

National Climate Change Adaptation Framework

Prepared by

**The
Intergovernmental Climate Change
Impacts and Adaptation
Working Group
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Intergovernmental Climate Change Impacts and Adaptation Working Group

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Introduction

Canada's climate has changed significantly in recent decades, and early impacts are now being detected in many regions. In the North, for example, melting permafrost is dramatically increasing infrastructure maintenance requirements. Northern people are also concerned about losing a traditional way of life, knowledge, and skills. In British Columbia, recent climate conditions have contributed to floods, droughts, and forest fires, as well as to the continuing devastation of large areas of timber by the mountain pine beetle. Across the Prairies, warmer temperatures, decreases in glacial runoff, and less reliable precipitation are exacerbating already-stressed water resources, increasing the potential for impacts on food supplies, health, industry, and the environment. And in the Gulf of St. Lawrence and along much of the Atlantic, Beaufort, and Pacific coasts, rising sea levels are increasing vulnerability to coastal erosion and storm-surge flooding.

While efforts to reduce greenhouse gas emissions may ultimately stabilize greenhouse gas concentrations in the atmosphere that will not happen soon. Excess greenhouse gases already in the atmosphere, will remain there for some centuries, making further climate change unavoidable. Changes in climate are having significant effects on our communities and economy. In one way or another, Canadians have to adapt to them. How we do so will have a considerable effect on our quality of life over the long term. Adaptation, therefore, is an essential response to climate change.

Recognition of this necessity prompted the federal, provincial, and territorial governments to set up a joint working group, in 2002, to prepare a National Adaptation Framework. This framework identifies ways in which governments can work together to increase Canada's capacity to adapt to climate change, so that risks can be recognized and reduced, and opportunities identified and pursued.

"Climate change is real, it is happening now and it is a truly global challenge. No nation and no region is immune to its impacts.... This is a wake-up call for all of us, not only of the need to reduce emissions, but to realize the importance of adapting to the increasingly changing climate."

— The Honourable Stéphane Dion, federal Minister of the Environment

"It is prudent for B.C., as it is for other jurisdictions around the world, to take both actions that reduce provincial greenhouse gas emissions and actions that enable the province to adapt to anticipated climate change impacts."

— *Weather, Climate, and the Future: B.C.'s Plan*, British Columbia Ministry of Water, Land and Air Protection (2004)

"In New Brunswick and the Atlantic provinces, due to our geographic location and our dependence on natural resources, we must adapt to the oncoming changes more quickly than other regions. And we are already seeing the effects that could be caused by climate change.

Our vast coastline and numerous coastal agglomerations make us vulnerable to the rising sea level; our agricultural industry could be seriously affected by changing weather patterns; our forests could be exposed more often to insect outbreaks and forest fires."

— The Honourable Brenda Fowlie, New Brunswick Minister of the Environment and Local Government

Development of the Framework has been guided by the following considerations.

To be most effective, adaptation should be proactive.

As our climate continues to change, the risks to Canadian communities and businesses will increase in both magnitude and number. Agriculture, natural resource industries, hydroelectricity, recreation and tourism, traditional hunting and fishing, and other cornerstones of our economy all face new and different challenges. The ability of Canadian society to minimize these risks depends on how effectively governments, businesses, and individuals respond to the adaptation challenges that face them. A reactive strategy — waiting for impacts to occur before making adaptive changes — is essentially a nonstrategy, likely to be costly and inefficient. Adaptation is much more effective if it is planned in advance and implemented systematically. A proactive approach to adaptation offers much greater scope for avoiding or limiting damage, spreading costs over time, and making investments in new opportunities that can at least partially offset losses from activities that are no longer sustainable.

Governments have a critical role in adaptation.

Governments have two roles to play in this process: first as adaptors themselves, and second, as catalysts to encourage and facilitate adaptation in other sectors of society. Governments, as custodians of public assets and providers of public services, must ensure that their own programs, policies, resources, and systems are resilient enough to cope with changing climatic stresses. At the same

time, they must provide leadership, support, and direction to assist other sectors of society to recognize their adaptation needs and to achieve their adaptation goals. Governments can promote adaptation in many ways — by engaging communities of interested people; by providing reliable and detailed information; by promoting research and development; by implementing regulations, codes, standards, and other policy instruments that encourage sound adaptation; and by setting an example through their own adaptation initiatives.

