

Leveraging investments in climate science and impacts and adaptation research to support business responses to climate change today

Framing note for a two-part webinar series by The National Round Table on the Environment and the Economy (NRT) and The Delphi Group

“We have the knowledge necessary to start undertaking adaptation activities in most situations now.” That is a key conclusion of Canada’s most recent science assessment of our country’s vulnerability to climate change.[1] So why do gaps in access to reliable, timely, and meaningful climate change information for business decisions and plans stand out as a barriers to taking action to adapt to a warming world?[2-4] Whose role is it to close the gaps? What are smarter ways to collaborate within and across private and public sectors to turn data, information, and knowledge into action? What improvements in data and information matter most? The two-part webinar series hosted by the NRT and The Delphi Group on November 22 and December 15, 2011, will explore such questions.

The background in this framing note is to help prepare participants for webinar discussions.

What data, information and tools are relevant for business adaptation to climate change?

Climate change information encompasses climate (e.g., temperature, precipitation) and related environmental factors (e.g., sea level, water supply), covers observed and future conditions, both averages and extremes, and ranges in temporal and geographic detail. It also includes qualitative and quantitative information on the effects of changes in climate on nature and society, such as projections of forest areas burned; projections of flood risk from the combined effect of sea-level rise, storms, and changes in storm run-off; and the health impacts of more severe and frequent heat waves. Assessments of climate change vulnerability of specific regions or sectors are also examples of climate change information. Analytical tools can help decision makers understand the potential consequences for business of climate change impacts, identify key climate risks, perform detailed assessments on priority climate risks, and assess management options. Climate change information can factor into strategic, planning, and operational decisions. Figure 1 provides examples of types of resources that can aid businesses in adapting to a changing climate.

Note to readers:

Throughout this note, we use “**climate change information**” as 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.

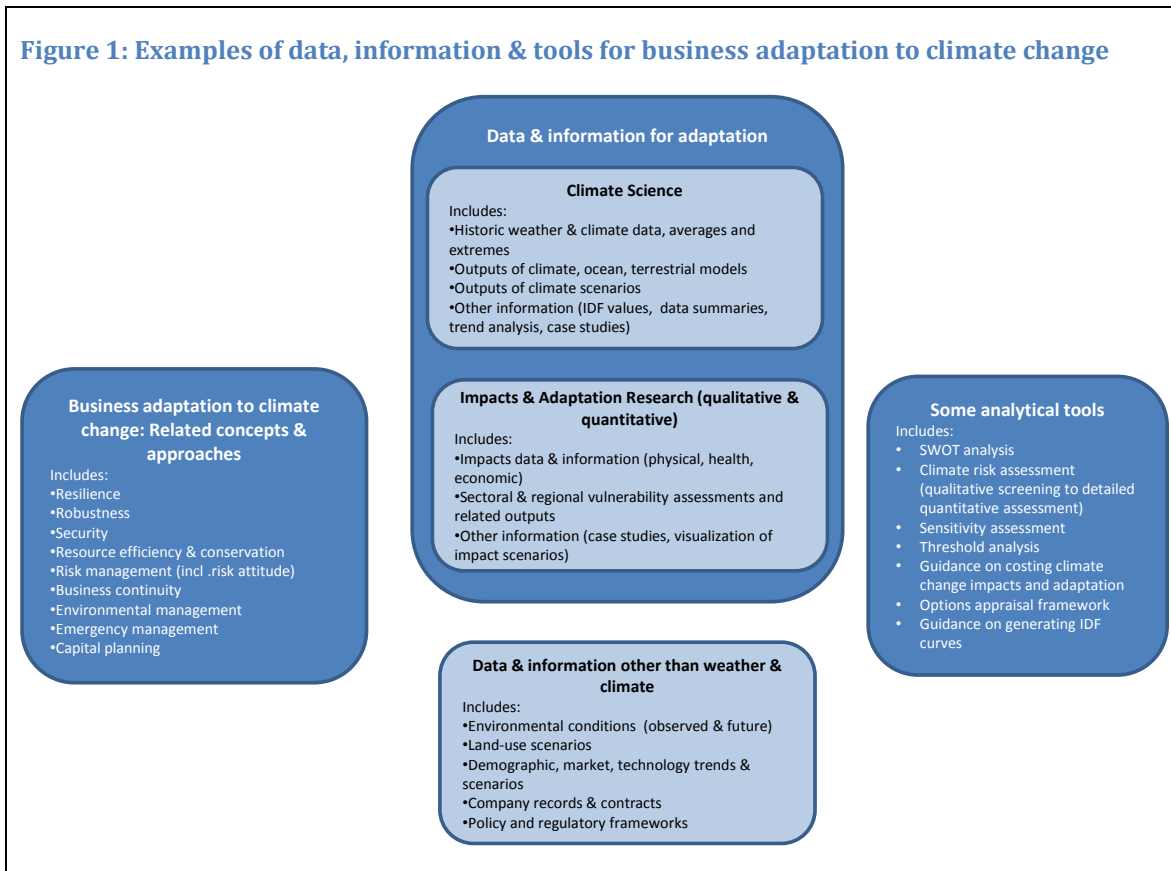
Not all decisions are equally subject to climate risk. Factors such as the degree of sensitivity to climate and the types of management options being considered influence the detail and precision of climate change information needed to make good decisions[5].

