3RD ANNUAL REPORT
MARCH 2015

# THE ADAPTATION PLATFORM

## EQUIPPING CANADIANS FOR A CHANGING CLIMATE

# Platform Plenary Members (2014-2015)

- Plenary Chair – Natural Resources Canada; Nick Xenos

**Territorial and Provincial Governments**

- Alberta - Alberta Energy and Utilities Board; Kendra Isaac
- British Columbia - Ministry of Environment Climate Action Secretariat; Liz Lilly
- Manitoba - Manitoba Conservation and Water Stewardship; Neil Cunningham
- New Brunswick - Department of Environment; Darwin Curtis
- Newfoundland and Labrador - Department of Environment and Conservation; Jackie Janes
- Northwest Territories - Environment and Natural Resources; Lisa Dyer
- Nova Scotia - Climate Change Directorate; Andrew Murphy
- Nunavut - Department of Environment; Rob Eno
- Ontario - Ministry of Environment; John Vidan
- Prince Edward Island – Department of Environment, Labour and Justice; Jim Young
- Saskatchewan - Ministry of Environment; Kim Graybiel / Scott Pittendrigh
- Yukon - Climate Change Secretariat; Rebecca World

**Federal Government Departments and Agencies**

- Aboriginal Affairs and Northern Development Canada; Catherine Conrad
- Agriculture and Agri-Food Canada; Sarah Kalff
- Environment Canada; Matt Jones
- Fisheries and Oceans Canada; Paul Lyon
- Health Canada; Jim Frehs / Suzanne Leppinen
- Infrastructure Canada; Sonya Read
- Natural Resources Canada - Energy Sector; David Henry / Rob James
- Natural Resources Canada – Canadian Forest Service; Vincent Roy
- Natural Resources Canada – Minerals and Metals Sector; Diane Galus
- Parks Canada; Mike Wong
- Public Health Agency of Canada; Stephen Parker
- Public Safety Canada; Jacqueline Randall
- Standards Council of Canada; Michel Girard
- Transport Canada; Christian Pilon / Nicole Legault

**Private Sector and Research Organizations**

- Canadian Electricity Association; Michelle Turner
- Chartered Professional Accountants of Canada; Gord Beal
- Engineers Canada; David Lapp
- Federation of Canadian Municipalities; Jacques Nadeau
- Forest Products Association of Canada; Etienne Bélanger
- Insurance Bureau of Canada; Gregor M. Robinson
- Mining Association of Canada; Ben Chalmers
- Ouranos; Alain Bourque

**Observer Status**

- Quebec - Ministère du développement durable de l'environnement et des parcs; Catherine Gaultier *(observer)*

**Secretariat**

- Natural Resources Canada - Elizabeth Atkinson, Plenary Vice-chair and General Secretary
- Natural Resources Canada - Marie-Caroline Badjeck, Associate General Secretary (Reporting)

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**Contact Information** – For more information, please email: **NRCan.Adaptation.RNCan@Canada.ca**

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# THE ADAPTATION PLATFORM

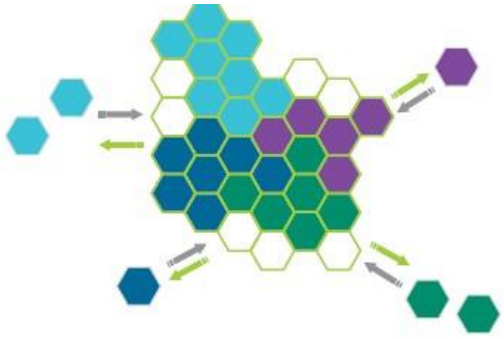
## The Adaptation Platform brings together key groups from government, industry and professional organizations to collaborate on climate change adaptation priorities.

By providing the structure to pool financial resources, knowledge, and people, the Platform works to create new information and tools for adaptation and get these products to the appropriate users.

Collaboration between the public and private sectors, and across jurisdictions and disciplines, is essential in order to address the complex and cross-cutting issue of adapting to a changing climate. The Adaptation Platform is a unique mechanism in Canada that brings together national industry associations, national professional organizations, representatives from federal, provincial and territorial governments, as well as other relevant organizations, to tackle shared adaptation priorities. Platform participants are both the users and producers of adaptation knowledge and tools. As a result, the Platform's work is demand-driven, facilitating the analysis and implementation of adaptation action, and directly responding to the needs of decision-makers in Canada's public and private sectors.

Launched in March 2012, through Natural Resources Canada's *Enhancing Competitiveness in a Changing Climate* (2011-2016) program, the Adaptation Platform is structured around two components: a plenary body and a series of working groups. The Plenary, comprised of senior-level representatives, meets twice yearly to identify critical and emerging adaptation priorities in Canada, channel efforts to focused areas of work, and to mobilize new and more efficiently direct limited resources. Plenary members also generate support for adaptation action and disseminate adaptation knowledge within their organizations and extended networks.

Working groups focus efforts on shared adaptation priorities. Plenary members nominate participants from their organizations and networks who bring the resources (time, money, expertise) needed to develop and carry out working group activities. In 2014-15, the participants worked on 12 priority areas, including mining, energy, infrastructure, forestry, coastal management and economic analysis (see Annex). More information on the 12 Working Groups and their projects can be found on Natural Resources Canada's Web site.



adaptation.nrcan.gc.ca

Adaptation involves making adjustments in our decisions, activities and ways of thinking in response to observed or expected changes in climate, with the goals of (a) reducing harm and (b) taking advantage of potential opportunities. Adaptation can include behavioural changes, operational modifications, technological interventions, planning changes and revised investment practices, regulations and legislation.

While adaptation in the natural environment occurs spontaneously, adaptation in human systems often benefits from careful planning that is guided by both scientific research and detailed understanding of the systems involved.

# MESSAGE FROM THE PLENARY CHAIR AND CO-HOST

## PLENARY CHAIR AND MAY 2014 PLENARY HOST

**To make an impact, and to have a real and lasting effect in helping Canadians become safer, communities more resilient, and Canada's industries more competitive in a changing climate — that's the objective of the Adaptation Platform.**

How successful are we in this effort? Are Platform products being applied in the work of intended users? After three years of concentrated effort in multiple theme areas, resulting in the collaborative creation of more than 80 adaptation tools and knowledge products, it's time to direct our attention to the real, on-the-ground impact of the Platform.

Identifying the impact of our work is not always an easy task in the adaptation field, for some of the following reasons:

- there can be a significant time delay between knowledge application and impact realization;
- avoided events are often not identified, making the resulting lives or money saved difficult to calculate; or
- adaptation measures can be implemented as part of a broader policy decision and are often not recognized as adaptation or influenced by adaptation knowledge.

That being said, we are seeing some excellent cases of real impact. For example, permafrost risk assessment maps are helping the Ministère des Transports du Québec and the Kativik Regional Administration to identify construction sites for residential housing in Nunavik, Quebec. The maps are used to climate proof an estimated average of $3-5 million in annual infrastructure investments in a region where demographic expansion is closely linked to mining development.

In another example, through mapping future storm surge flooding and economic forecasting of resulting damages, measures to enhance the climate resilience of a key rail and road corridor linking Nova Scotia and New Brunswick are being implemented. The route is part of the larger Atlantic Gateway Corridor which moves $43 billion worth of international trade annually, with the largest users being manufacturing, forestry, wholesale and retail trade.

Engineers Canada created a climate risk screening tool (PIEVC) to assess the vulnerability of infrastructure to the effects of a changing climate. This tool has been applied to more than 40 projects in Canada including highways in British Columbia, roads and bridges in Edmonton, Toronto, and Sudbury, storm and wastewater systems in Montreal, Trois-Rivières, Calgary and Vancouver.

The analysis is incorporated into the design, operation and maintenance of the various infrastructure, changing design guidance and operational practices, which will result in money saved in maintenance and infrastructure failure over the intended lifespan of the structure.

We expect Platform products and activities highlighted in this report to have similar real impacts for communities, regions and economic sectors. For instance, two recent products from the British Columbia Department of Transportation and Infrastructure (BCMoTI) are helping build a more resilient highway system: a best practices guidance document outlines climate change adaptation considerations for engineering design as related to the BC transportation infrastructure; and a new Technical Circular officially requires that climate change and extreme weather events be considered in any new highway engineering work, whether done in house or procured from 3rd parties.

These are good indicators that adaptation is happening and the trend is such that this will only expand in the future. The Platform is providing a sound mechanism by which adaptation knowledge and tools are co-created and mobilized. Interest and active participation in the Platform at both the Plenary and working group levels continues to build with new and seasoned members bringing additional interests and assets to the mix. There is no lack of willing partners wanting to engage on adaptation and it is thanks to the efforts of those involved in the Platform that results are being translated to change on the ground.

