traditional funding channels. It aims to provide financial resources to cooperatives to fulfill

their cash-flow needs during harvest time and to make infrastructure investments that result in better competitiveness.

Beginning in 2009, Starbucks is investing in innovation and working with CI to promote mutually beneficial forest conservation and the sequestration of carbon. Through forest conservation and habitat restoration efforts, Starbucks and CI are helping coffee communities to gain access to emerging forest carbon markets.

Outcomes

Farmers who follow C.A.F.E. Practices see greater stability of local natural habitats, while use of pesticides, herbicides, and chemical fertilizers decrease. Third-party studies conducted in Columbia and Guatemala indicate farmers benefit from higher sales and overall income compared to farmers not following the standards. Almost 99 percent of participating farms had not converted any new forests into agriculture since 2004 and had turned over 250,000 acres of land to conservation in that time period. Though not designed in response to climate change, the C.A.F.E. standards contribute to more climate-resilient communities and coffee supply chains while also promoting economic development.



LEARN MORE

- [“C.A.F.E. Practices”](#) [Conservation International 2012]
- [“C.A.F.E. Standards”](#) [Starbucks 2007]
- [“Starbucks Ethical Coffee”](#) [Starbucks 2012]



CLIMATE RESILIENCE IN ACTION

Swiss Re

The Swiss Re Group is a leading wholesale provider of reinsurance, insurance, and other insurance-based forms of risk transfer. Dealing direct and working through brokers, Swiss Re has a diverse client base for which it deploys its capital strength, expertise, and innovation to enable the risk taking upon which enterprises depend. Founded in Zurich, Switzerland, in 1863, Swiss Re serves clients through a network of over 60 offices globally.

Introduction

The increasing incidence of natural disasters associated with a changing climate increases the risks of communities. For example, farmers in east Africa face significant risks from droughts, which are increasing in frequency and severity as the climate changes. Among Ethiopia's 85 million people only four-tenths percent have insurance; crop failures threaten more than just their harvests, but also incomes, livelihoods, and regional development as well. Meanwhile, a series of hurricanes have caused severe damage and have slowed economic development in Haiti.

Actions to Build Resilience

Swiss Re, in partnership with Oxfam America and other partners, provides a holistic risk management framework to enable poor farmers in the drought-prone northern state of Tigray in Ethiopia to strengthen their food and income security through a combination of community climate resilience projects (risk reduction), insurance (risk transfer), and microcredit ("prudent" risk taking). Called the Horn of Africa Risk Transfer for Adaptation (HARITA) project, it allows cash-poor farmers the option to work for their insurance premiums by engaging in community-identified projects to reduce risk and build climate resilience, such as improved irrigation or soil management.

In 2011, Swiss Re also became a founding partner in the formation of the Microinsurance Catastrophe Risk Organization (MiCRO), an donor-capitalized microinsurance facility developed by a syndicate of strategic stakeholders. Insurance products help Haiti's micro-entrepreneurs protect themselves against the economic aftermath of severe natural catastrophes. The facility's innovative solutions are aimed at the country's "informal sector" – the organized poor – who have taken steps to increase their economic standing and stability through the creation of small businesses. MiCRO's solutions are the first to provide micro-

entrepreneurs with comprehensive protection, and a fast payment mechanism, against natural catastrophes in Haiti.

Outcomes

Launched in Ethiopia in 2009 with just 200 households, uptake of this insurance model has been rapid, expanding to 75,000 people in 13,000 households across 43 villages by 2011. HARITA's success has led to the launch of a joint project between Oxfam America and the World Food Program called the R4 Rural Resilience Initiative, for which Swiss Re is the founding sponsor and also provides support through technical expertise and reinsurance coverage. The R4 program will expand this innovative model to cash-poor farmers in Ethiopia and other countries while opening up new markets for insurers.

Haiti's largest microfinance institution, Fonkoze, which provides microloans to women entrepreneurs, made coverage available to clients starting in January 2011 through the MiCRO platform. By December 2011, the product covered almost 60,000 Fonkoze clients against earthquakes, hurricanes, and excessive rainfall. Nearly 6,700 clients had suffered losses covered by the insurance protection during the year. Fonkoze used the proceeds to provide loan relief (their loans were reimbursed to Fonkoze) and emergency cash payments to clients, totaling more than \$1.9 million, for an average benefit per client of about \$280. The clients also received a new loan from Fonkoze to recapitalize their business as soon as they were ready to resume their business activities.



LEARN MORE

- ["Innovative Weather Insurance for Farmers in Ethiopia is Gaining Momentum" \(Swiss Re 2012\)](#)
- [Horn of Africa Risk Transfer for Adaptation \(Oxfam America 2012\)](#)
- ["R4 Rural Resilience Initiative" \(Oxfam America 2012\)](#)
- ["Closing the Financial Gap" \(Swiss Re 2011\)](#)

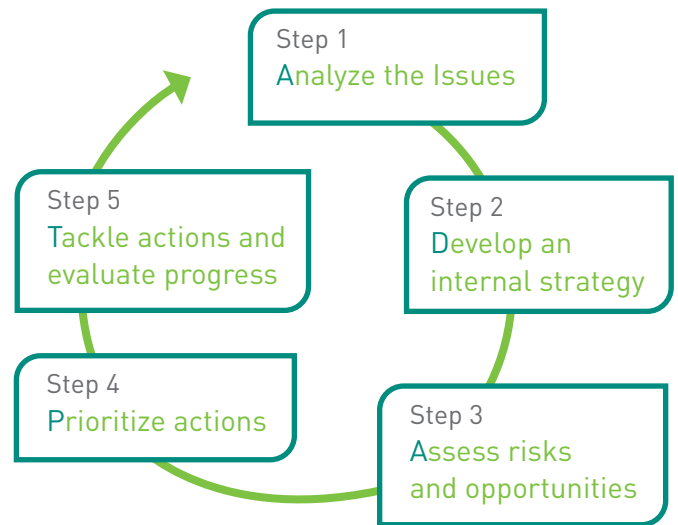
Business ADAPT – A Business Value Chain Approach to Building Climate Resilience

Mainstreaming climate risk management within an organization is a journey, and not all organizations are at the same stage. Business ADAPT proposes a five-step climate resilience framework inspired by existing good practice processes and populated with guiding questions to help company executives and senior managers move their organizations on a pathway towards climate resilience (See Figure 3). All corporate leaders can find relevant questions to inform their decisions, engage others in their company, and assess the robustness of their approach, wherever they are on their own climate resilience pathway. The questions can also be useful to functional corporate managers in working out the implications of climate risk management for their specific roles.