How climate change will affect water supply is an important question for Quebec, which has significant hydro-electric generating capacity. Hydro Quebec, the provincial government, Canada, and other partners are investing in tools and research to reduce uncertainty about future water supply and inform future planning. Through the Ouranos Consortium, they are developing scenarios of future climate and hydrology, and reconstructing the relationship between past climate and hydrology using tree-ring and other paleoecological data.

Governments can act now.

Although there are still many uncertainties about the extent of future changes in climate and the impacts that may result, these should not be an impediment to action. There is solid scientific evidence that the global climate — and the Canadian climate — have warmed significantly over the past century. Early impacts on our communities and our economy are already apparent. Current research has also identified many areas of vulnerability and given us some of the

tools we need to assess and manage risks more effectively.

By acting now, we can identify risks and opportunities at an early stage and be better prepared to respond to them. We can make better decisions about land use, infrastructure, resource management, and other aspects of public policy and investment, and avoid commitments that may not be sustainable. And we can enhance our capacity to meet future adaptation needs by expanding our knowledge base, research capabilities, and risk management expertise and by extending networks of stakeholders engaged in adaptation planning. To do all of this, however, we must increase awareness of potential impacts, incorporate adaptation into ongoing decision-making and planning processes, develop appropriate decision-making tools, and expand intergovernmental and cross-sectoral partnerships devoted to adaptation.

Remote northern communities have historically relied on temporary ice and snow roads for transporting goods and people during the winter months, but climate change means winter warming and a shorter, less reliable winter road season. The Government of Manitoba is already preparing for a warmer future by investing in building all-season roads into some communities, changing some routes to avoid dangerous water crossings, and building bridges over streams and rivers where needed.

Governments have both separate and shared responsibilities.

The risks and opportunities that come with changes in climate will vary, often considerably, from one region to another and from one sector to another. Some may be specific to a certain region or

sector; others may be broader in scope. Consequently, different jurisdictions will have different adaptation needs and priorities, as well as differing responsibilities. It is also true, however, that the federal, provincial, and territorial governments share many of the same interests in helping decision makers adapt to climate change. There is, therefore, good reason for coordinating many adaptation initiatives regionally or nationally — and there is considerable scope for doing so.

Collaboration between governments and with other stakeholders is essential for effective adaptation planning.

Because climate and the impacts of a changing climate recognize neither borders nor sectoral boundaries, collaboration is an essential requirement for resolving many of the adaptation challenges that face our society. Without a high level of cooperation and interaction within government, between governments and with other stakeholders, many adaptation goals will be difficult to accomplish.

Collaboration improves communication and the exchange of knowledge makes more efficient use of the country's intellectual and financial resources. With coordinated action, the acquisition of information and the development of adaptation tools and skills will be both easier and more effective.

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The National Adaptation Framework provides a foundation for collaboration between the participating governments in raising awareness of the need to enhance Canada's adaptation

capabilities, in promoting research, and in developing tools that will further the development of detailed adaptation plans and initiatives.

“Our biggest concern for this province regarding climate change are the physical effects of more severe weather patterns, rising sea levels over the next 50 to 100 years and this of course can have devastating effects on our coastal communities and our river systems. In planning and managing our communities and our infrastructure we must take such potential events into account in order to minimize the long term costs. We need to prepare and adapt to such changes.

It is clear that the impacts of climate change are already being felt in this province. Indicators of climate change include increased storm action, flooding and the introduction of new warm weather diseases such as Lyme disease.”

— The Honourable Tom Osborne,
Newfoundland and Labrador Environment
and Conservation Minister

“We have first-hand knowledge of environmental conditions and are now witnessing the impacts to the environment because of climate change. These changes are making it increasingly difficult to travel and access our resources. It is possible that our environment, and the land and wildlife resources we depend on, and the current social and economic systems could be further influenced by the predicted change.”

— The Honourable Paul Okalik, Premier of
Nunavut

— The Honourable Olayuk Akesuk, Nunavut
Sustainable Development Minister

— The Honourable Edward Picco, Nunavut
Energy Minister

The Framework consists of six elements in which action should be taken to improve our capacity to adapt to the impacts of climate change. Each element includes specific objectives and a list of recommended actions to facilitate their achievement. The recommended actions are intended as a guide to achieving the objectives and not as rigid requirements.