Looking ahead, emerging areas of work are likely in health, transportation, biodiversity and rural/urban communities. There is no lack of willing partners wanting to engage on adaptation and it is thanks to the efforts of those involved in the Platform that the mechanism is performing well and results are being translated to change on the ground.

***Nick Xenos***

*Chair, Adaptation Platform Plenary*
*Director, Climate Change Impacts and Adaptation Division*
*Natural Resources Canada*

*Plenary meeting April 29–30 2014,*
*Ottawa, Ontario.*

# CO-HOST PLENARY OCTOBER 2014

## Prince Edward Island is particularly vulnerable to the impacts of climate change. On a daily basis, we see the effect that climate change is having on our small Island.

Our coast is eroding and sea level is rising. This is leading to more storm surges and flooding than ever before. Our province is physically shrinking; we have lost 20 square kilometers due to erosion alone. We can expect effects—possibly some positive, certainly some negative—in vital industries like farming, fishing, and forestry. We will experience changes in our tourism industry, and in the way we produce and consume energy. Prince Edward Island's future under a changed climate will depend on our ability to adapt and evolve.

The Regional Adaptation Collaborative (RAC) Program, and now the Adaptation Plenary Platform, have been two key components in our strategy to better understand and minimize the impacts of climate change in our region. As a result of this partnership with Natural Resources Canada and the Atlantic Provinces, we have:

- generated climate change scenarios to guide local adaptation planning;
- classified the sensitivity of our shoreline to storm surge and erosion;
- mapped coastal erosion hazards across the province and flood risk in vulnerable communities;
- updated information on rainfall intensity, duration, and frequency; and
- explored the susceptibility of coastal groundwater aquifers to saltwater intrusion.

In collaboration with academia, the private sector, and provincial partners in Atlantic Canada, we are currently developing a decision-support tool for coastal communities and completing a cost-benefit analysis of adaptation options in select communities. More information on these and other projects can be found at www.atlanticadaptation.ca.

Lastly, we are working closely with the Climate Research Lab and the University of Prince Edward Island (UPEI). We have helped to support their ongoing efforts to develop locally relevant climate change information. This has included the development of CLIVE (CoastaL Impacts Visualization Environment), an interactive three-dimensional map of Prince Edward Island which allows users to explore the province's coastlines and simulate sea level rise and storm surge scenarios. We will be working with UPEI in the future to help develop a new climate change strategy for the province, one in which adaptation will feature prominently.

We continue to support the Platform's mandate that climate change is an issue that needs to be collaboratively addressed today. We look forward to having more opportunities to collaborate and share knowledge and resources as, together, we strive to address climate change.

***Jim Young**, P.Eng., Director of Environment*
*Department of Environment, Labour and Justice*

***Erin Taylor**, Manager, Climate Change and Air Quality Department of Environment, Labour and Justice*

*Plenary Meeting October 21–22, 2014*
*Charlottetown, Prince Edward Island*

# EQUIPPING CANADIANS FOR A CHANGING CLIMATE: 2014-15 HIGHLIGHTS

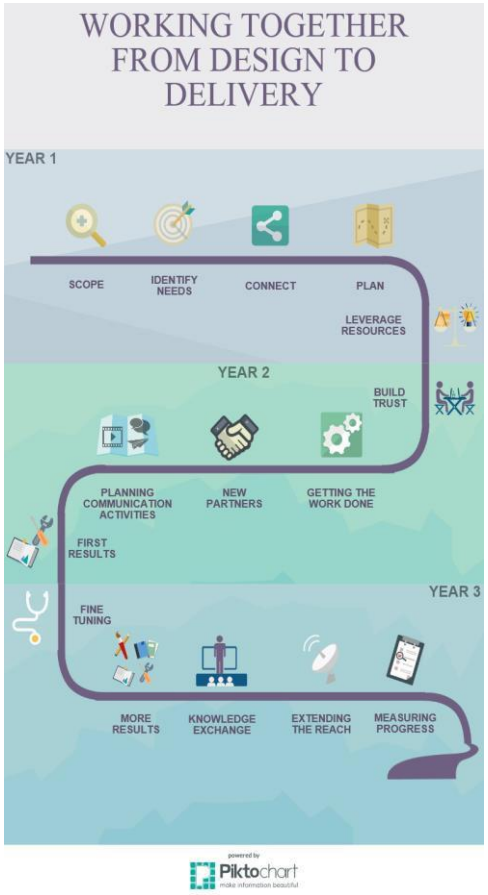
**The Adaptation Platform is successfully connecting the resources, people and ideas needed for Canada's regions and industries to understand the effects of a changing climate and adapt their operations accordingly.**

In the first two years of operation, Adaptation Platform members focused on identifying adaptation priorities, planning the activities needed to adapt to a changing climate, investing the resources (time, money, expertise) needed to implement them, creating new partnerships, getting the work done and planning to better connect Platform products with the people who will use them. This past year, the results of those efforts were being realized:

- 12 Working Groups have generated more than 80 tools and knowledge products as evidenced by the product list in the Annex of this report;
- more than 2500 people participated in the 2014-15 Platform webinar series;
- Public Safety Canada and the Federation of Canadian Municipalities joined the Adaptation Platform Plenary; and
- agriculture was added as a new working group theme.

Success of the mechanism is good but the value of the Platform is realized when products are used by the people in Canada's regions and industries. The Platform continued to implement its communication strategy, deepen engagement with industry, and build on the work undertaken at the regional level through the Regional Adaptation Collaboratives (RAC) initiative. While the impact of Platform activities is starting to emerge, more work is needed to capture and demonstrate the impact of investments in adaptation in the coming years.

## WORKING TOGETHER TO ADAPT



# PLENARY

In its third year of operation, the work of the Platform Plenary focused on ensuring that Platform products will reach those who need them, identifying new priorities and opportunities for collaboration – especially with industry, and taking stock of Platform work and results to date, including how to capture the results of adaptation investments. The results of this year's meetings, held in Ottawa on April 29-30, 2014 and in Charlottetown, Prince Edward Island on October 21 and 22, 2014, include:

1. Engaging industry and federal government stakeholders at senior levels in the natural sectors to identify priorities and opportunities to work together

2. Elaborating the Platform communication strategy

3. Establishing the Agriculture Working Group

4. Showcasing innovative local adaptation tools and approaches that can be integrated into adaptation activities across Canada

5. Setting measuring and capturing the impact of adaptation investments and identifying new adaptation goals as priority for the coming year

The Plenary meetings continue to provide insights on the progress of adaptation in Canada and leverage the diverse resources around the table. This was evidenced by the sustained attendance of more than 40 representatives from provincial and territorial governments, key federal adaptation departments, as well as research organizations, and national and professional organizations at both the Spring and Fall meetings, and the addition of new Plenary members, specifically the Federation of Canadian Municipalities and Public Safety Canada.

## *Adaptation in natural resource sector industries: status, needs and potential for collaboration*

Hosted by Natural Resources Canada, the Spring 2014 Plenary meeting in Ottawa focused on identifying industry adaptation needs in the natural resource sectors and opportunities for collaboration with Platform members. The highlights of the meeting were the industry panels focused on mining, energy and forestry.

Industry representatives included Jim Burpee (President and CEO of the Canadian Electricity Association), Ben Chalmers (Vice President, Sustainable Development, Mining Association of Canada), and Virginia Flood (Vice President, Canada, Rio Tinto). Government representatives and participants from academia included Marian Campbell Jarvis (Assistant Deputy Minister, Minerals and Metals Sector, NRCan), Glenn Mason, (Assistant Deputy Minister Canadian Forest Service, NRCan) and Mark

Johnston (Senior Research Scientist, Forest Ecology and Climate Change, Saskatchewan Research Council).

The purpose of focusing on the mining, electricity and forestry sectors at this meeting was to explore adaptation actions currently underway in these sectors and identify gaps and needs that could be addressed collaboratively. In brief, managing risk to operations and long-term thinking are elements already present to various degrees in the three sectors. However, there is a need to better communicate how adaptation can be integrated into operational and business models in a language used by the private sector. Several panelists mentioned the importance of peer-to-peer communication, with companies talking to each other and championing adaptation within their sectors. The real success of mainstreaming adaptation in the sectors will hinge upon finding these adaptation champions and equipping them with the tools and knowledge needed to make a business case for adaptation action to be implemented.

Many panelists recognized the value of the Platform. For example, Mr. Burpee stated that the CEA has a long-term commitment to the Platform and the Energy Working Group, noting the need for integration of climate change adaptation in developing a systems approach for managing the North American grid.