Some companies are stepping up to the challenge and offer examples of how to build climate resilience in practice. In the absence of globally approved standards for managing climate risks, such examples provide a valuable resource to other businesses: they delineate the contours of emerging practices in the private sector and offer important lessons to be built upon. Selected examples of climate resilience in action, provided throughout this document as a resource for readers, illustrate different aspects of business risks and climate resilience.

The most successful approaches to climate resilience span the value chain, consider the triple bottom line, and are integrated within core corporate strategy, processes, and projects. In line with good practice principles for climate resilience, Business ADAPT covers climate resilience considerations across business value chains while giving a central role to community and ecosystem vulnerability and adaptation needs.

Figure 3. Business ADAPT: five step guide to building climate resilience



Each step of Business ADAPT cites entry points where businesses can readily integrate climate resilience considerations into mainstream corporate processes or documents. For users who would like to learn more about specific questions, Business ADAPT additionally provides links to examples of climate resilience in action, existing tools and methods.

Business ADAPT also includes sector-specific questions for company executives operating in several highly vulnerable sectors: Food, Beverage, and Agriculture; Water and Energy Utilities; and General Manufacturing.

The aim is that Business ADAPT is a living document with the potential to evolve and incorporate new knowledge, examples, tools, and methods as they emerge.

Step 1. Analyze the issues – Have you started thinking about the resilience of your business in the face of climate-related impacts?

Discussing climate resilience in the value chain

- What have been the impacts of recent and historic weather-related events on your business?
- Which areas of your business value chain are potentially vulnerable to future climate change, based on your knowledge of the business (asset types, geographic locations, management systems, etc.) and the findings of available scientific and industry synthesis reports? (Consider using GIS and mapping tools to help with this high-level screening exercise.)
- Do you have long-term investment plans and/or new long-lived projects in your pipeline that could be affected by a changing climate?
- What actions, if any, have peers and leaders in your industry taken to assess climate risks, build resilience, and take advantage of potential market opportunities?
- What information, tools, and guidance are available to help your company start building climate resilience?
- What information is included in your hard and soft disclosures regarding weather and climate impacts (e.g., Securities Exchange Commission 10-K filings, Carbon Disclosure Project questionnaires)?



Engaging with government and stakeholders on climate resilience

- What are the positions of national and local governments and the expectations of your key stakeholders on climate resilience?
- What have been the impacts of recent and historic weather-related events on local communities?
- What is the level of adaptive capacity of the local communities you rely on or are located near your operations or suppliers?



Entry points into mainstream corporate processes and documents

- Enterprise risk matrix and register
- Investor relations
- Environmental reporting, climate change groups
- Regulatory and financial reporting
- Business continuity plan
- Investment appraisal, mergers, acquisitions, and divestitures
- Supply chain risk management
- Marketing plan and new market entry analyses
- All-hazards plan
- Early weather/disaster warning response
- Country risk assessment
- Sustainability plan
- Asset management plan
- Facility and partner/supplier siting



LEARN MORE

See Appendix for more information.

Step 2. Develop an internal strategy – Have you mobilized the right team to address climate resilience?

Discussing climate resilience in the value chain

- Which departments of your company are most concerned by the business impacts of climate change?
- For each of these departments, what is the specific business case to incorporate climate resilience considerations?
- What are the respective levels of knowledge about climate-related impacts and associated resilience needs in these departments?
- What is their capacity to build climate resilience? What support do they require, if any?
- Have you assigned responsibility to climate resilience at the senior management level and formed a climate resilience team with a clear leader?
- What are the mandate, schedule, and available resources of your climate resilience team?



Engaging with government and stakeholders on climate resilience

- What national or local government program or projects on climate resilience could you contribute to?
- What stakeholder groups should be involved in your climate resilience efforts? (Consider those managing critical infrastructure or services to your company, holding critical data and information to assess risk, with useful expertise to build climate resilience, or affected by the same impacts and possibly vulnerable to your climate resilience actions.)
- Do you have processes and appropriate staff in place to reach out on an ongoing basis to communities affected by climate impacts and/or your resilience actions? Do you have a plan for how to incorporate community participation and engagement in your climate resilience strategy?



Entry points into mainstream corporate processes and documents

- Line of management
- Departmental review
- Executive review
- Continuous improvement and quality systems
- Enterprise communication system
- Customer relationship management system (CRM)
- Supplier relationship management system (SRM)






LEARN MORE


See Appendix for more information.

Step 3. Assess risks and opportunities – Have you taken steps to assess the areas where opportunities to build climate resilience or invest in emerging market opportunities exist in your business value chain?

Discussing climate resilience in the value chain

- Have you chosen a process for assessing climate change vulnerability, risks, and opportunities in your value chain? 
- Are some of the suppliers or assets (current, planned, and third-party owned) critical to your operations located in areas considered “hotspots” for climate-related impacts?
- What are the impacts of climate change throughout your business value chain, inside and outside business fence lines? (Figure 1 includes examples of potential risks.)
- For each impact identified, have you analyzed the “cause-effect relationship” and risk pathway between climate-related changes or hazards (e.g., prolonged drought) and business impacts (e.g., supply interruption of product X)? What are the underlying and non-climate conditions that contribute to explain such impacts (e.g., low levels of inventory of product X or defective irrigation system)? 
- What measures do you currently have in place to manage these impacts? For example, do you hold an insurance policy that covers your company against associated risks? What is the associated level of resilience of your company?
- Have you assessed and prioritized risks according to their magnitude and likelihood?
- What are the potential costs of inaction for your business from climate risks? 
- What is the materiality of future climate risks for investment decision making, bearing in mind the evolving demands of investors for climate-related information?
- What are the new market prospects for technology, products, or services helping to build climate resilience?
- Will you need to make your existing products or services resilient to climate-related impacts to maintain your market shares?

