NRT

NATIONAL ROUND TABLE ON THE ENVIRONMENT AND THE ECONOMY

CLIMATE PROSPERITY

A CANADIAN INITIATIVE

FACING THE ELEMENTS: BUILDING BUSINESS RESILIENCE IN A CHANGING CLIMATE

// REPORT 05

/// ADVISORY REPORT

/// ADVISORY REPORT

Canada

NRT

NATIONAL ROUND TABLE ON THE ENVIRONMENT AND THE ECONOMY

THIS IS NOT JUST ABOUT COPING WITH CLIMATE CHANGE, BUT PROSPERING THROUGH IT.

A CANADIAN INITIATIVE

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The NRT thanks the consultants who led distinct research components for this report: Marsh (supply chain resilience), Ceres and the Climate Change Lawyers Network (disclosure), Darrel Danyluk (critical infrastructure), and, Graeme Auld and Alexandra Mallett at Carleton University (effective climate policy design). We also want to acknowledge the support and expert feedback provided by the following individuals: Anne Argyris, Bob Armstrong, Nicholas Cheung, Julie Desjardins, Kay Johnstone, Pam Kertland, Richard Kinchlea, Nathan Mean, Erica Scharn, Orest Stanko, and James Wellstead.

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NRT Secretariat staff contributed to this report on several fronts. Policy advisors Jimena Eyzaguirre and Suzanne Loney worked as a team and commissioned and undertook the research, engaged stakeholders, developed preliminary advice, and drafted both this Advisory Report and the Business Primer. As project lead, Jimena's expertise, commitment, and leadership were especially valuable in delivering this project. We are grateful to Rachel Faulkner for organizing each of the stakeholder convening events and to our Communications team — Marie-Josée Lapointe, Tony Bégin, Richard Pilon, Edwin Smith, and Nadra Meigag — for managing the report design and production.

MESSAGE FROM THE VICE-CHAIR

This Advisory Report *Facing the Elements: Building Business Resilience in a Changing Climate* is the final contribution to the impacts and adaptation stream of *Climate Prosperity* by the National Round Table on the Environment and the Economy.

Already in *Degrees of Change: Climate Warming and the Stakes for Canada*, published in 2010, and *Paying the Price: The Economic Impacts of Climate Change for Canada*, published in 2011, the Round Table presented information about the physical and economic impacts of climate change we can expect if we fail to reduce emissions globally and fail to prepare for the impacts of climate change that are now inevitable. *Facing the Elements* explores the key challenges for Canada's business community in ensuring our country's prosperity in a changing climate by both managing risks and exploiting opportunities.

Facing the Elements presents new research and understanding on how businesses in Canada are investing so that they can adapt to current and future climate change impacts and what governments can do to further facilitate deliberate assessment and management of risks and opportunities created or exacerbated by a changing climate. The report presents a state of play of business adaptation in Canada and draws from real practitioner experience to highlight steps and strategies that need to be taken to build climate resilience in the private sector.

Too often uncertainty about the precise timing, location, and magnitude of specific impacts of climate change is held up as a reason for delaying cost-effective adaptation action. *Facing the Elements* clarifies for business the value of adapting ahead of the storm and recommends to government and organizations that engage with businesses practical needs and steps to shift business practices over time and put our economy on a path to climate resilience. That concerns us all.

Our climate is changing and that is causing all of us – governments, communities, and businesses – to change the decisions we make.

R.W. SLATER, CM, PH.D.
NRT Vice-Chair

MESSAGE FROM THE PRESIDENT AND CEO

Climate change means business. And adapting to a changing climate by reducing risks, seizing opportunities, and building resilience should be part of any business strategy. Many businesses are already on the frontline of climate change, experiencing or planning for extreme weather events, supply chain disruptions, and the need for long-term infrastructure investment. But many more need to get ready. And government needs to play its part too.

Our *Climate Prosperity* reports have illustrated the physical impacts of climate change already apparent across Canada's regions and sectors and those expected to occur this century. We have shown how unabated climate change presents an economic risk to Canada and how global action to arrest emissions and domestic action to adapt to climate change makes economic sense. Yet few firms are adjusting business strategies and practices to prepare for future climate realities.

We spent over a year considering how Canadian businesses can and should adapt to climate change and how governments can help. Our three-report series on *Facing the Elements: Building Business Resilience in a Changing Climate* is the product of new research and convening that explored the issue from the vantage point of the firm, outlining roles for government and business in tackling the adaptation challenge together. It consists of this Advisory Report to government and business, a Business Primer aimed at the business community, and a Case Studies report which forms the foundation of much of our learning and advice from climate pacesetters. The advice is practical and achievable.

During the course of this project three lessons became clear. *First*, governments and organizations that engage with businesses need to improve communications about what adaptation to climate change is, how it is relevant to business, and why a proactive stance can pay off. *Second*, adaptation to climate change will rarely be a first priority for business until it hits, so building resilience now within the firm from the boardroom right along the supply chain is sound business strategy. *Third*, collaboration between the public and private sectors to share climate change information and data, communicate across sectors, and invest in long-term critical infrastructure will be necessary.

Climate change impacts are inevitable. Planning for those impacts makes good business and government sense. Starting now will save time and money later. It's time to face the elements and withstand them. We hope our work will start real conversations in Canada that are long overdue.

DAVID McLAUGHLIN
NRT President and Chief Executive Officer

ABOUT US

Through the development of innovative policy research and considered advice, our mission is to help Canada achieve sustainable development solutions that integrate environmental and economic considerations to ensure the lasting prosperity and well-being of our nation.

Emerging from the famous Brundtland Report, *Our Common Future*, the NRT has become a model for convening diverse and competing interests around one table to create consensus ideas and viable suggestions for sustainable development. The NRT focuses on sustaining Canada's prosperity without borrowing resources from future generations or compromising their ability to live securely.

The NRT is in the unique position of being an independent policy advisory agency that advises the federal government on sustainable development solutions. We raise awareness among Canadians and their governments about the challenges of sustainable development. We advocate for positive change. We strive to promote credible and impartial policy solutions that are in the best interest of all Canadians.

We accomplish that mission by fostering sound, well-researched reports on priority issues and by offering advice to governments on how best to reconcile and integrate the often divergent challenges of economic prosperity and environmental conservation.

The NRT brings together a group of distinguished sustainability leaders active in businesses, universities, environmentalism, labour, public policy, and community life from across Canada. Our members are appointed by the federal government for a mandate of up to three years. They meet in a round table format that offers a safe haven for discussion and encourages the unfettered exchange of ideas leading to consensus.

We also reach out to expert organizations, industries, and individuals to assist us in conducting our work on behalf of Canadians.

The *NRTEE Act* underlines the independent nature of the Round Table and its work. The NRT reports, at this time, to the Government of Canada and Parliament through the Minister of the Environment. The NRT maintains a secretariat, which commissions and analyzes the research required by its members in their work.

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0.1 FACING THE ELEMENTS

The capacity of and actions by businesses to adapt to the impacts of changing climate conditions — both average and extreme — will shape Canada's future economic prosperity.

Businesses of all sizes, in all regions, and sectors will face both direct and indirect impacts to their business from climate change. And, since we live in a global economy characterized by lean inventories, long supply chains, and just-in-time delivery, impacts on one business have cascading consequences on others. Proactive planning for climate change can limit downside risks and help take advantage of commercial opportunities posed by the irreversible effects of greenhouse gases (GHGs) already in the atmosphere.

Yet relatively few companies appear to be taking a structured and explicit approach to incorporating climate change risk management and adaptation into regular business activities. Canadian businesses are already thinking about and acting on GHG emissions mitigation and carbon management, but they allocate far less attention to adaptation.

Facing the Elements: Building Business Resilience in a Changing Climate (Advisory Report) — the fifth report in the *Climate Prosperity* series by the National Round Table on the Environment and the Economy (NRT) — emphasizes the important, yet largely unexplored, role of Canadian business in defining our ability to prosper in a warming world. Through a combination of in-house and commissioned research and stakeholder perspectives captured in NRT events, this report addresses two questions: What can and should Canadian businesses do to prepare and take action to manage the risks and opportunities of a changing climate? How can and should governments support business capacity and action, alone and in collaboration with others?

From a public policy perspective, business engagement on adaptation matters for three reasons. First, a lack of preparedness for future climate can hurt the bottom line, affecting investors, customers, employees, and, ultimately, our economy and society. Second, corporations supplying essential services to Canadian households and businesses like electrical power, Internet and cellular services, and transportation should plan, build, and operate infrastructure with the future climate in mind. Third, a changing climate presents opportunities as well as risks to Canadian businesses and industry sectors. Countries like the U.K. are actively exploring and exploiting opportunities of adaptation, and so should Canada.

Throughout the project, our approach was to learn from the leaders, understand drivers of and barriers to business adaptation, and emphasize practical tactics and strategies to support and incent the integration of climate change risk and adaptation into economic decisions among Canada's private sector.

0.2 STATE OF PLAY

Risks and opportunities from the impacts of climate change are increasingly on the radar of large Canadian businesses. In particular, businesses are aware of the potential for more frequent and severe weather events to damage existing infrastructure, facilities, and capital equipment. But they don't necessarily see them as *material* risks. Public companies tend to provide much more information on how a changing climate could affect them in voluntary reports than in their mandatory securities filings. In addition, we've seen cases in the pipelines, chemicals and fertilizers, and utilities sectors of businesses disclosing material risks posed by severe weather, water availability and quality, and seasonality (a source of operational risk), but not in the context of a changing climate.

Terminology, risk perception, short-termism, and capacity impede businesses' progress in assessing and managing risks and opportunities of climate change. Confusion remains between mitigating GHG emissions, adapting to GHG emissions mitigation policy, and adapting to future climate itself. Some businesses don't see the need or the economic rationale to transform core practices and business strategy in anticipation of future impacts since businesses routinely manage risks and opportunities relating to extreme and unpredictable weather; instead, they think adjustments can and should be made as impacts occur. Some risk and operational managers see the need but have difficulties expressing business risks and opportunities in metrics that are meaningful to executives and show the costs of *not* adapting.

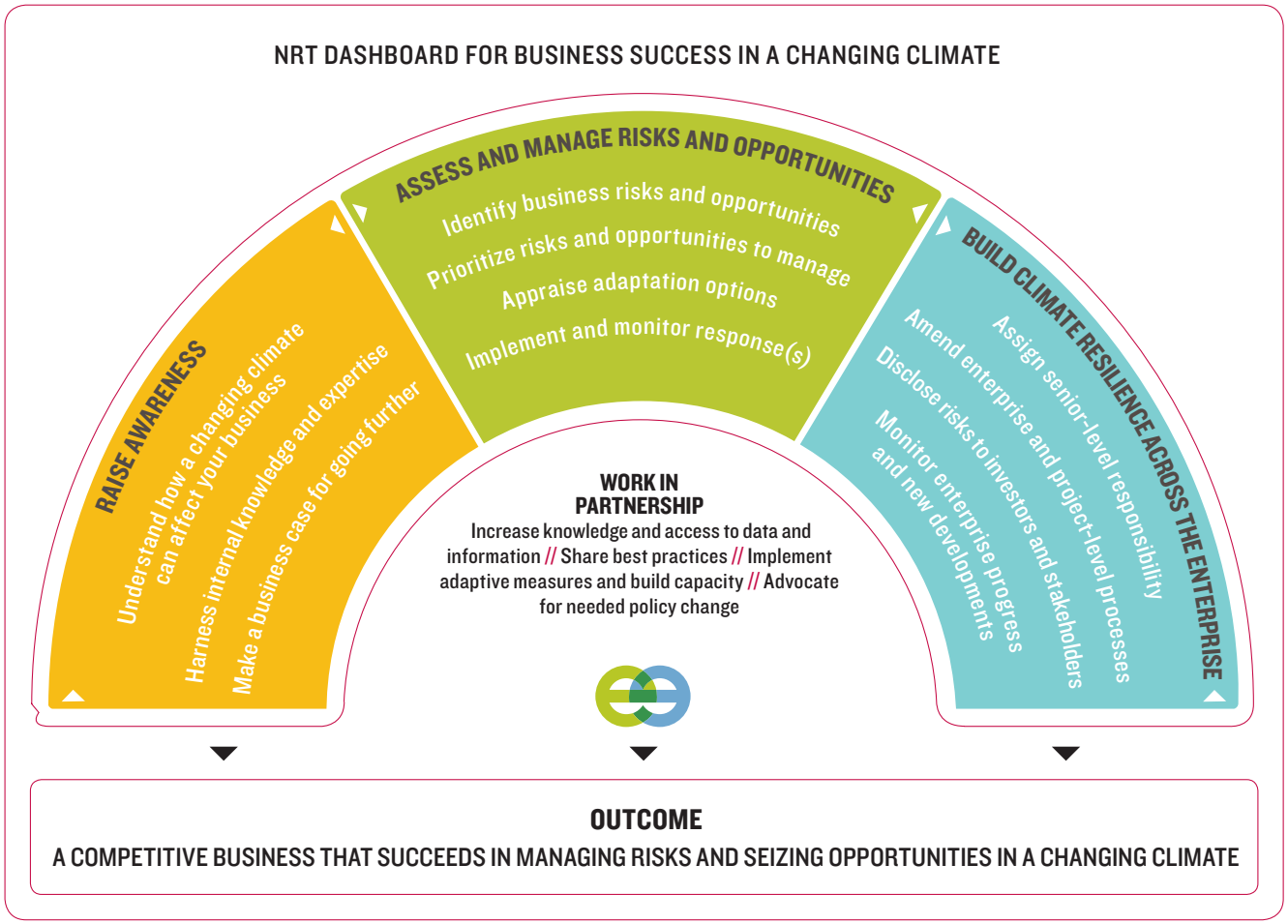
But a business case is apparent. The climate is already changing and businesses stand to be impacted directly and indirectly. Adapting to a changing climate builds resilience to today's weather and water-related risks. Also, implementing adaptive measures doesn't have to be complicated or costly, can benefit stakeholder relations, and can help move a business ahead of its industry peers.

0.3 LEARNING FROM "CLIMATE PACESETTERS"

The experiences of 13 pacesetting businesses set out in our *Facing the Elements: Building Business Resilience in a Changing Climate - Case Studies Report* show that businesses are already confronting the adaptation challenge and point to four key factors motivating action today: the ability and inclination to connect the physical impacts of climate change and related risks or opportunities to business objectives, awareness of stakeholder expectations about environmental and social performance and a commitment to sustainability as a business imperative, strong risk-management practices, and previous experience with climate-related events or impacts.

Their experiences also demonstrate that it's advantageous and possible to act now to prepare for future climate realities. Perceived benefits lie in both value protection, by reducing existing weather and climate-related risks, and value creation, by exploiting opportunities and strengthening market positioning relative

to peers. In the long term, benefits accrue by incorporating climate change into capital investments so that assets continue to perform reliably in the future. Taking stock of risk exposure and viable options for risk control ahead of stakeholder demands for this information is also of value. Their experiences illustrate how to follow the *NRT dashboard for business success in a changing climate* presented below.



Because risk management and entrepreneurship come naturally to business and industry, it's safe to assume that a degree of private-sector action to adapt to climate change will proceed without government intervention. However, our research revealed the need for support from government and organizations that engage with businesses (industry associations, banks, institutional networks, environmental organizations, etc.) to overcome five barriers: vulnerability through interdependencies, lack of policy and regulatory support; gaps in information and tools to aid decision making, lack of financial incentives from government, and lack of shareholder and investor commitment and support.

0.4 BUILDING RESILIENCE

Although by no means a comprehensive picture of unique and cross-cutting needs by Canada's industry sectors, the analysis in this report led us to draw three conclusions. First, organizations that engage with businesses must raise the profile of climate change risk management and adaptation as a business issue as opposed to an environmental one. Targeted communications to clarify how adapting to climate change is a departure from business-as-usual, why and when anticipatory action makes sense, and what the costs are of not adapting will help inform businesses' risk calculations. Second, to enable action, governments and business alike must embed adaptation within existing risk-management mechanisms and processes. Third, both small, practical steps and systemic changes are necessary to ensure business resilience in a changing climate. Systemic barriers, such as a focus on quarterly performance, are not unique to climate change adaptation, but nonetheless weaken incentives to plan ahead and invest in long-term measures.

To enable capacity and action by Canadian businesses to adapt to the impacts of climate change now and in the next five to ten years, the NRT recommends the following goals:

GOAL 1 // TAILOR CLIMATE CHANGE INFORMATION TO ADDRESS BUSINESS ADAPTATION NEEDS: Government agencies and research organizations generate and disseminate information of value to businesses that are planning for climate change. But much more could be done to expand the use of these information resources by business. What's needed is a basic understanding of business needs by industry sector and follow-up actions to improve access to reliable, relevant, and user-friendly climate change information and related guidance.

GOAL 2 // AUGMENT INVESTOR INFORMATION THROUGH BETTER CORPORATE DISCLOSURE: Quality disclosure is the foundation of strong capital markets; this includes disclosure about material risks from climate change and its impacts. Despite guidance to the effect already issued by the Canadian Securities Administrators, climate change risk disclosure in financial filings is limited, at best. Better enforcement of disclosure requirements is necessary, as are effective approaches for companies to demonstrate the value of climate change risk management and adaptation actions to investors.

GOAL 3 // ENHANCE THE RESILIENCE OF CRITICAL INFRASTRUCTURE: The resilience of our critical infrastructure — both public and private — to the impacts of climate change is key to our economic prosperity: companies that can't access essential services or efficiently get their products to market face competitiveness risks as a result. So, we must capitalize on existing processes and mechanisms to understand the economic risks we face and to encourage owners or operators to assess infrastructure risks posed by a changing climate and implement management actions where appropriate. And, since companies must also account for climate vulnerabilities in critical infrastructure systems in their business plans, providing access to this information is also important.

GOAL 4 // PREPARE NOW FOR FUTURE POLICY INNOVATION: Efficient and effective management of climate change risks and opportunities requires both public and private sectors alike to plan ahead. Governments must anticipate the need to correct for market failures hindering long-term adaptation by business. A forward-looking approach by government that integrates new investments in science and research, explores the potential of market-based instruments, and monitors the availability and affordability of adaptation solutions, intervening when necessary, will help position Canada to adapt and prosper in a changing climate in the decades to come.

INTRODUCTION

// CHAPTER 1.0

1.0 // INTRODUCTION

1.1 // THE ISSUE
1.2 // OUR CONTRIBUTION
1.3 // OUR APPROACH

1.1 THE ISSUE

Businesses of all sizes, regions, and sectors are exposed to both direct and indirect impacts to their business from the effects of climate change. Just how prepared are Canadian businesses?

> *"…the fight against climate change, perhaps the biggest threat to confront the future of humanity today…"*
>
> *Prime Minister Stephen Harper, 2007*[1]

Climate change means business. Natural and human drivers combined have already caused the Earth to warm by about 0.8°C relative to pre-industrial times.[2] Temperatures in Canada have risen faster than the globe as a whole, with an average 1.3°C rise since the mid-twentieth century.[3] Impacts of this warming are increasingly apparent across the country and include a decrease in the extent of Arctic sea ice, shrinking Western mountain glaciers, earlier spring snow melt in most regions, shifting distributions of plants and animal species, more frequent water shortages and supply restrictions in some locales, increasing risk to people and property from extreme weather, constraints to winter recreation for parts of southern Canada, and heightened security and resource claim issues in the Arctic.[4]

And although many Canadian businesses are already thinking about *mitigation* — namely, slowing the speed and scale of climate change through reduced greenhouse gas (GHG) emissions — they allocate far less attention to *adaptation*,[5] — that is, adjusting to the consequences of climate change by managing risks and exploiting opportunities.

WHY SHOULD WE CARE?

FIRST, the failure of businesses to adapt to future climate realities has implications for their bottom line, for their investors, customers, workforce, and ultimately, for our economy and society. Changes in climate variables like temperature and precipitation and the physical impacts that flow from them— including shifting water availability and degrading permafrost — have a direct bearing on industrial processes, fixed assets like buildings, and commodities. Operational losses, business disruptions, layoffs, and, in some cases, a worsening of businesses' competitive advantage could arise as a result. Lack of preparedness could lead to environmental and social impacts, to requests of relief assistance from governments, or in an extreme case of bankruptcy, abandoned sites and assets could become a liability for governments and taxpayers. The economic impacts of the mountain pine beetle in British Columbia, disruptions to Atlantic businesses from storm damages, and drought losses in the Prairies show what can happen when weather and climate take us by surprise.

SECOND, Canadians count on reliable access to essential services like electrical power, Internet and cellular services, and transportation; decision makers in public and private sectors alike should plan, build, and operate infrastructure that supplies these services with the future climate in mind. We currently have little idea about whether this is happening as routine practice, but some promising examples are taking shape. The U.K. government requires utilities and other businesses that provide public services to report to government on how they manage the risks and opportunities posed by climate change.[6] Here at home, municipalities are starting to apply a Climate Risk Protocol developed by Engineers Canada to safeguard community infrastructure in a changing climate.[7]

FINALLY, for many businesses at least some of the physical impacts of climate change may present opportunities as well as risks. We should figure out what these are and how to capture them in a way that contributes to job growth and prosperity in Canada. As the impacts of climate change play out across our country and globally, demand for products and services to manage the risks of climate change will also rise. These products and services include novel insurance products, drought and pest-resistant crop and tree breeds, specialized risk-management services, and innovative engineering solutions, to name a few.[8] In addition, the majority of financing for mitigation and adaptation in developing countries in the coming decades is expected to come from private sources.[9] Canadian businesses could tap into the growing demand for financing adaptation in developing countries via project lending, credit lines, and microfinance schemes.

The reality is this: due to past emissions some degree of climate change is inevitable even if the globe drastically decreased greenhouse gas emissions today, so businesses must plan now to adapt to those irreversible effects. Yet relatively few companies are taking a structured and explicit approach to incorporating climate change risk management into regular business activities. The business case for taking proactive steps is complicated by uncertainty about both the magnitude and precise timing of impacts. Added to this is the fact that some changes are incremental and long term, which can mask the sense of urgency and lead to a passive attitude. And in grim economic times, short-term financial concerns may tempt businesses to defer initiating adaptation actions. But is this effective risk management? Just as businesses must readily manage financial and regulatory uncertainty, they must also understand the risks and potential opportunities presented by a changing climate and position themselves to respond appropriately.

1.2 OUR CONTRIBUTION

Facing the Elements: Building Business Resilience in a Changing Climate is the fifth contribution in the *Climate Prosperity* series by the National Round Table on the Environment and the Economy (NRT). Two previous NRT reports described the many implications for our country of a changing climate and made a strong case for adaptation as a means to minimize negative impacts and exploit opportunities. Published in 2010, *Degrees of Change: Climate Warming and the Stakes for Canada* highlighted a range of physical impacts of climate change that we can expect in Canada over this century. In 2011, we released *Paying the Price: The Economic Impacts of Climate Change for Canada*, in which we estimated the economic costs of climate change for the country as a whole and for coastal areas, forestry, and human health in particular.

Facing the Elements emphasizes the key role of Canadian business in defining our ability to prosper in a warming world — a role largely unexplored to date. It brings together new research and perspectives on businesses' understanding of what's at stake and experience in how to manage risks and opportunities. It informs a pathway to support and incent the integration of climate change into economic decisions by business. In addition to risk management, here we emphasize resilience as a success factor for business adaptation. By building resilience, businesses can respond swiftly and recover readily from surprises and events beyond their control. Robustness is a related concept, allowing businesses to stay competitive even when faced with a broad range of events and changing circumstances.[10]

Businesses play a role in mitigation and adaptation, but our focus is on tactics and strategies to adapt to the risks and opportunities of *the changing climate itself*. Still, we recognize that adaptation and mitigation are sometimes related, so it's important to examine potential synergies and trade-offs between adaptation and mitigation. For example, investments in cleaner production in manufacturing can reduce energy or water use and reduce operational risk in the event of power and water shortages. And, as businesses pursue GHG emissions mitigation through renewable energy solutions such as solar, wind, or hydropower, operators and investors should apply adaptation thinking to manage weather-related risks to output volumes from renewable energy plants.

THE REPORT HAS THREE OBJECTIVES:

// **Increase understanding of business exposure to and preparedness for risks and opportunities from the physical impacts of climate change.** All industry sectors are exposed to upside and downside risks of climate change, but the extent and nature of this exposure varies, as does the capacity of different sectors and businesses to respond. How do Canadian businesses characterize their exposure to risk and opportunity from the physical impacts of climate change? Is adapting to them a priority? What key factors motivate and hinder firm-level action? We use a number of approaches to shed light on these questions.

// **Demonstrate the relevance and applicability of climate change adaptation across Canada's private sector today.** Drawing from the experiences of 13 pacesetting businesses, among other sources, our report points to practical steps that Canadian businesses can take now to help them understand the issue and take action. "Climate change adaptation" remains an ambiguous term among the business community. We offer examples that relate adaptation to business strategy.

// **Provide recommendations for government and organizations that engage with businesses to help shift business practices today and put our economy on a path to climate resilience.**

We encourage readers to consult the two companion reports to this Advisory Report: Business Primer, a report for business executives that provides both the rationale and key steps to manage climate change risks and opportunities and our Case studies, a report for adaptation practitioners comprising complete case studies of thirteen "climate pacesetters." Both are available for download on our website (nrtee-trnee.ca).