**Industry Panels at the Ottawa Plenary in April 2014.**

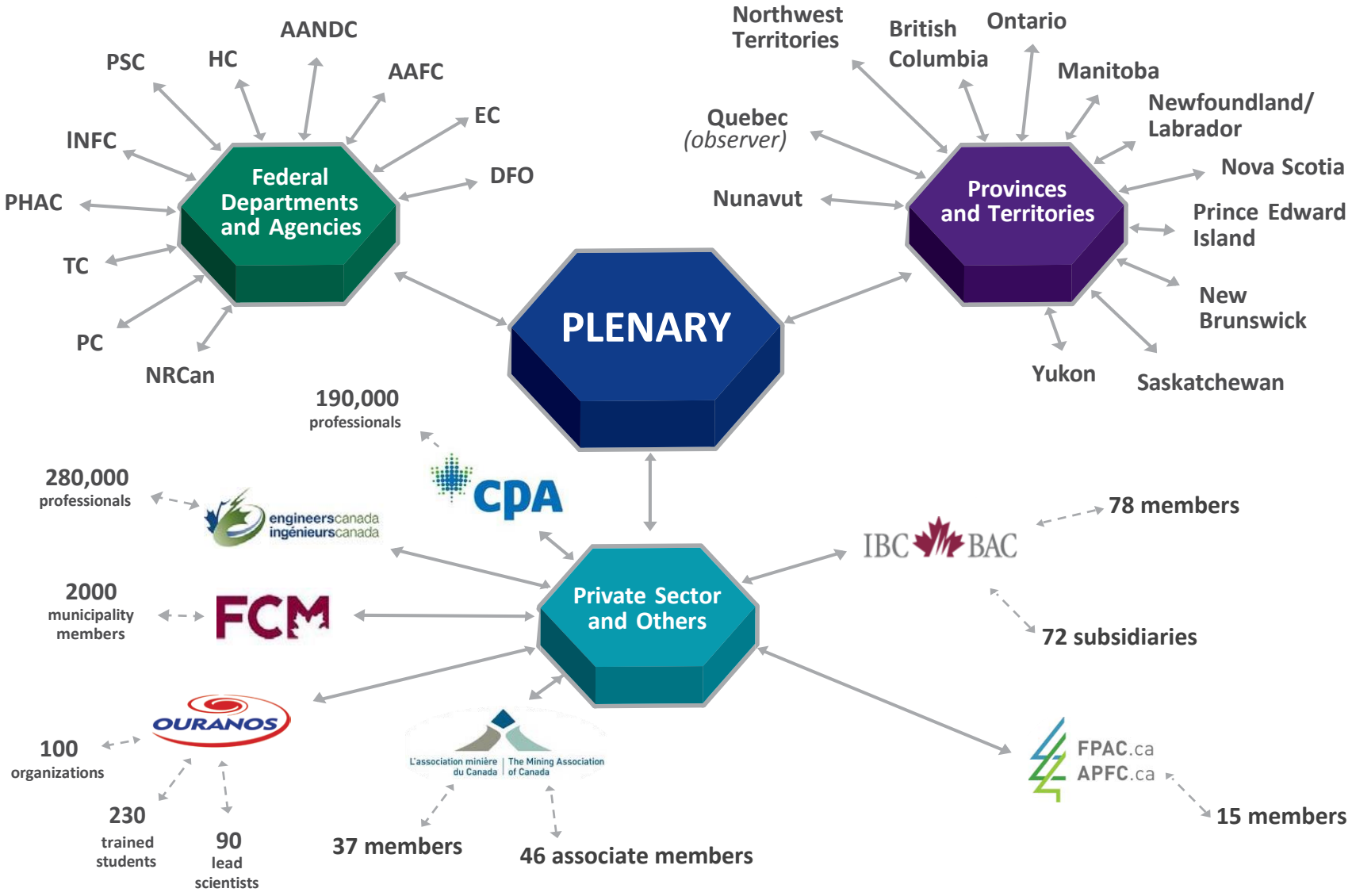
***Above:*** Glenn Mason, Associate Deputy Minister, Canadian Forest Service/NRCan (left) and David Lindsay, President and CEO, Forest Products Association of Canada.

***Below:*** Plenary members during the Energy Panel listening to David Curtis, Director of Asset Strategy, Hydro One Networks and Tom Lumley, Senior Manager at the Ontario Power Generation.

## *A network of networks to reach targeted users*

The Plenary is a network of networks providing important linkages for dissemination of adaptation-related products and knowledge to all provincial and territorial governments, 12 federal adaptation programs, and more than 250 professional organizations, 190 000 accountants and 280 000 engineers across Canada through professional and industry associations. This is a vital feature of the Platform and a critical component in the Platform communication strategy. Communication priorities include increasing dissemination to targeted audiences, as well as enhanced engagement at senior levels within members' organizations and their extended networks to be included in day-to-day management practices.

# The Plenary: A Network of Networks




AANDC: Aboriginal Affairs and Northern Development Canada, AAFC: Agriculture and Agri-food Canada, DFO: Fisheries and Oceans Canada, EnvCan: Environment Canada, HC: Health Canada, PSC: Public Service Commission of Canada, InfCan: Infrastructure Canada, PHAC: Public Health Agency of Canada, TC: Transport Canada, PC: Parks Canada, NRCan: Natural Resources Canada.

*: examples of membership

## *Initiating and informing new Platform adaptation work*

### Agriculture

Climate change poses risks and opportunities for the agriculture sector, including:

- increased pest and pathogen pressures, leading to declines in yields and increased input costs;
- water stress (excess or drought) leading to declines in productivity and quality of crops and livestock; and
- opportunities for new, warmer weather crops in Canada.

While the sector is inherently adaptive on an annual basis, farmers make annual production decisions based on economic consideration, so longer-term investments do need to consider future climate conditions. Recognizing that there was no existing national forum on agricultural adaptation, a new Agriculture Working Group was launched at the Spring Plenary meeting in Ottawa. It was recommended that the new Working Group include efforts surrounding food security and supply chains (e.g. transportation) and participation from national farmer organizations and the food transformation industry.

### Economics of Adaptation

The economics of adaptation is a new and evolving area of research and application in Canada. Work is now well underway in the Platform Economics Working Group and the results are eagerly anticipated. In particular, the work on standardizing an approach to valuing climate change impacts and assets at risk as well as the cost-benefit analysis of adaptation measures will help provide an economic lens on the decision-making process in both industry and government.

At the Fall Plenary meeting in Charlottetown, the economics presentations demonstrated how the current projects will help to strengthen the business case for adaptation across sectors and regions. For example, the Territories are especially interested in this application for rural communities and projects and Engineers Canada is interested in integrating the economic knowledge with existing risk and vulnerability assessment tools such as the Public Infrastructure Engineering Vulnerability Committee Engineering Protocol (PIEVC).

## *Connecting members to new ideas and approaches across Canada*

Plenary meetings co-hosted across Canada are an opportunity to highlight innovative local adaptation tools and approaches that can be more broadly integrated into adaptation activities, facilitating the spread of innovation while ensuring that users don't have to reinvent the wheel.

In Ottawa, the Government of Ontario highlighted work on ecological vulnerability assessments and adaptation-planning activities taking place in various parts of the province and demonstrated how the government established collaboration with the wine industry to enable innovation, integration, and adaptation in this sector (Box 1). The potential for collaboration with other Plenary members on ecosystem vulnerability to climate change and adaptation planning for the Great Lakes Basin was highlighted at the meeting.

At the Plenary meeting in Prince Edward Island, the CoastaL Impacts Visualization Environment (CLIVE) tool (Box 2) demonstrated how new interactive visualization and simulation tools help to increase awareness of climate change impacts and motivate adaptation planning. CLIVE is an interactive tool that allows people to visualize 3D sea-level rise and storm surge scenarios at the community level. The tool combines data from numerous sources, including projects developed under the Adaptation Platform and the Regional Adaptation Collaboratives initiative.

**Box 1: Practical approaches to developing and implementing adaptation actions in Ontario**

Jenny Gleeson, from the Ontario Ministry of Natural Resources, highlighted the ecological vulnerability assessments and adaptation planning activities that are taking place in various parts of Ontario. She elaborated on the importance of developing knowledge and tools that are usable at the local level. The potential for collaboration with other Plenary members is great, as this multi-year initiative will include additional elements such as infrastructure.

Alex Rosenberg, from the Ontario Ministry of Agriculture, Food and Rural Affairs, presented the program "Innovation, Integration, Adaptation: A winning response to climate change for the Ontario grape and wine industry". This collaborative initiative with stakeholders in the wine industry will focus on high-quality Ontario-grown product and will enable innovation, integration, and adaptation in this sector. Dr. Rosenberg noted that innovative models of collaboration such as this will be critical to drive change and to adapt to future conditions.