Engaging with government and stakeholders on climate resilience

- Are your business risks captured in government climate risk assessments and adaptation plans (US Interagency Climate Change Adaptation, city adaptation plans, etc.)? If so, what could be the opportunities for collaboration with government?
- Are there public-sector actions and finance needed to promote resilience for your company and affected communities?
- What are the perspectives and interests of local communities on the impacts of your company’s operations and value chain and on climate resilience?
- Is there a risk that the efficacy of CSR programs will be eroded by climate-related impacts on communities and environments?
- Could your company be blamed for community impacts that are the result of changes in climatic conditions because communities perceive your operations – rightly or wrongly – as worsening environmental or social conditions? 

Entry points into mainstream corporate processes and documents

- Departmental risk matrix and register
- Feasibility study
- Environmental and social impact assessment
- Stakeholder engagement
- Supplier and partner selection
- Sustainability goals development and assessment
- Business continuity plan
- Energy management plan
- All-hazards plan
- Country risk assessment



LEARN MORE

See Appendix for more information.

Step 4. Prioritize actions – Have you taken steps to identify and assess measures to build climate resilience in your value chain?

Discussing climate resilience in the value chain

■ What are you trying to achieve by building climate resilience? What are your company's vision, high-level goals, and department-specific objectives in relation to climate risks that should influence your climate resilience plan?

■ What research, technical, and policy actions can you implement to manage the risks of a changing climate for your company's business value chain?

■ Are siting and diversification part of your climate resilience plan?

■ Have you identified actions that deliver benefits no matter the future extent of climatic changes (known as "no regrets")?

■ Have you compared the avoided costs and revenue losses due to climate change with your planned climate resilience expenditure?

■ Have you prioritized the actions in your climate resilience plan by using cost-benefit analysis, multi-criteria analysis, or more informal methods?

■ How will your company take advantage of the market opportunities triggered by a changing climate?



Engaging with government and stakeholders on climate resilience

■ Do you know national or local government's priorities for climate-adaptation investments and do these correspond to some of the climate resilience actions you have identified? If so, how could you collaborate with government?



■ Have you consulted with and engaged local communities concerning possible climate resilience actions your company is planning to take? Conversely, are there public-sector actions and finance sources that could help your company promote resilience in the business value chain and surrounding communities?

■ Have you considered community-based (e.g., irrigation to improve local livelihoods in a drier climate) and ecosystem-based solutions (e.g., mangroves to protect against storm surges) to build climate resilience?

■ Have you assessed that your climate resilience actions do not cause harm to local communities or ecosystems and, where relevant, identified ways to minimize any negative impacts? Did you assess whether your climate resilience actions fit within your broader community and sustainability strategies?

■ Have you identified actions that deliver co-benefits in relation to surrounding the vulnerability of local communities and environmental conditions to a changing climate and also build your own resilience and/or improve corporate reputation (known as "win wins")?



Entry points into mainstream corporate processes and documents

- Integrated Resource Plan*
- Construction
- Environmental and social management plan
- Facility and partner/supplier siting
- Partner and supplier capacity building
- Supplier/buyer/investor questionnaires
- Stakeholder engagement
- Annual report and regulatory disclosures (e.g., SEC 10-K filings)
- Carbon Disclosure Project questionnaire
- Sustainability/CSR report
- Global Reporting Initiative
- Organizational chart
- Staff performance measures and rewards
- Change management process
- Staff education and training

* This is a typical process in the power utility sector.



LEARN MORE

See Appendix for more information.

Step 5. Tackle actions and evaluate progress – How will you successfully implement actions to build climate resilience in your value chain and evaluate and monitor the effect of your actions over time?

Discussing climate resilience in the value chain

- Have you identified windows of opportunity in your asset planning lifecycles to integrate climate resilience (e.g., consider the new projects that you have in your pipeline and how you can integrate climate resilience in project design)?
- Do you have approval from members of the board and shareholders to begin implementing climate resilience actions? What are the schedules and financing options of your climate resilience plan?
- Have you created budget lines for supporting climate resilience actions and recover from possible extreme climate shocks?
- Have you assigned responsibilities at the executive and operational levels to implement your climate resilience action plan, and what support is needed from your internal teams (e.g., engineering, finance, logistics)?
- Do you have the appropriate tools in place to implement your climate resilience actions (e.g., impact modeling programs, communication instruments, training modules)?
- Have you looked for organizations that can support you in the implementation of your climate resilience actions, such as suppliers, other businesses, local authorities, and universities? (Consider those that have a stake in an aspect of the business that is vulnerable to climate conditions and those with value chains vulnerable to similar climate issues).
- Have you made sure that the staff responsible for your climate change disclosures is in close communication with the staff responsible for implementing your climate resilience action plan?
- Have you adjusted your business goals and performance indicators to reflect climate-resilient priorities, risks, and opportunities? Do you need to update internal codes of practice or manuals to support the implementation of your climate resilience actions?
- Are you monitoring ongoing developments in climate change science and research?
- What mechanisms are in place to monitor the effect of your climate resilience actions on your value chain and evaluate benefits for the company (e.g., consider whether the information collected is sufficient to clearly identify successes and failures)?

- Across what timeframe will you monitor impacts?
- If negative effects from your climate resilience actions are identified, what mechanisms are in place to troubleshoot solutions?
- How do you communicate progress, milestone results, and lessons learned to internal teams and partners while implementation is in progress?



Engaging with government and stakeholders on climate resilience

- What kind of government and public-sector actions for climate resilience are needed in order for your company to take action?
- What kind of public-sector support or funding does your company need to implement climate resilience actions? What levels of government and what government departments need to be involved in your climate resilience actions, if any?
- Have you consulted local communities on the climate resilience actions that you have decided to implement and that could have impacts on them?
- How will you engage community stakeholders and government officials and solicit ongoing feedback as actions are implemented (e.g., through public forums, media outreach, surveys, published materials)?
- What role do communities and governments have in your monitoring and evaluation plan?



Entry points into mainstream corporate processes and documents

- Integrated Resource Plan*
- Construction
- Environmental and social management plan
- Facility and partner/supplier siting
- Partner and supplier capacity building
- Supplier/buyer/investor questionnaires
- Stakeholder engagement
- Annual report and regulatory disclosures (e.g., SEC 10-K filings)
- Carbon Disclosure Project questionnaire
- Sustainability/CSR report
- Global Reporting Initiative
- Organizational chart
- Staff performance measures and rewards
- Change management process
- Staff education and training

*This is a typical process in the power utility sector.