1.3 OUR APPROACH

TWO OVERARCHING QUESTIONS GUIDED OUR RESEARCH AND STAKEHOLDER ENGAGEMENT THROUGHOUT THE PROJECT:

// What can and should Canadian businesses do to prepare and take action to manage the risks and opportunities of a changing climate?

// How can and should governments support business capacity and action, alone and in collaboration with others?

We started from the vantage point of the firm, learning from the experience of leaders to explore adaptive strategies and tactics already within the reach of Canadian businesses. Next, we considered how government support could enhance the ability of Canadian business to successfully manage the impacts of a changing climate.

Along the way, we learned three factors to keep in mind when engaging business on climate change adaptation.

FIRST, observed and expected impacts of climate change are one driver among many with the potential to influence business decisions. It's important to put adaptation in the context of internal (e.g., profitability, business risk tolerance) and external (e.g., market competition, social licence to operate, regulation) drivers for business. At the same time, the impacts of climate change exacerbate existing business risks and influence existing drivers. For example, regions already exposed to water scarcity could become even more so in a changing climate, triggering new regulation.

SECOND, the current economic backdrop, where many businesses are struggling to improve their quarterly results, puts short-run performance front and centre. Dedicating resources to prepare for impacts expected decades down the road can be a tough sell, heightening the importance of demonstrating proof of value.

THIRD, some businesses already manage the risks of extreme weather, or have strategies in place to cope with water scarcity risks. These businesses can and will take advantage of these existing risk governance procedures and incorporate future expectations about the climate and it impacts, with no guarantees that they will call this adaptation.

To answer the questions we'd set out for this project, we undertook three types of research between January 2011 and January 2012: research to identify gaps, to highlight practical approaches for business, and to develop advice for the public and private sectors.

// **SCOPING:** An initial step was to understand current business perspectives on the importance of adapting to climate change and their progress, and on the extent and need for government support. We did this by first drawing on the literature, including sources like the Network for Business Sustainability, the World Business Council for Sustainable Development, the UK Climate Impacts Programme, the Council of British Industry, PriceWaterhouseCoopers, the World Bank, Acclimatise, and academic research. Next, we undertook original research: analysis of 27 interviews with representatives of a cross-section of Canadian business and of Canadian responses to the Carbon Disclosure Project from 2003 to 2010. This gap analysis and a scoping workshop in June 2011 shaped our research agenda on practical business approaches and our work on government action, both explained below.

// **PRACTICAL BUSINESS APPROACHES:** Early in the project the need to highlight practical and specific steps for business became evident. The business community is relatively new to the adaptation discussion, compared to municipalities, for example. We decided that the NRT could make a contribution by demonstrating the feasibility and benefits of adjusting business practices to preserve and create value in a changing climate, and by pointing to information and tools for ready application by business. For this phase of research, we commissioned case studies of strategies by 13 businesses to adapt to a changing climate. These businesses are: Cameco Corporation, Royal Bank of Canada, Hydro-Québec, Tolko, EBA Engineering Consultants Ltd., J.D. Irving Limited, Summerhill Pyramid Winery, Rio Tinto Alcan, Coca-Cola Canada, Whistler-Blackcomb, Entergy, Munich Re, and BC Hydro. It also included the in-house development and testing of a list of screening questions that small and mid-sized businesses can use to identify risks and opportunities from a changing climate, as well as commissioned research on best practices to enhance supply chain resilience in a changing climate.

// **OPPORTUNITIES FOR GOVERNMENT ACTION:** This research was iterative and responsive to our findings on barriers to and enablers for business adaptation to climate change in Canada. Our choices also considered direct feedback from businesses and industry associations on government roles in promoting and

supporting private-sector adaptation. Commissioned research entailed a review of 35 corporate financial disclosures to securities regulators to assess whether and how risks from a changing climate are presented, analysis of gaps in climate change risk management of Canada's public and private infrastructure and possible ways forward, and analysis of the effectiveness of existing government policies promoting low-carbon technology and sustainable water management among the private sector.

We also convened stakeholders to promote dialogue among Canadian businesses and industry associations on key issues and to maximize the relevance and utility of our work.

WE USED SEVERAL EXPERT ENGAGEMENT VEHICLES TO PREPARE THIS REPORT:[a]

1 // SCOPING WORKSHOP: We consulted with industry associations and adaptation experts in June 2011 to obtain stakeholder input and advice on the current status of climate change adaptation in Canada's business community, barriers faced, and roles of government in advancing private-sector adaptation.

2 // ADVISORY COMMITTEE: An advisory committee including representatives from businesses, the federal government, industry associations, non-government organizations, and the research community met four times throughout the project, providing feedback on research directions, convening events, and report framing.

3 // EXPERT REVIEWS: Selected practitioners reviewed draft sections of this report on supply chain resilience, financial disclosure, and small and mid-sized enterprises.

4 // STAKEHOLDER ENGAGEMENT SESSIONS: In partnership with the Network for Business Sustainability, the NRT hosted a forum in October 2011 to explore the business case for adaptation from two perspectives: capital market trends and leading business practices. Together with The Delphi Group, the NRT also convened stakeholders to discuss ways to improve the use of public climate change information among private sector decision makers through a two-part webinar series held in November and December 2011.

The NRT's advice in this report and other reports of this project benefited from two distinct sources:

// A framework for diagnosing barriers to climate change adaptation. The framework, published by Moser and Ekstrom in 2011[11], helped us organize information gleaned throughout the project on barriers faced by Canadian businesses in adapting to a changing climate. A clear view on barriers was an important part of developing useful and credible advice.

// A one-day stakeholder engagement session in January 2012. With the support of the Network for Business Sustainability, we convened 23 representatives from businesses, industry associations, federal and provincial governments, non-governmental organizations, and academia to advise the NRT on the direction,

a A list of participants to our stakeholder sessions appears in Appendix 6.3.

focus, and priority of actions needed to position Canada's private sector to thrive in a changing climate. Participants prioritized, clarified, and discussed the merits of 33 preliminary recommendations aimed at governments and business. The day's discussions directly shaped the recommendations in this report.

OUR REPORT HAS THE FOLLOWING STRUCTURE:

CHAPTER 2 provides insight on the relevance of climate change risks and opportunities for Canadian business and drivers for adapting. We highlight current perceptions of risk exposure and challenges some businesses confront in getting started on adaptation. Based on the experience of our 13 case study companies, it then summarizes key motivations for understanding, assessing, and managing risks and opportunities posed by the impacts of climate change.

CHAPTER 3 presents a dashboard for business success in a changing climate that includes three phases: (1) understanding the business implications of climate change, (2) assessing and managing risks and opportunities, and (3) building climate resilience across the enterprise. It includes examples of how leading businesses in Canada and abroad are accounting for future climate realities in the way they do business and as a result, enhancing risk management and future growth prospects and positioning themselves to seize opportunities.

CHAPTER 4 explores barriers that prevent businesses from taking forward-looking action to adapt to climate change. It discusses government roles and policy instruments to enable a proactive rather than reactive stance by businesses. It outlines four key areas for action by governments, business, and others to remove barriers and help build business resilience to a changing climate: tailor climate change information for application by business, augment investor information through corporate disclosure, enhance the resilience of critical infrastructure, and prepare now for future policy innovation.

CHAPTER 5 concludes with the key messages stemming from this work. It also includes priority recommendations for governments and organizations that engage with businesses.

STATE OF PLAY

// CHAPTER 2.0

2.0 // STATE OF PLAY

2.1 // ILLUSTRATING BUSINESS EXPOSURE

2.2 // UNDERSTANDING CURRENT AWARENESS OF RISKS AND OPPORTUNITIES

2.3 // EXPLORING BARRIERS TO TARGETED ACTION

2.4 // BUILDING A BUSINESS CASE

2.5 // KNOWING THE MOTIVATIONS FOR ACTION

2.0 STATE OF PLAY

In a changing climate, the past is no longer a good guide to the future. Businesses that plan ahead can limit downside risks and take advantage of commercial opportunities, gaining an edge in the near and long terms.

Businesses and industry sectors already manage a range of business risks and opportunities, some relating to extreme and unpredictable weather. Is adapting to the risks and opportunities of a changing climate any different? How do businesses perceive their exposure to the risks and opportunities of climate change, and how are they managing the issue? Why should adapting to a changing climate be on the radar of business? What actually motivates businesses to take steps and invest in measures to build resilience today, and what could do so in the future? This chapter explores these questions.

2.1 ILLUSTRATING BUSINESS EXPOSURE

Business has always faced risks from climate variability and environmental change. For our resource industries that work on the "frontier," planning for and adjusting to prevailing weather and seasonal climate is the normal way of doing business, and firms have amassed good practices to reduce exposure to physical and environmental risks. Eastern off-shore oil and gas businesses build platforms that withstand Atlantic hurricanes, and western oil and gas producers successfully operate under a wide range of climate conditions. Agri-businesses cope with floods and droughts and optimize production in response to changing weather forecasts. Forestry and tourism businesses are accustomed to dealing with environmental change, including natural disturbances like wildfires.

Yet there's a difference between coping in the short-term by relying on past experience in a stable climate and preparing for continuous change over the long term. For example, the rail industry recognizes that it needs better technologies for managing avalanche risk to deal with changing snow conditions and that rising sea levels and related flooding risks in coastal estuaries will affect operations and siting decisions.[12] Planning ahead for future impacts of climate change also means amending traditional management systems to accommodate greater uncertainty than what businesses are accustomed to, and doing so systematically. The prospect of increasingly intense hurricane seasons, for instance, could justify reinforcements of drilling platforms once viewed as too costly. And consider the economic and operational implications of the potential for both more severe and frequent drought and "unusually wet years" in the Prairies.[13]

For firms beginning to evaluate what a changing climate could mean for their own business, **Table 1** shows ways different industry sectors become exposed. Some risks are internal, others arise across supply chains, and still others relate to broader aspects of society like markets, stakeholder expectations, and the regulatory environment.

TABLE I

EXAMPLES OF CLIMATE CHANGE-RELATED BUSINESS RISKS AND OPPORTUNITIES

CATEGORY OF RISK / OPPORTUNITY	SUB-CATEGORY	IMPACT (INDUSTRY SECTOR)
FINANCIAL	• Credit • Liquidity	• Client exposure to extreme weather results in eroded creditworthiness and damages to loan collateral (financial services and insurance) • Changing patterns of seasonal energy demands lead to energy price volatility (utilities) • Extreme weather events cause network failures and higher operation and maintenance costs (technology, media and communications) • Businesses taking precautions, such as relocating away from a flood zone, are rewarded with lower insurance premiums (various)
OPERATIONAL	• HR • Capacity • Efficiency • Product development • Product/ service failure • Supply chains	• More frequent extreme weather events lead to higher employee absenteeism (various) • Extreme weather events lead to construction delays (manufacturing and capital goods) • Reduced water availability limits business expansion (energy) • Resource scarcity drives the creation of less water-intensive technologies and processes (energy, forest products) • Expanded shipping routes in the north reduce transportation costs (mining) • Changing water flows result in fluctuations in hydroelectric generation (utilities) • Droughts/extreme weather impacts in supplier regions trigger supply chain disruptions (various) • Sea-level rise and storms disrupt distribution channels such as ports (various)
STRATEGIC	• Reputation and brand • Competition • Customer wants • Technological innovation • Capital availability • Regulatory/political trends	• Extreme weather causes customer delays, which affect a business's reputation (transportation) • Opportunity to finance infrastructure upgrades and new builds to withstand climate change impacts (financial services and insurance) • An agile manufacturer responds to clients' adaptation needs (manufacturing and capital goods) • A firm supplies new IT applications that enhance business resilience (technology, media and communications) • Shifting geographic distribution of customer base creates opportunities in new markets (transportation) • A business responds more efficiently than competitors when regulatory changes are made, such as changes to water access and use (various) • Social licence to operate is affected by competition with communities over use of water (various)

SOURCED PRIMARILY FROM CANADIAN 2010 RESPONSES TO INVESTOR CARBON DISCLOSURE PROJECT (CARBON DISCLOSURE PROJECT 2010).
CLASSIFIED USING RISK CATEGORIES FROM ENTERPRISE RISK MANAGEMENT (RISK MANAGEMENT COMMITTEE 2003).

Since we live in a global economy characterized by lean inventories, long supply chains, and just-in-time delivery, the potential for climate change to create systemic risks is not out of the question. The global climate is complex. Changes in one aspect of it, like warmer air temperatures, have cascading effects on other aspects, like numbers and frequency of heavy rain events and related flooding.[14] The reality is that many different impacts of climate change — that materialize as sudden events or build up over time — could occur at the same time across different locations. In addition, interconnections across markets and societies make it hard to predict where, when, and how a situation could turn volatile, magnifying businesses' exposure to risks posed by climate change. For example, a changing climate could complicate a business growth strategy that increasingly relies on an emerging economy to both supply inputs and buy goods and services. More frequent and volatile extreme weather events in that country could trigger supply-chain disruptions, reduce customer growth prospects, and shift customer preferences.

2.2 UNDERSTANDING CURRENT AWARENESS OF RISKS AND OPPORTUNITIES

To understand business engagement in climate change adaptation in Canada, we analyzed two information sources on businesses' perceived exposure to risks and opportunities from the physical impacts of climate change.

FIRST, we looked at publicly available responses by Canadian businesses to the Investor Carbon Disclosure Project (CDP) from 2003 to 2010.[b] The CDP survey targets the largest businesses in terms of market capitalization. Its completion is voluntary, garnering an overall response rate of about 46% in 2010, with 37% of responses available to the public.

SECOND, we reviewed annual securities filings by 35 Canadian businesses across seven industries (chemicals and fertilizers, insurance, oil and gas, paper and forest products, pipelines, transportation, and utilities) with upward of $1 billion in market capitalization for 2008 and 2010. Publicly traded companies in Canada have long been required to disclose information that may be material to investors (i.e., information that a "reasonable investor" would consider in evaluating a business's position). To explore whether Canadian companies see material risks stemming from the physical impacts of climate change, we assessed annual reports and annual information forms, including Management's Discussion and Analysis (MD&A), as filed on the information system developed for Canadian Securities Administrators.[c]

b The Carbon Disclosure Project (CDP) is an international effort to track corporate progress on managing climate change risks and opportunities. Relying on voluntary responses to an annual survey of open-ended questions to large corporations, the CDP has amassed an extensive database of business responses since 2003. The NRT analysed 392 publicly available survey responses including 75 responses from 2010. The complete analysis is available upon request (Wellstead 2011).

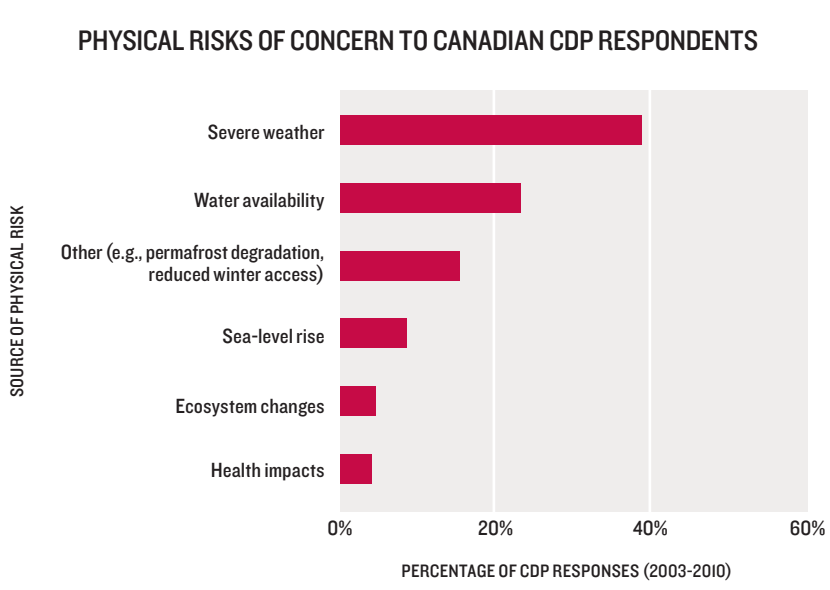
c Report available upon request (Ceres and Climate Change Lawyers Network 2012).

THIS IS WHAT WE FOUND:

Canadian firms have a growing appreciation of the potential risks to their business from the physical impacts of climate change. Our analysis of CDP responses reveals that in 2003, 17% of Canadian businesses responding to the survey identified a perceived exposure to the physical impacts of climate change; however, by 2010, 56% of respondents said they were exposed to these risks.

The most commonly identified risk is severe weather. By aggregating responses across all CDP survey years, and thereby smoothing out response variability over time, we were able to take a look at the kinds of physical impacts of concern to businesses. Firms are clearly aware of the potential for more frequent and severe weather events to damage existing infrastructure, facilities, or capital equipment, with 39% of respondents mentioning severe weather events as a risk to them. The impacts of potential shifts in run-off and precipitation patterns (23%) also receive relatively frequent mention. **Figure 1** shows the types of impacts businesses are most concerned with, according to our CDP analysis.

FIGURE 1



SOURCE: NATIONAL ROUND TABLE ON THE ENVIRONMENT AND THE ECONOMY (WELLSTEAD 2011)

Businesses also see opportunities arising from the physical impacts of climate change. Identification of opportunities has grown between 2003 and 2010, and responses pooled over the eight-year period of analysis let us shed light on whether and how Canadian businesses perceive opportunities in a changing climate. Overall, 38% of Canadian CDP responses indicated the potential for opportunities to arise, mostly stemming from lower production costs, increased demand for goods or services, or reduced competition with respect to existing lines of business. Far fewer mentioned business opportunities related to new product areas and services, but those that did mainly pointed to new financial products and resource development opportunities in the Arctic. Perceived opportunities have shifted over time: in 2003, no Canadian businesses identified opportunities related to the physical impacts of climate change; but by 2010, 43% did.

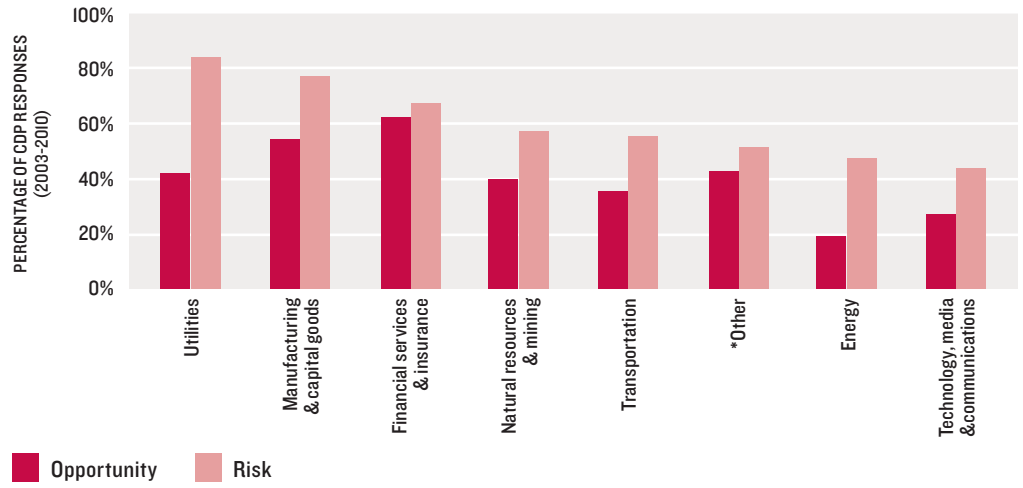
Perceptions of a changing climate as a source of risk or opportunity differ by industry sector. **Figure 2** shows the extent to which businesses see risk or opportunity from the physical impacts of climate change by industry sector, according to their CDP responses. For the most part, a changing climate represents to businesses a source of downside risk more so than opportunity. This is particularly the case for utilities, energy, manufacturing and capital goods, and transportation sectors where perceptions of risk outweigh opportunities by 20 percentage points or more. The financial services and insurance sector is the most likely to perceive opportunities related to the physical impacts of climate change. The three most represented sectors in the Canadian CDP responses are energy, financial services and insurance, and natural resources and mining. Here we offer general observations on each:

// FINANCIAL SERVICES AND INSURANCE: Banks and financial services firms tended to report both high levels of perceived risk (including types of risk rarely mentioned by other sectors) and high levels of perceived opportunity. CDP responses from this sector were the most comprehensive and thorough: they identified and discussed a range of risks and impacts and described their business implications.

// NATURAL RESOURCES AND MINING: Businesses' responses in this sector reflected a moderate concern and attention to both risks and potential opportunities. These businesses were more likely to express specific issues arising from physical changes, such as impacts on international supply chains or impacts on foreign operations, reduced or limited access to facilities due to unreliable use of winter roads or routes, and potential opportunities in a warming Arctic.

// ENERGY: Businesses in this sector were the least likely to report possible opportunities arising from climate change and the second least likely to report exposure to physical risks of all the sectors. It was not uncommon for energy firms to register the significance of physical climate change risks lower than the risks posed by GHG emissions mitigation policy.

FIGURE 2



*OTHER INCLUDES COMMERCIAL SERVICES AND SUPPLIES; CONSUMER SERVICES; FOOD AND STAPLES RETAILING; FOOD, BEVERAGE AND TOBACCO, RETAILING; REAL ESTATE; AND PHARMACEUTICALS, BIOTECHNOLOGY AND THE LIFE SCIENCES.

SOURCE: NATIONAL ROUND TABLE ON THE ENVIRONMENT AND THE ECONOMY (WELLSTEAD 2011)

For the most part, the physical impacts of climate change do not register as material risks. Compared to 2008 securities filings, disclosure rates of risks related to a changing climate in 2010 show some improvement for utilities and transportation. Still, disclosure rates and quality continue to be limited: the analysis of 35 annual securities filings yielded few examples of material risks presented by a changing climate.[d] Three material risks were identified: potential damage to electricity generation facilities and revenue losses linked to shifts in water flows and wind patterns; disruption to rail operations, infrastructure and properties, and adverse impact on financial position and liquidity related to more frequent severe weather events; and threats to operations through storm-water flooding. Some businesses in the pipelines, chemicals and fertilizers, and utilities sectors disclose material risks to their business posed by severe weather, water availability and quality, and seasonality (a source of operational risk), but not in the context of a changing climate. Remarkably, insurance businesses provide no disclosure of how a changing climate could present material risks.

Businesses tend to provide much more information on how climate change could affect them in voluntary reports than in their mandatory securities filings. This finding comes from a comparative analysis of the 35 companies' securities filings for 2010 with their CDP responses, when available. For example, companies in the chemicals and fertilizer sector provide little to no acknowledgement of risks from the physical impacts of climate change in mandatory filings yet describe the potential for sea-level rise to disrupt transportation logistics and port access in addition to longer growing seasons in certain

d The sample size of 35 was enough for the Ontario Securities Commission to assess environmental reporting of Ontario issuers in 2007 and conclude that climate change disclosure was largely boilerplate and insufficient (National Instrument 51-716).

markets in their CDP responses. Oil and gas companies discuss risks from physical impacts such as shifts in water availability, shorter windows of opportunity for production or exploration in "winter access" areas, and warmer air temperatures affecting the efficient operation of equipment, but only in response to the CDP questionnaire.

2.3 EXPLORING BARRIERS TO TARGETED ACTION

Business awareness of the risks and opportunities posed by climate change is growing world-wide, but concrete efforts to systematically and explicitly integrate these risks into business planning, practices, and investments is less apparent.[15] In 2009, for example, Acclimatise concluded that the largest U.K. businesses had not yet adjusted their business risk governance systems to enable preparedness for future physical impacts.[16] More recently, analysis of global CDP responses by the Organisation for Economic Co-operation and Development revealed that fewer than one in ten businesses aware of risks and opportunities from a changing climate were managing them.[17]

To examine the situation in Canada, we conducted 27 semi-structured interviews with businesses and industry associations across ten industry sectors.[e] We acknowledge that the sample size and self-selection in interview participation makes our findings indicative rather than representative of Canadian business views. However, these interviews, combined with our CDP and financial disclosure analysis, as well as discussions at stakeholder sessions lead to these observations:[f]

Some confuse GHG emissions mitigation, adapting to GHG emissions mitigation policy, and adapting to future climate. Businesses demonstrate a clear understanding of the importance of mitigation, and are adept at reporting efforts to achieve emissions reductions and energy efficiencies. In contrast, some confusion exists about what "adaptation" is. We noted instances in which businesses included adapting to a changing energy landscape and emissions reductions requirements in their definition. A 2009 survey by Natural Resources Canada noted that of roughly 40% of businesses claiming to be taking measures to adapt, 73% of them described mitigation actions and only 18% described adaptation actions.[g,18]

Businesses routinely adapt to severe weather events but the extent of action to adapt to longer-term and gradual impacts of climate change is unclear. Outside of a few "climate-sensitive" industry sectors, such as forestry, agriculture, and tourism, a dominant perception is that climate change impacts are an extension of those related to severe weather, and that these impacts are familiar and manageable. Our interpretation of these views is that businesses' consideration of risks from climate change is incomplete.

e Report available upon request (Deloitte 2011).

f Observation about the extent and quality of private-sector action on adaptation could understate actual levels of engagement. Firms tend to want to preserve the confidentiality of their climate change risk assessment and management activities. Some perceive risk disclosure as a competitive disadvantage. Others are concerned about disclosure of climate change risks to shareholders. Still others are concerned that stakeholders might interpret a public position on climate change adaptation as a cavalier attitude toward GHG emissions mitigation. The inseparability of adaptation from good risk management also presents challenges in drawing conclusions about the business adaptation.

g This sample size yields results that are accurate to within 5.6% 19 times out of 20. Businesses surveyed were primarily those seen as highly exposed to climate change including the resource sectors, tourism, and transportation so the survey is not representative of all Canadian businesses.