**Box 2: Practical approaches to developing and implementing adaptation actions in Prince Edward Island**

Jim Young, from the Prince Edward Island Department of Environment, Labour and Justice, conducted a session highlighting adaptation work being carried out in PEI. The session was an opportunity for Don Jardine and Andrew Doiron, researchers at the University of Prince Edward Island (UPEI), to present the CoastaL Impacts Visualization Environment (CLIVE), a new visualization tool that allows users to manipulate a 3D map of PEI and experience the impact of erosion and sea-level rise on Island infrastructure projected forward some 90 years. With CLIVE, people are able to 'fly' over the Island, raising and lowering the sea level and turning coastal layers on/off to visualize local areas that may be affected and identify how best to adapt to these conditions. CLIVE is one of the first public communication tools to enable citizens to interactively view historical evidence, current data, and predictive models of linked coastal impacts for an entire province. The tool was the 2014 People's Choice winner in the Massachusetts Institute for Technology's Center for Collective Intelligence contest on Communicating Coastal Risk and Resilience.

CLIVE, and its early success when presented to local communities, highlights the importance of using new technologies and visualization of climate change impacts to motivate adaptation. The objective is to support constructive dialogue on and planning of adaptation actions. CLIVE is a joint project between UPEI's Climate Research Lab and the Spatial Interface Lab at Simon Fraser University. For more information: www.youtube.com/watch?v=i00iA9ONycY and projects.upei.ca/climate/?s=clive+&submit=Search

**Erosion on Prince Edward Island beach.**
Source: Nicolas Raymond: http://freestock.ca/canada_g92-pei_beach_scenery_hdr_p1924.html

## *Capturing impacts of adaptation investments*

Identifying how to better measure and capture the impact of adaptation investments, and identifying goals and progress markers to achieve adaptation outcomes in Canada are Plenary priorities for the year ahead. At the Fall 2014 Plenary meeting it was recognized that achieving and reporting on impact on the ground was necessary to spur adaptation action. Indeed, the extent to which adaptation knowledge and tools are seen as being used and providing benefits will be a further stimulus for their uptake by communities and the public and private sectors. The Plenary explored how to use more multimedia products, such as video and interactive presentations, to communicate results to target audiences more effectively.

# ECONOMIC SECTORS

## *Agriculture*

The new Agriculture Working Group brings together a diverse mix of provincial and territorial government representatives, producer associations and industry representatives to better understand the state of adaptation in the agricultural sector and identify knowledge gaps.

The Working Group has initiated a survey of its members and various agriculture organizations to understand the extent to which climate vulnerability assessments and risk management actions have been undertaken in the sector. The survey will also gather information on key climate-related risks and opportunities for the agriculture sector. The results will be used to increase awareness and dialogue on adaptation among agriculture stakeholders. These are important step towards stimulating the implementation of adaptation actions. In the coming year, the Working Group is planning to further extend its networks and help organizations across the agriculture value chain to expand their knowledge on adaptation.

## *Forestry*

The Forestry Working Group led the development of a compendium of current or recent forestry adaptation initiatives across Canada. The compendium will be useful for professionals, researchers and policy makers in all of Canada's forest regions who are looking for examples of projects, policy initiatives, and

**Forest landscape from the Charlevoix Region.**
Source: Roberta Gal, Natural Resources Canada

forestry management practices that attempt to deal with future climate change. The compendium is available on the Climate Change Adaptation Community of Practice (CCACoP) Web site.

Going forward, the Working Group will develop partnerships with representatives of the Canadian Boreal Forest Agreement to implement adaptation tools in pilot projects on their land base. The Working Group is also planning to transform the Compendium into a user-updated on-line database.

## Energy

A new project was initiated to estimate changes in demand for heating and cooling over the next 50 years as a result of projected temperature changes in Canada. In this national-scale project, provinces and territories, energy and electricity agencies, companies, and climate information organizations are working together to better inform energy supply management and planning. This project, the first of its kind, is complemented by four regional projects incorporating future temperature changes in regional energy or electricity demand models and tools for British Columbia, Yukon, Quebec and Manitoba.

Canada has a diverse portfolio of energy resources, including hydro-electricity, oil, and gas, and a growing capacity in wind, solar, and biofuels. In order to be able to provide tailored knowledge and tools addressing the energy sector's specific needs, two projects were completed to assess the level of awareness and actions surrounding the electricity generation and transmission and oil and gas sub-sectors. The results will facilitate enhanced engagement with these two sub-sectors.

*"BC Hydro has participated in the NRCAN Adaptation Platform as part of the Energy Sector Working Group since the onset and believes that the value to our organization is to engage in a national collaborative to offer our perspective on business issues that require attention and research related to managing the potential effects of climate change for our customers. Often there are unique issues, but for many of us these uncertainties and risks are common across the sector, and collectively identifying tools, frameworks and approaches to apply internally is a smart way to leverage resources […].*

*With the results forthcoming for the research priorities invested in, the opportunity to further collaborate on applications, learnings, and convergence on tools will support harmonization between local, regional, provincial and federal efforts."*

*Brenda Goehring, BC Hydro (August 2014)*

More results from the Energy Working Group will be forthcoming as 20 projects are underway, including work to assess synergies between mitigation and adaptation in the Canadian energy sector in order to maximize the benefits from investments in responding to climate change and enhance the competitiveness of the sector.

## *Mining*

Case studies providing guidance on how to assess the economic costs and benefits of mining sector adaptation were completed and will be of use to managers who need to make a business case for adaptation investments. This guidance will help businesses to better compare the costs of continuing to cope with risks as they arise versus the cost of taking proactive adaptation actions. In one case study involving Glencore's integrated nickel mining operations in Sudbury, a methodology was developed to quantify climate risks, potential cost savings, and avoided costs associated with adaptation measures.. This methodology can also be used by other mining stakeholders.

The Mining Association of Canada completed a survey of its members for the Mining Working Group to help identify current activity on adaptation as well as tools and information that would be helpful to the sector. In the coming year, the focus will be on following up on issues identified in projects, including the need to develop updated guidance on incorporating a changing climate into environmental assessments.

## *Finance and Insurance*

Extreme events across Canada are a concern for all sectors, affecting business continuity, especially in relation to water, infrastructure and supply chains. The insurance industry is well placed to enhance efforts to manage climate risks, and a project under the Economics Working Group led by the Insurance Bureau of Canada is quantifying the economic cost

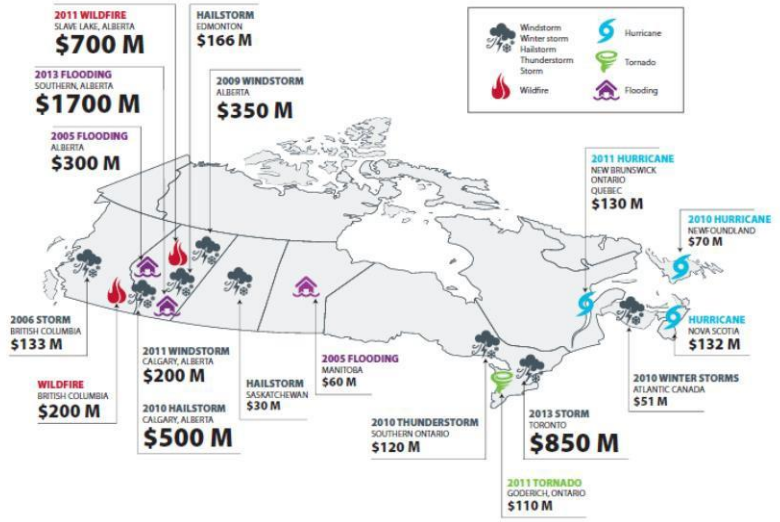



**Figure 2: Examples of insured losses from extreme weather events in Canada** (Kovacs, P. and Thistlethwaite, J. (2014): Industry; in Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, (ed.) F.J. Warren and D.S. Lemmen; Government of Canada, Ottawa, ON, p. 135-158.)

of extreme weather events (e.g. storm surges, flooding, freezing rain) spurred by climate change, in the municipalities of Halifax and Mississauga. The project will produce a tool that will allow larger municipalities to estimate the economic impact of extreme weather.

A new Platform initiative with the Chartered Professional Accountants of Canada is helping Canadian businesses and accounting professionals understand how climate change affects their operations. The project will help to equip them with the tools they need to consider climate-related financial risks as standard management and reporting practices. The project has so far produced a variety of informational materials including video case studies, and will develop guidance on how climate-related risks and opportunities could be integrated into the profession's core competencies.