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See Appendix for more information.

Business ADAPT Sectoral Module: Food, Beverage, and Agriculture
















Sector Module: Food, Beverage, and Agriculture		
Introduction	Step 1. Analyze the issues ►	Step 2. Develop an internal strategy ►
<p>This module of Business ADAPT includes specific questions for company executives and senior managers operating in the Food, Beverage, and Agriculture-Sector. These questions are organized into the same five-step structure as the general Business ADAPT presented on pages 21-26, but with added emphasis on the unique characteristics and climate resilience challenges facing this sector. Most questions are shown with icons that indicate which part of the value chain they are relevant to. Broad questions that relate to many elements of business value chains and corporate departments are not labeled with icons.</p> <div style="background-color: #008080; color: white; padding: 10px; margin-bottom: 10px;"> <p>Support resources and business environment</p> <ul style="list-style-type: none"> Access to finance Policy environment Stakeholder expectations </div> <div style="background-color: #90EE90; color: white; padding: 10px; margin-bottom: 10px;"> <p>Primary activities beyond business fencelines</p> <ul style="list-style-type: none"> Community and ecosystem resilience Raw materials sourcing Distribution Sales </div> <div style="background-color: #A9A9A9; color: white; padding: 10px;"> <p>Primary activities within business fencelines</p> <ul style="list-style-type: none"> Assets and infrastructure Production </div>	<p>Primary production</p> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div> <p>Have you experienced in the recent past considerable crop or livestock losses due to drought conditions, flooding, or pests/diseases?</p> </div> </div> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div> <p>Could your crops or livestock be affected by an increase in the intensity and frequency of extreme climatic conditions (e.g., heat waves and droughts)?</p> <p>Could crop yields be affected by projected temperature rise and rainfall changes?</p> </div> </div> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div> <p>Could the critical ecosystem services you rely on be significantly affected by a changing climate (e.g., pollination, pest and disease regulation, shading)?</p> </div> </div> <p>Processing</p> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div> <p>Have you suffered in the recent past disruptive problems with crop or livestock product supply (e.g., price, interruption, delay) or damage to your facilities due to extreme climatic conditions or climate-related hazards (e.g., drought, storm, flooding)?</p> <p>Could the crops you rely upon be affected by an increase in the intensity and frequency of extreme climatic conditions (e.g., heat waves and droughts)?</p> </div> </div> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div> <p>Could your critical assets be affected by an increase in the intensity and frequency of climatic conditions or climate-related hazards (e.g., storms, floods, landslides)?</p> </div> </div> <p>Both primary production and processing</p> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div> <p>Could local communities where you source or operate be at risk from an increase in the intensity and/or frequency of extreme climatic conditions or climate-related hazards (e.g., droughts, floods, storms)?</p> </div> </div> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div> <p>Do you know the positions and expectations regarding climate resilience of your country's food agency, producer associations, the UN Food and Agriculture Organization, and consumer groups?</p> <p>Are you aware of the climate resilience work of other primary or processing food and beverage companies?</p> </div> </div> <div style="display: flex; align-items: center;"> <div> <p>What information have you disclosed to regulators, investors and stakeholders on weather and climate business impacts (e.g., disruptions to supply chains, resource production costs, price volatility)?</p> </div> </div>	<p>Both primary production and processing</p> <p>Are your product supply, operations, transport and logistics, government affairs, investor relations, corporate responsibility, and regional departments aware of climate-related impacts?</p> <p>Do your departments most concerned by climate-related impacts have enough technical expertise (e.g., agroclimatology, climate epidemiology, design engineering) and staffing capacity to work on climate resilience?</p> <p>Have you assigned responsibility to senior managers responsible for regions or product lines vulnerable to climate change?</p> <p>Have you considered involving your suppliers, customers, producer associations, local community groups, agronomists, and engineers in your climate resilience efforts?</p>

Sector Module: Food, Beverage, and Agriculture, cont'd.


















Step 3. Assess risks and opportunities ►

Primary production		Both primary production and processing	
 <p>Do you know the potential cost of crop or livestock failures due to future weather- and climate-related impacts?</p> <p>What are the impacts of a changing climate for your crops or livestock? Consider incremental changes in climatic conditions (e.g., rising temperatures, changing rainfall patterns), increased extreme weather (e.g., heat waves, droughts, heavy downpours), and indirect implications (e.g., soil erosion, forest fires, pests and diseases).</p>	 <p>What are the impacts of a changing climate for your transport and logistics, whether those are directly managed by you or a third party? Consider how incremental changes in climatic conditions could affect maintenance (e.g., rising temperatures, increased sea level, changing rainfall patterns), increased extreme weather (e.g., heat waves, droughts, heavy downpours), and indirect implications (e.g., soil erosion, landslides, forest fires).</p>		
 <p>Are you located in an area where available water is constrained, in a flood-prone zone, or on the coast on a low-lying terrain?</p>	 <p>What are the impacts of a changing climate for the demand of your products? Consider how climate change will affect seasonal climate profiles and weather variability (e.g., hot and cold days).</p>		
 <p>What are the opportunities to utilize new strains of crops or animals?</p>	 <p>What are the impacts of a changing climate for the key community groups affected by your suppliers, your operations and/or your assets? Could your activities exacerbate the impacts of climate change on these communities, constrain their ability to build resilience to climate change in the future, and/or be perceived as the cause of community problems? Consider issues of health and safety, access to water, livelihoods, and cultural heritage.</p>		
Processing		 <p>What are the impacts of a changing climate for the ecosystems where you source or operate and could they have related implications for your environmental performance and reputation? Consider impacts over their lifetime (including after decommissioning) on environmental risk receptors, such as water resources and quality, biodiversity, waste, and air quality.</p>	
 <p>Do you know the potential cost of crop or livestock product supply or asset damage due to future weather- and climate-related impacts?</p>			
 <p>Are your operations highly dependent on reliable freshwater supply? If so, what is the risk of a reduction in available water?</p>			
 <p>What are the impacts of a changing climate for your supply of crop or livestock products? Consider impacts on reliability, quality, and price.</p>	 <p>What are the impacts of a changing climate on your access to finance? Consider how your investors' and lenders' demands on climate risk management could evolve and how this could reflect on finance terms.</p>		
 <p>What are the impacts of a changing climate for your critical assets (e.g., production plants and warehouses)? Consider how incremental changes in climatic conditions could affect maintenance (e.g., rising temperatures, increased sea level, changing rainfall patterns), increased extreme weather (e.g., heat waves, droughts, heavy downpours), and indirect implications (e.g., soil erosion, landslides, forest fires).</p>	 <p>What are the impacts of a changing climate for your ability to get insurance and your insurance policy terms?</p>		
	 <p>How will you take advantage of new customer preferences or demands in a hotter and more variable climate?</p>		
















Sector Module: Food, Beverage, and Agriculture, cont'd.

