ADAPTATION CANADA 2016
PROCEEDINGS
Adaptation Canada 2016

A National Symposium on Climate Change Adaptation
Symposium national sur l’adaptation aux changements climatiques

Adaptation Canada 2016 was organized by the Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) and OURANOS, with support from the Government of Canada

Adaptation Canada 2016 a été organisée par Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) et OURANOS, avec le soutien du gouvernement du Canada

Symposium Organizers

Co-chairs/Co-Président

Al Douglas, Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR)
Alain Bourque, Directeur Général, OURANOS

Symposium Co-ordination

Jacqueline Richard, Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR)
Anne Debrabandere, OURANOS
Valérie Bourduas-Crouhen, OURANOS
Paul Cobb, Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR)
Suzanne Perdeaux, Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR)
Annette Morand, Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR)

Symposium Advisory Committee/Comité consultatif du symposium

Al Douglas, OCCIAR
Jacqueline Richard, OCCIAR
Alain Bourque, OURANOS
Anne Debrabandere, OURANOS
Valérie Bourduas-Crouhen, OURANOS
Bob Purdy, Fraser Basin Council
Jim Vanderwal, Fraser Basin Council
Bob Manteaw, Government of Alberta
Kim Graybiel, Government of Saskatchewan

Randal Shymko, Government of Manitoba
Lee Fehler, University of Winnipeg
Terry Duguid, University of Winnipeg
Jeff Hoyt, Government of New Brunswick
Mikaela Comella, Government of New Brunswick
Don Jardine, University of PEI
Bronwyn Benkert, Yukon College
Beth Lavender, Natural Resources Canada
Alex Szumilas, Natural Resources Canada

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www.adaptationcanada2016.ca
Adaptation Canada 2016 – A National Symposium on Climate Change Adaptation

Together with OURANOS, a Quebec-based climate change impacts and adaptation consortium, the Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) organized a national symposium on climate change adaptation. The first national event focused primarily on adaptation to climate change since 2005 was held on April 12-14, 2016 and showcased adaptation products, information and tools that have been developed across Canada over the past 5 years. Over 600 delegates representing industry, government, non-governmental organizations, practitioners, scientific experts, decision-makers, and others were in attendance.

Extensive effort has been expended across Canada to advance climate change adaptation. Case studies, training material, sector-specific tools and a variety of other policy and planning aids have been developed by a variety of organizations across Canada in an attempt to advance adaptation planning and action in different sectors, agencies and communities. Showcasing this effort, the symposium provided an opportunity for speakers and delegates to share solutions-focused content, and examples of strategic planning and adaptation implementation that will catalyse further action to manage climate risks.
## Program at a Glance / Le programme en bref

### Tuesday April 12, 2016 / Mardi 12 Avril, 2016

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<tr>
<th>Time</th>
<th>Registration / Inscription</th>
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<tr>
<th>Time</th>
<th>Opening Plenary / Ouverture officielle du Symposium</th>
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<tr>
<td>8:30 am – 10:00 am</td>
<td>Opening Plenary / Ouverture officielle du Symposium</td>
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<td>Elder Josee Whiteduck, Kitigan Zibi First Nation – opening prayer</td>
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<td></td>
<td>Chief Jean Guy Whiteduck, Kitigan Zibi First Nation – opening greetings</td>
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<td>Honourable Catherine McKenna, Minister of Environment and Climate Change Canada</td>
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<td>Councillor David Chernushenko, City of Ottawa</td>
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<td>Symposium Co-chair Welcome / Mot de bienvenue</td>
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<td>Alain Bourque</td>
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<td>Keynote Speaker / Conférencière invitée</td>
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<td></td>
<td>Katharine Jacobs, Director Center for Climate Adaptation Science and Solutions, University of Arizona</td>
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<th>Time</th>
<th>Concurrent Sessions and Posters / Pause avec les partenaires et les affiches</th>
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<td>10:00 am - 10:30 am</td>
<td>Break with Partners and Posters / Pause avec les partenaires et les affiches</td>
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<td>10:30 am - 12:00 pm</td>
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<tr>
<th>Time</th>
<th>T1A: Adaptation in the Energy Sector - Risks, Opportunities and Solutions / Adaptation du Secteur de l'énergie : risques, opportunités et solutions – Marco Braun, OURANOS (chair)</th>
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<tbody>
<tr>
<td></td>
<td>Toronto Hydro Electrical Distribution System Climate Change Vulnerability Assessment</td>
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<td>Chee Chan, AECOM</td>
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<td>Risk and Opportunities for the Oil and Gas Sector in a Changing Climate in Northeast BC</td>
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<td>Jim Vanderwal, Fraser Basin Council</td>
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<td>Estimating Future Probable Maximum Flood (PMF): a Case Study on Five Watersheds in Canada</td>
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<td>John Perdikaris, OPG</td>
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<td>Including Climate Projections into Hydropower Investment Decision-making</td>
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<td>David Huard, Ouranos</td>
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<th>Time</th>
<th>T1B: Mainstreaming Adaptation: From Coast to Coast / Intégrer l'adaptation d’une côte à l’autre – Brian Sieben, Government of NWT (chair)</th>
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<tr>
<td></td>
<td>Building an adaptive culture: Nova Scotia Environment's Adaptation Workplan</td>
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<td>Jennifer Graham – Nova Scotia Government</td>
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<td>How Can We Make Adaptation Part of the Way we do Business? A Case Study from BC Ministry of Forests, Lands and Natural Resource Operations</td>
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<td>Kathy Hopkins, Government of British Columbia</td>
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<td>Renforcement des capacités de gouvernance et de résilience des communautés côtières de l'estuaire et du golfe du Saint-Laurent à l'heure des changements climatiques</td>
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<td>Liette Vasseur, Brock University and Steve Plante, Université du Québec à Rimouski</td>
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<td>Adaptation in the Government of the Northwest Territories – Moving to the Mainstream</td>
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<td>Brian Sieben, Government of Northwest Territories</td>
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Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR)