It's possible that they do not fully understand the risks accruing from gradual changes in climate conditions, from impacts beyond the "factory walls" such as supply chain interruptions, or from the adaptive responses of the financial sector that include adjustments in insurance coverage and affordability. Interviewees representing agriculture, forestry and tourism sectors, in contrast, indicated that future climate change could lead to substantial transformation for their industries. One emphasized that "adaptation will eclipse any discussion about emissions mitigation — it will become *the* policy issue within the next three-to-five years."[19]

Costs and uncertainty make transforming core practices and business strategy in anticipation of future impacts hard to justify. It's evident that businesses fail to grasp the value of making adjustments and investments today to foster resilience to impacts that may or may not materialize in the long term, even when that same corporation would benefit from these adjustments. One interviewee summarized the challenge of making the decision to adjust core practices and business strategy as follows: "It is difficult to plan for risks that are 20 to 40 years out and even harder to justify spending money now on risks that people don't understand."[20] Stakeholder discussions reinforced this sentiment by highlighting difficulties in translating data and information on climate change and its impacts into economic risks and opportunities for a given firm.

A reactive approach — that is, adjusting as physical impacts of climate change occur — is seen as sufficient. A common view is that climate change is one type of business risk, managed like any other through existing corporate risk management and business continuity practices. Not only is the perception that existing management systems are sufficient to manage risks related to climate change, but also that business can handle slow, gradual changes by adjusting practices incrementally — just as it has always done with any type of change or new risk. Some businesses view gradual, creeping changes like the entrance of invasive species, shifting agricultural growing zones, sea-level rise, and declining water flows as too distant in time to worry about within current business planning. Our CDP analysis also confirmed this by revealing few instances of Canadian businesses reporting that they developed or adjusted plans to specifically address increasing risks associated with a changing climate. And the situation was similar for responding to opportunities: while over a third of the total survey responses indicated that firms perceived potential business opportunities related to the physical impacts of climate change, few businesses indicated that they were engaged in business planning activities specifically focused on seizing these opportunities.

2.4 BUILDING A BUSINESS CASE

The effects of a changing climate are already evident in Canada and globally, and all firms — regardless of sector, location, and size — face both direct and indirect impacts to their business. Changing climate conditions and the resulting physical impacts (e.g., reduced water availability in some regions) can affect businesses' financial, operational, environmental, and social performance. Businesses that proactively plan for a changing climate can avoid many of the worst effects of climate change and take advantage of opportunities.

The business case for each firm depends on a host of variables. For example, for Entergy, an electric utility that operates in the hurricane-prone U.S. Gulf Coast, the case for action hinges on preserving its customer base, the well-being of its employees and communities in which it operates, and billions of dollars in investment.[21]

However, *an overall* business case for acting in anticipation of impacts to come is clear for a number of reasons:

// **THE CLIMATE IS ALREADY CHANGING; SOCIETY MUST ADAPT.** Previous reports in the NRT's *Climate Prosperity* series have clearly articulated that Canada and the world face continuing unavoidable change in climate conditions. Even if the world drastically decreases greenhouse gas emissions immediately, our environment, society and economy will need to cope with a changing climate for many decades as a result of emissions we have already put into the atmosphere. And, since reducing GHG emissions today will limit the speed and scale of climate change in the future, governments, communities, businesses, and households alike must take action to both adapt to the consequences of climate change already locked in and reduce future GHG emissions.

// **BUSINESSES STAND TO BE DIRECTLY IMPACTED.** Assets and supply chains, the health and safety of their employees, and the communities and environments in which they operate could all be affected.[22] Some businesses are particularly vulnerable. These include firms that undertake activities sensitive to prevailing weather and climate, have complex supply chains, rely on long-lived fixed assets, or operate in environments that are at (or near) climate thresholds and transition zones (e.g., regions underlain by discontinuous permafrost). In a world of increasingly volatile weather, warmer temperatures, and shifting precipitation patterns, infrastructure and capital assets built to operate within design criteria and margins based on past climate conditions are at risk of failure. The impacts of climate change could increase the frequency by which design, operation, and safety thresholds are exceeded, imposing costs through maintenance and repairs, shortened asset lifespans, early decommissioning, or additional capital investment for new assets that may be necessary.

// **BUSINESSES WILL ALSO FACE INDIRECT IMPACTS.** Non-market forces such as policy and regulation and the activities of interest groups will significantly alter how businesses operate. The indirect impacts of climate change across businesses' value chains are hard to ignore. Assessing the potential impacts of a changing climate for a business includes taking into account the position being adopted by investors, lenders, shareholders, insurers, and external partners like governments and communities. Stakeholder perceptions and expectations are likely to influence a business's licence to operate and the regulatory environment, together with their reputation. A report by four institutional investors focusing on four climate-sensitive investment sectors stated that "climate change is now recognized as one of the most serious long-term challenges facing the investment community."[23] Some institutional investors have taken notice of these potential impacts on corporate value and actively encourage businesses to assess and disclose risks and opportunities of a changing climate as part of business strategy.[24]

// **EARLY ACTION CAN BRING TANGIBLE BENEFITS.** Businesses that move quickly to assess and manage the risks and opportunities of changing weather and climate can save money and position themselves to address evolving stakeholder expectations. Our recent NRT report *Paying the Price: The Economic Impacts of Climate Change for Canada* concluded that climate change could impose high costs on Canada and that small investments in adaptive measures could yield large savings.[25] The benefits of adaptation are local, often accruing primarily to those fronting the costs.

In many cases, deferring adaptation, waiting for more and better information on future impacts, and relying on just-in-time solutions is more costly than taking a proactive stance.[26] First, it's often cheaper to incorporate climate change into capital investments upfront than to retrofit later. Second, building internal capacity to deal with climate change takes time. Developing the human resources, governance, and skills to effectively manage new challenges cannot be done overnight. Third, reacting with one-off adaptation actions to weather or climate events leaves businesses exposed to long-term shifts. Fourth, technology needs to be built over time; the "solutions" to all of our adaptation problems aren't readily available on the market. Finally, investments to manage business risks from a changing climate can reduce businesses' vulnerability to current weather, water, and other environmental risks.

// **CLIMATE CHANGE ADAPTATION DOESN'T HAVE TO BE COMPLEX OR COSTLY.** By integrating risks from climate change alongside other business risks, firms can build on existing expertise in their organization — among sustainability, procurement, business continuity, and environmental managers — and embed adaptation thinking within existing management systems. Several low and no-cost measures can be taken to improve the performance of infrastructure and assets as well as save businesses money. To deal with rising flood risks, for example, businesses can re-locate critical equipment and objects of high financial value to upper floors or higher elevation. Water efficiency measures are a low-cost response to seasonal water stress. Natural ventilation and shading offer a cheap solution for businesses in cities exposed to extreme heat, with the added benefit of conserving energy.

// **FIRST MOVERS WILL GAIN A COMPETITIVE EDGE.** A changing climate presents commercial opportunities for businesses[27] — opportunities to access new markets, develop new technologies and products, and stay ahead of regulation. These can be a source of competitive advantage — or disadvantage if a competitor gets there first. Businesses that are able to supply climate-sensitive goods (e.g., by growing crops that are less viable elsewhere) or that have adjusted their planning and decision-making processes with climate change can gain a competitive advantage.

2.5 KNOWING THE MOTIVATIONS FOR ACTION

As private-sector engagement on climate change adaptation is in its early stages, learning from the experiences of businesses already implementing strategies to prepare for future physical impacts is key. Direct dialogue with businesses is necessary to understand motivations, barriers, and enablers. From our thirteen case studies, we conclude that four factors stand out as motivations to adapt to climate change today.[h] These are entry points for governments and other actors seeking to engage business on the issue.

// **SEEING IMPACTS FIRST-HAND:** Many "early adapters" have experienced the impacts of climate change first-hand. When those impacts are costly or tarnish a firm's brand and reputation, businesses tend to prioritize adaptation. First-hand experience transforms the issue of climate change from an abstract, distant problem to a real, imminent risk to performance and operations.

// **UNDERSTANDING THE CONNECTION BETWEEN PHYSICAL IMPACTS AND BUSINESS SUCCESS:** Early adapters understand how direct and indirect impacts of climate change affect businesses' ability to meet certain objectives, be they financial targets, service level agreements, fiduciary responsibilities, or professional standards. Thus, an understanding of these interactions tends to be a pre-condition to taking the issue seriously.

// **TUNING IN TO STAKEHOLDERS:** Businesses that understand sustainability as a business imperative recognize climate change adaptation as a business performance issue. Forward-looking businesses are attuned to emerging global trends like heightened levels of scrutiny by investors, governments, banks, insurers, and NGOs regarding business climate change risk management and adaptation.[i] The potential for climate change to create or exacerbate tensions that lead to reputational damage, through impacts on the environment and local communities, is also a consideration. Businesses located in resilient communities will face fewer climate-related business disruptions caused by employee absences and interruptions in local supply chains.[28]

h The full case studies are available for download from nrtee-trnee.gc.ca

i An example of the ascendance of adaptation as a policy and economic issue on the global stage is the World Economic Forum's 2012 Global Risks Report. It highlights the failure of climate change adaptation as one of the most likely and impactful risks facing governments and businesses globally (World Economic Forum 2012).

// **EMPLOYING GOOD RISK MANAGEMENT:** Distinguishing climate change adaptation from overall business risk management is often difficult. The distinction is artificial or arbitrary because firms view risks from climate change alongside other business risks. Adapting to climate change will require changes in the way firms do business, but firms with strong risk-management cultures are well positioned to implement adaptive measures that further enhance business risk management. The inseparability of adaptation and risk management also means that tracking private-sector progress in adapting to climate change will not be easy.

In addition to the four motivations of relevance today, another four loom on the horizon. These external pressures are likely to increase the uptake of adaptation in the future.

// **REGULATION, LEGISLATION, AND STANDARDS:** Some countries have introduced requirements to integrate climate change risk and adaptation within business planning and projects.[29] Codes, standards, and guidelines shaping professional practice are beginning to embed future expectations of climate change to encourage behavioural change.[30]

// **LEGAL LIABILITY:** Legal professionals are beginning to consider risks from changing climate as "reasonably foreseeable." Individuals with fiduciary responsibilities (e.g., company directors, trustees) and professional advisors (e.g., engineers, environmental and social impact consultants) may be failing in their duties if they do not proactively consider and disclose such risks.[31] Although case law does not yet exist, litigation or the threat of litigation based on negligence or nuisance charges, for example, could drive adaptation.

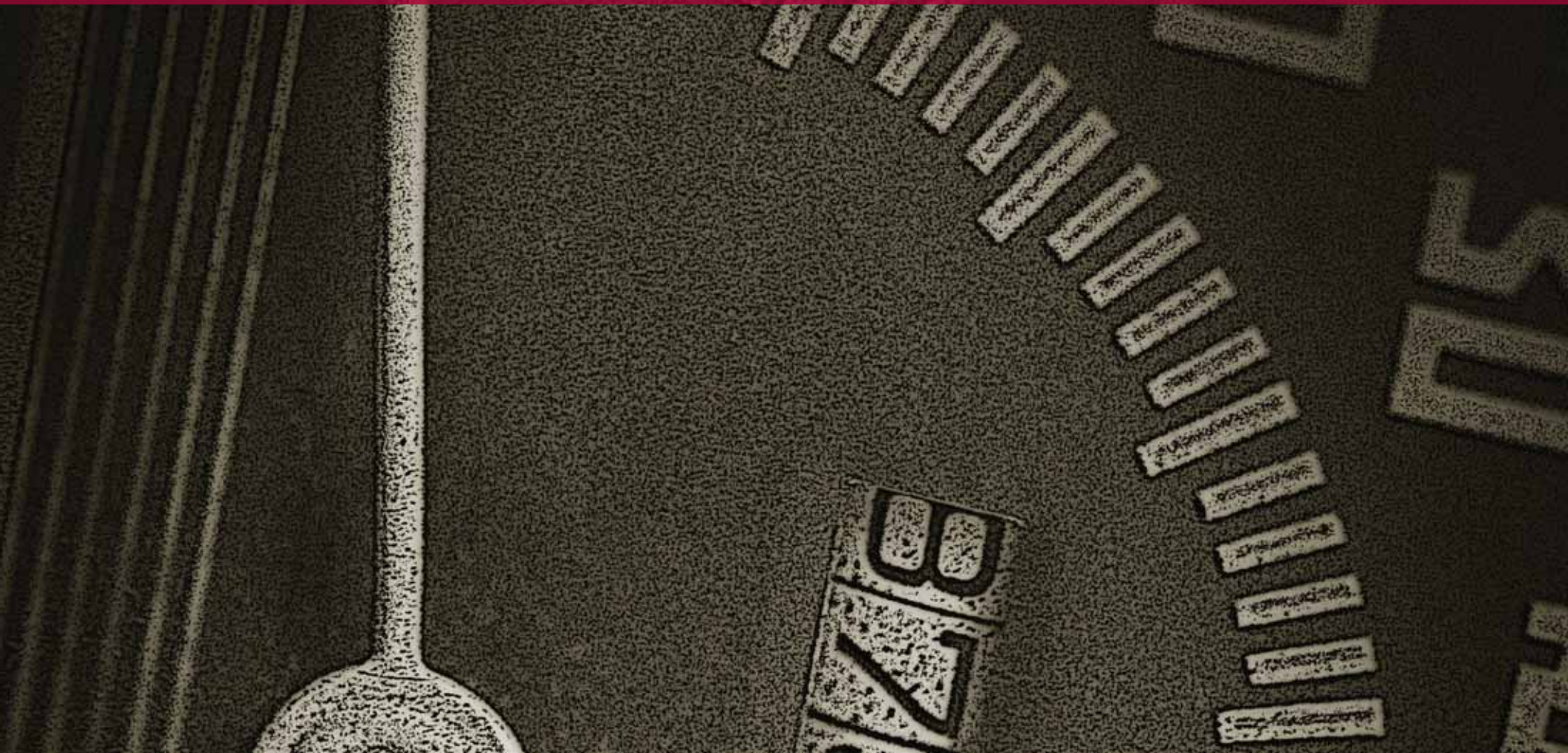
// **INSURANCE PRICING AND AVAILABILITY:** Global insured losses have increased roughly five-fold since 1980, with climate trends partly to blame.[32] A rise in claims often means a rise in insurance premiums, affecting businesses' bottom-line. Insurers may also stop covering certain perils in high-risk areas.[33] The threat of this removal provides an incentive for society to take adaptive measures at large, so as to maintain affordability and availability of coverage. Businesses that take adaptive measure to reduce their exposure could see lower insurance costs relative to competitors'.

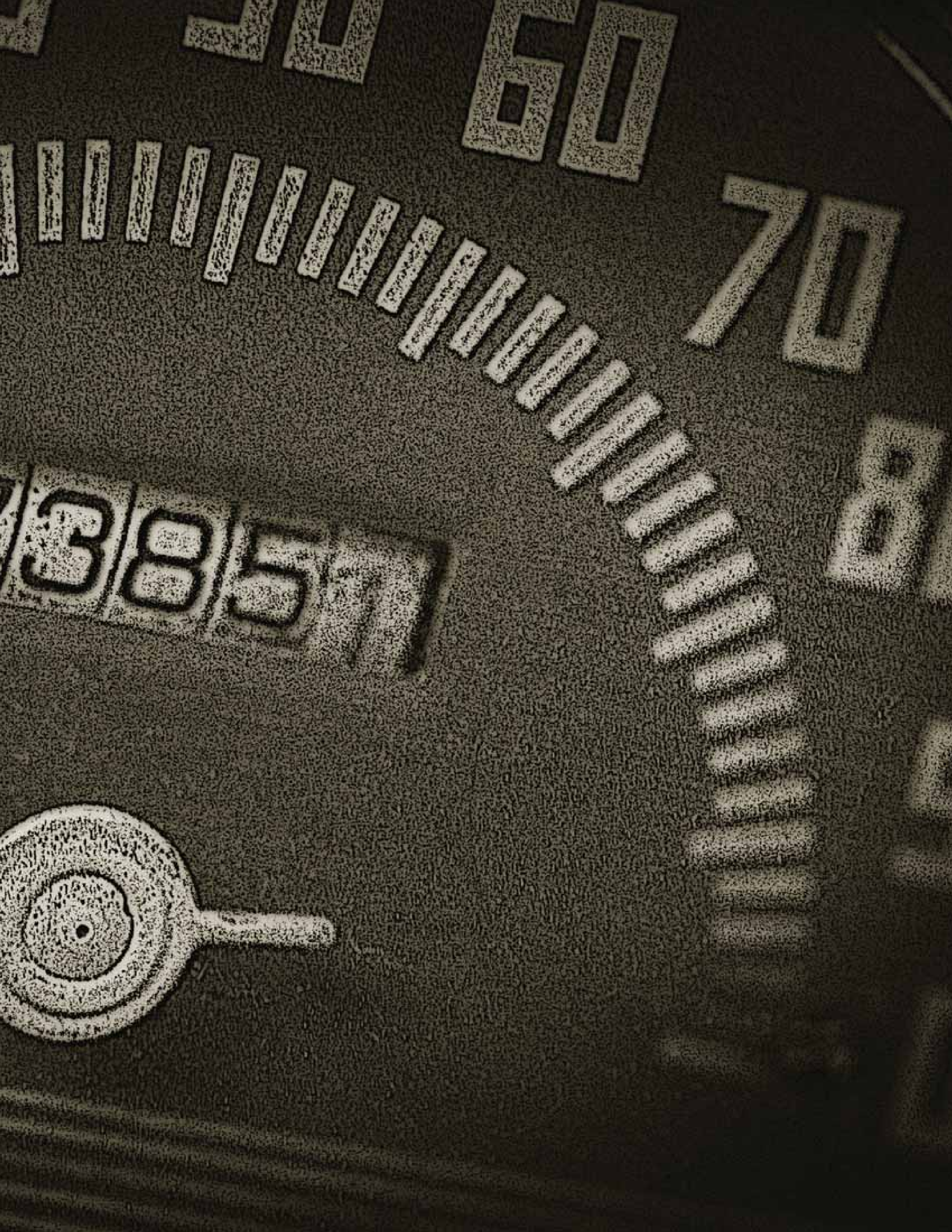
// **ACCESS TO CAPITAL:** To date, short time horizons for investor decisions and a focus on regulatory risk from GHG emissions mitigation policy have limited investor pressures relating to climate change risk, putting a premium on adaptive measures with short payback periods. That might soon change. In 2010, 78% of North American asset managers responding to an international survey claimed to have considered the physical impacts of climate change in their investment decisions.[34] Lending institutions are also beginning to integrate climate change impacts into credit risk analysis and updating their due diligence procedures accordingly.[35]

AN ADAPTATION DASHBOARD

FOR BUSINESS SUCCESS

// CHAPTER 3.0

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3.0 // AN ADAPTATION DASHBOARD FOR BUSINESS SUCCESS

3.1 // THE NRT DASHBOARD

3.2 // RAISE AWARENESS

3.3 // ASSESS AND MANAGE RISKS AND OPPORTUNITIES

3.4 // BUILD CLIMATE RESILIENCE ACROSS THE ENTERPRISE

3.5 // WORK IN PARTNERSHIP

3.6 // STRATEGIES FOR SMALL-AND MID-SIZED ENTERPRISES

3.0 AN ADAPTATION DASHBOARD FOR BUSINESS SUCCESS

Business success in a changing climate is about foresight and flexibility. It's also about making smart decisions under uncertainty. Lessons from NRT case studies and other sources show how businesses are taking action.

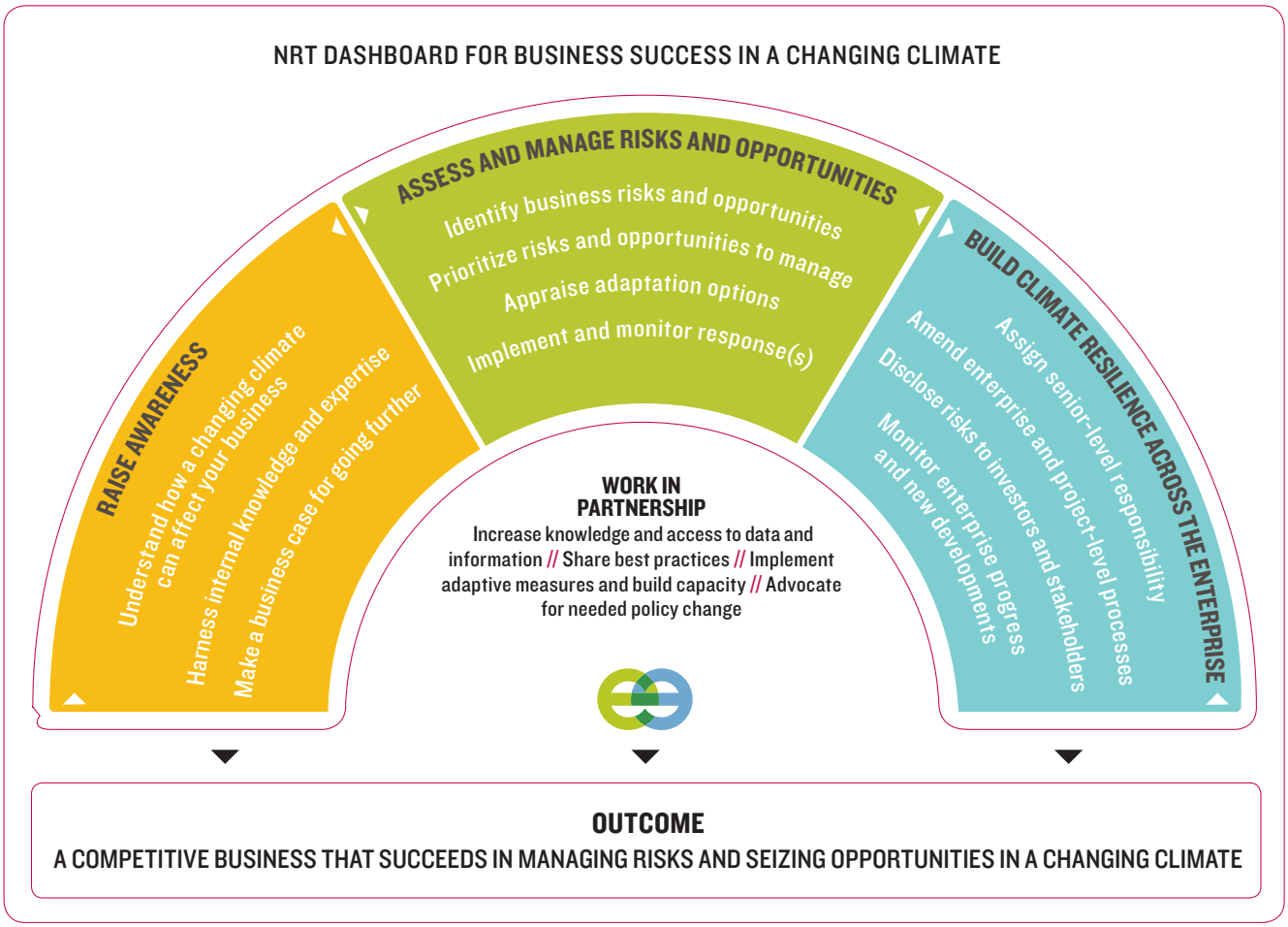
Despite a strong theoretical case for adaptation, preparing for future impacts is not common practice. Even getting started can be overwhelming for some, especially when "they don't know what they don't know." The challenge is particularly acute for small- and medium-sized businesses with limited resources to direct to the issue. So, what steps can and should Canadian businesses take to reduce risks and seize opportunities in a changing climate? What are the benefits? This chapter showcases a framework for business success in a changing climate, sourced mainly from NRT's case study research.

3.1 THE NRT DASHBOARD

In a changing climate, businesses that routinely incorporate climate change impacts and adaptation in major investment decisions and in decisions with long-term consequences will be better off than their competitors. **Figure 3** sets out a dashboard for business success in a changing climate broken down into three phases. Because the range of changes in climatic variables and the resulting physical impacts (and in turn the range of possible business impacts) is broad, businesses first need to understand how shifts in climate conditions — both average and extreme — affect them. To prioritize actions, businesses move on to assessing specific risks and opportunities, as well as options to manage them, and then on to implementation. A further phase is then to integrate climate resilience across the organization — from the boardroom to the copy room.

The dashboard in **Figure 3** is not prescriptive. The "right" strategy for a firm will depend on risk exposure and a host of firm-specific factors, including capacity, risk tolerance, and current knowledge of problems and solutions. Some businesses may undertake all the steps laid out below, others will instead focus on a few.