The six Framework elements are:

- 1. Raise awareness of adaptation**
- 2. Facilitate and strengthen capacity for coordinated action on adaptation**
- 3. Incorporate adaptation into policy and operations**
- 4. Promote and coordinate research on impacts and adaptation**
- 5. Support knowledge-sharing networks**
- 6. Provide methods and tools for adaptation planning**

Element 1: Raise Awareness of Adaptation

A changing climate currently affects major areas of government responsibility, such as resources, infrastructure, health, security, economic development, and other vital interests of Canadians. It is likely to have even more far-reaching effects on our environment, economy, and society in the future.

While some impacts will present opportunities, many will have costs. It is important that government and others recognize these costs when making decisions, especially long-term decisions, now.

Understanding the potential physical impacts of climate change, the possible social and economic implications, and the adaptation options is increasingly important. Government decision makers need more than awareness, however. They need to understand the complexity of these issues and the need for multidisciplinary and multijurisdictional cooperation in dealing with them, and they need information about how to incorporate climate change into decisions.

Other levels of government, the private sector, and the general public also face adaptation challenges. The federal, provincial, and territorial governments cannot respond to all of them. They can, however, raise awareness in other sectors and provide information and support to assist other levels of government, businesses, and the public in developing their own adaptation responses.

Objectives

To ensure that key decision makers understand that changes in climate are happening now and that there is a need to adapt to these and future changes to minimize risks and maximize opportunities.

To ensure that decision makers consider climate change impacts in their decisions.

To increase awareness among the Canadian public of the need to adapt to a changing climate.

Recommended Actions

Develop and share between governments materials that increase understanding of the need for adaptation.

Such materials would include local, regional, and national case studies; environmental impact assessments; economic assessments; and other analyses that make a business case for adaptation. Jurisdictions can share materials they have developed for their own needs, as well as collaborate on the preparation of presentations, graphic materials, and documents that serve common requirements.

Establish and maintain key partnerships outside of government to raise awareness of impacts and adaptation.

Governments should establish and maintain partnerships with other organizations with an interest in adaptation and outreach, including municipal, First Nations, Inuit, industry and

professional associations, and nongovernmental organizations. Such partners will be particularly effective in conveying to their members the business case for adaptation and details about how to adapt. An additional benefit is that outside partners can be valuable conduits for carrying adaptation concerns from their members back to government.

The federal, provincial, and territorial governments worked together through the Canadian Council of Ministers of the Environment to produce a national climate change report. *Climate, Nature, People: Indicators of Canada's Changing Climate* documents changes in climate and related impacts on people and the environment over the last century.

Develop key national messages and communication materials that incorporate these messages.
Governments could identify a shared set of messages for use in national and bilateral communications about climate change adaptation. Shared messages help promote consistency in the materials Canadians receive from governments on climate change impacts and adaptation.

Develop and share outreach strategies.
Adaptation requirements vary from one jurisdiction to another, and outreach strategies developed by different jurisdictions will vary accordingly. Nevertheless, many approaches and resources developed for these strategies will have more than regional value, and there is much to be gained from exchanging ideas and information about them.

Encourage and support the inclusion of content on impacts and adaptation in existing climate change outreach initiatives.

A number of sources, both governmental and nongovernmental, provide Canadians with information on climate change. Many, however, offer only very general coverage of impacts and provide little information about adaptation. More should be done to raise the profile of impacts and adaptation in existing outreach programs, and this can best be accomplished by encouraging the producers of such programs to give more attention to impact and adaptation issues and by providing them with the information and resources needed to do so.

Incorporate information on impacts and adaptation to climate change into other outreach and education programs.
Governments conduct numerous outreach and education programs. Climate change impacts should be added to existing programs as an emerging element for sectors that will likely be affected by climate change.

Element 2: Facilitate and Strengthen Capacity for Coordinated Action on Adaptation

Canada's geographical and ecological diversity means that changes in climate and their impacts will vary significantly across the country. Regional social and economic differences mean that adaptation responses — government policies and programs set in place to address climate-related risks and opportunities — will also vary from one jurisdiction to another. However, strong capacity to coordinate information, resources, and action between jurisdictions will help to reduce overlap and achieve a more efficient deployment of national and local resources.

Governments have two roles: they are adaptors in the face of specific regional impacts; and they act as catalysts to increase the ability of Canadians to identify the impacts of climate change and to manage risks and take advantage of opportunities.

As catalysts, governments have a common interest in increasing capacity to adapt, in sharing ideas about how to build that capacity, and in working jointly to identify and implement programs, policies, and other initiatives that increase capacity. Such sharing promotes a more efficient deployment of government resources and helps to reduce overlap.