Step 4: Prioritize actions ►		Step 5: Tackle actions and evaluate progress	
Primary production		Primary production	
	<p>What strains of your crops or livestock are resilient to future climatic conditions?</p> <p>What irrigation techniques or alternative water sources could you utilize to cope with a drier and/or more variable climate?</p>		How will you research and monitor the on-going impacts of climate change on crop and livestock production (e.g., yields and prevalence of pests and disease)?
	Where could you expand your current operations, or site your future projects to improve climate resilience?		How will you monitor changes in operational efficiency and infrastructure wear and tear due to changing climatic conditions?
	Have you considered the opportunity to pilot new strains of crops or animals in the most vulnerable product lines or regions of your business?		How will you measure over time the climate resilience of your key crop and livestock product suppliers?
Processing			How will you track, anticipate, and respond to changing consumer demand for food and beverages following changing seasonal conditions?
	What actions could you take to improve water efficiency or utilize alternative water sources?	Both primary production and processing	
	What alternative sources of supply for your crop and livestock products will become available in the future climate?		How will you plan for potential changes in government subsidies and regulations in reaction to increased climate-related hazards?
	How can you assist your growers and farmers to avoid, cope with, or recover from climate-related impacts?		Do your climate resilience actions have implications (positive or negative) for the adaptive capacity of communities and ecosystems where you source or operate?
Both primary production and processing			
 	How can you increase the resilience of your critical assets and infrastructure against climate-related impacts (e.g., floods, storms, landslides)?		
	What climate resilience actions have benefits for the adaptive capacity of the communities and environments where you source and operate, while helping to manage your business risks?		
	How can you incorporate climate resilience considerations into your company's core strategy, planning, and project processes?		
















Business ADAPT Sectoral Module: Water and Energy Utilities

Sector Module: Water and Energy Utilities		
<p>Introduction</p> <p>This module of Business ADAPT includes specific questions for company executives and senior managers operating in the Water and Energy Utilities Sector. These questions are organized into the same five-step structure as the general Business ADAPT presented on pages 21-26, but with added emphasis on the unique characteristics and climate resilience challenges facing this sector. Most questions are shown with icons that indicate which part of the value chain they are relevant to. Broad questions that relate to many elements of business value chains and corporate departments are not labeled with icons.</p>	<p>Step 1. Analyze the issues ►</p>	
<p>Support resources and business environment</p> <ul style="list-style-type: none">  Access to finance  Policy environment  Stakeholder expectations <p>Primary activities beyond business fencelines</p> <ul style="list-style-type: none">  Community and ecosystem resilience  Raw materials sourcing  Distribution  Sales <p>Primary activities within business fencelines</p> <ul style="list-style-type: none">  Assets and infrastructure  Production 	<p>Water</p>	
		<p>Have you experienced in the recent past disruptions to the volume and quality of surface and ground water resources or damage to water infrastructure due to extreme climatic conditions or climate-related hazards (e.g., drought conditions, heavy rainfall events, or floods)?</p>
		<p>Do you know the positions and expectations regarding climate resilience of your country's water agency, industry associations, the World Bank Forum, and civil society groups?</p> <p>Are you aware of the climate resilience work of other water utilities?</p>
	Energy	
		<p>Do you know the positions and expectations regarding climate resilience of your country's energy agency, industry associations, the International Energy Agency, and civil society groups?</p> <p>Are you aware of the climate resilience work of other electric utilities?</p>
		<p>Do you know the potential cost of asset damage, reduced power production, or increased peak power demand due to climate-related impacts?</p>
	Both water and energy	
		<p>Could your critical assets be affected by an increase in the intensity and frequency of climatic conditions or climate-related hazards (e.g., storms, floods, landslides)?</p>
		<p>Are you located in an area where available water is constrained, in a flood-prone zone, or on the coast on low-lying terrain?</p>
		<p>Could communities that you serve be at risk from an increase in the intensity and/or frequency of extreme climatic conditions or climate-related hazards (e.g., droughts, floods, storms)?</p> <p>Could the critical ecosystem services you rely on be significantly affected by a changing climate (e.g., water-flow regulation, erosion control, flood protection)?</p>
	<p>What information have you disclosed to regulators, investors and stakeholders on weather and climate impacts (e.g., droughts, storms, or flooding)?</p>	

Sector Module: Water and Energy Utilities, cont'd.