FIGURE 3



3.2 RAISE AWARENESS

Understand how a changing climate can affect your business

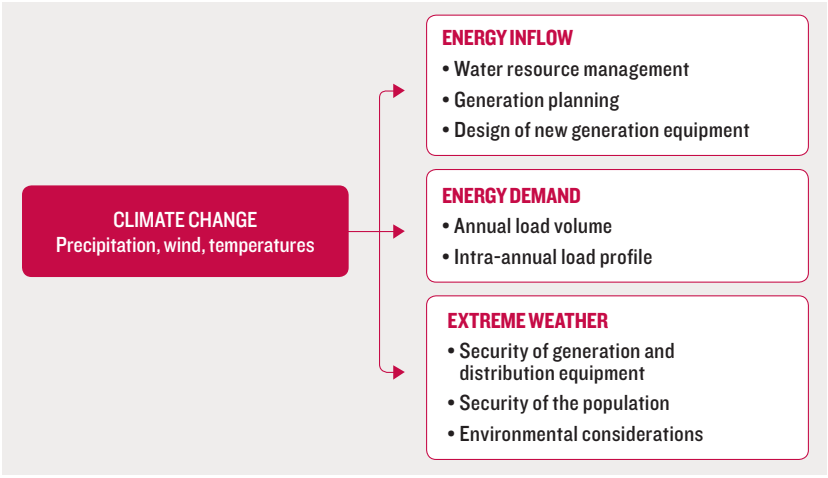
Several aspects of business are sensitive to changes in climate conditions and other environmental factors influenced by climate. It's important to map out just what those aspects could be. A high-level scan of regional climate projections and research on climate change impacts published by governments, research organizations, and others can help identify the climatic shifts and resulting impacts (both positive and negative) anticipated in regions where the business operates.[j]

j Appendix 6.2 lists resources to help with this step.

Hydro-Québec has developed a comprehensive program to tackle climate change. The firm started by identifying areas of activity that were sensitive to changing climate conditions, based on consultation with staff from different divisions. Figure 4 shows some of the areas identified.[k]

FIGURE 4

EXAMPLES OF SENSITIVITY OF HYDRO-QUÉBEC TO CLIMATE CHANGE



The scan should look beyond the "factory walls," to encompass the regions where upstream suppliers and downstream customers are based, as well as the corridors through which products and services move.

Firms should look backward to identify the business impacts of previous climate-related events likely to increase in frequency and intensity in a changing climate (e.g., storms, droughts, unusually hot or unusually cold seasons) and create an inventory of impacts, responses deployed, and their effectiveness.

J.D. Irving Limited, a wood products manufacturer operating in Eastern Canada and Maine, has already noted changes to winter harvesting due to milder winters and an earlier spring season. To minimize ecological disturbance, the company relies on frozen soils to access its considerable timber holdings. But this is made more challenging in a climate with a shorter window of opportunity to take advantage of seasonal ground ice. J.D. Irving Limited believes that site-by-site decision making lies at the forefront of climate change adaptation strategies for forest management. Using appropriate harvest methods across forest types is an integral part of forest operations.

k Unless otherwise noted, all corporate examples are taken from *NRT's Facing the Elements: Building Business Resilience in a Changing Climate - Case Studies Report*. The extracts in this Advisory Report are direct citations or paraphrasing.

Harness internal knowledge and expertise

Coming up with a business response to climate change has tended to be a task, at least initially, for environmental sustainability or corporate social responsibility officers. However, climate change impacts can have far-reaching consequences for businesses and therefore for employees across operations, legal, and finance units, to name a few. A changing climate could pose operational risks to the business, by, for example, increasing the scarcity of a resource that is an input to production. Legal liability risks could arise from climate-related damages to local communities. Gradual changes in climate variables and the physical impacts that flow from them can affect a business's long-term financial performance and, if that's the case, merit disclosure to investors.

By pooling knowledge and sharing expertise across business units, firms can develop a good picture of the links between climate change impacts and business objectives. Formal working groups, focused workshops, and information sharing through web-based platforms, are all examples of mechanisms to bring together a firm's intellectual capital. Cultivating ownership of the adaptation challenge and developing a shared "climate change story" are additional benefits of prompt engagement across the organization. An early step is to ensure all participants have a solid understanding of the difference between adaptation and GHG emissions mitigation.[36]

Buy-in at senior levels can make or break an initiative that aims to build business capacity to do things differently. Early engagement of senior management can add perspective to the discussion and lead to issue-championing around the executive and board tables.

Cameco, a global uranium producer based in Saskatchewan, created an Environmental Leadership team in 2006, part of a concerted effort to become a forerunner in understanding and managing the environmental issues facing the industry. This team's mandate includes scanning and studying environmental challenges that have the potential to become company liabilities and assessing whether they warrant inclusion in the corporate risk register. The physical impacts of a changing climate were identified as a potential company risk issue. As a first step, the Environmental Leadership team conducted a climate change risk assessment using a well-known framework for adaptation decision making in the context of uncertainty, which was developed by the UK Climate Impacts Programme.[37] The team looked at the implications of climate change for the company as a whole and for three specific sites (a uranium mill in Saskatchewan, a uranium refinery in Ontario, and a mining operation in Kazakhstan). Four working groups with staff from different divisions of the company considered a broad range of climate change risks and opportunities, including the potential need for higher amounts of cooling water, increased fire risk, higher road maintenance costs, and possible supply chain disruptions. This process provided senior management with confidence that no hidden liabilities exist because of climate change and helped the company improve its communication with stakeholders on climate change risks and opportunities.

Make a business case for going further

The case for allocating scarce human and financial resources to assessing and managing risks and opportunities of climate change can be a tough sell: the perception looms large that up-front costs are high and payback is uncertain and long-term.

Articulating a business case, therefore, is a key early step. This is easier to do for businesses that have suffered recent, costly climate-related damages, particularly if brand and reputation issues were at stake. Businesses interested in taking a proactive stance can also cite experiences of competitors that have taken a hit due to recent extreme weather events.[l]

Firms can also use the generic business case presented in Chapter 2 to develop their own. It should identify vulnerabilities to current climate-related events, highlight the direct impacts the business could face due to inevitable climate change already underway and from future climate change, consider stakeholder positions shaping business reputation and licence to operate, point to the immediate and long-term benefits of investments in adaptation, show that there are simple and inexpensive ways to adapt, and finally highlight commercial opportunities in adaptation that first-movers can exploit.

Prompted by a study on the impacts of climate change on investment drivers, a group of investors asked an international extractive company about its climate risk-management practices. In turn, this led the extractive company to seek assistance from a specialized climate risk consultancy to undertake a high-level risk assessment, develop a strategic framework, and estimate the costs of climate change risks out to the 2020s and 2050s.[38]

3.3 ASSESS AND MANAGE RISKS AND OPPORTUNITIES

Identify business risks and opportunities

The point of phase one is to gather basic information and intelligence on the possible implications of climate change for the business and to start building capacity and buy-in across the enterprise. This second phase involves a detailed assessment of the risks and opportunities for the business, and organizing this assessment along the following five areas is a good place to start.[m] Firms can also scope their assessment down to a specific component of the business's operations that is critical to the bottom line or to a specific geographic site, for example. Starting small has the advantage of learning-by-doing without huge outlays in resources.[39]

l Although no single extreme weather event can be attributed to climate change, business impacts of extreme weather events highlight exposure to current climate conditions, which could grow as climate conditions shift.

m The categories we present more or less align with the themes covered in the UK Climate Impacts Programme's risk assessments (UK Climate Impacts Programme 2010c; Willows and Connell 2003). It also makes sense to use categories embedded in firms' existing management systems.

// SITE CONDITIONS, PHYSICAL ASSETS, AND INFRASTRUCTURE. Climate change impacts could positively or negatively affect the suitability and performance of operation sites, physical assets, and privately owned infrastructure. For example, permafrost degradation could increase the operating costs of northern resource extraction sites. Machinery and buildings could underperform in warmer and wetter conditions. More volatile weather and more frequent freeze-thaw cycles may alter infrastructure repair and upgrade schedules.

For **Whistler Blackcomb** — a ski resort in British Columbia — taking stock of future snow conditions and their bottom-line implications was the first step in developing a climate change strategy. The resort combined data from the Intergovernmental Panel on Climate Change (IPCC) that projected a 120 m-snowline rise per degree Celsius of warming and a scenario-based approach for the assessment. The resort determined it could withstand the financial consequences of an increase in global average temperatures between 2 and 3.5°C this century over 1980–1999 levels. This kind of information helps the company to avoid over-adapting, given that some climate risk-management measures (e.g. snow-making machines) are costly.

// PROCESSES AND WORKFORCE. Climate conditions and climate hazards can influence industrial processes and workforce safety and productivity. Rising stream temperatures will hinder energy producers' efforts to cool generation plants. Construction businesses, however, could benefit from a longer ground-ice free season. Storms and other weather extremes contribute to employee absenteeism. In a changing climate, outdoor workers could be less exposed to cold-weather hazards but more exposed to excessive heat.

// RAW MATERIALS, SUPPLY CHAINS, AND LOGISTICS. Rising numbers of extreme weather events and gradual shifts in climate will create winners and losers by disrupting flows of raw materials (like water and fibre) and products and services across supply chains. In a global economy, climate-related events abroad cause ripple effects domestically: a hurricane along the U.S. Eastern Seaboard can shut down a supplier's plant in Southern Ontario. Commercial opportunities are also apparent: Canadian logistics businesses can move quickly to become leading providers of supply chain management solutions.

Coca-Cola — Water is the main ingredient in Coca-Cola drinks. The impacts of climate change on water availability, therefore, represent a key business risk for the company globally. Coca-Cola is taking steps to ensure reliable supply of this valued input. All Coca-Cola manufacturing plants, including Canadian facilities, must complete a Source Water Vulnerability Assessment and prepare and implement a Source Water Protection Plan. These assessments include assumptions about the impacts of future climate change alongside assumptions about infrastructure pressure, pricing, drought, competing use, consumer demand, regulatory limits, and social acceptance. Coca-Cola's efforts to protect the supply of water and demonstrate good corporate citizenship have the benefit of safeguarding competitiveness.

// PRODUCTS, SERVICES, AND MARKETS. A changing climate and responses to it could shift demand for the products and services the business provides.[n] A rise in demand for engineering services and changing patterns of summer and winter demand for power are just two examples.

Munich Re — a global reinsurance group based in Germany — is meeting the growing demand for risk transfer options related to climate change with new insurance products. For example, it now offers coverage to solar electric producers to insure against revenue losses due to poor sunlight conditions.

Hydro-Québec anticipates annual energy savings of 2 TWh by 2050 due to warmer temperatures and reduced heating needs in the region. The utility's 2008 demand forecast included a potential decrease in energy requirements by almost 0.5% per year resulting from lower heating needs. Using climate and hydrological models, the utility also forecast a 1.0% drop in peak loads. The revised demand forecasts informed Hydro-Québec's annual tariffs and its 10-year Procurement Plan, both of which received regulatory approval.

// REGULATORY RISKS, CHANGING STANDARDS, AND BUSINESS REPUTATION. As awareness of climate change impacts becomes widespread, businesses in highly regulated sectors, such as energy and telecommunications, will see increased demand for assessment and disclosure of risks from climate change and actions to manage them. Governments, multi-lateral agencies, and professional bodies may also create new regulation and performance standards to this effect, tapping into the expertise of engineers and other professionals. Businesses' reputations could suffer if stakeholders perceive them to be lagging or negligent on the issue. This provides a good incentive for businesses to work with stakeholders on shared adaptation challenges.

EBA Engineering Consultants Ltd. — an Alberta-based firm that offers planning, design, regulatory permitting, and project management services for mining, energy, transportation, and infrastructure development — is renowned for its engineering expertise in areas of permafrost, ice, and winter conditions. EBA's professionals have developed innovative engineering methodologies and technical solutions to manage climate variability and long-term changes in the North, creating opportunities for EBA to lend expertise to climate change adaptation projects and support the development of standards for building infrastructure in permafrost.

n A changing climate, and related physical and social impacts, could very well trigger temporary or permanent displacement of people and communities away from places that have become inhospitable (UNEP 2012), potentially resulting in market dislocations.

Prioritize risks and opportunities to manage

After completing a high-level scan, a business can then triage the long list of risks and opportunities into those that demand immediate action, should simply be monitored, or can be put aside. Risk is a function of the probability of an event occurring and the magnitude of the consequence should it occur. Exposure to the impacts of climate change is rarely — if ever — the only or most important factor determining a business's overall risk profile (see **Box 1**). A business' overall risk profile should guide the extent to which climate change risks require specific managed responses.

BOX 1

FACTORS SHAPING BUSINESSES' RISK PROFILES

Businesses face a range of cross-enterprise risks and opportunities. A changing climate exacerbates these risks and has the potential to create new ones. The following factors shape businesses' overall risk profile, including how exposed, sensitive, and capable they are of managing climate change risks and opportunities.

// Nature of product and service mix

// Business model and firm-specific cost structures

// Industry competitive dynamics — ability/inability to pass costs on to consumers

// Location of head office, production and sales facilities, business-owned properties, and physical assets and related tax and regulatory regimes

// Location and vulnerability of key elements in supply chain and tax and regulatory regimes

// Distance and route goods must travel to reach the business's production or sales locations

// Ability to identify and capture upside and revenue opportunities, including resource efficiencies, and new product/service opportunities

// Business-specific risk-management capability

SOURCE: ADAPTED FROM KIERNAN OCTOBER 27, 2011 AND KOVAL OCTOBER 27, 2011.

To prioritize risks and opportunities to act on, businesses can assess each in turn using pre-defined criteria covering the following dimensions:

// **FINANCIAL RISK:** To what extent could climate change risk or opportunity threaten or enhance overall business value? Do previous experiences within the business or for competitors show the financial implications of the risk or opportunity?

// **TIMING:** When are climate change impacts expected to materialize? What kind of lead time could the response require? Both questions are relevant here. For example, in renewing its forest management plan, a business managing large forested areas may prioritize early investments in adaptive measures because a given tree species could cope well with changing climate conditions over the next two decades but not over the 80 years or so that trees take to mature.

// **ALIGNMENT WITH CORPORATE VALUES:** What risks can the business absorb? At what point do they become unacceptable? Criteria like risk to health and safety, business reputation, and share value are among those that can help prioritize both upside and downside risks to manage.

// **PROPORTIONALITY:** Businesses face a range of risks, some completely unrelated to climate. The degree of effort to manage risks either created or exacerbated by the impacts of climate change should be comparable to other risks being actively managed.[40]

// **KNOWLEDGE:** The precise magnitude, timing, and location of climate change impacts will never be certain. But that's not a valid reason to ignore climate change risk and defer action. Use the best available information to treat uncertainty about climate change and its impacts like any number of sources of business uncertainty (see **Box 2**).

BOX 2

APPROACHES TO NAVIGATE CLIMATE CHANGE UNCERTAINTY

Adapting to risks and opportunities of climate change is about making decisions under uncertainty. Uncertainty stems from several sources: our inability to predict with confidence future levels of greenhouse gas emissions, the extent of global climate change resulting from emissions levels, local impacts of climate change, and the effectiveness of adaptive measures.[41]

To assess and prioritize actions to manage risks and opportunities in a changing climate, businesses are inclined to quantify the consequences on the bottom line on a risk basis. Numerous models and quantitative techniques exist to help quantify risk and put a value on averted losses for a range of adaptive measures (e.g., estimation of probabilistic outputs through Monte Carlo simulations). Trend data on business impacts from weather and climate-related events (gathered internally) can help, as can a wide range of freely accessible climate model projections, if detailed assessments are necessary. Technical specialists within businesses can work with climatologists and impact modellers to better understand the limitations of climate models and interpret the outputs on a sound basis. Businesses with experience in integrating climate and impact modelling into decision making treat uncertainty about future climate as one source among the many they face in business planning. It doesn't stop them in their tracks.

Quantifying the potential consequences to the business of climate change and its impacts as "values-at-risk" will not always be possible, however. For instance, businesses expanding to new geographic areas or markets lack internal trend data to quantify impacts and monetize risk. In cases of deep uncertainty, where knowledge about probabilities and possible consequences is incomplete, quantitative risk-based techniques can, in fact, be inappropriate.[42] Techniques such as the Q-method, multi-criteria analysis, and focus groups are useful to qualitatively arrive at a consensus on a range of consequences when sufficient knowledge exists about the probability of an event occurring but not about the possible consequences. In contrast, when sufficient knowledge about possible consequences exists but not about event probabilities, techniques such as scenario approaches and sensitivity analysis can be helpful to explore the outcomes under a range of futures.

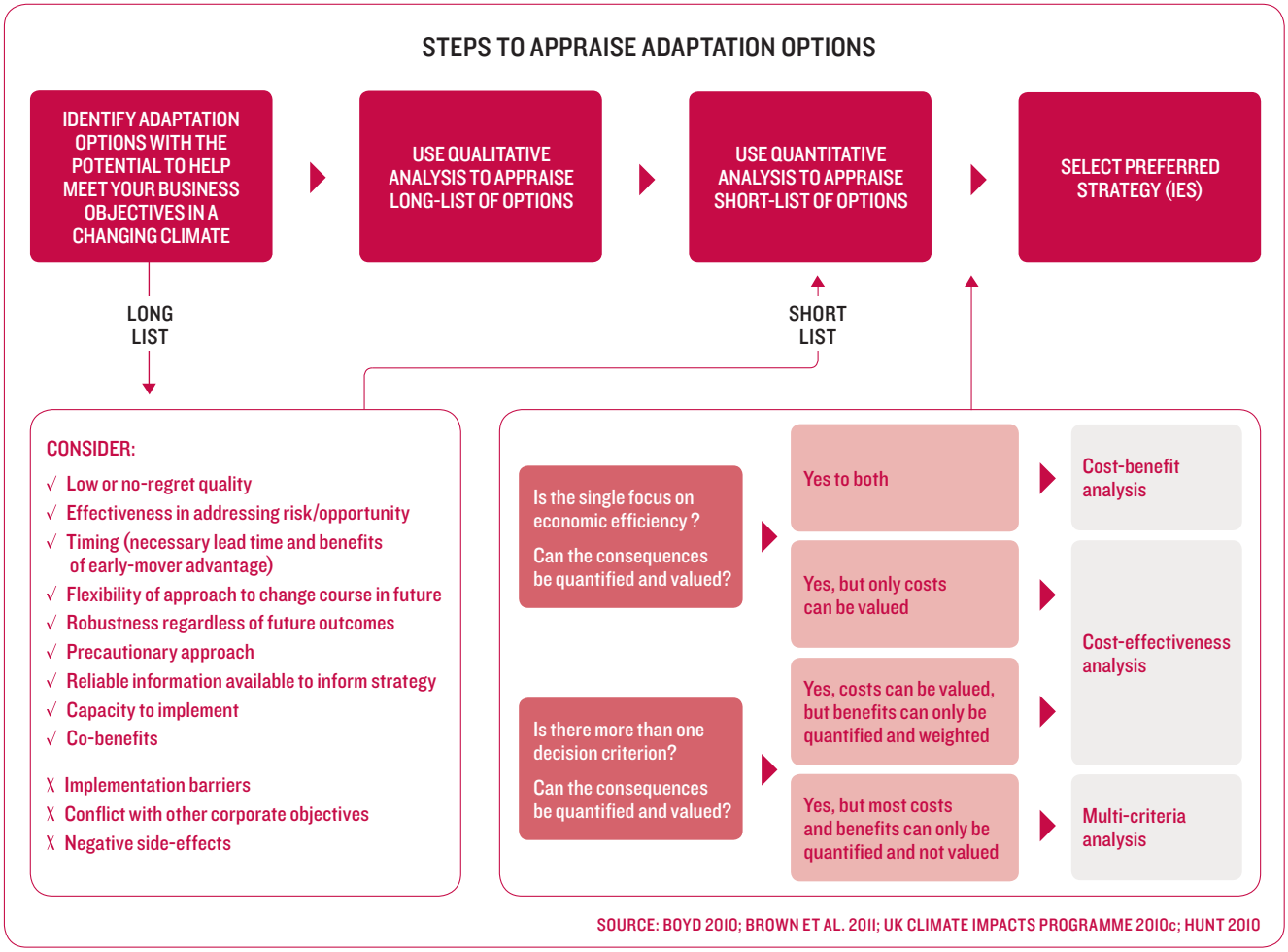
Rio Tinto Alcan — a global miner of bauxite and producer of alumina and aluminum based in Montreal — is developing a climate change sensitivity framework to assess the exposure of operations and associated infrastructure to climate change risks. An output of the framework is a matrix that highlights priority risks. Instead of using a top-down approach that attempts to foresee the future, Rio Tinto Alcan's approach is bottom-up. It relies on the expert input of Rio Tinto staff, emphasizes learning from past events, and increases the company's capacity to deal with the unexpected. The application of this framework has the potential to realize opportunities in new geographies, identify new risk dimensions, and enhance competitiveness.

Appraise adaptation options

Prioritizing risks and opportunities to manage gives way to deciding what to do about them. In the appraisal process, options to both manage specific climate-related risks and build system resilience warrant attention. Throughout this appraisal, think beyond business boundaries, collaborating with infrastructure providers, suppliers, and others in the value chain. Vulnerability can be reduced by transferring or spreading risk, reducing risk exposure, and avoiding risk. Other options are accepting the loss and exploiting new opportunities.[43]

In choosing the most appropriate responses, businesses may benefit from the approach and criteria set out in **Figure 5**. Since we will never have complete information about the precise magnitude and timing of future climate change or its impacts at a given location, instead of pursuing "optimal" solutions, businesses subject to climate change risk should adopt strategies that minimize the cost of being wrong.[44]

FIGURE 5



SOURCE: BOYD 2010; BROWN ET AL. 2011; UK CLIMATE IMPACTS PROGRAMME 2010c; HUNT 2010

In some cases postponing action to study the issue and try to narrow uncertainties makes sense, all the while monitoring for shifts in risk profiles.[45]

Cameco's climate change risks assessment concluded that the benefits of climate change are likely to outweigh the potential risks. As a result, climate change was not considered to be an enterprise risk and no specific management measures were put forward. Responsibility for climate risk management currently sits with individual site managers. Cameco will continue to monitor possible risks and opportunities at a high level, especially in connection with communication and investor relations, so long as climate change remains a high profile issue in the public realm. Unless new information showing considerable under- or over-estimation of future changes in climate becomes available, there is no plan to update the results of Cameco's climate change risk assessment.

In 2010, the electrical utility **Entergy** quantified climate change risks in the U.S. Gulf Coast where it operates to identify cost-effective adaptive strategies. Completed in collaboration with Swiss Re and others, the study identified adaptive measures, including upgrades to building codes, beach nourishment, and improved standards for offshore platforms for which the benefits exceeded the costs, each with cost-benefit ratios of 0.7.46 The results helped inform Entergy's adaptation strategies and provided a foundation for community engagement, so Entergy could encourage community adaptation and better respond to its customers' needs.

Implement and monitor response(s)

Key elements of an implementation plan include roles and responsibilities, resource requirements, possible implementation challenges and corresponding ways to address them, links to other business activities, tasks and timelines, and a stakeholder engagement and communication strategy.[47]

Whistler Blackcomb has always relied on a stable climate, and now finds itself on the front lines of climate change impacts. It is responding with a climate change strategy based on three pillars: assess, act, and advocate. The company is taking a number of actions to both preserve and create value in a warming world. It has expanded its snow-making capacity and invested in a summer grooming program, and plans to increase upslope lift capacity. Whistler Blackcomb is also spreading risk by enhancing recreational offerings throughout the year. Equipped with a strategy and actions to show for it, the company is now better prepared to respond to media or investor queries about the future resilience of the resort.

Tolko — a wood products manufacturer based in British Columbia — has adjusted its practices to strengthen the ecological resilience of the timber stands that it manages. Actions include increasing the diversity of the timber stand, considering local bioclimatic conditions in choices about tree species to plant, avoiding soils that are considered to be vulnerable to climatic stresses, and favouring more resilient tree species. The company has increased the proportion of Douglas firs planted in certain forest areas to increase resilience and improve carbon sequestration, despite the incremental cost of planting this species. These measures will increase the capacity of a timber stand to cope with different possible climate futures, in line with the ecological concept of "resilience".

Implementation goes hand in hand with monitoring and evaluation. This means establishing key performance indicators, success criteria, procedures for collecting data, as well as mapping the process in a monitoring and evaluation strategy.[48] Gathering baseline data is a key step in monitoring and evaluation. Evaluations conducted midstream not only flag needed course corrections but also inform future planning decisions,[49] provided findings reach the right people. The results of some adaptive measures may take time to materialize. Plus, responses taken to adapt to climate change are often inseparable from good risk management, posing challenges to linking the implementation of adaptive measures to particular outcomes. In such cases it makes sense to use process indicators to assess performance. For example, monitoring can be used to evaluate whether and how corporate governance systems facilitate assessment, reporting, and management of risks and opportunities from a changing climate.

3.4 BUILD CLIMATE RESILIENCE ACROSS THE ENTERPRISE

Assign senior-level responsibility

Managing the risks and opportunities of climate change is a corporate governance issue. Senior leadership is an essential ingredient.[50]

Assigning responsibility for building climate resilience at senior levels sends a message to the whole business that the issue is a priority. Promoting risk awareness across the enterprise, strengthening coherence among businesses' sustainability and financial units, and creating a mechanism for adaptation to efficiently infuse senior-level discussions and planning exercises are just a few possible benefits of this. Several businesses have a corporate climate change strategy. Including adaptation as part of it clarifies the corporate position to staff, articulating the need and rationale for integrating adaptation thinking across the business model.

At **Munich Re,** responsibility for climate risk management sits within the Board. In 2007, Munich Re adopted a corporate climate change strategy founded on three pillars: investing in risk assessment, including research on climate change impacts and climate risk-management measures; seizing opportunities by responding to the growing demand for climate change risk transfer solutions with new insurance products; and, considering climate change risks as part of investment decision making. The company has gained confidence in its understanding of the business risks of a changing climate and has pursued business opportunities as a result.