As adaptors, governments also have a common interest in sharing ideas about how to incorporate climate change into ongoing management approaches and about ways of responding to specific risks and opportunities. Moreover, changes in climate affect biophysical

systems, such as ecosystems and watersheds, that cross jurisdictional boundaries. Governments should work together, along with other stakeholders, to ensure that adaptive responses are consistent and mutually supportive.

As interest in adaptation continues to grow in Canada, collaboration will be increasingly important.

The federal, provincial, and territorial governments have worked together through the Intergovernmental Climate Change Impacts and Adaptation Working Group to complete this National Adaptation Framework. The Working Group has also acted as an informal peer network through which governments have shared information about tools, methods, and approaches, and identified partnership opportunities.

Objectives

To develop and maintain a capacity for coordinated action between provinces, territories, and the federal government.

To develop and maintain a capacity for sharing information between jurisdictions.

Recommended Actions

Renew and expand the mandate of the Intergovernmental Climate Change Impacts and Adaptation Working Group. The Intergovernmental Climate Change Impacts and Adaptation Working Group (IAWG) has been the primary vehicle for sharing information and ideas between jurisdictions on the best ways to increase Canada's ability to identify and

manage risks and opportunities related to climate change. Its primary purpose has been to develop this Framework, which embodies the ideas developed in IAWG discussions. The IAWG has also been a vehicle for member jurisdictions to share information about their adaptation policies, programs, and initiatives. The IAWG is the only group that facilitates sharing on adaptation between member governments at the policy level.

The Conference of New England Governors and Eastern Canadian Premiers — including the governments of Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick, and Quebec — has recognized that global warming has negative social, economic, and environmental consequences. In 2001 the Conference accepted a regional climate change action plan to jointly address concerns by increasing understanding of projected impacts and promoting regional adaptation strategies.

As interest in adaptation continues to increase in Canada and as the field of adaptation evolves, there will be continued value to jurisdictions in sharing information through the IAWG. Enhanced information sharing between governments should build upon the expertise IAWG members have already gained. In addition, implementation of the capacity-building actions identified in this Framework will require coordination between jurisdictions and an expanded role for the IAWG. Finally, there is ongoing need for a core intergovernmental group at the policy level to give leadership on the issue and to encourage all parts of government to address adaptation as appropriate. To carry out an expanded mandate, the

IAWG will need additional resources and the support of a secretariat.

Identify an intergovernmental ministerial body responsible for adaptation in Canada.

Changes in climate will have social, economic, and environmental impacts and will affect many communities, sectors, and industries across Canada. Adapting to climate change is a long-term process and requires government leadership and intergovernmental cooperation. For that reason, adaptation should be the responsibility of a ministerial-level intergovernmental body with a broad mandate that encompasses socioeconomic as well as environmental considerations. The IAWG should report to the ministerial-level body.

Establish an intergovernmental Web site or other arrangement for sharing information between governments.

A shared intergovernmental information source with access to material from other jurisdictions would be useful for policy and program development and communication activities. Such material could include completed documents and presentations, as well as drafts of work in progress and items such as graphs, artwork, and photographs.

Engage existing intergovernmental and multistakeholder bodies to promote further collaboration on adaptation.

Climate change is expected to continue to have impacts on many sectors and on all parts of Canada. Ultimately, adaptation will require that the potential impacts of climate change be considered in all long-term planning processes, as well as intergovernmental initiatives. Meetings of senior officials, ministers,

and first ministers provide recurring opportunities to deal with adaptation concerns and activities at a high level. International bodies, such as the International Joint Commission, and

regional fora, such as binational meetings of premiers and state governors, can also be useful vehicles for establishing cooperation on adaptation.

Element 3: Incorporate Adaptation into Policy and Operations

As the climate changes, governments face an increasing array of challenges and opportunities. Climate change has the potential to affect not only the sustainability of existing public assets and resources but also the outcomes of many policy, program, and investment decisions. It is important, therefore, that governments consider climate change in policy and operational areas that are sensitive to climate and in decisions that may affect the ability of governments and others to adapt to these changes.

Climate change may increase existing pressures on water resources in the Prairies. *Water for Life: Alberta's Strategy for Sustainability* is the Government of Alberta's effort to address these pressures and ensure a sustainable future for Alberta that includes safe drinking water, healthy aquatic ecosystems, and reliable supplies for other users. Through research, partnerships with stakeholders, conservation, and other water management improvements, Alberta will address existing threats and improve its capacity to adapt to future climate-related impacts on water.