Two additional points are worth making here. First, an effective approach to adapting to the impacts of climate change is to integrate climate change considerations into existing planning and

decision making approaches (examples are in Figure 1). So, for example, a company with an environmental management system in place could include information on current and potential business impacts of climate change under “environmental aspects” of the planning process.[6] Second, it’s important to get comfortable with the notion of making decisions under climate uncertainty, since we will never have complete information about the precise magnitude and timing of future climate change or its impacts at a given location. This means moving away from trying to find “optimal” solutions and looking to strategies that minimize the cost of being wrong.[7]



Figure 1: Examples of data, information & tools for business adaptation to climate change



The supply side: Who provides data, information and tools for adaptation? How are they generated and disseminated?

Weather and climate shape our surroundings, livelihoods, and economic activities. So it's no surprise that a range of disciplines, research organizations, and government agencies are involved in understanding climate variability, climate change, its impacts, and how to adapt to them. Much of the climate change information so far developed in Canada has relied on substantial government funding by virtue of the “public good” nature of the research.[8] For example, a number of federal agencies collect, compile, process, and make climate-related data and information publicly available. Provinces and territories have also invested in building the adaptation knowledge base of their respective regions, through the funding of regional climate service centres, for instance. Because of the cross-cutting nature of the issue, many of the research projects and programs addressing climate change information needs are based on partnerships and serve varied audiences. The regional climate change consortium proposed for Ontario includes as partners twelve Ontario universities, Environment Canada, Ontario Ministry of Environment, municipalities, and Conservation Authorities; consultations are underway to secure private-sector partners as well.[9]

Increasingly, governments and other research organizations are paying attention to user needs and demands in setting their agendas and in funding research ventures. For example, much of the climate change impacts and adaptation work funded by Natural Resources Canada places a premium on projects that involve stakeholders throughout the research cycle, that address questions being asked by decision makers, and that include a knowledge translation and dissemination component.ⁱ The creation of regional climate service centres like the Pacific Climate Impacts Consortium (PCIC) and Ouranos represent an effort to increase the uptake of high-quality, regionally-relevant research that can be applied to reduce vulnerability to weather extremes, climate variability, and climate change. Through workshops, presentations, and specific requests for

information, these regional climate service centres work with users to define what they require and what is feasible to supply.[11]

Mechanisms and approaches to consolidate and transfer climate change information vary. Abundant data and information on observed climate, climate trends, and future climate – including how to interpret these – are available on websites for users to download in a variety of formats. Information on climate change impacts and adaptation options tends to be contained in research reports and scientific assessments, which are available on websites as well. Government agencies also work with professional bodies (e.g., Engineers Canada, Canadian Institute of Planners) and practitioner communities (e.g., sustainable forest management practitioners) to get information resources and tools into the hands that need them.ⁱⁱ Finally, a market for certain types of guidance related to climate change adaptation is starting to emerge. For example, the Canadian Standards Association sells a technical guide for building on permafrost terrain that takes into account climate change adaptation[12] and the British Standards Institution has recently published guidance to help organizations integrate adaptation into existing management systems.[6]

The demand side: What climate change information do businesses and sectors need and use to adapt to climate change? What are challenges in obtaining and applying these?

In general, needs and priorities vary by industry sector, geographic location, and by end-use. To our knowledge, comprehensive sectoral assessments on data and information needed or used by Canadian business have not yet taken place. Table 1 is a summary for four major Canadian industry sectors based on a literature review and the NRT's own research. It is by no means complete, but provides an indication of the diversity in needs and uses.

Table 1: 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[13, 14]	<ul style="list-style-type: none"> • 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) 	<ul style="list-style-type: none"> • Adjusting insurance products & creating new ones • Adjusting loss & catastrophe models • Exercising due diligence when buying securities • Assessing credit risk
Hydropower utilities[15]	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Informing environmental assessments • Assessing climate risk to operations • Assessing benefits of changing operating rules • Adjusting annual tariffs • Optimizing reservoir operations • New site selection and design
Forestry[11, 15]	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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[16, 17]	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Adjusting building codes and product standards • Designing engineering projects

Although Table 1 provides examples of stated needs and actual uses of existing resources, integration of climate change information into business risk management in planning is far from mainstream. Through our webinar series we hope to confirm some of the challenges preventing business' uptake of climate change information and identify new ones. The following list summarizes the challenges we've observed to date, based on NRT research and stakeholder consultations:[2, 15]

1. Confidence in climate projections and related challenges choosing projections as inputs for impact assessment.
2. Availability of climate projections at meaningful scales for business decisions: high spatial resolution, short time-frames.
3. Climate change information in formats, language, and locations that are accessible by business.
4. Awareness of practical tools and guidance available to help assess climate risk for business and appraise adaptation options.