BC Hydro developed a comprehensive climate change strategy called Power Smart in 2009. This strategy comprises both mitigation and adaptation. Adaptive actions include collaborative research on impacts, corporate climate change risk assessments, and practical action to manage operational risks posed by climate change. This strategy empowers employees and allows business units to appraise and assess changing needs and risks.

Amend enterprise and project-level processes

Amending business management systems to integrate climate change risks is an effective and efficient way to hard-wire adaptation into the way firms do business.[51] Firms already rely on a number of management systems that cut across business functions, emphasize continuous improvement, and are relevant to climate change adaptation. These include enterprise risk management, business continuity planning, quality assurance, and environmental management systems.[o] But the scope of the climate change adaptation challenge and coverage of the existing management systems is not a perfect match and some amendments are necessary. For example, a quality management system is unlikely to cover the risk of more costly or unavailable insurance posed by climate change.

Taking stock of enterprise-wide processes and guidelines that merit adjustments in light of climate change is a good place to start. What, if anything, needs to be done so adaptation thinking factors into key decision points, including siting decisions, long-term planning, and capital asset plans?[52] Are contracting and procurement processes sufficiently flexible to accommodate disruptions in raw material availability in a changing climate? Should infrastructure projects require additional and explicit consideration of future climate conditions, and at what stages? How can relationships with suppliers and customers foster resilience across the supply chain (see **Box 3**)?

RBC has thorough risk management and investment due diligence processes in place. For example, RBC assesses industry, company, and transaction-level risks and ensures that staff is trained to address these as part of its credit risk analyses. In some cases, RBC has added new risk dimensions to its credit review process in response to the increasing body of knowledge on climate change and its impacts. RBC's analysis has identified the following sectors as most impacted by climate change: tourism and recreation, agriculture and fisheries, forestry, insurance, and hydropower.[53] The benefits of these actions register as improved risk management and due diligence, key to the performance and reputation of firms in the financial services sector.

o See Appendix 6.2 for links to some of these management systems.

Munich Re is well aware of the challenges that re-insurers and insurers face in integrating climate risk management into their operations. The industry has the advantage of annually reviewing premiums so that insurance premiums reflect current loss risk. However, this creates little incentive for underwriters to use long-term climate change projections. Munich Re takes the long view in underwriting. By integrating information on recent climate trends and future projections, insurers avoid client discontent from abrupt premium hikes.

BOX 3

MANAGING RISKS AND OPPORTUNITIES ACROSS THE SUPPLY CHAIN

In an increasingly interdependent world, characterized by long supply chains and just-in-time delivery systems, Canadian businesses are more than ever exposed to disruptions occurring far from the factory walls. Businesses are aware of the risks they face: a 2007 survey of 500 European and North American financial executives identified supply chain disruptions as one of the biggest risks to revenues, second only to competition.[54]

Climate change affects the frequency and intensity of extreme weather events, which makes these intricate relationships more volatile. The impacts of climate change are challenging businesses to take an outward-looking focus and factor supply chain resilience into their adaptation strategies.[55] Recent extreme weather events illustrate the cascading interruptions for business resulting from supply chain disruptions:

// Widespread flooding in Thailand in 2011 reduced the global production of computer hard drives by 30%, dampening IT revenue streams such as the rollout of cloud services (i.e., remote data storage).[56]

// Flooding in Queensland, Australia, in 2010–2011 reduced global coal supply in an already-tight market, driving down global steel production.[57]

// A hurricane in North Carolina in 1999 flooded a Daimler Chrysler parts manufacturer, leading to a two-day shutdown of a minivan production plant in Windsor, Ontario.[58]

Understanding the supply chain, via supply chain mapping, is a first step to building resilience. Knowledge of the values that flow across the supply chain, including materials and products, cash, and information, is a critical part of developing risk-management strategies. Businesses need to identify the products and services that contribute most to the bottom line and focus efforts accordingly. A collective effort with suppliers and customers of an industry sector to map and understand the up- and downstream values can provide the same results at lower cost than if undertaken independently.

Equipped with this knowledge, businesses can prioritize risk-management investments by assessing current and future exposure to climate-related events and clarifying their risk tolerance. Engaging suppliers in the process makes sense: the strength of suppliers' risk-management programs is a key piece of information, as is understanding how they prioritize customers during a disruption, and what they are doing to manage risks associated with extreme weather events and gradual climate changes. A common communications framework also goes a long way. It can include risk-management definitions, provisions for data collection, and agreed-upon communications channels when responding to a disruption.

MANAGING RISKS AND OPPORTUNITIES ACROSS THE SUPPLY CHAIN (CONT'D)

A high-tech firm in California sees several benefits of setting common standards and definitions together with its suppliers. For one, a common language facilitates communication and decision-making up and down the supply chain. For another, common expectations on data collected by all stakeholders save everyone time and money when it comes time to prioritize actions to manage supply chain risks and invest in recovery efforts when an interruption occurs.

Clarifying accountabilities for supply-chain resilience is another important step. Supply-chain management is often split among many departments, including sourcing, procurement, production, logistics, finance, and marketing. This especially applies to large businesses with operations spread over several regions. Establishing roles, responsibilities, and accountability fosters alignment across the enterprise.

With this foundation, businesses are on solid ground to develop and implement specific strategies to manage risks related to short and long-term changes in climate. Consider the following strategies:

// Stress-testing business continuity plans in light of increased climate volatility.

// Putting in place an enterprise-wide plan that kicks in each time a supply chain disruption occurs and facilitates communication with up- and downstream suppliers and clients.

// Diversifying and duplicating sourcing across businesses and geographies.

// Investing in risk-transfer mechanisms, such as insurance, to cover profit loss or increased costs stemming from supply chain interruptions. If a business expects more frequent weather-related disruptions in a changing climate and this exceeds its tolerance level, insurance products are available to cover interruptions due to insured damage at suppliers' or customers' premises. Insurance coverage can also apply to cases where a business's premises is unaffected but an incident nearby restricts access.

// Undertaking real-time monitoring to track supply chain disruptions and inform decisions. A strategy to do this could include selecting preferred sources of weather data, be they publicly available or tailored third-party services; using decision-analytical software to enhance decision making during a business interruption; and applying IT solutions (such as the "Virtual Command Center" promoted by IBM) to visualize and manage upstream and downstream value flows during a supply chain disruption.

// Updating strategies for supply chain resilience with information on emerging threats.

A global high-tech manufacturer considered its physical proximity to "high climate-risk" geographies and their potential impacts on profit margins to define its 12 most critical supplier relationships. The manufacturer first communicated its risk tolerances to its suppliers, and then asked them to furnish a continuity strategy describing the actions it would take if volatility surpassed the stated tolerances. The firm then scheduled a twice-yearly test with each supplier and other key stakeholders to clarify mutual expectations and identify and jointly address areas of concern. In some instances, the manufacturer provided training and tools to suppliers to help accelerate recovery in the future.

A global provider of aerospace and defence equipment created SWAT teams for deployment should significant supply chain disruptions occur. Teams shared lessons on preparing for and responding to supply chain disruptions due to climate-related events. They also recommended investments in decision-support tools, technologies and incentives to build resilience.

MANAGING RISKS AND OPPORTUNITIES ACROSS THE SUPPLY CHAIN (CONT'D)

Businesses with systems in place to manage supply chain risks are well positioned to expand practices in supply chain resilience across the sectors or regions where they operate. Businesses can benefit from collaboration by keeping supply chains functional in the face of a major climate-related event. Collaboration can be a route to policy influence. For example, large businesses with operations in Thailand could collectively lobby for improved flood warning and prevention systems to better cope with future disasters and restore investor confidence.

A changing climate also presents commercial opportunities for businesses offering solutions to supply chain challenges. Here are two examples:

// Logistics: Businesses already invest in technology applications to monitor the flow of values across their supply chains.[59] A rise in supply chain disruptions could boost demand for real-time tracking of goods and services and related technology solutions. For instance, radio frequency identification (RFID) technology can help manufacturers and downstream product users understand the location of their product relative to a potential threat from a climate-related event and take action.

// Insurance and risk management: The insurance industry is in the business of risk solutions and stands to gain from the sale of new tailored products and a rise in market penetration. Insurance solutions benefit both insurance providers and their customers, by facilitating risk sharing and creating incentives for businesses to reduce supply-chain vulnerability. "Contingent-business-interruption" insurance is now available to provide coverage for interruptions that occur at various points along the supply chain and suspend operations for suppliers or customers.[60] "Denial-of-access" coverage can compensate for disruptions that prohibit access to a business's premises.

Climate scientists have drawn a link between global greenhouse gas emissions and the global increase in the number of hot days and in the frequency and intensity of rainfall events observed in the past decades.[61] Over the 21st century, they project more heavy rainfall events and more intense droughts in some parts of the world. Instead of reacting to events, businesses stand a better chance if they prepare and plan for the rising weather and water-related shocks to global supply chains[62] that climate change will likely exacerbate.

SOURCE: CONSULTANT REPORT PREPARED FOR THE NRT BY MARSH, AVAILABLE UPON REQUEST (MARSH 2011b).

Disclose risks to investors and stakeholders

Quality disclosure is the backbone of strong capital markets and stakeholder confidence. By law, publicly traded companies must report material risks and associated management actions to investors under continuous disclosure obligations. In 2010, the Canadian Securities Administrators issued guidance to clarify how environmental risks, including climate change, may be material and how this disclosure should be presented.[63] According to this guidance and advice published by the Canadian Institute of Chartered Accountants, businesses should do the following:

// Provide business-specific instead of boilerplate disclosure of material risks.

// Disclose existing and planned risk management, adaptation, and mitigation strategies along with expected implementation costs.

// Employ robust controls and procedures to identify and manage material risks.

// Not assume information furnished on their website or through voluntary reporting initiatives replaces the need to disclose material risks in their financial filings. Consistency is important.

// Consult several sources to identify material information for inclusion in annual securities filings. These include CDP survey responses (the business's own response as well as peer businesses' responses), industry research papers (for sector-based impacts), corporate social responsibility or sustainability reports, enterprise risk-management reports, board minutes, and strategic statements and plans.[64]

"Best practices" in disclosing risks from the impacts of climate change and related adaptive measures in financial filings do not yet exist, but monitoring disclosure practices of industry sector peers helps anticipate increased demand for enhanced quantity and quality of disclosure from investors and stakeholders.

In its 2010 securities filings, the **Greater Toronto Airports Authority (GTAA)** noted that climate change may lead to more severe weather, creating flooding risk for airports. The GTAA is spending roughly $100,000 to identify improvements and adjustments in operational practices to prevent storm flooding.[65]

Because of the many similarities between Canadian and U.S. securities reporting requirements, an example of "good" disclosure of physical risks from climate change by an American issuer is worth noting.

In its 2009 filings, **Chiquita Brands International, Inc.** reported that "unfavorable growing conditions… may result in lower sales volume and… increased costs due to expenditures for additional agricultural techniques or agrichemicals, the repair of infrastructure, and the replanting of damaged or destroyed crops." It then reported financial impacts related to a flooding event in 2008, which allowed them to quantify the scale of the risk facing the company.[66]

Monitor enterprise progress and new developments

Leading-edge businesses stay attuned to advancements in climate science and adaptation research and scan for new risks and opportunities on the horizon. As the landscape changes, businesses then factor new information into their ongoing process of assessing and managing risks (i.e., phase two in the dashboard). These businesses also step back from the micro-assessment of each individual strategy and take an enterprise-wide view of their progress in adapting to the risks and opportunities of a changing climate.

Anglian Water, a large private water utility in the U.K., views climate change as among the greatest risks to the business due to the expected reduction in summer rainfall and the already dry nature of the region. It has put in place several adaptive measures to secure alternative supplies and to promote conservation among its customers. The company relies on asset performance indicators to monitor its climate resilience. Anglian Water believes that a flexible approach to adaptation is critical, and plans to use its ongoing review process to identify new risks and adaptive responses over time.[67]

The U.K.'s Thames tidal floodplain is home to 1.25 million residents, £200 billion in current property value, and a network of flood defence measures including the Thames Barrier. The U.K. Environment Agency held consultations and conducted in-depth analysis to identify flood risks out to 2100, taking into account anticipated climate change and its consequences on sea level, high tide level, and wave height. Because of the degree of uncertainty about changes in the far future, the Thames Estuary 2100 Plan is flexible and iterative: reviews against a set of key indicators every 10 years inform flood management actions, including selecting, adjusting, accelerating, or postponing action.[68]

3.5 WORK IN PARTNERSHIP

Each of the three phases in our dashboard can include working in partnership. Some good ideas how are set out below.

Increase knowledge and access to data and information

Working in partnership with like-minded businesses is efficient: businesses can gain valuable knowledge and information at low cost. Businesses in a same industry sector are often sensitive to similar types of climate change impacts. By working through an industry association, for example, businesses can leverage resources to undertake a sectoral risk and opportunity assessment or to come up with key indicators to measure adaptation performance. Such partnerships could work on a regional basis as well, in this case involving a number of industry sectors and leveraging resources to study local impacts of climate change.

Outsourcing specific knowledge gaps, tool development, or other services to external experts is also an option to consider for all phases of the process. A key question is how much to rely on external advisors instead of investing in building internal business capacity. Businesses can tap into knowledge through consulting firms, academics, regional climate service centres, and other businesses confronting the same issues.

Hydro-Québec — A string of severe weather events — including the 1996 Saguenay-Lac-Saint-Jean flooding and the 1998 ice storm — highlighted the risks of a changing climate for electricity generation, transmission, and distribution for Hydro-Québec. In response, Hydro-Québec and the Québec government joined efforts to create a unique research consortium, Ouranos, with the mandate to study the regional climate, climate change impacts and adaptation solutions. Through Ouranos, Hydro-Québec co-operates with Rio Tinto Alcan, Ontario Power Generation, and Manitoba Hydro on climate change risk and adaptation issues.

Tolko has seen recent climate-related damage, including the consequences of the mountain pine beetle outbreak and increased wildfire risk. Tolko chairs the Timber Supply Area team of the Kamloops Future Forest Strategy (KFFS), an initiative involving the BC government, First Nations, academics, and industry. The KFFS aims to guide forest management activities and investments toward diversity and resilience. The KFFS team used a number of plausible climate change impact scenarios to recommend adaptive actions that minimize the impacts of climate change on forests and preserve access to the many ecological, economic, and social benefits that forests provide. Tolko believes that the adaptive measures the company has put in place will help its woodlands better cope with future climate change.

Share best practices

In this emerging field, sharing best practices can only help accelerate action and reduce transaction costs. Industry associations can create forums for this information-sharing to occur, particularly when competition among businesses is limited (e.g., where regional monopolies exist). Professional bodies and trade associations have a role to play in disseminating best practices by integrating climate change adaptation into standard professional guidance.

The **International Federation of Consulting Engineers (FIDIC)** is raising the profile of climate change among its members. FIDIC issued a final draft policy on climate change in October 2011, stating that, because of changing climate conditions, engineers should be careful in relying on historic design conditions, also emphasizing the need for a heightened level of care and innovation in providing design services.[69]

The **Canadian Electricity Association (CEA)** held a joint workshop between its Generation Council and Sustainable Electricity Steering Committee in spring 2011 to explore climate change impacts and adaptation issues for the sector. In the two-day workshop, the 12 participating utilities learned about drivers for adapting to climate change, including insurance, legal liability, and risks to infrastructure; they also shared best practices, challenges, and lessons learned. This workshop launched CEA's engagement with its members to help advance climate resilience across the electricity sector.[70]

Implement adaptive measures and build capacity

Firm-level action can accomplish a lot; however, implementing adaptation strategies can require engagement by others. Collaboration to reduce risks across a supply chain, to manage shared access to a limited resource, to build community resilience, and to enhance ecosystem resilience are a few examples.

For Entergy, the billion dollar losses incurred from Hurricanes Katrina and Rita spelled out a clear business case for adaptation. Entergy works with stakeholders to increase the region's resilience to storms and recognizes the many benefits afforded to its employees, their families, and the surrounding community. Entergy collaborated with America's Wetland Foundation to create the Blue Ribbon Resilient Communities, which helps local communities prepare for extreme events and improve their resilience against unanticipated disasters like the recent hurricanes and the BP oil spill.

Summerhill Pyramid Winery is an organic vineyard in British Columbia's Okanagan Valley. Summerhill's proprietors are taking conscious, deliberate steps to preserve watershed purity (through avoiding the use of pesticides and fertilizers) and build ecosystem resilience (through enhancing biodiversity using native plants). Though their motivations centre on organic wine production rather climate change adaptation, these actions have the side benefit of making the business (and, indeed, the region) more resilient in the face of a changing climate. The winery collaborates with the Okanagan Basin Water Board, which supports climate change adaptation by improving water efficiency and developing policies for resource sharing during times of water shortages.

Industries like insurance, engineering, and construction could become providers of adaptation solutions, and may want to work in partnership to highlight the role they can play to support adaptation.

Munich Re emphasizes the responsibility of the insurance industry to help vulnerable populations and countries adapt to climate change. The reinsurer successfully advocated for the inclusion of insurance as part of the climate change response in recent global climate change negotiations and promotes partnered approaches to make insurance available to developing countries with known climate change vulnerabilities.

Advocate for needed policy change

As the impacts of climate change intensify, policy and regulatory change is sure to follow. Businesses may find it advantageous to work collaboratively to engage with governments on the issue. Existing and future government policy frameworks have the potential to help or hinder industry's progress in managing climate change risks and opportunities, and government agencies are starting to use an adaptation lens in policy and program development and review.[p] In some cases, new policies that mandate assessment of climate change risk or specific management actions among the private sector may also be necessary. Being at the table as policies are adjusted or new ones created is key.

p For example, British Columbia's climate change adaptation strategy includes "make adaptation a part of government business" as one of its three strategies (British Columbia Ministry of Environment 2010).

Whistler Blackcomb — With increasing temperatures, ski areas such as Whistler Blackcomb will need to move upslope to gain access to snowpack. At present, this is impossible since the province owns land at higher altitudes. Land transfer mechanisms or flexible land-use legislation could help to maintain the size of ski areas by facilitating exchanges between lowland mountain areas owned by ski resorts and highland mountain areas owned by the Crown.

Intact Financial Corporation, a major insurer operating in Canada, teamed up with the University of Waterloo to support research and policy action on six climate change adaptation challenges for Canada: agriculture, biodiversity, city infrastructure, First Nations, freshwater resources, and insurance. The project includes an outreach plan and through it, a commitment to engage policymakers, among others.[71]

3.6 STRATEGIES FOR SMALL-AND MID-SIZED ENTERPRISES

Small businesses are an important source of jobs and economic prosperity in Canada. The 2.4 million SMEs[q] across the country contribute 45% of Canada's gross domestic product,[72] are responsible for 43% of Canadian exports,[73] and employ 70% of Canada's private sector workforce.[74]

Although about half of SMEs rank climate change among the top environmental issues for their business,[75] capacity issues and short planning horizons can make it difficult to manage the risk and opportunities of a changing climate. Unlike larger businesses, SMEs often lack the resources to fund or undertake comprehensive studies, or to spend on preventative measures with large up-front costs. They may not have the management systems in place to integrate climate change information into business decisions. Furthermore, some SMEs may be inclined to dismiss the need to prepare for future climate change as too complex or too distant to consider.

Yet the ability of Canada's SMEs to thrive in a changing climate and take advantage of new commercial opportunities is critically important. Results from one survey suggest that more than half of Canada's SMEs are unprepared for an unexpected disruption to their business, and almost as many small business owners are unfamiliar with the concept of business continuity planning.[76] That same survey noted that roughly 40% of small business owners had suffered a significant disruption to their business, with 80% of those disruptions lasting at least five days.

Because many of the tactics and strategies in this chapter are likely most relevant for large businesses, we dedicate **Box 4** to SMEs.[r] It includes examples and questions designed to raise awareness of risks and opportunities from climate change and actions to address them.

q The Canadian Chamber of Commerce defines SMEs as companies "with less than 500 employees and annual sales of $30,000 to $5,000,000" (The Canadian Chamber of Commerce 2011). The number of SMEs is based on figures provided in Industry Canada 2011, and assumes "indeterminate" businesses are small.

r The tips in this section may be less applicable to the smallest SMEs, likely with the least resources to dedicate to the task.

BOX 4

BUILDING RESILIENCE TO A CHANGING CLIMATE – A CHECKLIST FOR CANADA'S SMEs

Why should SMEs plan ahead for these changes when time and money are in short supply? Consider these five reasons:

// As an agile business, you are uniquely positioned to seize opportunities created by a changing climate and become an important provider of solutions to help others adapt.

// In highly competitive industries, boosting your resilience to weather and climate-related interruptions can give you an edge.

// Climate change is already here. Its impacts will continue unfolding for decades to come. Acting in advance of these changes has future pay offs but also helps manage risks and opportunities businesses face today.

// Implementing adaptive measures can be inexpensive and can help you save money. In the manufacturing industry, small businesses spend over 1% of revenues on insurance and a further 0.6% to 1.7% on maintenance and repairs. In the service industry, insurance costs can vary from 1.2% to 2.3% of revenues, with maintenance and repairs representing 1.0% to 7.8% of revenues.[s] Adaptation can help control these costs so they don't drag down your profits.

// If you don't think your business could survive an extended interruption, you can't afford not to act. Climate change adaptation can build your resilience and establish processes to cope with rare events and minimize their disruption.

Use these nine simple questions to set priorities and act now:

Site conditions, physical assets, and infrastructure	√
1 // Are your **premises** adequately prepared for a changing climate?	
Are you at risk of flooding from oceans, rivers, or sewer backups?	
Have past weather events revealed vulnerabilities in your premises?	
Are your materials and products vulnerable to damage from weather?	
Are you committed to a long-term lease that would constrain your ability to relocate if the need arose?	

ACT: Develop plans to evacuate stock in the case of an emergency; move items to safer locations where warranted (e.g., raise off ground to reduce risk of damage from flooding)

An accounting office located in a coastal area may want to store key files above ground if basement flooding is a risk.

2 // Are you planning to make major **investment decisions** that have long-term horizons?	

ACT: Incorporate climate change considerations into investment choices.

A coffee franchise establishing a new shop may adjust its building design if it is located on a floodplain.

3 // Does your **insurance** provide adequate coverage for flooding, extreme weather, and business interruptions?	

ACT: Talk to your insurers to make sure you have the coverage you need.

A factory that is vulnerable to weather events may choose to purchase special insurance against business interruptions.

s Based on NAICS codes 311, 312, 335 for manufacturing and 53, 551, 562 and 72 for services (Statistics Canada 2008).

BUILDING RESILIENCE TO A CHANGING CLIMATE – A CHECKLIST FOR CANADA'S SMEs (CONT'D)

Processes and workforce	√
4 // Are your **employees** exposed to weather risks at work (e.g., extreme heat, flooding, freezing rain)?	

ACT: Implement measures to keep employees safe during extreme heat and other weather events; make a list of emergency contacts available to your employees.

A roofing business may be able to extend the season during which employees can work outside, taking care to put a plan in place to protect employees' health in times of extreme heat.

5 // What would be the implication of a disruption to your **utilities** supply (e.g., power, water, or telecommunications)?	

ACT: Make sure you can easily turn off the supply to your premises. Consider whether it would be cost-effective to reduce your reliance on utilities or invest in back-up systems.

A veterinary hospital may choose to install a generator so it could continue to serve customers in the event of a power failure.

6 // If a weather event makes access to your premises impossible, can your business **operate remotely**?	

ACT: Where appropriate, provide staff with tools that allow for telecommuting; store IT equipment in a safe location; back up electronic and hard-copy files off-site.

A local newspaper may choose to give staff access to servers from home so that they can continue to produce a paper even if the office becomes inaccessible.

Raw materials, supply chains, and logistics	√
7 // Do you expect the **supply and demand of inputs** to your operations to shift due to climate change?	

ACT: Capitalize on business opportunities and minimize risks resulting from shifting supply and demand for your inputs.

An orchard in a water-scarce region may invest in water efficiency measures to enhance its competitiveness as water becomes less available.

8 // Are your **supply chains** vulnerable to weather-related disruptions?	
// What would be the impacts if suppliers could not reach you?	
// If you could not distribute your products or services?	
// If customers could not access you?	

ACT: Share the risks of supply chain disruptions with others along your supply chain. Consider options for making your supply chains more resilient to weather.

A grocery store may choose to source a given product from multiple suppliers to ensure that the product will be available even if one supplier's business is interrupted by extreme weather.

Products, services, and markets	√
9 // Do you expect the **supply and demand of the products and services** you produce to shift due to climate change?	

ACT: Capitalize on business opportunities and minimize risks resulting from shifting market conditions. Engage staff in periodic scans to identify shifting market conditions.

An air-conditioner installation business could see greater demand with warmer summer temperatures.

ROLES FOR GOVERNMENTS

// CHAPTER 4.0

4.0 // ROLES FOR GOVERNMENTS

4.1 // SETTING THE STAGE

4.2 // THE ROLE OF GOVERNMENT

4.3 // KEY BARRIERS TO ACTION IN CANADA

4.4 // OUTLINING PRIORITIES FOR MOVING FORWARD

4.0 ROLES FOR GOVERNMENTS

Preparing for the impacts of climate change before they occur is cheaper than reacting to repeated crises. Governments should remove barriers and create incentives so that businesses are more inclined to proactively adapt. Governments should also ensure the climate resilience of key goods and services like critical infrastructure and ecosystem services for the smooth functioning of businesses and our economy, and step in when businesses' failure to adapt to a changing climate puts society at risk.