In New Brunswick, rising sea levels have already had negative impacts, including coastal flooding, erosion, and infrastructure damage. Sea levels will likely continue to rise as the climate warms. New Brunswick's Coastal Areas Protection Policy establishes protected and buffer areas along the coast, and imposes strict conditions on activities and development within these areas. It helps to maintain dunes and other features that protect inland areas from storm surges and flooding, and to ensure that new developments take past and projected future climate into account.

While this may be a new requirement for many government departments and agencies, it can be accomplished for the most part within existing government structures and in much the same way that governments already identify and develop management strategies for other risks. Managing these risks, however, requires coordination between different policy and operational areas to ensure a coordinated response over the long term.

Policy decisions that do not consider climate change may limit future adaptation choices. At the same time, actions taken to reduce current climate-related risks may also help governments prepare for long-term climate change. It is both prudent and wise to factor in the changing climate and its potential impacts in making policy and management decisions.

Objectives

To ensure governments have the capacity to identify and evaluate climate-related risks to new and existing initiatives and emerging opportunities related to climate change

To encourage governments to incorporate adaptation into policy and operational planning and to report on their progress in this activity.

Recommended Actions

Identify or develop procedures that governments can use to discover and assess climate-related risks to new and existing government initiatives and emerging opportunities related to climate change.

Examples of such procedures include:

- Conducting government-wide assessments of vulnerability to changes in climate. Such assessments identify aspects of government business that are sensitive to climate, review existing vulnerability to extreme weather events, and identify whether climate change would increase or decrease existing vulnerability. They determine whether current policies and programs are appropriate in the face of climate change and whether they strengthen or weaken ability to adapt. Where possible, such assessments would ideally consider broad social and economic trends and the capacity of human and natural systems to adapt to changes in climate and their impacts.
- Routinely considering potential changes in climate in new government policy, program, and operational decisions, especially where climate is already known to be a risk factor.

Develop a compendium of approaches that government adaptation champions can use to encourage decision makers across government to routinely consider climate change and its impacts in decision making.

Such approaches include:

- Housing adaptation in a high-level coordinating ministry to facilitate collaboration between departments and agencies, exchange of information on the implications of climate change, assessments of government policy and program susceptibility to climate change effects, consistency in government policy on climate change adaptation,

and greater understanding across government of various aspects of adaptation policies and their connection to other policies.

- Developing new or adopting existing climate change risk assessment methodologies and integrating them as appropriate into government's existing policy and operational planning processes.
- Establishing working groups within government to focus expertise from the various disciplines on key challenges and opportunities related to climate change, to develop adaptation strategies, and to recommend actions.
- Providing the appropriate expertise, information, analysis, tools, resources, and methodologies to those responsible for implementing adaptation initiatives.

The Canadian Environmental Assessment Agency, through a committee of experts from its member federal, provincial, and territorial governments, produced a guidance document for government and other environmental assessment practitioners. *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners* (2003) includes a practical approach for identifying the potential threats that climate change and its impacts pose to new and existing projects.

Report on government progress in assessing and managing climate-related risks.

Reporting on progress encourages action on adaptation. The resulting documents provide valuable information on problems and successes in different

jurisdictions. Governments could establish formal requirements for reporting on their progress in incorporating adaptation into policy and operational decisions across government. For example:

- the federal, provincial, and territorial governments could report to each other on a regular basis through the IAWG;
- the Government of Canada could report to appropriate international bodies, such as the United Nations Framework Convention on Climate Change (UNFCCC) and the Organisation for Economic Co-operation and Development (OECD), on national, regional, and sectoral progress on adaptation.

Element 4: Promote and Coordinate Research on Impacts and Adaptation

Research plays a vital role in helping government and other decision makers to understand the risks and potential benefits associated with climate change and to devise effective adaptation strategies. To date, most research in this field has focused on the biophysical impacts of climate change. While this element is important and requires further work, there are also critical social and economic research gaps that need to be filled to better understand how climate change and various options to adapt to it will affect people, communities, and industries.

Governments can ensure their own investments in research are relevant to policy and answer current information needs. Governments can also encourage and support integrated research projects that forge partnerships across academic disciplines and between researchers and stakeholders. Such partnerships are essential for effective adaptation and they often expand the funding available for research.

Objectives

To facilitate research that meets the needs of government and stakeholders.