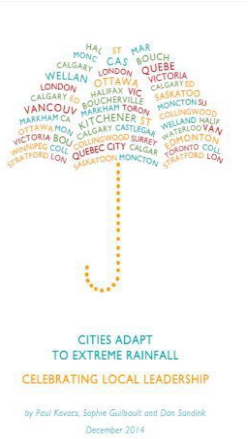
## *Infrastructure and Buildings*

The Infrastructure and Buildings Working Group has proven to be a successful venue for members to work jointly on initiatives to reduce risks associated with climate change and create momentum for the implementation of adaption actions in the buildings and infrastructure sector in Canada. For instance, the Institute for Catastrophic Loss Reduction (ICLR) is now working with Health Canada to develop a best practices guide related to the management of extreme heat risks in urban areas (Box 3). Also, ICLR and Ouranos have begun a partnership to better coordinate their work on adapting buildings to extreme weather events.

In the coming year, the Working Group will provide input on a new Infrastructure Resilience Professional certification for professional engineers, initiated by Engineers Canada. The first version of the program will focus on climate resilience. Another area of work is the development of a procedure and process for the forensic investigation and analysis of the impacts of extreme weather events.

**Box 3: Co-creating knowledge products for greater impact**

The Institute for Catastrophic Loss Reduction (ICLR) is now working with Health Canada on a book titled *Cities Adapt to Extreme Heat* which will provide best practices adopted by municipalities across Canada related to the management of morbidity and mortality risks associated with extreme heat events across Canada. This new initiative is part of the ICLR Cities Adapt series, which launched in 2014. *Cities Adapt to Extreme Rainfall* is a book of 20 highly accessible best-practice case summaries of cities applying practical measures to adapt homes and infrastructure to extreme rainfall events. For more information http://www.iclr.org/citiesadaptrain.html



# REGIONS

## *Coasts*

The Coastal Management Working group produced 15 new knowledge products and tools that will help to increase the resilience of coastal regions to climate change impacts. In one collaborative initiative, the British Columbia Ministry of Transportation and Infrastructure developed guidance on integrating climate change considerations into highway infrastructure management and into the Ministry's engineering design work.

In Prince Edward Island, average rates of erosion were used to generate future coastlines, and to identify and quantify risks for coastal residences, and critical (e.g. roads) and heritage (e.g. churches) infrastructure. The information generated contributed to the development of the CoastaL Impacts Visualization Environment tool (CLIVE) and will help to build the case for adaptation.

The Coastal Working Group will be reviewing these knowledge products to identify how to ensure that they reach users across Canada. The Working Group will also work on broadening its networks and exploring opportunities to collaborate with the United States where there are common interests.

## *North*

The Northern Working Group continued to facilitate exchanges between policy-makers, scientific experts and industry professionals to develop and disseminate decision-useful products, optimize the use of resources for adaptation, and address common issues and needs related to practical adaptation in Canada's North.

Drawing on seven case studies, a new report provides northern stakeholders with lessons learned on the integration of climate change considerations into decision making by natural resource development sectors in the Hudson Bay Inland Sea Region, including Agnico Eagle Mines and Manitoba Hydro. Current projects are assessing climate risks to infrastructure and implications for operational management and planning. Aboriginal Affairs and Northern Development Canada and the Nunavut Government now lead the Northern Working Group,

*"Climate change is an important issue in the north because we are really on the frontlines. We are already seeing impacts, our communities are seeing impacts, industry is seeing impacts and government as well has to deal with issues of climate change every day through a variety of departments […] The NRCan Adaptation Platform has really opened a lot of doors for us in terms of partnerships and exploring new relationships with organizations across Canada that we previously didn't have contact with."*

*Lacia Kinnear, Northern Climate ExChange, Yukon Research Centre (September 2014)*

taking over from Natural Resources Canada and the Yukon Government in the Fall of 2014. This transition will allow the Working Group to reflect on progress and identify emerging priorities to further meet the needs of all northerners

## *Regional Adaptation Collaboratives*

The Regional Adaptation Collaboratives (RACs), funded under the Government of Canada's Clean Air Agenda (2007-2012), created opportunities for regions to tackle self-identified priorities while generating collaborative networks. More than 400 cost-shared reports, tools and case studies emerged over the course of the initiative, most of them now available on the Natural Resources Canada Web site as well as the various RAC Web sites (see Table 1 below) and the Adaptation Library.

Building on the momentum generated with this work, the RACs are now disseminating products, undertaking policy analysis, and helping decision-makers and stakeholders build awareness of climate impacts and encourage adaptation mainstreaming. The British Columbia RAC program (delivered by the Fraser Basin Council) is engaging and supporting leaders in the forestry, mining and energy sectors as they identify risks, common issues of concern, adaptation options and opportunities to work together, as evidenced by the meeting of British Columbia professional associations hosted by the BC RAC and the BC Climate Action Secretariat in early 2015.The purpose of the meeting, which included professional organizations representing engineers, planners, foresters, biologists and lawyers, was to exchange information on professional activities on adaptation and new developments in the provincial government.

The RACs are also using various media (e.g. Web sites, webinars, newsletters, social media, workshops or symposiums) to disseminate Platform products. In Quebec, 400 participants attended the Ouranos 6th Scientific Symposium, with Platform products featured in many of the presentations. In addition, Ouranos published a report on the state of knowledge on climate change science, impact and progress in adaptation in Quebec. In Ontario, the Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) is producing Ontario-relevant summaries of the newly released science assessment update *From Impacts to Adaptation: Canada in a Changing Climate.* OCCIAR will target sector-specific audiences to present the results.

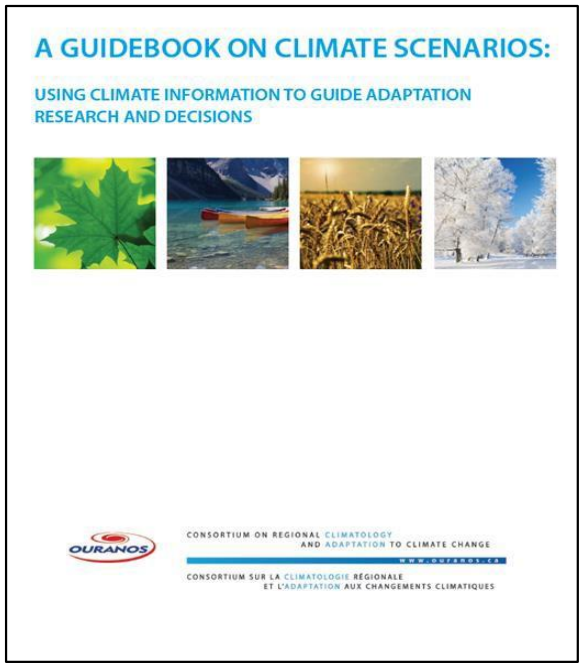
**Asphalt depression caused by localized permafrost melting, Iqaluit airport**

Source: August 2012, A.-M. Leblanc, Natural Resources Canada

**Table 1: Regional Adaptation Collaboratives: 2014-15 Activities**

| RAC | Lead | Example of Activities in 2014-15 |
|---|---|---|
| British Columbia | Fraser Basin Council www.fraserbasin.bc.ca | • Featured two case studies on adaptation to climate change in the mining sector on the retooling.ca Web site and in the ReTooling for Climate Change Newsletter<br>• Co-hosted a meeting with British Columbia professional associations on January 22, 2015 to allow them to share lessons learned on incorporating climate adaptation into professional practice, standards and training |
| Prairies | University of Winnipeg www.parc.ca/rac/ (past projects) | • Organized meetings with public, private, academic and not-for-profit stakeholders to explore the creation of a Prairies climate change adaptation centre of excellence dedicated to the integration of adaptation into decision making. |
| Ontario | Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) www.climateontario.ca | • Developed a small Community of Practice in collaboration with members of the Great Lakes / St. Lawrence Cities Initiative, through which members can access information on climate change impacts and adaptation in the Great Lakes Basin<br>• Initiated discussions with the City of Toronto regarding the WeatherWise Partnership in order to kick-start discussions about key climate change challenges and adaptation |
| Quebec | Ouranos www.ouranos.ca | • Organized and hosted the 6th Science Symposium in December 2014 in Montreal. The event was attended by 400 participants and offered more than 40 presentations including Platform projects. |
| Atlantic | University of Prince Edward Island www.atlanticadaptation.ca | • Organized a conference on inland and coastal flood management for Atlantic communities in Truro, NS. More than 200 participants discussed good practices and case studies of municipal flood management tools. |

Additionally, the RACs were involved in the synthesis of existing adaptation knowledge to maximize their impact and legacy across Canada through the Platform RAC and Tools Synthesis Working Group. The Working Group completed its objective in 2014-15 with the development of value-added and synthesis products for application beyond the region of origin (see Annex for information on where to find them). These include the *Guidebook on Climate Scenarios: Using Climate Information to Guide Adaptation Research and Decisions*, a tool for decision-makers to familiarize themselves with future climate information and better evaluate what climate information best suits their needs.