Businesses in Canada and abroad can take and are taking action to adapt to the risks and opportunities of a changing climate with existing information, tools, and capacity. Government funding for consortia specializing in regionally-relevant research; collection and provision of climate data; support for impacts and adaptation research; and initiatives to raise awareness of future impacts and to develop tools are all public-sector actions that have helped. But should Canadian governments take further action to incent private-sector adaptation, and if so, how? In building climate resilience, what support can Canadian business expect from government? This chapter investigates these questions by first exploring broad government roles in driving business adaptation and then singling out key business barriers that warrant government intervention.

4.1 SETTING THE STAGE

Risk management and entrepreneurship come naturally to business and industry, so it's safe to assume that a degree of private-sector action to reduce risk and seize opportunities of a changing climate will proceed unaided by governments. Unlike measures to reduce GHG emissions, which provide global benefits, benefits from measures that build resilience to physical impacts tend to accrue to those who invest in them. Combined with the mounting sources of information on climate change, its impacts, and options to adapt, the locality of physical impacts and the associated potential for loss or gain will likely provide sufficient motive for many businesses to invest in adaptive measures.

However, spontaneous responses alone may not be enough. In particular, the literature and our own research suggest shortcomings in the ability and inclination of businesses to make adjustments today to prepare for future climate realities. In many instances, acting in advance to prepare for the impacts of climate change before they occur is cheaper than reacting to crisis situations, so governments have a role to play in removing barriers and creating incentives[t] that encourage businesses to take a proactive stance. Governments also have a role to play in protecting and investing in capital goods and services — such as infrastructure systems and ecological goods and services — that are essential to our continued economic prosperity. Both roles are justified on grounds of economic efficiency.[77] Finally, the prospect of significant threats to the environment or human health from businesses' failure to adapt to a changing climate warrants government intervention in defence of the public good.

Governments in Canada and abroad acknowledge the importance of private-sector action to adapt to climate change, but few have implemented targeted policy measures. Several government strategies or plans focus on assessing sectoral vulnerabilities and encouraging collaboration. For example, British Columbia's 2010 Adaptation Strategy provides for the completion of climate change assessments for key sectors, and the first such assessment is underway with the agriculture sector.[78] Denmark's 2008 National Adaptation Strategy emphasizes impacts and adaptation research, information provision, and inter-departmental collaboration for eleven priority sectors, including buildings and construction, water, energy supply, insurance, fisheries, and agriculture and forestry.[79]

Among national governments Australia and the United Kingdom are, perhaps, two exceptions. The Australian government is fulfilling its role in enabling action by businesses and communities to adapt by adjusting existing institutions and policy frameworks. For example, in collaboration with the Murray-Darling Basin state authorities, the Australian government is amending water pricing mechanisms and setting new water-use limits.[80] The U.K. Climate Change Act (2008) grants government the power to mandate corporations providing public services like water, electricity, fuel transportation, airport and harbour operators to assess and disclose the risks of climate change, as well as related management actions.[81] In addition to risk reduction, the U.K.'s approach seeks to exploit commercial opportunities in climate change adaptation (see **Box 5**).

t For our purposes, "incentives" broadly refer to resources or institutions that encourage or discourage certain types of behaviour. Incentives can include relevant information, price signals, regulations, standards, and financial rewards or penalties. Provision of or access to these incentives can be by design or unintentional.

BOX 5

SEIZING COMMERCIAL OPPORTUNITIES OF CLIMATE CHANGE ADAPTATION IN THE U.K.

In exploring and promoting commercial opportunities of adaptation four motivations stand out for the U.K.: the early impacts of climate change in the U.K. and globally, the belief that it's cheaper to adapt to climate change proactively than to let the impacts of climate change occur, synergies between adaptation and mitigation, and the opportunity to be a leader in the provision of adaptation solutions.

The U.K. Department of Trade and Investment commissioned a report describing global adaptation opportunities for British businesses. This report — based on a global survey of 705 businesses — provided insights into business opportunities across a range of sectors. The following are some of its findings:

// Executives perceive both risks and opportunities from climate — but opportunities were more frequently cited than risks.

// Roughly 40% of businesses said that businesses within their industry are starting to help clients adapt to climate change.

// Emerging markets — and Asia in particular — are seen to be strong markets for buying adaptation solutions.

In addition to offering this market intelligence, the U.K. government is incenting energy efficiency improvements and considering private-sector roles in disbursing adaptation funding to developing countries via the United Nation's Framework Convention on Climate Change (UNFCCC) Green Climate Fund.

U.K.-based businesses are already moving to exploit some of the opportunities presented by a changing climate. For example, HSBC has entered the crop insurance market, Anglian Water is investing in its infrastructure to prevent future flood and drought damage, and Hybrid Air Vehicles is developing unmanned airships to move cargo to remote northern communities without relying on winter roads.

SOURCE: WALLACE JANUARY 24, 2012, UK TRADE & INVESTMENT 2011

4.2 THE ROLE OF GOVERNMENT

Table 2 summarizes policy measures that governments can employ to help businesses and industry adapt, including examples of their current international application. Relative to the potential scope of policy intervention, the examples we found are few, and even less is known about their effectiveness. This is a sign of two factors: the level of maturity of private-sector adaptation as a policy issue and the challenge of distinguishing between efforts to promote adaptation to climate change and efforts to promote sustainable development, sustainable resource management, and good risk management overall.

Although not designed to address the impacts of climate change, a number of regulations in Canada mandate actions that could yield adaptation benefits. Environmental regulations such as the *Canadian Environmental Assessment Act (*CEAA) and the *Québec Water Act* provide good examples of these. Despite enforcement challenges, anecdotal accounts from NRT stakeholders lead us to conclude that environmental assessments and other environmental permitting requirements will only grow in importance as a mechanism to drive business adaptation. Codes and standards, land-use planning and permitting at the provincial, territorial,

and municipal level are also germane, in that they influence siting (e.g., New Brunswick's Coastal Planning Policy and Halifax's harbour front plan) and operational decisions (e.g., requirements for infrastructure engineering design, requirements to manage storm water, and building permits) of business.

Adjustments to existing policies and creation of new ones to support proactive adaptation by business and industry will be multi-faceted. Unlike GHG emissions mitigation, relying on one major policy instrument, such as an economy-wide carbon price, is hardly appropriate for the context and site-specificity implicit in adapting to the impacts of climate change. Sectoral adaptation priorities at the national level are not obvious either. Industry sectors already exposed to the early impacts of climate change, including forestry, agriculture, and tourism, are known to be vulnerable, but all industry sectors are implicated and their exposure to climate change risk and economic importance is regionally variable. Finally, evaluating adaptation success won't be as straightforward as collecting and analyzing economic performance and emissions data. Canadian governments and researchers have only recently started to investigate how to set targets for adaptation and how to measure progress.[u]

The message from Canadian business and industry to us was clear: at this stage, government roles lie in creating an enabling environment for private sector-action rather than introducing new requirements to adapt.[v] The federal government has not yet clarified to Canadians its roles and responsibilities on climate change adaptation or announced what regulatory or policy reforms could ensue. Canadian governments have had limited dialogue to date with the private sector on adaptation as a policy and business issue. However, the federal government has recently committed to new investments in domestic adaptation programming to build Canadians' capacity to adapt to a changing climate that could have some benefits for business (for example, see **Box 6**).

BOX 6

FEDERAL GOVERNMENT INVESTMENTS IN ADAPTATION 2012-2017

Recently-announced federal investments to help Canadians adapt to the impacts of climate change allocate $148.8 million over the next five years to nine departments including Environment Canada, Natural Resources Canada, Fisheries and Oceans Canada, Transport Canada, and Health Canada. According to Minister of Environment Peter Kent, the funding "*will help us frame a credible, science-based response to the impact that climate change has and will have on our economy… our health… our security… and — in particular — our northern and Aboriginal communities.*"[82]

The 2011 Federal Budget committed $58 million over two years to support domestic adaptation to climate change. These funds will build capacity to adapt, expand tools and information for decision making, enhance health system responses to climate change-related risks, promote adaptation planning in Aboriginal and northern communities, and other activities.[83] Investments build on previous initiatives to support regional adaptation projects and tools for decision making.

u For example, in March 2012, NRT staff participated in a national workshop on measuring progress on adaptation in Canada organized by Ouranos and Natural Resources Canada. The objectives were to: "initiate a discussion on the topic in Canada; clarify what our objectives are in measuring adaptation; and identify the types of guidelines, tools and data required."

v This direction came from discussions with NRT's advisory committee to this project and other sources (Deloitte 2011; National Round Table on the Environment and the Economy Secretariat 2011).

So, what policy interventions to support business adaptation should Canadian governments prioritize today? And, how should Canadian governments work with others to remove barriers and create the conditions for investment in adaptive measures by business in anticipation of future physical impacts? The needs and barriers faced by business in managing climate change risks and opportunities and in building long-term resilience form the launching point for these discussions.

TABLE 2

GOVERNMENT INITIATIVES TO SUPPORT PRIVATE-SECTOR ADAPTATION

INSTRUMENT	TYPES OF INITIATIVES	INTERNATIONAL EXAMPLES
INFORMATION	• Awareness-raising / communication • Weather forecasts and climate scenarios • Information on sectoral and regional vulnerabilities	• The U.K. has developed a set of detailed, probabilistic climate projections and scenarios that are publicly available and widely promoted. [84] • Denmark developed a web portal [85] to facilitate information exchange on adaptation approaches and experiences, with a specific section for business. • The Netherlands Route Planner[86] includes descriptive likelihoods of consequences arising from climate change impacts to eight sectors, including energy, water, infrastructure and agriculture, and provides three different examples of climate-proofing strategies. • New Zealand's Ministry of Agriculture and Forestry developed an adaptation toolbox that includes a five-step risk-based process, with information and resources to assist users. [87]
REGULATION	• Amending building and design codes and standards • Endorsing voluntary codes of conduct • New or amended legislation and policy encouraging climate resilient development, land use, and investment	• The U.K. Climate Change Act (2008) provides for the Adaptation Reporting Power (ARP).[88] The ARP requires providers of public services (e.g., water utilities, electricity generators/transmitters/distributors, gas transporters, rail/aviation, airport operators, and harbour authorities) to assess and publicly report risks to operations and business functions presented by climate change, as well as planned and actual measures to address them. • Covering water abstraction and consumption, France's National Climate Change Impact Adaptation Plan (2011–2015) includes regulatory action to improve water efficiency of the electricity sector.[89]
MONEY	• Water permitting, metering and pricing • Tax credits for climate-proofing buildings • Capital cost allowances on technologies for adaptation • Payment for ecosystem goods and services • R&D subsidies • Technology deployment subsidies	• Australia's AU$(2008)12.9 billion investment laid out in "Water for the Future" includes among its priorities developing a robust water market and funding private irrigation infrastructure operators to modernize and upgrade irrigation infrastructure both on and off farm.[90] • France is developing a mutual fund that compensates farmers for losses in the event of an outbreak of an animal or plant disease or an environmental disaster.[91]
DIRECT ACTION	• Climate science, impacts and adaptation R&D • Monitoring and early warning systems • Coordination • Partnerships to deliver training and decision-support • Partnerships to ensure availability of risk transfer options	• The U.K. Climate Change Act (2008) commits the government to report on adaptation progress. This is carried out through the National Climate Change Risk Assessment (CCRA)[92] to both understand how well-prepared the United Kingdom is to deal with the impacts of climate change and help prioritize adaptation policy both geographically and by economic sector. Published in January 2012, the first assessment comprised a detailed analysis of over 100 impacts of climate change for the U.K. across eleven sectors. • New Zealand's Ministry of Agriculture and Forestry supports research on "Climate change business opportunities for Maori land and Maori organizations."[93]

4.3 KEY BARRIERS TO ACTION IN CANADA

Our research and convening activities revealed several factors standing in the way of business action to adapt to a changing climate.[w] Some barriers are best dealt with by businesses alone. However, case study businesses and firms participating in scoping research and NRT events clearly articulated a need for support from government and others to overcome five key barriers:

// **VULNERABILITY THROUGH INTERDEPENDENCIES:** Several businesses profiled in this report have suffered climate-related damages beyond their direct control, e.g., consequences from failure of built infrastructure or transport systems during extreme weather events and idle production when critical inputs were adversely affected by climate conditions elsewhere. Diversifying and strengthening supply chains and distribution channels can help, but cannot completely manage these risks. Regardless of businesses' individual efforts to plan and protect themselves from the impacts of climate change, vulnerable infrastructure makes them vulnerable too. Businesses expect governments to protect, invest in, and adjust the policy environment governing critical infrastructure systems to ensure their continued performance in a changing climate.

// **LACK OF POLICY AND REGULATORY SUPPORT:** Canada currently lacks a consistent, clear national signal to highlight the importance to business of assessing and managing risks of a changing climate. Climate change risk management by business is, for the most part, optional. Perspectives on the need for a national framework, for example, differ, but perceived benefits include coordination across regions, sectors, and levels of government, and clarity on roles and responsibilities. A national framework, however, should help — not hinder — decentralized efforts in areas such as land-use planning, water, and infrastructure. Existing regulations that fail to account for climate change could constrain businesses' action to prevent climate-related damage in the future. In the forestry industry, for instance, reduced water consumption and increased process efficiency can help offset operational risks in times of water scarcity (and also benefit other water users) but could lead to increased discharge of effluent concentrations, putting a business at risk of non-compliance. In other regulated sectors, the inability to pass costs on to customers creates a bias against capital investments now that would lead to longer-term benefits and reduced costs in the future.

// **GAPS IN INFORMATION AND TOOLS FOR DECISION SUPPORT:** Although needs and priorities vary by industry sector, geographic location, and end-use, a widespread perception exists of inadequacies in the availability of and access to climate change information.[x] Perceived inadequacies lead to a "wait-and-see" attitude that constrains decision making on adaptation. We note four specific challenges: confidence in climate projections and related challenges in choosing projections as inputs for impact assessment; availability of climate projections at meaningful scales for business decisions (high spatial resolution, short time-frames); climate change information in formats, language, and locations that are accessible by business; and availability of practical tools and guidance to help assess climate change risk for business and appraise options to adapt.

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w See Appendix 6.1 for a full list.

x "Climate change information" is a catch-all term that includes databases of climate variables, both average and extreme, climate projections and their interpretation, climate change impacts and adaptation research, and analytical guidance and tools to assess business impacts, develop, and select response options.

// **LACK OF FINANCIAL INCENTIVES FROM GOVERNMENT:** Businesses respond to government signals. Currently, businesses don't have access to financial incentives from government for assessing or managing climate change risks, other than the economic benefits of improved risk management. Yet some adaptive measures could require considerable capital or operational expenditure (e.g., upgrading building foundations) and others provide public benefits (e.g., actions to enhance forest resilience). The lack of incentives, combined with the difficulty of passing costs on to customers in highly regulated sectors, puts those businesses that invest in adaptation at a perceived disadvantage.

// **LACK OF SHAREHOLDER AND INVESTOR COMMITMENT AND SUPPORT:** If key capital market players prioritize and buy into the importance of investing now to avoid potential losses later, so too will businesses. Although public acknowledgement of climate change risk and adaptation as a material issue for investor decisions could well increase,[y] a focus on short-term value creation is likely to prevail. This puts the onus on businesses to demonstrate the value of long-term adaptation to investors.

4.4 OUTLINING PRIORITIES FOR MOVING FORWARD

We prioritize four high-level goals for government action to enable business adaptation. These goals are based on our diagnosis of the main barriers to business adaptation in Canada today and direct feedback from businesses on how governments could best support action.

// Tailor climate change information for application by business.

// Augment investor information through better corporate disclosure.

// Enhance the resilience of critical infrastructure.

// Prepare now for future policy innovation.

Tailor climate change information for application by business

An effective and efficient adaptation approach for businesses is to apply climate change information to operational and strategic decisions using management systems and frameworks already familiar to business.[z] And as this report demonstrates, leading businesses are already doing so by making good use of the climate change information generated by federal, provincial, and territorial initiatives and funding, among others. For example, businesses combine the observed climate data with their internal records (site-specific maintenance costs, for example) to analyze their own vulnerability to climate-related hazards. Businesses profiled in this report have also benefited significantly from collaborative partnerships with academic researchers, specialist

y There is some evidence of this among Canadian institutional investors: the British Columbia Investment Management Corporation (bcIMC) joined the Ceres Investor Network on Climate Risk (Ceres 2010b) and bcIMC along with the Ontario Municipal Employees Retirement System (OMERS) participated in the development of a recent Mercer report titled Climate Change Scenarios — implications for Strategic Asset Allocation (Mercer 2011).

z Enterprise risk management, business continuity, environmental management, and quality management systems, are a few examples of the management systems that can help translate knowledge of climate change risks and opportunities into strategies that preserve and create value.

organizations, and industry peers through regional climate service centres (e.g., Ouranos consortium in Québec and the Pacific Climate Impacts Consortium in British Columbia). For the most part, businesses are taking this on voluntarily, although some have been prompted by environmental regulations.[94]

However, the integration of climate change information into business risk management and planning is far from mainstream. Until recently, information providers in Canada saw limited demand from the private sector for specific information resources for their climate change adaptation efforts. Comprehensive assessments of data and information needed or used by Canadian industry sectors have not taken place. Yet we know that strategic business decisions are being made every day in Canada that have long-term implications and that are subject to risks from changing climate. We also know that uncertainty in the precise timing and nature of climate change impacts is hardly a valid reason to ignore these risks. Needs and end-uses for climate change information are diverse within and across industry sectors (**Table 3** contains examples), requiring tailored approaches to turn data, information, and knowledge into action. Translating climate change information into business risks, and in particular expressing those risks in financial terms, is a challenge for many businesses.

Provision of information and tools to aid decision making across regions and sectors is core to several adaptation strategies of Canadian governments. It's something governments are already committed to doing. For example, federally, Natural Resources Canada's new phase of adaptation programming promises to get information into the hands of natural resource sectors to support competitiveness.[95] Since abundant information to aid adaptation efforts already exists, collaboration is key to identifying practical and cost-effective approaches to leverage the resources we already have to make good decisions under climate uncertainty.

Part of this lies in recognizing that putting information and tools out there is insufficient to shift behaviour. The U.K.'s experience is worth noting here. Robust and detailed climate projections and scenarios have been available to the U.K. public for some time now, but their uptake by British industry has been limited. In 2010 the Confederation of British Industry recommended that "*[t]he UK Climate Projections should be packaged as a range of more tailored offerings…for non-climate-specialists*."[96] For Canadian businesses to continue improving the quality of their risk models and be able to identify effective and economically-sound adaptive measures, addressing barriers to information access and gaps in capacity to apply and integrate climate change information into routine business procedures are all important.

TABLE 3

EXAMPLES OF INFORMATION NEEDS FOR ADAPTING TO CLIMATE CHANGE BY INDUSTRY SECTOR

INDUSTRY SECTOR	EXAMPLES OF INFORMATION NEEDS & PRIORITIES	EXAMPLES OF END-USES
FINANCIAL SERVICES[97]	• Outputs of high resolution climate projections (5–10 year, 10–30 year horizons) • Quality & confidence assessments of climate projections • Observed weather / extreme event data • Sectoral analyses (especially tourism, agriculture, fisheries, forestry, hydropower)	• Adjusting insurance products & creating new ones • Adjusting loss & catastrophe models • Exercising due diligence when buying securities • Assessing credit risk
HYDROPOWER UTILITIES[98]	• Outputs of global and regional climate projections of key variables (e.g., average and extreme temperature, precipitation and wind) • Observed and projected changes in water run-off into reservoirs • Electricity demand forecasts	• Informing environmental assessments • Assessing climate change risk to operations • Assessing benefits of changing operating rules • Adjusting annual tariffs • Optimizing reservoir operations • New site selection and design
FORESTRY[99]	• Outputs of regional climate projections • Assessments of future wildfire risk, pest outbreak risk, future climate suitability of trees, future ecosystem composition • Expected impacts on watersheds • Forest yield forecasts • Synthesis of tree genetics research	• Adjusting forest management practices (site selection, planting density, increasing proportion of drought tolerant species) • Assessing benefits of increased investment in fire risk management (e.g., purchase of helicopters)
ENGINEERING & CONSTRUCTION SERVICES[100]	• Observed weather / climate data (e.g., temperature, heating degree days, cooling degree days, frost penetration, snow loads, wind loads, wind pressure) • Assessments of potential changes in storm water run-off, future wildfire risk, termite migration • Guidance to select outputs of global and regional climate model runs • Guidance on integrating different data sources and types for trend analysis of extreme rainfall conditions	• Adjusting building codes and product standards • Designing engineering projects

Augment investor information through better corporate disclosure

Publicly listed companies must disclose material information to investors through their continuous disclosure obligations under Canadian securities laws, including material risks of a changing climate and related management strategies. The Canadian Securities Administrators' (CSA) National Instrument 51-102 *Continuous Disclosure Obligations* requires Canadian companies (other than investment funds) to file a completed Management's Discussion & Analysis (MD&A) form with their annual and interim financial statements. In the MD&A, companies must disclose material information. Companies must also file an annual information form (AIF), which includes a statement of the risk factors relating to its business, including "environmental and health risks" and "any other matter that would be most likely to influence an investor's decision to purchase securities of [the] company."[101]

Companies know they must disclose material risks and information but can struggle to determine exactly which risks meet this threshold and how they should be disclosed. To help companies comply with the law, the CSA published its *Environmental Reporting Guidance*[102] in October 2010, eight months after the *Commission Guidance Regarding Disclosure Related to Climate Change* was published by the U.S. Securities and Exchange Commission.[103] Among other aspects, the CSA guidance asks companies to determine how they are likely to be "affected by physical risks of environmental matters, such as the impacts of […] changing weather patterns and water availability."[104] Implicit in this guidance is an acknowledgement that companies still fail to meet their disclosure obligations around climate change, despite their legal requirements and investors' incipient concerns over climate change impacts and adaptation.[105]

Our analysis of 2010 annual securities filings of 35 issuers across seven industries revealed limited climate change disclosure, including of physical climate change risk and adaptation strategies. Even when issuers discuss how severe weather events or water availability affect their business operations, they rarely link these to broader climate trends, despite the weight of scientific evidence on current and projected climate change impacts. In some cases, businesses acknowledge climate change-related risks in voluntary reports, providing only minimal or boilerplate disclosure in their mandatory reports.

Limited climate change disclosure in financial filings among the Canadian companies assessed could simply reflect management's determination that climate change impacts aren't a material business risk. However, disclosure of risks to business operations from severe weather occurred at higher rates in 2010 annual filings than even as recently as 2008. Also, physical risks from climate change are unlikely to affect only a single or handful of businesses in a particular sector. For example, in the transportation sector, if climate change has the potential to increase the frequency of adverse weather events for one railway business it likely warrants mention for others of similar size and geographic location — unless significant differences in risk controls and governance among businesses existed. It's possible that some businesses narrowly focus their materiality analysis on regulatory risks from GHG emissions mitigation policy and fail to incorporate knowledge of operational, financial, and strategic risks posed by the impacts of climate change.

Insufficient disclosure presents information challenges for investors and enforcement questions for securities regulators. For investors to make informed decisions about the risks a business faces from a changing climate (let alone attempt to influence such positions), businesses must disclose these risks and their management strategies to investors in their mandatory financial filings. Relative to risks from GHG emissions mitigation policy, risks from future physical impacts of climate change are becoming increasingly certain, at least in a directional sense.[106] A rise in demand for greater disclosure on adaptation by the investing public and other stakeholders is soon to follow. Limited recognition of material risks from a changing climate by the insurance companies assessed is a particular concern since failure to incorporate climate change risk in underwriting could have knock-on implications for the performance of investments.[107]

Enhance the resilience of critical infrastructure

Businesses depend on networks of public and private physical assets to deliver goods and services reliably. Infrastructure providers include local, regional, and national actors — among them departments within federal, provincial, territorial, and municipal governments, as well as Crown corporations and private-sector providers of energy (e.g., pipelines, electricity generation, transmission and distribution), transport (rail and ports) and telecommunications.

Disruptions in service have cascading implications for businesses, capital investment, and the economy, so it's important that infrastructure operators — regardless of ownership — take steps to assess infrastructure risks from climate change and address any deficiencies. This is particularly key for "critical infrastructure" where society risks paying the costs of infrastructure failure or service disruptions. Consider the ripple effects of a 2011 heat wave in the U.S., where temperatures in several states exceeded 40°C.[108] The heat caused significant stress on electricity transmission and distribution systems. Twenty-five thousand households and businesses in four Detroit townships suffered the consequences of rolling blackouts.[109] The 2005 Finch Avenue washout in Toronto led to disruptions of natural gas, electricity, telecommunications, and water and sewer service delivery. This one storm resulted in $(2005)547 million in costs associated with settling insurance claims (e.g., damage to homes from sewer backups) and bringing the city's infrastructure back in service.[110]

Several complementary mechanisms in Canada can help build the climate resilience of our key infrastructure systems.[aa] The National Strategy for Critical Infrastructure sets out an approach to manage the risk exposure of critical infrastructure to natural, intentional, and accidental hazards[111] and risks from a changing climate fit that scope. Codes, standards, and related instruments (CSRIs) govern all new infrastructure design and construction, and engineers and architects must adhere to CSRIs in their professional practice. CSRIs are evolving to account for changing climate conditions, but these updates wouldn't apply to existing infrastructure, and it could well take over a decade to significantly change new design and construction practices. The NRT's *True North: Adapting Infrastructure to Climate Change in Northern Canada* discussed some of the shortcomings of CSRIs as mechanisms to facilitate adaptation.[112] To complement CSRI updates, short-term, site-specific initiatives to assess and manage climate change risks to infrastructure are necessary and are taking shape. Supported by federal funding and expertise, Engineers Canada has developed an infrastructure assessment protocol — referred to as the Climate Risk Protocol — that several municipalities in Canada have used to determine the vulnerability of new and existing infrastructure to the changing climate. International application of this protocol is also occurring.