To facilitate interaction between researchers, policy makers, and users of knowledge to define research objectives and stimulate uptake of knowledge.

To achieve a more efficient use of research resources through the coordination of efforts and the pursuit of joint initiatives.

Recommended Actions

Identify important knowledge gaps and analytical tools required to close these gaps.

Governments need to identify which sectors and activities within their regions are most likely to be affected by changes in climate, and the principal knowledge gaps that limit the ability to prepare for such changes. They can also work with researchers and stakeholders to identify analytical instruments, such as scenarios, assessments, and costing tools, required to close these gaps. Regional and sectoral meetings that bring decision makers together with researchers and stakeholders are one way to help clarify these needs.

Identify shared national, regional, and sectoral research priorities and review these priorities on a regular basis.

Once governments have identified the knowledge gaps and analytical tools that are most critical for policy development within their own jurisdictions, they can identify collective national needs and opportunities for collaborative research and development of analytical tools. As research needs and resources change over time, governments should regularly review these collective priorities and projects. The IAWG is one mechanism through which governments can work.

Stimulate outcome-based research and analysis to fill the identified gaps.

Governments already support applied research on some priorities through direct grants and contracts but they could also encourage the broader research

community to undertake projects that fill public policy information needs.

Climate change impacts and adaptation are long-term issues, and there are two important steps that governments can take to supplement academic research over the longer term:

- First, governments can enhance their own capabilities to carry out impact and adaptation research.
- Second, governments can improve existing capabilities for monitoring and gathering physical climate-related data (e.g., data related to stream flow, stream sediment, weather, and sea level). Long, uninterrupted runs of data are important for identifying environmental trends, determining sensitivities and vulnerabilities, and assessing the effectiveness of adaptation responses.

Identify existing funding sources that can support these priorities and propose new arrangements where needed.

Impact and adaptation research could receive an important boost if more money from existing funding sources were directed toward it. Governments need to make major funders of university research, such as the Natural Sciences and Engineering Research Council of Canada (NSERC), the Social Sciences and Humanities Research Council of Canada (SSHRC), the Canadian Institutes of Health Research (CIHR),

and the Canadian Foundation for Climate and Atmospheric Science (CFCAS), more aware of the importance of this area of research and should inform them of knowledge gaps and research priorities that need to be addressed. Shared-cost research partnerships that include the private sector should also be encouraged, and options should be considered for leveraging resources through participation in projects that, though not primarily related to adaptation, involve an adaptation component.

Identify opportunities for governments to cooperate with other partners in setting research priorities, and in collecting and sharing information and knowledge.

Other governments and organizations — such as municipalities, First Nations, Inuit, professional organizations, universities, businesses, and foreign governments — have adaptation concerns and knowledge that can help define research needs and contribute to research activities. Joint conferences, workshops, and more formal partnerships with such parties can be useful for identifying common needs and opportunities for collaborating on research. Informal networks of government, academic, and private sector researchers with common goals can help to sustain the exchange of information over time. The Canadian Climate Impacts and Adaptation Research Network (C-CIARN) provides an effective, existing link to the academic research community.

Element 5: Support Knowledge-Sharing Networks

Networks play a valuable role in transferring knowledge. They can also help to build alliances, facilitate discussion, shape debate, and develop support for action. Several networks in Canada — including C-CIARN, the Prairie Adaptation Research Collective (PARC), ArcticNet, and the Ouranos Consortium in Quebec — have mandates that include the transfer of knowledge about climate change. Governments support and participate in these networks. In addition, some professional networks, including the Canadian Institute of Planners (CIP), the Canadian Council of Professional Engineers (CCPE), the Canadian Standards Association (CSA), and the Canadian Water Resources Association (CWRA), also contribute to sharing such knowledge. Members of these professional networks include academic researchers, government experts, and professionals in industry.

The knowledge that circulates within existing networks is not always getting to key decision makers in government or in the broader community. In addition, there is currently no effective mechanism for broad outreach to the Canadian public on impacts and adaptation. There is, therefore, a need to engage new networks on adaptation and to establish a mechanism for reaching decision makers who are currently outside this knowledge-sharing sphere.

In addition, information about impacts and adaptation is often scientific or technical and therefore not accessible to decision makers. The large amount of information on adaptation also means individuals have difficulty keeping up

with the literature. There is a need, therefore, to translate adaptation knowledge into a form that is useful to those who need practical guidance.