- Analyse de la vulnérabilité sociétale et territoriale aux inondations en milieu urbain dans le contexte des changements climatiques : Cas d’étude la Ville de Montréal
  Isabelle Thomas, University of Montreal
- Assessing Abilities of Policies to Reduce Vulnerability to Climate Change by using the Adaptool
  Livia Bizikova, IIISD
- Infrastructure Climate Risk Assessment in Canada: An Engineering Strategy for Adaptation
  David Lapp, Engineers Canada
- The Infrastructure and Buildings Working Group - Part of the NRCan Adaptation Platform
  Paul Kovacs, ICLR

**T1D:** Communities Adapting to Climate Change in Canada’s North – Martin Tremblay, Indigenous and Northern Affairs Canada (chair)

- Climate Change and Health Adaptation Program for Northern First Nations and Inuit Communities
  Daniel Brown, Health Canada
  Anna Bunce
- SmartICE: an Adaptation Tool to Support Sea-ice Travel Safety under Changing Arctic Climate and Shipping Conditions
  Trevor Bell, Memorial University of Newfoundland
- Life on Permafrost: Community Planning Empowerment
  Michel Allard - Centre d’études nordiques, Université Laval

**T1E:** Climate Change Science in the Great Lakes Basin – Rachel Gagnon, Ontario Ministry of Natural Resources and Forestry (chair)

- State of Climate Change Science in the Great Lakes Basin
  Edmundo Fausto, TRCA
- Using Water Balance Dynamics to Identify Vulnerabilities to Climate Change
  Dr. Robert Metcalfe, Ontario Ministry of Natural Resources and Forestry
- Risk Assessments of the Cumulative Effects of Climate Change, Human Movement and Water Connectivity and the Spread of Aquatic Invasive Species
  Shannon Fera, Ontario Ministry of Natural Resources and Forestry
- How Quickly Can Populations Adapt to Climate Change? Genetic Responses to Thermal Physiology of Cold Water Fishes
  Dr. Chris Wilson, Ontario Ministry of Natural Resources and Forestry
- Lake Ontario Nearshore Fish Habitat Vulnerability Assessment
  Susan Doka, Fisheries and Oceans Canada

**T1F:** An Overview of Agricultural Adaptation Activities in Canada – Sarah Kalff, Agriculture and Agri-food Canada (chair)

- Canadian Agricultural Adaptation: An Overview
  Jamie Hewitt, Agriculture and Agri-food Canada
- A Research Program to Address Agricultural Stakeholders’ Concerns Regarding the Evolution of Crop Pests Associated with Climate Change
  Anne Blondlot, Ouranos
Supporting Agricultural Adaptation to Climate Change: Programs, Projects and Progress in B.C.
Emily MacNair, BC Agriculture & Food Climate Action Initiative

Managing Canada’s Soil Resource to Mitigate Climate Change and Provide Ecological Goods and Services
Paul Thoroughgood, Soil Conservation Council of Canada

12:00 pm – 1:30 pm
Lunch with Partners and Posters / Diner avec les partenaires et les affiches

1:30 pm – 3:00 pm
Concurrent Sessions / Sessions parallèles

T2A: Cities Becoming Climate Resilient: Examples of Available Tools and Canadian Cities Taking Action / Villes résilientes au climat : exemples d'outils disponibles et de villes qui passent à l'action - Chee Chan, AECOM (chair)

UNISDR Disaster Resilience Scorecard
Jon Philipsborn, AECOM
ICLEI Building Adaptive and Resilient Communities Program
Ewa Jackson, ICLEI
Toronto’s Collaborative Multi-Sectoral Approach to Climate Adaptation
David MacLeod, Energy and Environment Division, City of Toronto
L’adaptation aux changements climatiques à Montréal : du constat aux actions
Julie Guicheteau, Ville de Montréal
100 villes résilientes et Montréal
Louise Bradette, Ville de Montréal


Standards as Tools for Adaptation
Kelly Montgomery, Standards Council of Canada
Guidance for parking lots to reduce UHI: 2 years later, its current and future applications
Nathalie Bleau, Ouranos
Northern Infrastructure Standardization Initiative
Mike Burns, Government of NWT
Voluntary Standards for Climate Adaptation – through ISO and Beyond
Ira Feldman, GreenTrack