The RAC and Tools Synthesis Working Group has also produced 10 case studies demonstrating how communities, governments, non-governmental organizations and industry are now assessing risks and vulnerability to a changing climate, building the adaptive and planning capacity of decision-makers, or implementing adaptation actions across Canada (see Annex for additional information).

## COSTING ADAPTATION AND MEASURING PROGRESS

### *Economics of Adaptation*

In addition to working directly with the insurance and financial sectors, the Economics of Adaptation Working Group is working with partners in governments and academia to place an economic value on the impacts of changing climate and to analyze the costs and benefits of adaptation measures for targeted areas and sectors in the Atlantic, Great Lakes and St. Lawrence regions. For instance, in the Great Lakes and St. Lawrence region, the Mowat Centre, the Council of the Great Lakes Region and Ouranos are quantifying the economic impact of lower water levels and assessing the costs and benefits of adaptation measures for commercial shipping and harbours,

hydroelectric generation and tourism. The Economics Working Group is also exploring how economic instruments (e.g. financial, behavioural, informational and regulatory instruments) could incentivize and/or finance adaptation measures in various sectors, including forestry and real estate.

## *Measuring progress*

Measuring adaptation progress is useful to document the impact of the investment of resources and to demonstrate accountability, to provide information to improve future adaptation activities, and to engage decision-makers by showcasing the benefits of adaptation actions.

The Measuring Progress Working Group generated eight products determining the availability and suitability of existing tools, techniques and data for adaptation measurement (see Annex for links). These will help to build the capacity of practitioners in Canada to measure the progress and effectiveness of adaptation. Products include reports providing insights from measurement approaches taken in other countries, including the United Kingdom, and reviews of indicators currently used in Canada to measure the effectiveness of policies and actions in communities, coastal management, infrastructure and other issues for their potential application to measure adaptation to climate change (Box 4).

In addition to Measuring Progress Working Group activities, a preliminary compilation of impact stories showcasing how adaptation is being implemented across Canada was initiated. In British Columbia, the City of Vancouver has created Designated Flood Plain Standards and Requirements, including a new flood construction level that will change the way new buildings are constructed along the coast. Various collaborative projects have contributed to this outcome, including the development of sea dike guidelines to address sea level rise and estimates of the financial costs of sea dikes and alternative strategies. The BC Regional Adaptation Collaborative provides an overview of the BC experience with sea level rise adaptation and the drivers behind sea level rise action in BC, and highlights lessons learned in integrating science into government policy.

In the coming year, the Platform will continue to collect impact stories and, through the Measuring Progress Working Group, provide guidance on measuring progress in adaptation. There will also be increased focus on the dissemination of these impact stories within and outside of the Platform.

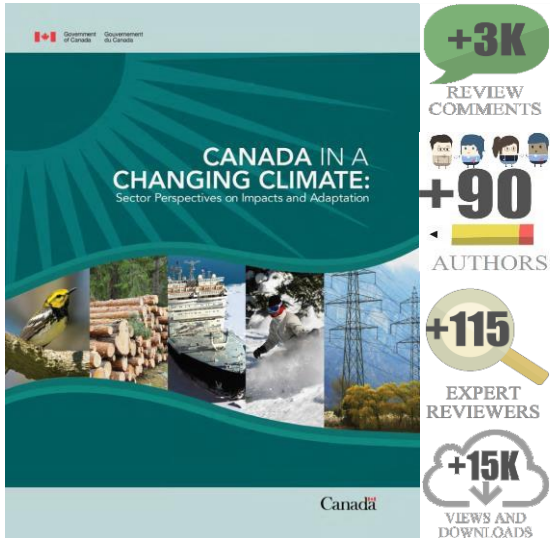
**Box 4: How existing indicators can be used to measure adaptation progress: Indicators of Climate Adaptation in the Columbia Basin**

The Columbia Basin Trust partnered with the Columbia Basin Rural Development Institute (RDI) to develop a suite of regional-level climate change indicators to measure community climate adaptation efforts. The study, co-funded through the Measuring Progress Working Group, analyzed how the current "State of the Basin" indicators could be used to measure adaptation to climate change and identified new indicators that would be useful. The results will assist communities in understanding climate change and adaptation and help decision-makers in the Basin make informed decisions and measure the success of adaptation efforts. The indicator suite complements RDI's State of the Basin monitoring initiative. For more information on the project, visit www.cbrdi.ca/climatechangeadaptation/

# SCIENTIFIC INFORMATION

## *Science Assessment*

The national science assessment Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, released in June 2014, provides a credible, up-to-date source of scientific information and targeted sectoral analysis of climate change adaptation to inform adaptation decision making. More than 1500 publications published since 2007 were assessed to advance the understanding of climate impacts, and highlight actions taken by the public and private sectors in Canada to enhance climate resilience. This collaborative effort involved more than 90 authors and over 115 expert reviewers from federal departments, provincial governments, academia, and industry associations.




*As a senior official in the Yukon government, I am very impressed with the sector-based approach taken in this update to the 2008 report as it facilitates information sharing with the private sector.*
*Eric Schroff – Yukon Government*

## *Water and Climate Information*

The Water and Climate Information Working Group met in February 2015. Work is focused on development of a user guide for historical climate data. Environment Canada presented preliminary results of its national climate services “mapping exercise” in the context of the Global Framework for Climate Services.

# EXTEDING THE PLATFORM REACH VIRTUALLY: CONNECTING PEOPLE AND KNOWLEDGE

## *Workspace*

The Adaptation Platform membership includes participants from across Canada. The use of new technology such as the Workspace, a virtual forum where Working Group and Plenary members can plan, work, share and review newly released products, is an efficient manner to connect people and knowledge available across the country. This virtual forum complements traditional forms of discussion and collaboration such as teleconferences and face-to-face meetings. The Workspace now counts more than 370 members (from 198 in 2012) and participation has remained constant over the last three years (an average of 100 unique users per month).

## *Webinars*

The webinar series, officially launched in 2013 -14, aims to mainstream adaptation knowledge and encourage uptake and use of Platform products. The webinar series also facilitates the transfer of experiences and lessons learned from local users to a national scale.

In the last year, the 13 webinars hosted had more than 2500 participants. Of these, almost 80% were not members of the Platform. The demand for adaptation knowledge and tools is evident across jurisdictions and sectors, with participation from federal (23%), provincial and territorial governments (29%), the private sector (19%) and academia (12%). Regionally, most participants were from Ontario and British Columbia (see Table 2). It is worth noting that webinar series participants viewed four webinars on average, suggesting that the format and content of the webinars are meeting the various needs of practitioners.

| | |
|---|---|
| **Atlantic** | 10.7 % |
| **British Columbia** | 21.6 % |
| **North** | 2.7 % |
| **Ontario (includes federal departments)** | 48.7 % |
| **Prairies** | 10.1 % |
| **Quebec** | 5.5 % |
| **Other** | 0.6 % |

**Table 2 Platform Webinar participants by region**

In addition, targeted webinars by the Forestry Working Group were used to engage the forestry sector and showcase forestry adaptation work in Canada. More than 500 people participated in eight webinars held by the Working Group between September 2014 and March 2015.