But significant hurdles stand in the way of systematically assessing and managing climate change risk to publicly and privately owned infrastructure — to our economic peril. We note three issues in particular. First, infrastructure operators may defer action on longer-term issues like climate change in favour of more immediate cost savings. Second, neither public- nor private-infrastructure owners have specified accountability for

aa Analysis in this section comes from D.J. Danyluk Consulting Ltd. 2012. The consultant's report is available from the NRT upon request.

adaptation among operational teams to efficiently integrate risk assessment and management within annual maintenance, operational, and capital planning. Third, the potential for legal liability, in some cases, acts as a deterrent to identify infrastructure vulnerabilities in the first place (see **Box 7**).[113]

BOX 7

INFRASTRUCTURE, CLIMATE CHANGE, AND LEGAL LIABILITY

As the impacts of a changing climate become more evident and knowledge of related infrastructure risks becomes "reasonably foreseeable," businesses, communities, and individuals will have grounds to sue investors, owners, and operators of infrastructure to compensate for property damage and personal injury resulting from a failure to adequately adapt infrastructure to new climate realities. If it is no longer reasonable for those who make decisions about infrastructure to deny or seriously dispute the significance of climate change risks ignorance of, or silence about, these risks in relevant circumstances cannot provide shelter from potential legal liability. Beyond the financial cost of compensating affected parties, the implications of this heightened exposure to legal liability include increased investor risk aversion and reputational damage.

Those responsible for infrastructure should ask themselves two questions when gauging legal liability:

1 // Could the physical impacts of climate change affect the infrastructure asset during its lifecycle?

2 // If the asset could be affected, does the technology exist to design the new asset or repair or otherwise improve the asset to withstand the impacts of climate change?

Engineers and climate specialists can help you answer these questions with confidence. But a next step is deciding what to do about it. In such cases, infrastructure decision makers should weigh the additional cost of building, refurbishing, and maintaining infrastructure to withstand the impacts of climate change against the potential future costs of repair, refurbishment, rebuild, eroded reputation and investor confidence, and potential legal liability arising from a decision to not take climate change impacts into account. Taking proactive adaptation measures can help avoid the latter costs.

SOURCES: TORYS LLP 2008; KOVAL OCTOBER 27, 2011

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Adapting to a changing climate is a long-term process. This report, however, largely focuses on the importance of accelerating private-sector action to adapt to the changes already locked-in to the global climate system. Climate futures are inherently uncertain, though, with scientific evidence raising the prospect of needing to adapt to as much as a 4°C world over this century.[114] This has important implications for decisions and investments with long lifetimes, such as major economic decisions involving infrastructure development and land-use changes. The possibility of more intense and rapid changes in climate than science can predict also raises questions about our continued reliance on certain business models (e.g., the viability of just-in-time practices) or on goods and services whose access we take for granted (e.g., air conditioning or mountain snowpack as stored energy).

BOX 8

DESIGNING EFFECTIVE PUBLIC POLICIES FOR CLIMATE CHANGE

In 2011 the Network for Business Sustainability commissioned a review of 342 climate policies (focusing on low carbon technology and water management as proxies) to assess the design choices that contribute to effective public policy. The NRT then commissioned a filtered analysis to extract lessons on policy design with businesses and industry or professional associations as policy targets, amounting to an analysis of 223 policies.

Here are the key lessons on effective policy design for business-focused climate policies:

// Integrate new objectives within existing policies where practical.

// Ensure consistency with existing policies that apply to the businesses and associations being targeted.

// Factor in information asymmetries and information gaps that may hamper policy effectiveness.

// Consider the potential for unintended consequences.

// Make reporting mandatory.

// Provide long-term certainty to induce permanent and structural private-sector responses rather than one-offs.

// Use tax credits to encourage businesses to make investments with large up-front costs.

// When it comes to technology-related policies, target demand along with supply. Innovation incentives will be more effective if a ready market exists.

// Build flexibility into policies to promote an economically efficient response from businesses. Favour expenditure instruments (e.g., biodiversity offsets, water pricing) as they let businesses choose least-cost strategies to meet the objective.

// Count more on information instruments (e.g., mandatory water-use reporting) when dealing with businesses that have a strong risk-management culture and for issues where cross-sectoral partnerships exist (thereby reducing information asymmetries and tapping into trusted information sources).

// Consider bundling multiple policies together to achieve a policy objective that is shared by different actors who can all contribute to progress.

SOURCES: AULD ET AL. 2011; AULD AND MALLETT 2012

Long-term planning is, at the best of times, a challenge for decision makers in public and private sectors alike. But the combination of scientific uncertainty and the potential for surprises makes long-term planning all the more necessary.[115] Some of the most significant requirements of government and business will involve setting long-term goals, building the evidence base to inform adjustments in existing policy frameworks or development of new policy, and making tough choices to account for climate change–related shifts in demand and supply of key goods and services (see **Box 8** for design considerations for climate policies). Long-term signals from governments will help encourage investment in adaptive measures and establish a level playing field for competitive business success.

CONCLUSIONS AND RECOMMENDATIONS

// CHAPTER 5.0

5.0 // CONCLUSIONS AND RECOMMENDATIONS

5.1 // FINDINGS

5.2 // IMPLICATIONS

5.3 // RECOMMENDATIONS

5.0 CONCLUSIONS AND RECOMMENDATIONS

The NRT's *Paying the Price* showed what the economic impacts of climate change could be for Canada; *Facing the Elements* explores the key role of Canada's private sector in ensuring our country's prosperity in a changing climate.

As a country we have abundant knowledge about the impacts of climate change we can expect and are beginning to understand what options are available for us to adapt. It's time to talk about how Canadian businesses and industry sectors stand to both gain and lose from the local and global impacts of climate change, how targeted approaches can drive private-sector action, and how to capitalize on adaptation needs in Canada and elsewhere. Our three reports under *Facing the Elements* highlight examples of how business adaptation is unfolding in Canada and some challenges that lie ahead. We expect our work to start conversations in Canada that are long overdue.

Adapting to a changing climate by reducing risks, seizing opportunities, and building resilience can and should be part of any business strategy. For climate pacesetters, adaptation is no longer a far-off, theoretical concept, but a forward-looking way of doing business that takes advantage of public information on climate change and its impacts and embeds adaptation within existing management systems. But even for engaged and active companies, our research and stakeholder consultations have revealed barriers to making progress on adaptation. Here we summarize the main findings from our work, the implications of these findings for building business resilience in a changing climate, and the NRT's recommendations for government action.

5.1 FINDINGS

Progress by Canadian businesses on climate change adaptation is variable but difficult to benchmark. Some Canadian businesses are actively integrating future climate considerations into the way they do business; others focus on managing extreme weather risks and water availability risks of today's climate; while still others lack an understanding of the business relevance of climate and climate change impacts. Increasingly, large Canadian businesses are beginning to register concerns about the potential risks and opportunities presented by climate change in voluntary reports and, to a much lesser extent, in mandatory financial filings. Differences in perception of the physical impacts of climate change as a source of risk or opportunity are evident across industry sectors. No coherent mechanism exists in Canada to efficiently benchmark business awareness of and action on adaptation by industry sector, firm size, or other qualities. Added to this is the hesitation of some businesses to report actions to manage risks or opportunities of a changing climate because of confidentiality and reputational concerns.

Key enablers to action today include corporate governance and experience with climate-related impacts. The climate change adaptation experiences of thirteen pacesetting businesses helped us identify four key factors motivating action today. First is the ability and inclination to connect physical impacts and related risks or opportunities to business objectives; second, awareness of stakeholder expectations regarding environmental and social performance and a commitment to sustainability as a business imperative; third, strong risk-management practices; and fourth, previous experience with climate-related events or impacts.

Terminology, risk perception, short-termism, and capacity impede businesses' progress to assess and manage risks and opportunities of climate change. Confusion remains between mitigating GHG emissions, adapting to GHG emissions mitigation policy, and adapting to future climate itself. To date, much of the policy attention and business concern has focused on the first two issues. As the impacts of climate change intensify and as adaptation permeates policy and management discussions on water, northern development, urban infrastructure, etc., familiarity with the third issue — adapting to future climate — will grow. In some cases, businesses question the need to do things differently in light of changing climate conditions. It's possible that experience managing extreme weather risks and climate variability provides a false impression of built-in preparedness over the long term or that a reactive approach is sufficient to ensure continued profitability. Presenting a solid business case to justify investments and process adjustments is critically important when competing for scarce resources expected to yield short-term results. Managers within businesses need help using climate change information to express business risks and opportunities in metrics that are meaningful to executives and show the costs of *not* adapting.

Pacesetting businesses demonstrate that it's possible and advantageous to act now to prepare for future climate realities. Benefits of getting out in front of the issue lie in both *value protection*, by reducing existing weather and climate-related risks, and in *value creation*, by exploiting opportunities and strengthening market positioning relative to peers. In the long term it means incorporating climate change into capital investments so that assets continue to perform reliably in the future. It also pays to be informed about risk exposure and viable options for risk control ahead of stakeholder demands for this information. Raising awareness within the firm of the business implications of a changing climate provides a foundation to assess and manage risks and opportunities. Instead of creating new business procedures, an efficient and effective approach is to integrate adaptation thinking into existing ones at operational, planning, and strategic levels. By doing so, businesses build climate resilience across the enterprise. Emphasizing co-benefits and short-term results to build momentum to go further, navigating uncertainty by combining best available information with structured decision-making processes, and making incremental improvements as new information comes to light can all boost the success of investments to adapt to climate change. Collaborating on pre-competitive research and on initiatives to ensure implementation success is an efficient way to leverage external data, information, knowledge, and trust –otherwise costly to procure by the business alone.

Private-sector adaptation will proceed unaided by governments, but focused actions to enable and accelerate action are needed. Governments can support and encourage proactive planning for a changing climate by business in four ways. First, governments can ensure access to business-relevant climate change information and decision-support tools for application by a range of users. Second, governments can use existing policy and regulatory mechanisms to signal the importance of long-term adaptation planning, level the playing field, and streamline the assessment, disclosure, and, management of business risks posed by climate change. Third, governments can take steps to safeguard critical infrastructure, which is essential to business profitability and the performance of our economy. A fourth role lies in anticipating, prioritizing, and undertaking research and stakeholder dialogue to prepare for future policy development for effective, efficient, and sustainable adaptation in the decades to come. In many cases, public–private collaboration, as well as partnerships with research and practitioner communities, will be necessary to set objectives and ensure implementation success.

5.2 IMPLICATIONS

Organizations that engage with businesses must raise the profile of climate change risk management and adaptation as a business issue. Beyond one-off interactions, governments have had little engagement with business on adaptation. It's time to change this approach and begin to assemble a picture of unique and crosscutting needs by Canada's industry sectors. Non-governmental organizations and institutional networks also play important roles in awareness-raising, advocacy, and engagement. Adaptation is a legitimate and critical response to the climate change challenge. Businesses should be encouraged to reduce risks and seize opportunities posed by a changing climate and to talk about their efforts. In all engagement, language and framing matters. Targeted communications to clarify how adapting to climate change is a departure from business-as-usual, why and when anticipatory action makes sense, and what the costs are of not adapting can only help inform businesses' risk calculations.

To enable action, governments and business must embed adaptation within existing mechanisms and processes. Governments already engage business and industry on a range of issues and make several kinds of information asks. Experience shows that messages about climate change adaptation without a context do not work. That's why it's important to build it into ongoing discussions and consultations with industry, whether on northern development, energy policy, or Great Lakes shipping, as examples. Several decision-making, management, and planning systems already used by businesses could be useful entry points for embedding climate change and adaptation considerations. But they are only useful if they promote effective risk governance today and can accommodate uncertainty about climate change and its impacts.

Both small and practical steps as well as systemic changes are necessary to ensure business resilience in a changing climate. This report highlights a range of tactics and strategies that businesses can undertake now, with existing information, tools, and capacity, including several low- or no-regrets approaches. However, we recognize the existence of systemic barriers that, although not unique to climate change adaptation, still weaken incentives to plan ahead and invest in long-term measures. In 2007, the NRT issued a report on capital markets and sustainability, which included recommendations to address the impact of short-termism on the integration of environmental, social, and governance risks in capital allocation decisions.[116] Advice in that report remains relevant today. Internationally, we are seeing examples of leading businesses taking the long view in investment and business strategy decisions. They do so by adjusting their communications strategies with investors and customers, creating financial incentives for executives and staff, and setting targets.[117]

5.3 RECOMMENDATIONS

The NRT offers twenty-one recommendations to help build the resilience of Canadian businesses in a changing climate (see **Figure 6)**. We applied the following criteria to guide our choices: we favoured recommendations that addressed identified barriers, created benefits regardless of future impacts of climate change, and where evidence of gaps existed and options to move forward were apparent. Because private-sector adaptation is an emerging issue, we focus on areas that we consider fundamental to demonstrating near-term success in integrating adaptation thinking in decision making. All contribute to the goals presented in chapter 4 on information, disclosure, critical infrastructure, and future policy development.

GOAL I // TAILOR CLIMATE CHANGE INFORMATION TO ADDRESS BUSINESS ADAPTATION NEEDS

Government agencies and research organizations generate and disseminate information of value to businesses that are planning for climate change. But much more could be done to expand the use of these information resources by business. What's needed is a basic understanding of business needs by industry sector and follow-up actions to improve access to reliable, relevant, and user-friendly climate change information and related guidance. Our recommendations are as follows:

Reduce barriers to access by putting reliable information on climate change and its impacts in one place

I // Led by Environment Canada the federal government and regional climate service centres should improve access to existing climate data, projections, and physical impacts research by consolidating what's available in a single window. User needs should drive its architecture and functionalities. So an essential first step is to engage industry sectors to understand climate parameters and physical impacts variables that matter most, gaps in capacity to use information, characteristics of "useful" information, and entry points for climate change information in operational and strategic decisions by business.

Flexibility to accommodate multiple sources of information and new sources over time is important, as is the ability to facilitate (virtual and face-to-face) dialogue among users and between users and providers of climate change information.

Provide advice to business on which future climate conditions to plan for

2 // Led by Environment Canada, the federal government should develop and promote business-savvy guidance on how to interpret and apply climate data and projections in long-term plans and decisions by industry sectors with large capital assets and legacy impacts. Information on this topic offered by the Canadian Climate Change Scenarios Network (CCCSN) is primarily for researchers, but provides a foundation to develop guidance for industry audiences.[118] Once developed, this guidance should be actively and consistently promoted by government departments, agencies, and Crown corporations implicated in industrial and business development. At the same time, Canada should learn from international experiences in disseminating detailed sets of climate projections that act as a default "go to" data source for users.

Make business impact data available

3 // Governments must define their role in undertaking physical impacts modelling so industry sectors and businesses can assess the investments needed to convert publicly provided climate change information into physical and economic metrics (i.e., business impacts) for use in operational and strategic decisions, and begin to make the necessary investments. A market opportunity also exists to develop industry-specific guidance on this conversion process.

4 // Industry associations should collect data and disseminate aggregate statistics on the costs of climate change impacts and adaptive strategies to contribute to the crucial quantification of short-, medium-, and long-term impacts and inform reporting and disclosure efforts, and publish this information in a way that protects business confidentiality.

Raise the profile of climate change adaptation among Canada's small and medium-sized enterprises

5 // Industry Canada and its provincial and territorial counterparts should engage small and medium-sized enterprise (SME) business-delivery agents such as Chambers of Commerce and trusted advisors including banks, lending agencies, accountants, and insurers to raise awareness of risks and opportunities of a changing climate and enable adaptive action among SMEs. An effective approach to reach SMEs is to integrate climate change adaptation messaging and information into advice and services that SMEs already receive.

GOAL 2 // AUGMENT INVESTOR INFORMATION THROUGH BETTER CORPORATE DISCLOSURE

Quality disclosure is the foundation of strong capital markets; this includes disclosure about material risks from climate change and its impacts. Despite guidance to the effect already issued by the Canadian Securities Administrators, climate change risk disclosure in financial filings is limited, at best. Better enforcement of disclosure requirements is necessary, as are effective approaches for companies to demonstrate the value of climate change risk management and adaptation actions to investors. Our recommendations are as follows:

Improve enforcement of existing securities rules and regulations as applied to climate change disclosure

6 // Securities regulators should educate staff to enhance their familiarity with climate change-related risks they should be looking for in reviewing issuer's financial filings. Facilitating dialogue between securities and environmental regulators will help identify key risk factors.[bb]

7 // Securities regulators should notify companies from sectors of known climate change vulnerability when there is no or poor disclosure of risk from the physical impacts of climate change and of related adaptive strategies. This will send a signal to companies of the need for greater transparency and detail in disclosure and will strengthen disclosure quality over time.[cc]

8 // The Office of the Superintendent of Financial Institutions Canada should monitor and evaluate the quality of climate change risk disclosure by insurance companies to ensure that adjustments in pricing, underwriting, and investment practice account for physical risks of climate change.

Increase engagement on climate change disclosure among companies and capital market players

9 // Industry associations and other non-governmental organizations that work with large businesses should educate businesses about disclosure issues including the sector-based guidance available, trends and emerging issues, consistency in reporting in mandatory and voluntary venues, and risks related to legal liability. These groups should also engage accounting businesses and other key capital market players to enhance understanding of the long-term financial impacts of a changing climate.

bb This type of collaboration has taken place for GHG emissions mitigation. In the U.S., Securities and Exchange Commission (SEC) Environmental Protection Agency (EPA) collaboration was important in developing interpretive guidance, and continued collaboration is expected since the public release of new EPA GHG facility data in January 2012. In a 2004 report on environmental disclosure, the U.S. Government Accountability Office recommended such collaboration to protect investors, stating, "[B]ecause environmental disclosure is one issue that is specifically addressed in SEC's regulations—and is important to a growing number of investors—it makes sense for SEC to ensure that its staff is taking advantage of relevant information available from EPA" (U.S. Government Accountability Office 2004, p. 36).

cc Since the U.S. SEC issued interpretive guidance on climate change disclosure in 2010, 15 companies have received comment letters asking for improved climate change-related reporting, including seven companies in high risk industries such as electric power and insurance. This figure is based on internal research conducted by Ceres.

Help businesses benchmark performance

10 // Industry associations should develop key performance indicators for climate change risk and adaptation in a way that facilitates efficient and effective disclosure across their membership.[119] Each industry should identify performance indicators that provide a useful proxy for climate change risk management and adaptation, such as water use per unit of output, or nature and magnitude of insurance coverage for business disruptions. These indicators could be used by businesses to set goals, assess, and report on their own performance.

11 // Industry Canada, in collaboration with the Canadian Institute of Chartered Accountants, should engage industry sectors to assess the value of developing an online database where businesses can benchmark disclosure of risks of a changing climate and management actions, allowing best practices in disclosure to be highlighted.

GOAL 3 // ENHANCE THE RESILIENCE OF CRITICAL INFRASTRUCTURE

The resilience of our critical infrastructure — both public and private — to the impacts of climate change is key to our economic prosperity: companies that can't access essential services or efficiently get their products to market face competitiveness risks as a result. So, we must capitalize on existing processes and mechanisms to understand the economic risks we face and to encourage owners or operators to assess infrastructure risks posed by a changing climate and implement management actions where appropriate. And, since companies must also account for climate vulnerabilities in critical infrastructure systems in their business plans, providing access to this information is also important. Our recommendations are as follows:

Integrate assessment of climate change risk into Canada's National Critical Infrastructure Strategy

12 // As federal lead of the *National Critical Infrastructure Strategy*, Public Safety Canada should ensure sector risk profiles currently under development factor in both the direct risk of a changing climate on specific infrastructures and the risks due to cascading failures for the economy, society, and the environment. Guided by sectoral risk profiles, Public Safety Canada should lead a public–private dialogue to assess interdependencies among sectors and develop systems-wide risk assessments, analyze choke points and weak links through systems mapping, define acceptable risk tolerances, and establish priority actions to enhance the climate resilience of critical infrastructure.

Use a range of levers to drive assessment and reporting of climate change risk to critical infrastructure

13 // In consultation with industry, infrastructure practitioners, and climate scientists, Public Safety Canada should develop, publish, and disseminate guidance on conducting risk assessments of the impact of climate change on infrastructure and promote a standard reporting framework to foster comparability in assessment and reporting. This guidance should align with existing corporate risk assessment tools to the extent practical and build on existing methods to assess climate change risk to infrastructure.

14 // Federal and provincial/territorial governments should use procurement processes, existing regulations (e.g., *Canadian Environmental Assessment Act, Canadian Environmental Protection Act*), and the leverage afforded by project financing of Crown corporations to mandate climate change risk assessment of privately owned and operated critical infrastructure. The results should be used to ensure projects are adequately funded to allow for investments to manage infrastructure vulnerabilities.

15 // Governments should mandate climate change risk assessment of publicly-owned and operated critical infrastructure and use the results to identify and fund short-, medium-, and long-term adaptation investment priorities.

16 // In collaboration with other levels of government, Public Safety Canada should compile and disseminate the results of public and private climate change risk assessments of critical infrastructure through a centralized, publicly accessible and user-friendly database so that businesses can understand where critical vulnerabilities exist and make risk-based decisions to locate facilities, optimize supply chain and logistics planning, and update business continuity plans.

GOAL 4 // PREPARE NOW FOR FUTURE POLICY INNOVATION

Efficient and effective management of climate change risks and opportunities requires both public and private sectors alike to plan ahead. Governments must anticipate the need to correct for market failures hindering long-term adaptation by business. A forward-looking approach by government that integrates new investments in science and research, explores the potential of market-based instruments, and monitors the availability and affordability of adaptation solutions, intervening when necessary, will help position Canada to adapt and prosper in a changing climate in the decades to come. Our recommendations are as follows:

Invest in new science and research based on user needs

17 // On a consultative basis, the federal government should develop an adaptation science agenda to create data and information that supports private decision-making on adaptation. This agenda should be multi-disciplinary — spanning climate science to behavioural economics — subject to periodic performance reviews, collectively owned to promote continuity, and adequately resourced to ensure delivery and effective transfer of research outputs. Jointly established principles should guide priorities. The adoption of "value-of-information" principles (e.g., perfect information may not be worth its cost of acquisition; information is less useful if no action can be taken in response) merits consideration.

Investigate commercial opportunities of climate change adaptation for Canada

18 // The federal government should undertake a sector-based assessment of commercial opportunities of climate change adaptation for Canada that identifies near- and longer-term priorities targeting domestic and international markets. The assessment should analyze Canada's comparative advantage and the value of developing and marketing innovative technologies for adaptation. Wide dissemination of assessment results to Canadian businesses is key, as is the integration of assessment results in industrial development and trade policy.

Assess the potential for market-based instruments to shift behaviour in a changing climate

19 // Federal and provincial/territorial governments should investigate using markets and pricing as incentives to safeguard our natural adaptive defences (e.g., through ecosystems goods and services payment schemes like wetland banking, biodiversity offsets) and to manage demand of services such as water supply and electricity to ensure resources flow to the most valued use in a changing climate. Implementation of market-based instruments to promote adaptation is an emerging issue, requiring new research. Research on the effectiveness of pricing to induce behavioural shifts, backstops needed to protect the integrity of supply, the impact of pricing on access to essential services and across different users, and the appropriate use of revenues from pricing schemes will be necessary.