Objective

To ensure that existing networks effectively facilitate the sharing of information and knowledge about impacts and adaptation.

The Canadian Climate Impacts and Adaptation Research Network (C-CIARN) brings researchers together with decision makers from industry, governments, and nongovernmental organizations to improve knowledge of Canada's vulnerabilities to climate change and to identify appropriate adaptation measures. This national network promotes new research techniques and methodologies, disseminates information, and provides a voice for an emerging impacts and adaptation community.

Recommended Actions

Review the mandates and resources of existing government-created networks. Governments in Canada have created, supported, and/or participated in the establishment of several adaptation networks (e.g., C-CIARN, PARC, Ouranos) that promote research to support adaptation and sharing of research results. These networks have been in operation for a number of years and have demonstrated their value. As understanding and capacity increase and new needs emerge, there will likely be value in these networks changing, broadening, or refocusing their mandates. Governments can help ensure that these networks continue to be as effective as possible in meeting current

Model forests in Canada represent partnerships between land owners, forest managers, and other local interests. Partners work together to develop, apply, and monitor innovative approaches to forest management. The Canadian Model Forest Network is developing and testing a workbook to help forest-based communities assess their vulnerability to climate change. The governments of Canada, British Columbia, and Manitoba are supporting this initiative by participating in regional pilot projects.

needs by reviewing their mandates and resources on a regular basis and making any recommended improvements.

Partner and collaborate with professional organizations and other networks of practitioners.

National and regional professional organizations, such as the CCPE, the CWRA, and the CSA, are involved in adaptation to varying degrees and have a significant role to play in disseminating expertise about adaptation. Governments can encourage such involvement through partnerships, collaboration, and support. In return, such partnerships can provide governments with information about the needs and concerns of professionals and others working on the ground. Such knowledge can be useful to governments in developing new programs and policies.

Facilitate the exchange of knowledge with municipal and Aboriginal governments.

Many adaptation decisions will be made at the local level, and therefore municipalities and Aboriginal

governments have an important role to play as users and adaptors of such knowledge. Municipalities and Aboriginal governments can also identify local issues and information needs and provide information about impacts on the ground. Governments at the federal, provincial, and territorial level should therefore ensure that municipalities and Aboriginal communities are engaged on this issue.

Increased collaboration with bodies such as the Assembly of First Nations, the Inuit Tapiriit Kanatami, and the Federation of Canadian Municipalities can provide unique and valuable knowledge.

Establish and maintain a Web-based resource on climate change impacts and adaptation.

Information is more likely to be used if it is easy to locate, easy to understand, and relevant to the user. These conditions could be met by establishing and maintaining a national Web site for sharing information on impacts and adaptation that would include links to other relevant sites (e.g., those of professional organizations in Canada, the Intergovernmental Panel on Climate Change, and the sites of governments active on adaptation such as the United Kingdom, Australia, and New Zealand); original source materials (e.g., Canadian research); and simplified and/or synthesized information developed for a range of user groups.

Element 6: Provide Methods and Tools for Adaptation Planning

Adaptation is a way of preparing for and responding to a changing climate, minimizing climate-related risks, and maximizing climate-related opportunities. To adapt proactively, decision makers need to understand our vulnerability to the current impacts of climate change; consider potential future climate change, its impacts, and related risks and opportunities; identify adaptation options; and evaluate the costs and consequences of these options. A variety of analytical tools are essential. These include scenarios that explore possible climatic and socioeconomic futures, methodologies for making decisions and managing risks, and procedures for evaluating the costs of impacts and response options.

Canadian decision makers inside and outside government increasingly need access to such tools. Some tools are already available, but others need further development or modification to suit Canadian needs. Governments can make essential tools available earlier and at less cost by collaborating in identifying and developing a basic set of adaptation tools to be used by all jurisdictions. The development of this basic adaptation toolkit should be given a high priority.

Objective

To develop a basic adaptation toolkit and make it available to Canadian decision makers.

Recommended Actions

Identify the tools and methodologies that should be included in a basic national adaptation toolkit.

Through the IAWG, the federal, provincial, and territorial governments can establish a joint process to determine the components of a basic national adaptation toolkit. The process will likely involve professional organizations and other potential users. A comprehensive list of existing tools that meet Canadian specifications, or that could be adapted to meet them, is required.