Step 2. Develop an internal strategy ▶	Step 3. Assess risks and opportunities ▶		
Water	Water	Both water and energy cont'd	
<p>Are your resource, treatment, distribution, and supply teams aware of climate-related impacts on infrastructure, water resources, water treatment, and demand?</p> <p>Does the staff of the departments most concerned by climate-related impacts have enough technical expertise (e.g., hydroclimatology, climate hydrogeology, design engineering, demand forecasting) and time to work on climate resilience?</p>	 Do you rely on one or a limited number of sources of drinking water supply?		<p>What are the impacts of a changing climate for the key community groups affected by your operations and/or assets? Could your activities exacerbate the impacts of climate change on these communities, constrain their ability to adapt to climate change in the future, and/or be perceived as the cause of community problems? Consider issues of health and safety, access to water, livelihoods, and cultural heritage.</p>
	  What are the impacts of a changing climate for your water resources? For example, do you rely on runoff from glacial or snow melt for a considerable portion of your water supply?		
<p>Energy</p> <p>Are your generation, transmission and distribution, and sales teams aware of climate-related impacts on power-asset design, generation, transmission, distribution, and demand?</p> <p>Does the staff of the departments most concerned by climate-related impacts have enough technical expertise (e.g., hydroclimatology, design engineering, demand forecasting) and time to work on climate resilience?</p>	 What are the impacts of a changing climate for your drinking water and water treatment assets and network?	 	<p>What are the impacts of a changing climate for the ecosystems where you operate, and could they have related implications for your environmental performance and reputation? Consider impacts over their lifetime (including after decommissioning) on environmental risk receptors, such as water resources and quality, biodiversity, waste, and air quality.</p>
	Energy		
<p>Both water and energy</p> <p>Are your government affairs, investor relations, and corporate responsibility departments aware of climate-related impacts?</p> <p>Have you assigned responsibility over climate resilience to senior managers responsible for projects and operations vulnerable to climate change?</p> <p>Have you considered involving your large customers, governments, regulators, community groups, hydrologists, hydrogeologists, and engineers in your climate resilience efforts?</p>	 Do you know the potential cost of crop or livestock product supply or asset damage due to future weather- and climate-related impacts?		<p>For privately owned utilities, what are the impacts of a changing climate on your access to finance? Consider how your investors' and lenders' demands on climate risk management could evolve, and how this could reflect on finance terms.</p>
	 Do you look after a large transmission and distribution network with significant portions going through "hotspot areas" for climate-related hazards (e.g., low-lying coasts, forest fires, landslides, etc.)?		
	 What are the impacts of a changing climate for your power production?		<p>What policy, legislative, or regulatory changes could a changing climate trigger (e.g., disclosure obligations, water restrictions, health and safety requirements, technical standards, such as maximum design temperature)?</p>
	 What of your transmission and distribution business?		
	 How will you take advantage of increased summer peak demand in areas where hotter temperatures will increase air conditioning use?		
	Both water and energy		
	 What are the impacts of a changing climate for your transmission and distribution business? Consider how climate change will affect seasonal climate profiles and weather variability (e.g., hot and cold days).		

Sector Module: Water and Energy Utilities, cont'd.










Step 4: Prioritize actions ▶	Step 5: Tackle actions and evaluate progress
Water	Water
 What alternative water sources could you utilize to cope with a drier and/or more variable climate?  What engineering measures could help your company's drinking water and water treatment assets and networks cope with climate-related impacts?	 How will you monitor ongoing changes in climatic and climate-related variables that affect water resources (e.g., runoff, rainfall, evaporation)?  How will you monitor changes in operational efficiency and wear and tear of drinking water and water treatment infrastructure due to changing climatic conditions?
Energy	Energy
 How can you take account of climate impacts (e.g., changes in runoff and evaporation and rising temperatures) in your scenarios of average annual power production and firm capacity?	 How will you monitor changes in climatic and climate-related variables that could limit your energy supply (e.g., runoff, solar radiation, wind speed)?
 What engineering measures could help your company's power generation, transmission, and distribution assets and networks cope with future climate impacts? 	 How will you monitor changes in operational efficiency and wear and tear of your power generation, transmission, and distribution infrastructure?
 How can you take account of climate impacts (e.g., rising temperatures, increased heat waves) in your demand forecasts? How can you respond to increased summer peak demand?	 How will you track, anticipate, and respond to changing peak and seasonal power demand following changing climatic conditions?
Both water and energy	Both water and energy
 What climate resilience actions have benefits for the adaptive capacity of the communities and environments where you source and operate, while helping to manage your business risks?	 Do you need to update the design standards of new assets to reflect the rate of observed changes in the return periods and magnitude of extreme weather events and changing climate norms?  How will you plan for potential changes in government subsidies and regulations in reaction to increased climate-related hazards?
How can you take account of climate impacts in your Integrated Resource Plans?	
How can you incorporate climate resilience considerations into your company's core strategy, planning, and project processes?	 Do your climate resilience actions have implications (positive or negative) for the adaptive capacity of communities and ecosystems where you source or operate?

Business ADAPT Sectoral Module: General Manufacturing









Sector Module: General Manufacturing		
Introduction	Step 1. Analyze the issues ▶	Step 2. Develop an internal strategy ▶
<p>This module of Business ADAPT includes specific questions for company executives and senior managers operating in the General Manufacturing Sector. These questions are organized into the same five-step structure as the general Business ADAPT presented on pages 21-26, but with added emphasis on the unique characteristics and climate resilience challenges facing this sector. Most questions are shown with icons that indicate which part of the value chain they are relevant to. Broad questions that relate to many elements of business value chains and corporate departments are not labeled with icons.</p> <div style="background-color: #008080; color: white; padding: 10px; margin-bottom: 10px;"> <p>Support resources and business environment</p> <ul style="list-style-type: none"> Access to finance Policy environment Stakeholder expectations </div> <div style="background-color: #90EE90; color: white; padding: 10px; margin-bottom: 10px;"> <p>Primary activities beyond business fencelines</p> <ul style="list-style-type: none"> Community and ecosystem resilience Raw materials sourcing Distribution Sales </div> <div style="background-color: #A9A9A9; color: white; padding: 10px;"> <p>Primary activities within business fencelines</p> <ul style="list-style-type: none"> Assets and infrastructure Production </div>	<p>Primary production</p>	<p>Are your product supply, operations, transport and logistics, government affairs, investor relations, corporate responsibility and regional departments aware of climate-related impacts?</p> <p>Does the staff of the departments most concerned by future climate-related impacts have enough technical expertise (e.g., design engineering) and time to work on climate resilience?</p> <p>Have you assigned responsibility over climate resilience to senior managers responsible for regions or product lines vulnerable to climate change?</p> <p>Have you considered involving your suppliers, customers, producer associations, local community groups, and engineers in your climate resilience efforts?</p>
	<p>Have you suffered in the recent past disruptive problems with raw material supply (e.g., price, interruption, delay) or damage to your facilities due to extreme climatic conditions or climate-related hazards (e.g., drought, storm, flooding)?</p>	
	<p>Could your critical assets be affected by an increase in the intensity and frequency of climate-related hazards (e.g., storms, floods, landslides)?</p>	
	<p>Could the raw materials you rely upon be affected by an increase in the intensity and frequency of extreme climatic conditions (e.g., crops, timber, etc.)?</p>	
	<p>Could local communities where you source or operate be at risk from an increase in the intensity and/or frequency of extreme climatic conditions or climate-related hazards (e.g., droughts, floods, storms)?</p>	
	<p>Could the critical ecosystem services you rely on be significantly affected by a changing climate (e.g., flood protection)?</p>	
	<p>Are you aware of the climate resilience work of other general manufacturing companies?</p>	
	<p>What information have you disclosed to regulators and investors on risks associated with climate-related events (e.g., droughts, storms or flooding)?</p>	