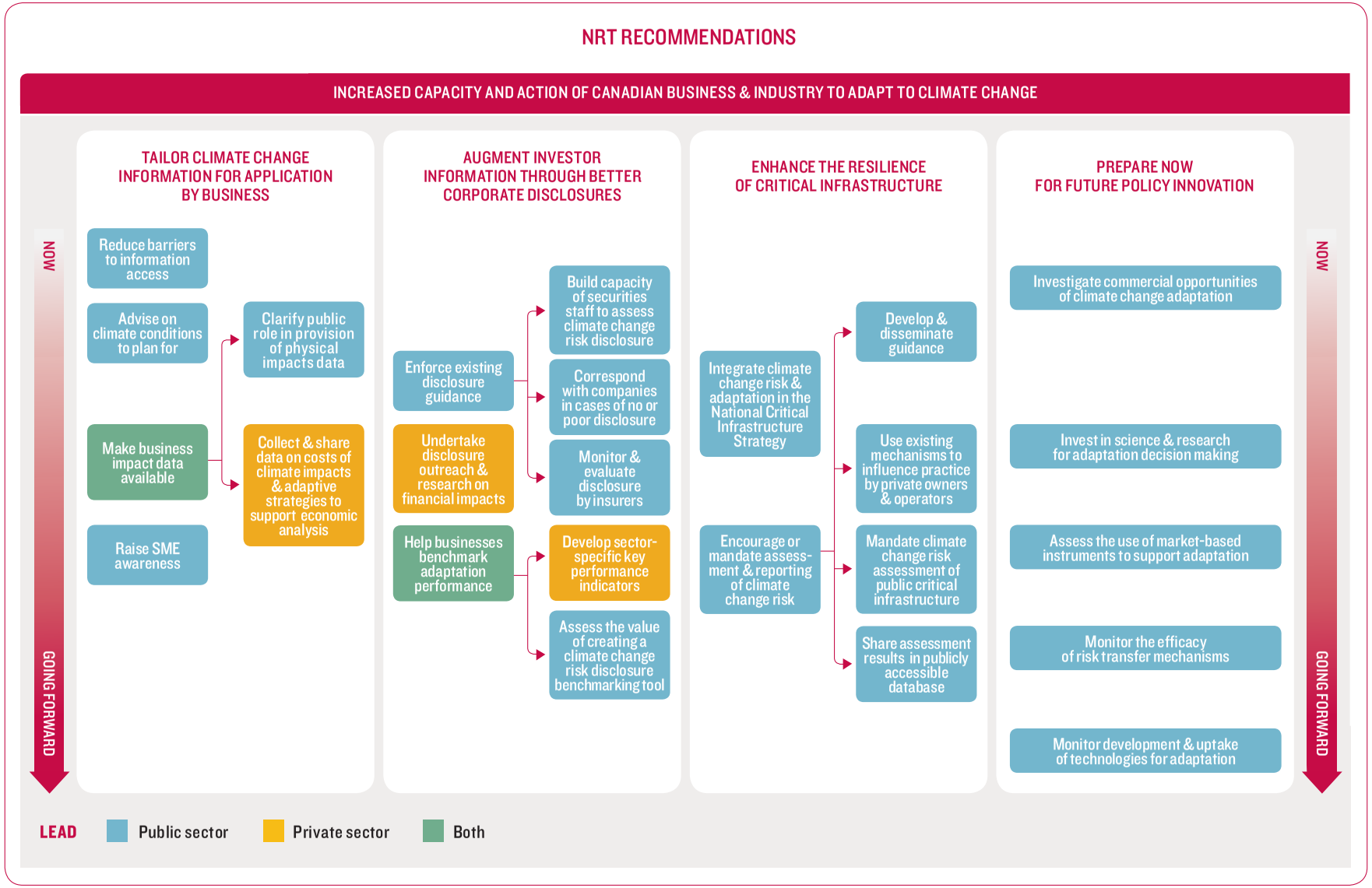
Monitor the efficacy of risk transfer mechanisms

20 // Insurance and other risk transfer mechanisms can create market signals that encourage adaptation, but can also create moral hazard, and pose financial risks if insurance becomes prohibitively expensive or coverage for specific climate-related perils stops (e.g., damage from windstorms). Federal and provincial/territorial governments should monitor the efficacy of risk transfer mechanisms and the take up of insurance innovations that respond to shifting risk profiles, industry needs, and intervene when necessary. Interventions could include requirements to disclose anticipated dislocations to insurance markets due to a changing climate.

Monitor development and uptake of technologies for adaptation

21 // Federal and provincial/territorial governments should monitor and identify emerging innovations that help reduce risk from the impacts of acute and chronic climate changes and determine the need for financial incentives (e.g., capital cost tax deduction) to encourage market penetration domestically and boost export potential.

FIGURE 6


NRT RECOMMENDATIONS
INCREASED CAPACITY AND ACTION OF CANADIAN BUSINESS & INDUSTRY TO ADAPT TO CLIMATE CHANGE
NOW
GOING FORWARD
TAILOR CLIMATE CHANGE INFORMATION FOR APPLICATION BY BUSINESS
Reduce barriers to information access
Advise on climate conditions to plan for
Clarify public role in provision of physical impacts data
Make business impact data available
Collect & share data on costs of climate impacts & adaptive strategies to support economic analysis
Raise SME awareness
AUGMENT INVESTOR INFORMATION THROUGH BETTER CORPORATE DISCLOSURES
Enforce existing disclosure guidance
Build capacity of securities staff to assess climate change risk disclosure
Correspond with companies in cases of no or poor disclosure
Undertake disclosure outreach & research on financial impacts
Monitor & evaluate disclosure by insurers
Help businesses benchmark adaptation performance
Develop sector-specific key performance indicators
Assess the value of creating a climate change risk disclosure benchmarking tool
ENHANCE THE RESILIENCE OF CRITICAL INFRASTRUCTURE
Integrate climate change risk & adaptation in the National Critical Infrastructure Strategy
Develop & disseminate guidance
Use existing mechanisms to influence practice by private owners & operators
Encourage or mandate assess-ment & reporting of climate change risk
Mandate climate change risk assessment of public critical infrastructure
Share assessment results in publicly accessible database
PREPARE NOW FOR FUTURE POLICY INNOVATION
Investigate commercial opportunities of climate change adaptation
Invest in science & research for adaptation decision making
Assess the use of market-based instruments to support adaptation
Monitor the efficacy of risk transfer mechanisms
Monitor development & uptake of technologies for adaptation
LEAD
Public sector
Private sector
Both

APPENDICES

// CHAPTER 6.0

6.0 // APPENDICES

6.1 BARRIERS TO CANADIAN BUSINESS ACTION TO ADAPT TO CLIMATE CHANGE

Our research and convening activities over the course of one year revealed several factors standing in the way of business action.

Table 4 summarizes the ones most commonly raised by either businesses or industry associations. Our focus was on Canadian needs and challenges, yet the barriers that we highlight are striking in their similarity to those in the 2011 publication "Adapting for a green economy: companies, communities and climate change" by the United Nations Global Compact, United National Environmental Programme, Oxfam, and World Resources Institute. This hints at the broad applicability of these barriers and also of the opportunity for Canada to both learn from and contribute to public- and private-sector innovations worldwide, as markets for adaptation solutions mature.

Businesses can overcome a number of barriers internally (i.e., those in the column "direct business control"). The lack of top management commitment and support, competing priorities, and organizational culture are critically important but far from unique to climate change adaptation and so we skip these in our descriptions below.

TABLE 4

ADAPTATION BARRIERS NOTED DURING THE NRT PROJECT

DIRECT BUSINESS CONTROL	LIMITED BUSINESS CONTROL
• Language and communications	• Language and communications
• Awareness	• Information and tools for decision support*
• Risk and uncertainty	• Inability to benchmark against peers
• Internal skills and funding	• Vulnerability through interdependencies*
• Top management commitment and support	• Policy and regulatory weakness*
• Competing priorities (e.g., short versus long term)	• Lack of financial incentives from government*
• Organizational culture (e.g., preference for tried and tested tactics and strategies)	• Lack of shareholder and investor commitment and support*

* WE DESCRIBE THESE BARRIERS IN CHAPTER 4.

// LANGUAGE AND COMMUNICATIONS: Climate change adaptation is a vague term. And many still perceive climate change as an environmental issue. Business managers can increase the internal salience of adaptation by instead referring to specific operational risks related to preparing for severe weather risks or water availability risks, and also to strategic risks such as insurance affordability.

// AWARENESS (of the connection between risks of climate change and business objectives): Limited information and knowledge exists linking the impacts of climate change to businesses risks and opportunities. Available information is too seldom presented in a way that resonates with sector-specific business objectives. Though few businesses fully understand the risks they face as a result of future climate change, many are well aware of the business impacts of extreme events in the current climate (e.g., intense summer precipitation events), and can apply this knowledge as a first step. Several businesses profiled in this report noted the benefits of collaborative partnerships with academic researchers, specialist organizations, professional bodies, and others in similar industries, in increasing awareness and understanding of success factors for climate change risk assessment and adaptation planning.

// RISK AND UNCERTAINTY: Uncertainty around timing and magnitude of climate change impacts remains an impediment to adjusting core practices and business strategy in anticipation of future impacts. This is, in part, due to the perception that managing risks of climate change involves actions with high up-front costs and uncertain, long-term benefits. As a result, the case for action can be a hard sell, particularly with the use of discount rates. But, as examples in Chapter 3 demonstrate, adaptive measures can be inexpensive and implemented incrementally, reducing the need for high up-front costs. The businesses we profile in case studies treat uncertainty about future climate not as a barrier to decision making, but as just another uncertainty among the many they face in business planning.

// INTERNAL SKILLS AND FUNDING: Allocation of staff (expertise and time) and financial resources for climate change risk management is small and often inadequate. Because of wide-ranging consequences of climate change impacts, successful management of the issue requires a diverse skill set, and individuals with technical and management skills are too often overloaded with responsibilities. Collaboration among businesses and with umbrella groups like professional bodies and industry associations is an efficient approach to promoting the integration of climate change adaptation into standard business practices, and to aggregating demand for awareness-raising and education, and for tools or other resources to facilitate decision making.

Action by external parties to overcome barriers is also necessary (i.e., those listed under “limited business control” in **Table 4**) and these are the barriers we focus on in Chapter 4. The remaining two, “Language and communications” and “Inability to benchmark” merit a brief look:

// LANGUAGE AND COMMUNICATIONS: Industry associations, government departments and agencies and non-governmental organizations will have more success in promoting adaptation to business audiences with a positive framing rather than a "doom and gloom" framing. Highlighting cost reductions anticipated from the adaptation initiative, or advantages gained relative to the competition, can both create a positive framing. Discussions on commercial and investment opportunities of climate change impacts and adaptation are long overdue in Canada. However, a positive, opportunities framing is not always effective — a prevention framing works well for some audiences (e.g., preventing legal liability). So, understanding sectoral and organizational cultures is an important early step when designing engagement strategies.[120]

// INABILITY TO BENCHMARK: A lack of best practices in managing climate change risks and of guidance on how to measure, communicate, and benchmark performance against peers are hurdles for businesses looking to adapt. Several reporting frameworks are available to help businesses communicate and disclose actions to manage risks from climate change, but their adoption is voluntary and patchy. As well, consensus is yet to emerge on key performance indicators for comparison within and across industry sectors.

6.2 TOOLKIT

Over the course of the NRT project on business resilience and adaptation to climate change, stakeholders mentioned the following information sources, tools to aid decision making, and other resources that are useful for businesses.

INFORMATION ON CLIMATE CHANGE, IMPACTS, AND ADAPTATION

Canadian Climate Change Scenarios Network:
www.cccsn.ca

Climate trend analyses for 18 Canadian regions to 2050:
www.iclr.org/images/Bruce_climate_change_info_march_2011.pdf

Intergovernmental Panel on Climate Change:
www.ipcc.ch/index.htm

National Round Table on the Environment and the Economy:
www.nrtee-trnee.ca

Natural Resources Canada Impacts and Adaptation website:
www.nrcan.gc.ca/earth-sciences/climate-change/community-adaptation/54

Regional climate services:
www.ouranos.ca; www.pacificclimate.org; www.parc.ca

The Nature Conservancy Climate Wizard:
www.climatewizard.org

World Bank Climate Change Knowledge Portal:
sdwebx.worldbank.org/climateportal/index.cfm

GUIDANCE, TOOLS, AND STANDARDS

Australian Government Climate Change Impacts & Risk Management: A Guide for Business and Government:
www.climatechange.gov.au/community/~/media/publications/local-govt/risk-management.ashx

British Standards Institution: Climate Change Adaptation. Adapting to climate risks using ISO 9001, ISO 14001, BS 25999 and BS 31100:
shop.bsigroup.com/en/ProductDetail/?pid=000000000030213386

Canadian Securities Administrators Environmental Reporting Guidance:
www.osc.gov.on.ca/documents/en/Securities-Category5/csa_20101027_51-333_environmental-reporting.pdf

PIEVC Engineering Protocol for Climate Change Infrastructure Vulnerability Assessment:
www.nrcan.gc.ca/earth-sciences/projdb/pdf/211_e.pdf

Shaping climate-resilient development: a framework for decision-making:
mckinseyonsociety.com/downloads/reports/Economic-Development/ECA%20%20%20Shaping%20Climate%20Resilent%20Development%20%20%20Report%20Only.pdf

Standard CAN/CSA-ISO 14001-04 (R2009) — Environmental Management Systems - Requirements With Guidance for Use:
shop.csa.ca/en/canada/environmental-management-systems/cancsa-iso-14001-04-r2009/invt/27002912004

Standard CAN/CSA-ISO 31000-10 — Risk management — Principles and guidelines:
shop.csa.ca/en/canada/risk-management/cancsa-iso-31000-10/invt/27030372010

Standard CAN/CSA-ISO 9000-05 (R2010) — Quality Management Systems — Fundamentals and Vocabulary:
shop.csa.ca/en/canada/quality-assurance-and-quality-management/cancsa-iso-9000-05-r2010/invt/27012042005

UKCIP Climate adaptation: Risk, uncertainty and decision-making:
www.ukcip.org.uk/wordpress/wp-content/PDFs/Risk.pdf

United Kingdom Climate Impacts Programme (UKCIP) Business Areas Climate Assessment Tool (BACLIAT):
www.ukcip.org.uk/bacliat

INSTITUTIONAL NETWORKS

Canadian Centre for Emergency Preparedness (CCEP):
www.ccep.ca

Carbon Disclosure Project:
www.cdproject.net/en-US/Pages/HomePage.aspx

United Nations Framework Convention on Climate Change Adaptation Private Sector Initiative:
unfccc.int/adaptation/nairobi_work_programme/private_sector_initiative/items/4623.ph

FINANCIAL INCENTIVES

Canada Revenue Agency Scientific Research and Experimental Development (SR&ED) tax incentive program:
www.cra-arc.gc.ca/txcrdt/sred-rsde/menu-eng.html

Sustainable Development Technology Canada SD Tech Fund:
www.sdtc.ca/index.php?page=sdtech-funding-niche&hl=en_CA

STAKEHOLDER SCOPING SESSION

This meeting took place on June 3, 2011, and considered how the NRT could best contribute to advancing private sector adaptation through its work on business resilience in a changing climate.

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Canadian Standards Association

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THE BOTTOM LINE ON MANAGING CLIMATE CHANGE RISKS AND OPPORTUNITIES: A FORUM FOR FINANCIAL EXECUTIVES

This meeting hosted by the NRT and the Network for Business Sustainability took place on October 27, 2011, to explore the business case for action to manage and adapt to the impacts of climate change.

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LEVERAGING INVESTMENTS IN CLIMATE SCIENCE AND IMPACTS AND ADAPTATION RESEARCH TO SUPPORT BUSINESS RESPONSES TO CLIMATE CHANGE TODAY

A two-part webinar series (November 22 and December 15, 2011) hosted by the NRT and The Delphi Group explored new ways to collaborate within and across private and public sectors to turn data, information, and knowledge into action.

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James Hudson
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BUILDING BUSINESS RESILIENCE IN A CHANGING CLIMATE: A PATH FORWARD FOR BUSINESS AND GOVERNMENT

This meeting took place on January 24, 2012, to seek advice on the direction, focus, and urgency of actions by government, industry, and other stakeholders to position Canada's private sector to adapt and prosper in a changing climate.

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Advisory committee members participated in four teleconferences between August 2011 and January 2012 to provide advice and feedback on the project.

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6.4 GLOSSARY

KEY TERMS	DEFINITION
ADAPTATION	Adjustment in response to actual or expected climate and its impacts, in order to reduce harm or exploit benefits. There are various types of adaptation, including anticipatory, autonomous, and planned adaptation.[121]*
BARRIER	Any obstacle to reaching an adaptation goal that can be overcome or attenuated through deliberate action.
BUSINESS CASE	Approach that puts a proposed investment decision into a strategic context and provides the information necessary to make an informed decision about whether to go ahead with the investment and in what form.[122]
CLIMATE CHANGE	A significant and persistent change in an area's average climate conditions or their extremes.[123]
CLIMATE CHANGE INFORMATION	A catch-all term that includes databases of climate variables, both average and extreme, climate projections and their interpretation, climate change impacts and adaptation research, and analytical guidance and tools to assess business impacts, develop, and select response options.
CLIMATE PROJECTION	The estimated response of the climate system to emissions or concentration scenarios of greenhouse gases and aerosols, or radiative forcing scenarios, often based on simulations by climate models. Because climate projections are based on assumptions concerning, for example, future socioeconomic and technological developments that may or may not be realized, outputs are subject to substantial uncertainty.[124]*
CLIMATE SYSTEM	The climate system is defined by the dynamics and interactions of five major components: atmosphere, hydrosphere, cryosphere (frozen systems), land surface and biosphere. Climate system dynamics are driven by natural (e.g., volcanic eruptions, solar variations) and human-induced modifications to the planetary energy balance (e.g. via anthropogenic emissions of greenhouse gases and/or land-use changes).[125]
CODES, STANDARDS AND RELATED INSTRUMENTS (CSRIs)	Institutions that help to "set the bar" in relation to the processes and materials that shape the quality of our physical infrastructure. Their primary objective has been to safeguard human safety and health throughout the full infrastructure lifecycle, constituting for society one of the most basic mechanisms for risk management. As a lever for governments, CSRIs can fall into "command and control regulations." That is, they are rules and restrictions specifying behaviours, courses of action, or performance requirements.[126]

* Modified from source

CRITICAL INFRASTRUCTURE	Physical and information-technology facilities, networks, services and assets that, if disrupted or destroyed, would have a serious impact on the health, safety, security or economic well-being of a population or the effective functioning of governments.[127]
DESIGN CRITERIA	Criteria that (engineering) professionals should meet in designing infrastructures. Statistics pertaining to weather and climate events inform design criteria. These values include calculated return periods for extreme weather (such as intense rain, wind, snow, extreme cold, and freezing rain) of varying intensities and durations. Climate design values generally reflect historical conditions for a given geographical location, an approach that is challenging in a changing climate.
ENTERPRISE RISK MANAGEMENT	The discipline by which an organization assesses, controls, exploits, finances, and monitors risks from all sources for the purpose of increasing the organization's short- and long-term value to its stakeholders.[128]
EXPOSURE	The nature and degree to which a system is exposed to significant variations in climate conditions.[129]
FIDUCIARY RESPONSIBILITY	An obligation to act for the benefit of the person to whom one owes fiduciary duties, to the exclusion of any contrary interest.[130]*
GOVERNANCE	The process whereby societies or organizations make decisions, including determining who has power, who makes decisions, how other players make their voice heard and how account is rendered.[131]*
HAZARD	The potential for a negative interaction between an event (of a natural or technological origin) and the vulnerable parts of the population, an organization, or function within an organization. Three factors combine to create a hazard: the events that can impact on a community, organization, or function; the vulnerability to such impacts; and the resources to cope with those impacts.[132]*
IMPACT	The effects of climate change on natural and human systems.[133]
INCENTIVE	A mechanism to encourage or discourage certain types of behaviour. Incentives can include information, price signals, regulations, and financial rewards or penalties. Provision of or access to these incentives can be by design or unintentional.
ISSUER	A public company that publicly issues securities.
MATERIALITY	Information that would likely influence a reasonable investor's decision whether or not to buy, sell, or hold securities in a company.[134]*

* Modified from source

MITIGATION	In the context of climate change, mitigation is an intervention intended to reduce adverse human influence on the climate system; it includes strategies to reduce greenhouse gas sources and emissions and enhance greenhouse gas sinks.[135]*
MORAL HAZARD	A situation in which the expectation of insurance coverage or disaster relief reduces an individual or organization's incentive to take precautions or make adjustments to reduce risk exposure.
OPPORTUNITY	A risk with positive consequences.
RESILIENCE	The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the same capacity for self-organization and the same capacity to adapt to stress and change.[136]
RISK	A combination of the likelihood (probability of occurrence) and the consequences of an event (e.g., climate-related hazard). In line with the multi-dimensional character of climate change, the framing of risk considers three questions: What can happen? How likely is it to happen? If it does happen, what are the consequences? Thus, risk from the impacts of climate change is an expectation that involves a threat or hazard (climate change as a source of or contributor to adverse or beneficial outcomes), outcomes (gains or losses), and uncertainty of occurrence and outcomes (the likelihood of the outcome actually materializing).
RISK MANAGEMENT	A systematic approach to setting the best course of action under uncertainty, by applying management policies, procedures and practices to the tasks of analyzing, evaluating, controlling and communicating about risk issues.[137]
RISK TRANSFER MECHANISMS	Mechanisms such as insurance and catastrophe bonds that distribute risk away from an individual or organization.
ROBUSTNESS	Ability to cope with a broad range of events and changing circumstances.
SENSITIVITY	The degree to which a system is affected, either adversely or beneficially, by climate change or variability. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea-level rise).[138]
SUPPLY CHAIN	The cycle of products and services, beginning with design then moving through sourcing, production, distribution, sales and ending with consumption.

* Modified from source

SYSTEMIC (RISK)	The potential loss or damage to an entire system as contrasted with the loss to a single unit of that system. Systemic risks are exacerbated by interdependencies among the units often because of weak links in the system. These risks can be triggered by sudden events or built up over time with the impact often being large and possibly catastrophic.[139]
TECHNOLOGIES (FOR ADAPTATION)	Technologies that, when implemented or applied, work toward adaptation goals. They include "hard" forms (e.g., new irrigation systems or drought-resistant seeds) and "soft" forms (e.g., insurance schemes or planning processes), or they can be a combination of hard and soft (e.g., early warning systems that combine hard measuring devices with soft knowledge and skills that can raise awareness and stimulate appropriate action).[140]
TOOLS	Methodologies, guidelines and processes that enable stakeholders to assess the implications of climate change impacts and relevant adaptation options in the context of their operating environment. Tools may occur in a variety of formats and have diverse applications: cross-cutting or multidisciplinary (e.g., climate models, scenario-building methods, stakeholder analysis, decision-support tools, decision-analytical tools) to specific sectoral applications (e.g., crop or vegetation models, methods for coastal-zone vulnerability assessment).[141]
UNCERTAINTY	An expression of the degree to which a value (e.g., the future state of the climate system) is unknown. Uncertainty can result from lack of information or from disagreement about what is known or even knowable. It may have many types of sources, from quantifiable errors in the data to ambiguously defined concepts or terminology, or uncertain projections of human behaviour.[142]
VULNERABILITY	Degree to which a system is susceptible to, and unable to cope with, adverse impacts of climate change, including climate variability and extremes.*

* Modified from source

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137 Canadian Standards Association 1997; as cited in Lemmen et al. 2008b
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FOR THEIR COLLABORATION ON THE CASE STUDIES REPORT, THE NRT THANKS

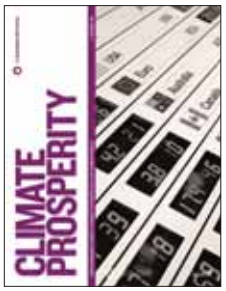
CLIMATE PROSPERITY

THE TIMELINE

NRT

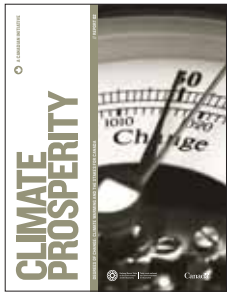
NATIONAL ROUND TABLE ON THE ENVIRONMENT AND THE ECONOMY

2010 → 2012



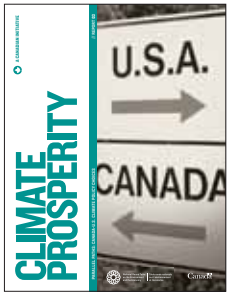
REPORT 01 //
MEASURING UP:
BENCHMARKING CANADA'S COMPETITIVENESS IN A LOW-CARBON WORLD

This report will assess Canada's capacity to be competitive in a new global low-carbon economy, by comparing us to other G8 nations in areas such as emissions and energy, skills, investment, innovation and governance.



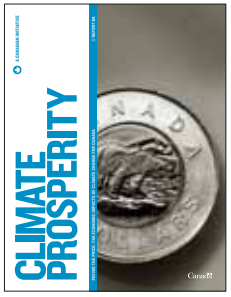
REPORT 02 //
DEGREES OF CHANGE:
CLIMATE WARMING AND THE STAKES FOR CANADA

This report will communicate the risks and benefits that a warming climate poses to Canada over the next one-hundred years in areas such as ecosystems, water resources, health, infrastructure and natural resource sectors and how adaptation can help.



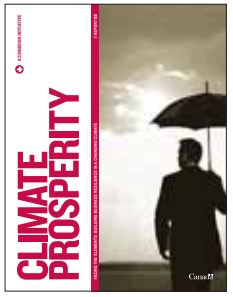
REPORT 03 //
PARALLEL PATHS:
CANADA-U.S. CLIMATE POLICY CHOICES

This report will examine Canadian climate policy choices based on potential U.S. courses of action and what this means for achieving Canadian environmental goals at the least economic cost.



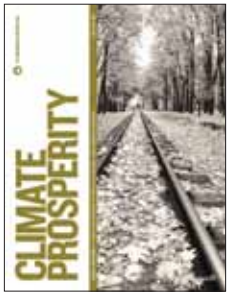
REPORT 04 //
PAYING THE PRICE:
THE ECONOMIC IMPACTS OF CLIMATE CHANGE FOR CANADA

This report will provide, for the first time, national economic costings of the impact of climate change on Canada, together with a detailed look at three key sectors.



REPORT 05 //
FACING THE ELEMENTS:
BUILDING BUSINESS RESILIENCE IN A CHANGING CLIMATE

/ CASE STUDIES
// BUSINESS PRIMER
/// ADVISORY REPORT
These three reports set out what Canadian businesses can and should do to prepare and take action to manage the risks and opportunities of a changing climate, and how governments can help.



REPORT 06 //
POLICY PATHWAY REPORT FOR GLOBAL LOW-CARBON TRANSITION

Building on previous reports in the series, this advisory report will provide policy pathways and actions necessary for Canada to thrive in a global low-carbon economy in areas such as energy, innovation, skills, investment and governance.

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