The governments of Canada and Quebec, with Hydro Quebec and other partners in the Ouranos Consortium in Montreal, are funding development of the Canadian Regional Climate Model (CRCM). The CRCM can generate scenarios of future climate change in Canada at a geographical scale finer than previously possible. The British Columbia government contributes to the development of the CRCM and regional scenarios, and works with Ouranos to provide relevant results to provincial decision makers.

Work with partners to acquire existing tools and methodologies and develop those that are not already available.

A number of adaptation tools are already available or being developed through various agencies working specifically on issues related to climate change, both within and outside Canada.

Consideration should also be given to existing tools currently being used in applications not specifically related to climate, such as risk management frameworks now used in government and industry and in community development applications. Some existing

tools may have to be modified for Canadian use or for use on climate change. Tools and methodologies not currently available will have to be developed to complete the toolkit. Governments should work collaboratively and in partnership with the private sector, universities, and others to develop and enhance Canadian capabilities in this area.

Work with partners to test these tools and methodologies.

Testing is an important part of the development process, not only for detecting and removing weaknesses in the tools, but also for familiarizing personnel with their use. Given the importance of these tools for advancing the adaptation agenda, it is important that pilot projects be initiated, in either fully developed or prototype versions. Given the range of climate change impacts and the systems affected, pilot projects should be dispersed across Canada and the participation of the private sector, other governments, and local communities should be encouraged.

Work with partners to promote the dissemination of selected adaptation tools and methods.

Researchers and decision makers will need guidance and training in interpreting and using data from regional climate models and other downscaling initiatives, related biophysical and socioeconomic models, vulnerability and other assessment methods, and other

climate change adaptation tools. Governments should also work collaboratively and in partnership with the private sector, universities, professional organizations, and others to disseminate selected adaptation tools and methods within government and to outside users.

Maintain and improve climate-related observation networks and improve their coordination across jurisdictions.

In addition to needing access to analytical tools, decision makers need access to reliable data to detect and respond to extreme conditions, document long-term changes in climate patterns and their impacts, and measure the success of adaptation actions. Historic data are also vital for models, scenarios, and other adaptation tools. The federal, provincial, and territorial governments should use their best efforts to ensure that their climate-related observation networks are of sufficient quality and density to provide long-term observations and real-time observations where critical for public safety. To ensure efficient access to data and comparability of results, it is important that data collection standards and reporting protocols be closely coordinated among the various networks. The main climate-related networks include meteorological, hydrometric, stream sediment, and tide networks

What Should Go into the Toolkit?

Decision support tools

These include a number of tools, such as vulnerability assessment, cost-benefit analyses, multicriteria analyses, decision matrices, environmental assessments, risk management frameworks, and cost-effectiveness analyses, that help decision makers choose between different adaptation options. Some of these tools use a single criterion, like cost, as the basis for decisions. Others use multiple criteria.

Sector-specific methods and tools and integrated assessment tools

These are usually models, such as hydrological, crop, or ecosystem models, that evaluate the response of natural systems or economic sectors to various climate scenarios. They can provide quantitative estimates of changes in these systems, although confidence in these estimates is currently limited by uncertainties in the models and in the representation of local conditions. Integrated assessment models assess impacts in several sectors and also consider interactions between sectors.

Stakeholder analysis tools

These include a variety of opinion-gathering techniques. They are used to identify the adaptation concerns of groups or communities and to ascertain how they will respond to different impacts and adaptation options. These tools help to clarify the human impacts and dynamics of climate change and are most useful for developing shorter-term adaptation responses at local and regional levels.

Data sets

Climatic, hydrometric, biological, socioeconomic, and many other types of data sets are the foundation of adaptation. While requirements will vary significantly across Canada, the basic toolkit should contain some data sets that are national in scope for illustrative purposes and some that are regional or local in scope to support decision making.

Scenarios

Scenarios suggest how climate change may affect biophysical or socioeconomic systems. Scenario building incorporates baseline data and biophysical and/or socioeconomic modelling, and is often sector- or region- specific. Scenarios allow decision makers to analyse how vulnerabilities and adaptation options may be affected by different climatic, biophysical, and socioeconomic conditions. They are commonly applied to models of ecosystems or economic sectors and are most useful for assessing large-scale, long-term physical and biological impacts.

Regional climate models and other downscaling products

Downscaling makes the results of global climate models more regionally relevant. Most downscaling is of regional or local value; however, the Canadian Regional Climate Model covers all of North America and consequently has continental implications. Governments can work together to share information about downscaling techniques and about how to use, and train others in the use of, downscaling products.