In addition, Table 2 highlights lessons from over 20 years of global experience with seasonal climate forecasts, which may also apply to the uptake of different types of climate change information (particularly quantitative).

Table 2: Factors that influence uptake of seasonal climate forecasts[18]

User context	Factors shaping information production
<ul style="list-style-type: none"> • Institutional constraints (e.g., preference for tested practice, rules imposed by external parties) • Other kinds of information being more influential in the decision • Organizational culture & individual reward structures (e.g., risk tolerance) • Acceptability of forecast uncertainty • Availability of alternative courses of action 	<ul style="list-style-type: none"> • Mutual understanding between suppliers & users of information • Spatial & temporal scale, forecast skill • Confidence in, & legitimacy of, information • Accessibility (attention to availability, language, format, user understanding)

From our literature review, it's clear that gaps in observed weather and climate data remain, and that some stakeholders prioritize "bolstering the baseline" over improving access and relevance of forward-looking climate change information.[19] These perspectives are important, as is identifying priorities for investments in upgrades in research infrastructure. However, our webinar series will focus on making the best use of existing climate change information.

Matching supply and demand: What are the gaps? What are potential solutions?

According to the US National Research Council, "even though the information on which decisions affected by changing climate are based may become less certain, it is increasingly necessary to make decisions of high[er] quality, making good use of the information that is available." [3] Governments across Canada are committed to helping regions and sectors adapt to the impacts of climate change. Providing a foundation to support wise decisions is part of this.ⁱⁱⁱ Until recently, information providers did not see much of a demand for climate change information to support private sector adaptation so a clear picture of specific and common gaps in the current situation and potential ways forward does not yet exist. This is exactly where we hope to get to with our webinar series.

By having a better idea about the nature of the problem, be it communication, visibility, fragmentation, translation, engagement, trust, capacity, or any combination thereof, we can then move to explore practical and cost-effective approaches to leverage the resources we already have, so that Canadian businesses are equipped to adapt to climate change. Here are a few examples of initiatives taking place that might be useful in thinking about our own situation:

- **Two-way- dialogue** - In the US, NOAA's National Climatic Data Center (NCDC) has identified twelve priority sectors for engagement on adaptation.^{iv} Each sector has a team dedicated to it, with the mandate of learning more about and better serving their needs. Activities include developing sectoral fact sheets, hosting or co-hosting sectoral workshops, participating at sectoral conferences, and partnering on research activities.

- **Consolidation** - The Danish government has a [portal](#) that consolidates government-funded climate projections and information on impacts and adaptive strategies for various sectors and systems (e.g., energy, agriculture, health, nature).
- **Information-sharing** - A partnership between Western Economic Diversification, University of Lethbridge, and Cybera has led to the creation of a [web platform](#) that hosts water and environmental data and makes it available for use. Using Google maps, this website shows the location of all available data sets and allows the user to search and browse. Users can post freely to the site, with no guarantees of accuracy.

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18. Dilling, L., and Lemos, M.C., *Creating usable science: Opportunities and constraints for climate knowledge use and their implications for science policy*. *Global Environmental Change*, 2011. 21: p. 680-689.
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Endnotes

ⁱ As an example, Natural Resources Canada initially funded the development of a risk assessment tool for communities, which has now been applied to several communities across the North and Alberta. A key lesson from running training sessions was the importance of simplifying the selection of climate conditions to include in the risk assessment. In response, NRCan and others commissioned the development of a report that summarizes for 18 Canadian regions, the observed climate trends to date and some climate related factors, and the results of trend analysis to 2050. (10. Bruce, J.P., *Climate change information for adaptation: Climate trends and projected values for Canada from 2010 to 2050*. 2011, Institute for Catastrophic Loss Reduction. p. 54.)

ⁱⁱ For an example of a tool, see the PIEVC Engineering Protocol for Climate Change Infrastructure Vulnerability Assessment (http://adaptation.nrcan.gc.ca/projdb/pdf/211_e.pdf)

ⁱⁱⁱ For instance, British Columbia's adaptation strategy provides for investments in tools for adaptation planning, in knowledge transfer and outreach activities, and in sectoral vulnerability assessments to guide future priorities (http://www.livesmartbc.ca/attachments/Adaptation_Strategy.pdf).

^{iv} These are: agriculture, civil infrastructure, coastal hazards, energy, health, insurance, litigation, marine and coastal ecosystems, national security, tourism, transportation, and water resources.