Sector Module: General Manufacturing, cont'd


Step 3. Assess risks and opportunities ►

 	<p>Are your operations highly dependent on reliable freshwater supply? If so, what is the risk of a reduction in available water?</p> <p>Are you located in a flood-prone zone or on the coast on low-lying terrain?</p> <p>What are the impacts of a changing climate for your operations? Consider how incremental changes in climatic conditions could affect maintenance (e.g., rising temperatures, increased sea level, changing rainfall patterns), increased extreme weather (e.g., heat waves, droughts, heavy downpours), and indirect implications (e.g., soil erosion, landslides, forest fires).</p>		<p>What are the impacts of a changing climate for the ecosystems where you source or operate, and could they have related implications for your environmental performance and reputation? Consider impacts over their lifetime (including after decommissioning) on environmental risk receptors, such as water resources and quality, biodiversity, waste, and air quality.</p>
	<p>What are the impacts of a changing climate for your transport and logistics (whether those are directly managed by you or a third party)? Consider how incremental changes in climatic conditions could affect maintenance (e.g., rising temperatures, increased sea level, changing rainfall patterns), increased extreme weather (e.g., heat waves, droughts, heavy downpours), and indirect implications (e.g., soil erosion, landslides, forest fires).</p>		<p>What policy, legislative, or regulatory changes could a changing climate trigger (e.g., disclosure obligations, water restrictions, health and safety requirements, technical standards, such as maximum design temperature)?</p>
	<p>What are the impacts of a changing climate for the demand of your products? Consider how climate change will affect seasonal climate profiles and weather variability (e.g., hot and cold days).</p>		<p>What are the impacts of a changing climate for your ability to get insurance and your insurance policy terms?</p>
	<p>What are the impacts of a changing climate for the key community groups affected by your suppliers, your operations, and/or your assets? Could your activities exacerbate the impacts of climate change on these communities, constrain their ability to adapt to climate change in the future, and/or be perceived as the cause of community problems? Consider issues of health and safety, access to water, livelihoods, and cultural heritage.</p>		<p>How will you take advantage of new customer preferences or demands in a hotter and more variable climate?</p>

Sector Module: General Manufacturing, cont'd

Step 4: Prioritize actions ►		Step 5: Tackle actions and evaluate progress	
	How can you assist your key suppliers to avoid, cope with, or recover from climate-related impacts?		How will you monitor changes in operational efficiency and infrastructure wear and tear due to changing climatic conditions?
	How can you increase the resilience of your critical assets and infrastructure against climate-related impacts (e.g., floods, storms, landslides)?		How will you track, anticipate, and respond to changing consumer demand following changing seasonal conditions?
	What climate resilience actions have benefits for the adaptive capacity of the communities and environments where you source and operate, while helping to manage your business risks?		How will you plan for potential changes in government subsidies and regulations in reaction to increased climate-related hazards?
	What new market opportunity associated with a changing climate can you pilot in your vulnerable business lines or regions?		Do your climate resilience actions have implications (positive or negative) for the adaptive capacity of communities and ecosystems where you source or operate?
	How can you incorporate climate resilience considerations into your company's core strategy, planning and project processes?		

Appendix: Learn More

Challenging questions in the Business ADAPT guide are marked with a , referencing users to this appendix where they can explore further sources of information and identify key resources to help them navigate and complete the guide.

Step 1

Do you have long-term investment plans and/or new long-lived projects in your pipeline that could be affected by a changing climate?

See IPCC 2007 Fourth Assessment Report and 2012 Special Report on Managing the Risks of Extreme Events, US Global Change Research Program Global Climate Change Impacts in the US, and BSR Insights Climate Change Adaptation.

What actions, if any, have peers and leaders in your industry taken to assess climate risks, build resilience, and take advantage of potential market opportunities?

See UNFCCC Adaptation Private Sector Initiative, NRTEE 2012 Facing the Elements Case Studies, OECD Private Sector Engagement in Adaptation to Climate Change, and Acclimatise Climate Resilience Network.

What information, tools, and guidance are available to help your company start building climate resilience?

See IPCC Data Distribution Centre, UNFCCC Adaptation Private Sector Initiative, World Bank Knowledge Portal, UK Climate Impacts Programme Business Areas Climate Assessment Tool and Risk, Uncertainty and Decision-Making, Acclimatise Aware Screening Tool, Engineers Canada PIEVC Engineering Protocol for Climate Change Infrastructure Vulnerability Assessment, Australian Government Climate Change Impacts & Risk Management Guide for Business, British Standards Institution Adapting to Climate Change Using ISO9001, and UNFCCC Compendium on Methods and Tools.

What information is included in your hard and soft disclosures regarding weather and climate impacts (e.g., Securities Exchange Commission 10-K filings, Carbon Disclosure Project questionnaires)?

See CDP Investor Information Requests, SEC 2010 Guidance Regarding Disclosure Related to Climate Change; Canadian Standards Association 2010 Staff Notice 51-333 Environmental Reporting Guidance; ASTM 2010 E2718-10 Standard Guide for Financial Disclosures Attributed to Climate Change; Oxfam America, Calvert Investments, and Ceres, 2012 Guide for Companies and Investors on Disclosure and Management of Climate Impacts; Ceres 2011 Disclosing Climate Risks & Opportunities in SEC Filings; and Acclimatise 2012 Corporate Disclosure of Physical Climate Change Risks and Adaptation.

What are the positions of national and local governments and the expectations of your key stakeholders on climate resilience?

See UNFCCC National Communications from Annex 1 and Non-Annex 1 Parties, UNFCCC National Adaptation Programmes of Action of the Least Developed Countries, and national/regional/municipal climate change adaptation strategies.

What have been the impacts of recent and historic weather-related events on local communities?