For more information please visit: webinars.cullbridge.com/AdaptationPlatform

| Webinar Dates | Webinar Title | Webinar Speaker |
|---|---|---|
| March 24, 2014 | Preparing Your Coast for a Changing Climate: Tools and Lessons Learned | Sarah O'Keefe, Liz Ferris, Carrie Baron |
| April 8, 2014 | Key Findings of the Working Group II (Impacts, Vulnerability and Adaptation) Contribution to the IPCC 5th Assessment Report | Stewart Cohen, Paul Kovacs, Fiona Warren |
| May 6, 2014 | Adaptation Library: Community Resources for Climate Adaptation | Jim Vanderwal, Valerie Crouhen, Nicole Rowsell, Kevin Behan |
| September 9, 2014 | Climate Change and Adaptation on Canada's Coasts | Dirk Nyland, DG Blair, John Readshaw, Adam Fenech |
| September 18, 2014 | Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation - Synthesis + Adaptation: Linking Research and Practice | Fiona Warren , Jimena Eyzaguirre |
| October 2, 2014 | Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation - Overview of Canada's Changing Climate | Elizabeth Bush |
| October 8, 2014 | Managing Climate Change Information For Adaptation | Isabelle Charron, Andrew Sherin |
| October 16, 2014 | Canada in a Changing Climate: Sector Perspectives on Impact and Adaptation - Natural Resources and Industry | Mark Johnston, Jason Thistlewaite |
| October 30, 2014 | Canada in a Changing Climate: Sector Perspectives on Impact and Adaptation - Food Production - and - Biodiversity and Protected Areas | Ian D. Campbell, Kim Hyatt, Patrick Nantel |
| November 4, 2014 | Policy Barriers and Drivers | Jennifer Pouliotte, Graham Farstad, Thomas White, Pauline Gerrard |
| November 13, 2014 | Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation - Human Health - and - Water and Transportation Infrastructure | Peter Berry, Jean Andrey, Pamela Kertland |
| February 3, 2015 | New Sea Level Rise Projections in Canada | Thomas James |
| February 10, 2015 | Using Columbia Basin 'State of the Basin' Indicators to Measure Climate Adaptation: A Case Study | Kate Mahoney |
| March 31, 2015 | Forest Change: Canadian Forest Service Contribution to the Federal Adaptation Program | Catherine Ste-Marie |

# ANNEX – WORKING GROUP OBJECTIVES AND PRODUCT LIST

Previous fiscal-year projects and current projects can be found at adaptation.nrcan.gc.ca.

## ADAPTATION PLATFORM WORKING GROUPS 2014-15

| Working Groups | Objectives |
|---|---|
| **Agriculture*** | Build a community of practice on agriculture adaptation in Canada, and design and deliver a Program of Work that addresses common issues and needs related to adaptation in the agriculture sector. |
| **Coastal Management** | Increase understanding of the impacts of climate change on economic, human and cultural coastal assets and potential adaptation responses. |
| **Economics of Adaptation** | Create economic knowledge and tools that help decision-makers in both the private and public sectors make better adaptation investment choices and policy decisions. |
| **Energy** | Advance adaptation and increase resilience to a changing climate in the electricity and oil and gas sectors. |
| **Forestry** | Address sustainable forest management in the context of a changing climate. |
| **Infrastructure and Buildings** | Build capacity, generate evidence and provide outreach to increase the capability of infrastructure managers, municipalities, builders, insurers, engineers and other relevant stakeholders to adapt and facilitate adaptation to climate change. |
| **Measuring Progress** | Improve the ability of decision-makers to measure progress in the implementation and effectiveness of adaptation. |
| **Mining** | Address information gaps while developing tools and information that will help the sector to adapt. |
| **North** | Provide northern decision-makers with the information and tools necessary to advance adaptation. |
| **Regional Adaptation Collaborative and Tools Synthesis** | Provide a forum through which value-added RAC and Tools products can be identified and developed. |
| **Science Assessment** | Improve how science assessments in Canada are developed, how they are communicated, and how they are used. |
| **Water and Climate Information** | Provide improved access to an inventory and tools for water and climate information products to support adaptation in Canada. |

*Working group established in 2014-15

## ADAPTATION PLATFORM PRODUCTS 2014-15

Links to products can be found on the **Adaptation Platform Website**

| Products | Product Description |
|---|---|
| **Coastal Management** | |
| **Analysis of Climate Change Projections for the Ministry of Transportation and Infrastructure Highways Risk Assessment** | This report provides climate change projection information for specific infrastructure risk assessments in BC. |
| **Atmospheric Rivers State of Knowledge Report** | This paper summarizes the state of knowledge on risks from and responses to atmospheric rivers (meteorological systems associated with intense rainfall events that can lead to flooding and landslides) in British Columbia. This will be useful to BC emergency, flood management, planning, and engineering communities. |
| **Climate Change Engineering Vulnerability Assessment of Three British Columbia Highway Segments: Hwy 20 in the Bella Coola Region; Hwy 37A in the Stewart Region; Hwy 97 in the Pine Pass Region** | This report details the findings of climate change risk assessments of three highway segments in BC that used the PIEVC Engineering Protocol for Infrastructure Vulnerability Assessment and Adaptation to a Changing Climate. This information will be of interest to practitioners and decision-makers conducting similar assessments. |
| **Considerations for Addressing Climate Change for Transportation Infrastructure in Highway Management, Design, Operation and Maintenance in British Columbia - Best Practices Document** | This "Best Practices" document provides guidance to the BC Ministry of Transportation and Infrastructure on integrating climate change considerations into highway water-handling infrastructure management including planning, engineering, and operations activities. The general approaches that are outlined for adapting practices will also be useful to practitioners in other regions of Canada. |
| **Developing Effective Dialogue between Practitioners Of Climate Change Vulnerability-Risk Assessments: A Primer for Understanding Concepts, Principles and Language Use Across Disciplines** | This Primer outlines concepts, principles and language used across climate science and engineering disciplines to facilitate effective communication in climate change engineering vulnerability assessments. This report may be of interest to practitioners across Canada. |
| **Engineering Analysis Report for the Climate Change Engineering Vulnerability Assessment** | This report describes detailed engineering analysis of several water infrastructure examples using climate change projections for extreme precipitation and the PIEVC Engineering Protocol for Infrastructure Vulnerability Assessment and Adaptation to a Changing Climate. |

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| **Evaluation of B.C. Flood Policy for Coastal Areas in a Changing Climate** | This report evaluates British Columbia flood policies and programs for coastal areas and identifies those that support and those that create barriers surrounding implementation of climate change adaptation measures. This will be of interest to water management practitioners, policy-makers and decision-makers. |
| **Greening Shorelines to Enhance Resilience: An Evaluation of Approaches for Adaptation to Sea Level Rise** | This report compares the effectiveness and relative cost of several "soft" and "hard" shore armouring options in British Columbia. It considers sea level rise, flooding, and economical resilience. This information will be useful to coastal zone planners, engineers and decision-makers for assessing adaptation options |
| **L'adaptation en zone côtière: de la parole aux actes. (in French)** | This report provides an assessment of the interactions between different scales of actors in two regions in New Brunswick, and identifies potential bottlenecks to progress on adaptation action. |
| **Methods for Projecting the 2010 Prince Edward Island Coastline into Future Coastlines for 2040, 2070 and 2100** | This report documents the method developed for quantitatively assessing Prince Edward Island's coastline considering future sea level rise projections. This methodology and lessons learned could inform similar assessments in other regions. |
| **Prince Edward Island Land Area Changes: 1968 – 2010** | This report, accompanied by a series of maps, provides information on historic land area and coastline change rates on Prince Edward Island from 1968-2010. This information was used to assess future risks to Prince Edward Island's coastal residences, infrastructure and heritage from receding coastlines projected for 2040, 2070 and 2100 |
| **Review and Analysis of Climate Change Vulnerability Assessments of Canadian Water Management and Drainage Infrastructure** | This report details the findings of a review of climate change vulnerability assessments from across Canada and identifies common risks to water management and drainage infrastructure standards. These assessments used the PIEVC Engineering Protocol for Infrastructure Vulnerability Assessment and Adaptation to a Changing Climate. This information will be of interest to infrastructure owners and engineering professionals. |
| **Risk Assessment to Prince Edward Island's Coastal Residences, Infrastructure and Heritage from Receding Coastlines in 2040, 2070 and 2100** | The report presents a quantitative risk assessment of future projections for coastal erosion on Prince Edward Island's coastal residences, infrastructure and heritage. Practitioners and decision-makers can utilize this information to increase resilience along PEI's coasts |

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| **The Future of Atmospheric Rivers and Actions to Reduce Impacts on British Columbians** | This multi-agency qualitative risk exploration report presents a summary of a multi-disciplinary workshop that explored high impact risks from future projections of extreme events. This will be useful to BC emergency, flood management, planning, and engineering communities. |
| **Understanding Policy Enablers and Barriers for the Adaptive Management and Resilience of Coastal Communities in the Hudson Bay Inland Sea Region** | This report describes the results of using the ADAPTool to analyze selected policies relevant to the transportation sector along the coast in the Hudson Bay Inland Sea Region in order to identify enablers and barriers to climate change adaptation. |
| **Energy** | |
| **Climate Change Impacts to the Oil and Gas Sector in Western Canada – How are we Preparing?** | This report describes the results of an examination of the current state of information, planning and action on adaptation to climate change among oil and gas companies operating in Western Canada. The report focuses on the upstream and transmission oil and gas industries in British Columbia, Alberta, and Saskatchewan. |
| **Understanding Canadian Electricity Generation and Transmission Sectors' Action and Awareness on Climate Change and the Need to Adapt** | This report summarizes research conducted with representatives in the energy transmission and generation sector to determine the current status of climate change adaptation in this sector. These results will help to inform the best approach to developing adaptation policy and practices. |
| **Forestry** | |
| **Compendium of Forest Adaptation Initiatives across Canada** | This report provides a centralized collection of information on current or recent forestry adaptation initiatives across Canada. It outlines projects, policy initiatives, and forestry management practices that have attempted to deal with future climate change. This compendium is a first step in cataloguing current or recently completed forestry adaptation initiatives. |
| **Infrastructure and buildings** | |
| **Best practices guide: Management of inflow and infiltration in new urban developments** | This research/best practices report provides guidance for those involved in infrastructure management. It is aimed at those involved in the planning, design, construction, maintenance and operation of municipal storm and wastewater systems. |