See EM-DAT International Disaster Database, WWF Climate Witness Community Toolkit, and local newspapers.

What is the level of adaptive capacity of the local communities you rely on or are located near your operations or suppliers?

See United Nations University 2011 World Risk Report, CLIMATESAVE Report Describing the Adaptive Capacity Methodology, and Global Adaptation Institute GAIN Index.

Step 2

For each of these departments, what is the specific business case to incorporate climate resilience considerations?

See National Roundtable on the Environment and the Economy 2012 Facing the Elements Business Primer.

What national or local government program or projects on climate resilience could you contribute to?

See UNFCCC National Communications from Annex 1 and Non-Annex 1 Parties, UNFCCC National Adaptation Programmes of Action of the Least Developed Countries, national/regional/municipal climate change adaptation strategies, and World Bank Climate Change website.

What stakeholder groups should be involved in your climate resilience efforts? (Consider those managing critical infrastructure or services to your company, holding critical data and information to assess risk, with useful expertise to build climate resilience, or affected by the same impacts and possibly vulnerable to your climate resilience actions.)

See the Entergy example in this report, America's Wetland Foundation and its America's Energy Coast Partners Blue Ribbon Resilient Communities initiative, UNDP Toolkit for Designing Climate Change Adaptation Initiatives, and WWF Climate Witness Community Toolkit.

Step 3

Have you chosen a process for assessing climate change vulnerability, risks, and opportunities in your value chain?

See UK Climate Impacts Programme Business Areas Climate Assessment Tool and Risk, Uncertainty and Decision-Making, Acclimatise Aware Screening Tool, Engineers Canada PIEVC Engineering Protocol for Climate Change Infrastructure Vulnerability Assessment, Australian Government Climate Change Impacts & Risk Management Guide for Business, British Standards Institution Adapting to Climate Change using ISO9001.

For each impact identified, have you analyzed the “cause-effect relationship” and risk pathway between climate-related changes or hazards (e.g., prolonged drought) and business impacts (e.g., supply interruption of product X)? What are the underlying and non-climate conditions that contribute to explain such impacts (e.g., low levels of inventory of product X or defective irrigation system)?

See UK Climate Impacts Programme Business Areas Climate Assessment Tool and Risk, Uncertainty and Decision-Making, UNDP Toolkit for Designing Climate Change Adaptation Initiatives, and Acclimatise Business Risk Pathway Model.

What are the potential costs of inaction for your business from climate risks?

See Stern, N. 2007 The Economics of Climate Change, UNFCCC 2007 Investment & Financial Flows to Address Climate Change, America's Wetland Foundation, NRDC 2008 The Cost of Climate Change, America's Energy Coast & Entergy 2010 Building a Resilient Energy Gulf Coast, and IFC 2010 Climate Risk and Business.

Could your company be blamed for community impacts that are the result of changes in climatic conditions because communities perceive your operations – rightly or wrongly – as worsening environmental or social conditions?

See UNFCCC National Communications from Annex 1 and Non-Annex 1 Parties, UNFCCC National Adaptation Programmes of Action of the Least Developed Countries, national/regional/municipal climate change adaptation strategies, and World Bank Climate Change website.

Step 4

What research, technical, and policy actions can you implement to manage the risks of a changing climate for your company's business value chain?

See the examples of climate resilience in action in this report, NRTEE 2012 Facing the Elements Case Studies, UK Climate Impact Programme Adaptation Actions Database, and UNFCCC Private Sector Initiative.

Have you identified actions that deliver benefits no matter the future extent of climatic changes (known as “no regrets”)?

See UK Climate Impact Programme Identifying Adaptation Options.

Have you prioritized the actions in your climate resilience plan by using cost-benefit analysis, multi-criteria analysis, or more informal methods?

See UK Climate Impact Programme Identifying Adaptation Options and Metroeconomica 2010 Costing the Impacts of Climate Change.

Do you know national or local government's priorities for climate-adaptation investments and do these correspond to some of the climate resilience actions you have identified? If so, how could you collaborate with government?

See UNFCCC National Communications from Annex 1 and Non-Annex 1 Parties, and national/regional/municipal climate change adaptation strategies.

Have you identified actions that deliver co-benefits in relation to surrounding the vulnerability of local communities and environmental conditions to a changing climate and also build your own resilience and/or improve corporate reputation (known as "win wins")?

See WRI 2012 Corporate Ecosystem Services Review, WWF Climate Witness Community Toolkit, UNDP Toolkit for Designing Climate Change Adaptation Initiatives, UK Climate Impact Programme Identifying Adaptation Options, and the examples in this report.

Step 5

Have you looked for organizations that can support you in the implementation of your climate resilience actions, such as suppliers, other businesses, local authorities, and universities? (Consider those that have a stake in an aspect of the business that is vulnerable to climate conditions and those with value chains vulnerable to similar climate issues.)

See UNFCCC Private Sector Initiative and national/regional/municipal climate change adaptation strategies.

How do you communicate progress, milestone results, and lessons learned to internal teams and partners while implementation is in progress?

See GIZ, BMZ, and WRI 2011 Making Adaptation Count and ICLEI USA Adaptation Database and Planning Tool.

What role do communities and governments have in your monitoring and evaluation plan?

See America's Wetland Foundation and its America's Energy Coast Partners Blue Ribbon Resilient Communities initiative, and Centro Internacional de Agricultura Tropical, Catholic Relief Services and Green Mountain Coffee Roasters Coffee Under Pressure, WWF Climate Witness Community Toolkit, UNDP Toolkit for Designing Climate Change Adaptation Initiatives, and ICLEI USA Adaptation Database and Planning Tool.

Notes

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Acclimatise
5333 Casgrain, Suite 509
Montréal, Q.C.
H2T 1X3
Canada

Head office: +44 1623 884347
E: jc.amado@acclimatise.ca
W: www.acclimatise.ca



Oxfam America
226 Causeway Street, 5th floor
Boston, MA
02114
United States of America

T: +1 617 728 2585
E: hcoleman@oxfamamerica.org
W: www.oxfamamerica.org



BSR
88 Kearny Street, 12th Floor
San Francisco, CA
94108
United States of America

T: +1 415 984 3200
E: rschuchard@bsr.org
W: www.bsr.org