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| **Cities Adapt to Extreme Rainfall Celebrating local leadership** | This book provides 20 highly accessible best practice case studies of practical measures applied by municipalities across Canada to adapt homes and infrastructure to the impacts of extreme rainfall. |
| **IDF CC Tool: Updating Intensity-Duration-Frequency (IDF) Curves to Account for Climate Change Impacts** | The IDFCC Tool is a publicly accessible, online tool that allows local water managers and other interested stakeholders to apply Global Circulation Model (GCM) outputs to local Intensity-Duration-Frequency (IDF) curves in order to generate IDF curves that account for climate change impacts. The Tool provides access to outputs from 22 GCMs, and is pre-loaded with rain monitoring data from roughly 700 stations. Users can also create and enter data for their own rain monitoring stations. |
| **Measuring Progress** | |
| **An assessment of the transferability of the UK's approach to monitoring and evaluating climate adaptation progress to the Canadian context** | This study reviewed the United Kingdom's past and current approach to measuring adaptation and provided recommendations for adopting its approach in Canada. |
| **Are we there yet? Applying Sustainability Indicators to Measure Adaptation.** | This report lists forty indicators used in four sectors (coastal management, flood management, infrastructure and health) that can be used to measure adaptation. |
| **Best practices in surveying for the measurement of climate change adaptation – Guidance document** | This document provides guidance on the use of surveys for measurement of progress and effectiveness of adaptation. |
| **Climate Resilience Indicator Literature Review (Prepared as part of "Using Columbia Basin State of the Basin Indicators to Measure Climate Adaptation")** | This literature review documents and describes the types of indicators that are currently in use or that have been proposed for tracking climate change, impacts and adaptation. |
| **Indicators of Climate Adaptation in the Columbia Basin – How 'State of the Basin' Indicators can be used to Measure Climate Change, Impacts and Progress Towards Adaptation** | This report analyses how current Columbia Basin "State of the Basin" indicators could be used to measure adaptation to climate change, and identifies new indicators that would be useful. |

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| **Introducing State of Climate Adaptation and Resilience Indicators in the Basin: Using Indicators to Measure Community Progress on Adaptation** | This whiteboard-style video introduces the use of indicators to measure adaptation and resilience in the Canadian Columbia Basin. |
| **Measuring progress on climate adaptation in the Columbia Basin Indicators and pathways to chart the course – a summary report.** | This report provides an overview of the process taken to review and develop indicators for measuring progress on adaptation, including the development of adaptation pathways for five key topics (agriculture, extreme weather and emergency preparedness, flooding, water supply and wildfire). |
| **Research into the use of climate change adaptation indicators in OECD countries: Lessons for Canada** | This document includes a "matrix" of 355 adaptation indicators from nine countries. |
| **Mining** | |
| **Addressing Weather-Related Challenges at the Galore Creek Project, Northwestern British Columbia.** | This case study focuses on work undertaken at Galore Creek Mining Corporation in response to an extreme rainfall event in 2011, and to address future weather- and climate-related challenges. It is intended to be a source of information for other mining operations seeking to understand how their business will be impacted by climate change. |
| **Case Study: Economic Case Analysis of Climate Change Impacts and Adaptation Measures: Sudbury Integrated Nickel Operations** | This case study summarizes the results of a cost-benefit analysis of climate change impacts and potential adaptation measures related to water management for Glencore's Sudbury Integrated Nickel Operations. |
| **Climate Adaptation in the Canadian Mining Sector** | This report presents the results of a survey of 26 Canadian mining companies with operations across Canada regarding their current adaptation actions. |
| **Cost-Benefit Analysis of Climate Change Impacts and Adaptation Measures for Canadian Mines – Literature Review** | This literature review, specific to the mining sector, explores existing tools and resources available to assist decision-makers in assessing the costs and benefits of adaptation. |
| **Cost Benefit Analysis of Climate Change Impacts and Adaptation Measures for Canadian Mines – Final Report** | This final report describes the development and application of cost-benefit analysis for potential adaptation actions at two Canadian mine sites. |

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| **Developing Climate Change Economic Case Analysis: A guide to using the climate change cost-benefit analysis tool.** | This report provides guidance for the use of the cost-benefit analysis approach developed and used to assess potential adaptation actions at two Canadian mine sites. |
| **Economic impacts of a changing climate on mine sites in Canada – Assessing proactive and reactive adaptation approaches** | This report discusses the results of a study examining the costs and benefits of investing in proactive adaptation measures versus a "do nothing" scenario that included only repair and remediation costs. Data from four Canadian mine sites was used to conduct this study. |
| **Economic implications of climate change adaptations for mine access roads in Northern Canada – A Case Study of the Tibbitt to Contwoyto Winter Road** | This report presents the results of a cost-benefit analysis for a range of adaptation options for the Tibbitt to Contwoyto winter ice road. The Tibbitt to Contwoyto Winter Road supports four mines, and is the busiest heavy-haul ice road in the world. |
| **North** | |
| **Baseline Analysis of Mainstreaming Adaptation into Natural Resource Development Activities in the Hudson Bay Inland Sea Region** | This report provides a baseline of how climate adaptation is being incorporated into development planning by government and industry in the context of community level adaptive capacity in the Hudson Bay Inland Sea Region. |
| **Regional Adaptation Collaborative and Tools Synthesis** | |
| **A Guidebook on Climate Scenarios: Using Climate Information to Guide Adaptation Research and Decisions** | This guide provides information on categories and types of products for future climate scenarios. It also describes what type of information may be most appropriate for different types of analysis and decision situations. This guide will be useful to practitioners, researchers and decision-makers across all sectors. |
| **Climate Change Adaptation Framework Manual, 2010 (Alberta)** | The Adaptation Framework Manual was developed to provide clear, straightforward instructions for initiating and completing the adaptation planning process using the Adaptation Framework. The manual itself is adaptable and can be modified for any purpose or organization as the Adaptation Framework is based on broadly recognized standards for risk management. |
| **Drought and Excessive Moisture Preparedness Planning in Saskatchewan Watersheds** | This case study focuses on the process used by three watershed stewardship groups to assess the vulnerability of their watersheds to climate change, and to prioritize actions.<br>Each case study provides a unique perspective regarding vulnerabilities to climate change, and stakeholder engagement. |

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| **Engaging Small Communities of PEI in Assessing their Vulnerability to Climate Change** | This case study describes the various approaches used to engage community members in Prince Edward Island (PEI), and the results. Efforts focused on involving key decision-makers in the study team; gathering local knowledge through one-on-one interviews, history circles, storytelling, and community meetings; and using maps and photographs. |
| **Helping Newfoundland and Labrador Communities Assess Climate Change Vulnerability** | This case study provides information on the development of the "7 Steps to Assess Climate Change Vulnerability in Your Community" guide with Newfoundland and Labrador communities. |
| **Provincial Planning on Adaptation for Excessive Moisture in the Manitoba Interlake Region** | This case study will review the methodology, results and lessons learned from the report *Provincial Planning on Adaptation for Excessive Moisture in the Manitoba Interlake Region*. Guidance for generating this review was largely taken from the Clean Air Partnership. |
| **The Contribution of the RAC Atlantic Climate Adaptation Solutions Project Towards Building Adaptive Capacity in Nova Scotia** | This report outlines the efforts of the Atlantic Climate Adaptation Solutions (ACAS) program to involve a focused group of Nova Scotia institutions in numerous capacity building activities in order to improve awareness and understanding of climate adaptation in Nova Scotia. This case study provides a short overview of the ACAS program in Nova Scotia (2007-2012), giving some insights regarding the achievement of its objective to develop adaptive capacity in some targeted institutions. |
| **Science Assessment** | |
| **Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation** | Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation is an update to the 2008 science assessment report. It assesses advances made in understanding climate change impacts and adaptation from a sectoral perspective, based primarily on literature published up to the end of 2012. |


ADAPTATION.NRCAN.GC.CA