T2C: The Role of Data in Water Management / Le rôle des données dans la gestion de l’eau - Linda Mortsch, University of Waterloo (chair)

Integrated Water and Climate Monitoring for Climate Change Detection and Adaptation
Scott MacRitchie, Ontario Ministry of the Environment and Climate Change
Addressing Climate Change Effects in Great Lakes-St. Lawrence River Water Level Regulation
Wendy Leger, Environment and Climate Change Canada
Augmenter les capacités de surveillance hydrologique du Québec comme moyen d’adaptation aux changements du régime des crues
Richard Turcotte, Centre d'expertise hydrique du Québec (CEHQ)
Use of resilience in adaptation to climate-change caused natural disasters
Angela Peck, University of Western Ontario

T2D: Adapting to climate change in the Canadian Arctic - James D. Ford, University McGill (chair)

James D Ford, McGill University
### T2E: What constitutes extreme weather? Considerations and approaches for defining extreme weather at local scales to support adaptive planning in agricultural landscapes - Ruth Waldick, Agriculture and Agri-Food Canada (chair)

**What Constitutes Extreme Weather?**
Ruth Waldick, Agriculture and Agri-Food Canada/ Carleton University

**Historical and Modelled Climate Data Issues with Extreme Weather**
Neil Comer, Risk Sciences International

**Extreme Weather: Envisioning Ontario Agriculture**
Scott Mitchell, Carleton University

**Adaptation to Extreme Weather Events in Agricultural Watersheds in Five Countries**
David Sauchyn, University of Regina

**Estimation of Crop Yields under Future Climate Extremes**
Suren Kulshrestha, University of Saskatchewan

### T2F: The Role of Numerical Models in Climate Scenarios and Services - Patrick Grenier, OURANOS (chair)

**Recent and Upcoming Developments in the Fifth Generation Canadian Regional Climate Model**
Laxmi Sushama, UQAM

**Added Value of Very High-Resolution Regional Climate Model Simulations Compared to those of Commonly Used Intermediate Resolution**
Philippe Lucas-Picher, UQAM

**Post-processing and Bias Correction of Climate Models: Rationale, Assumptions, and a New Multivariate Approach**
Alex Cannon, Environment and Climate Change Canada

**Considering Adaptation to Climate Change as a Timescale Problem: Examples from the Tourism Industry**
Dominique Paquin, Ouranos

### 3:00 pm – 3:30 pm
Break with Partners and Posters / Pause avec les partenaires et les affiches

### 3:30 pm – 5:30 pm
Concurrent Sessions / Sessions parallèles

**T3A: Producing Climate Information: for whom and for what purpose? - Isabelle Charron, OURANOS and Kevin Anderson, Environment and Climate Change Canada (chairs)**

**Climate Change and the Challenge of Delivering Information**
Francis Zwiers, PCIC and James Hiebert, PCIC

**The Canadian Climate Data and Scenarios (CCDS) Website - An interface for Distributing Climate Change Information.**
Benita Tam, Environment and Climate Change Canada

**High resolution climate models for Canada: methods, limits and applications.**
Dan McKenney, Canadian Forest Service/Great Lakes Forestry Centre

**Adapting Ontario to an Uncertain Future: Making Climate Information Relevant to Local Decision-Makers**
Glenn Milner, Ontario Climate Consortium / Toronto and Region Conservation Authority

**Spatial Climate Change Data to Aid Adaptation in Resource Management**
Francis Zwiers, PCIC

**Crossing Boundaries: Enabling Decisions on Climate Change Adaptation**
Stewart Cohen, Environment and Climate Change Canada

T3B: Climate Change Adaptation in Aquatic Environments - Blair Greenan, Fisheries and Oceans Canada (chair)

Fisheries and Oceans Canada's Climate Adaptation Program
Paul Lyon - Fisheries and Oceans Canada
État des lieux des pêches et de l'aquaculture au Québec en lien avec les changements climatiques
Valérie Bourduas Crouhen, Ouranos
Atlantic Impact and Vulnerability Assessments from the Aquatic Climate Change Adaptation Program
Pierre Pepin, Fisheries and Oceans Canada
Cost benefit analysis of the risks of coastal flooding and erosion on infrastructure and properties at Tracadie Harbour, Prince Edward Island
Hope Parnham, DV8 Consulting

T3C: Climate change adaptation and coastal zones: the cost-benefit analysis as a tool for decision makers - Claude Desjarlais, Ouranos (chair)

Évaluation économique des répercussions des changements climatiques et analyse coûts-avantages des options d’adaptation en zone côtière – Survol méthodologique
Manon Circé, Ouranos
Cost-benefit Analysis of Climate Change Adaptation Options for the Chignecto Transportation Corridor
Sabine Dietz, Aster Group
Analyse coûts-avantages des options d’adaptation en zone côtière à Percé
Laurent Da Silva, Ouranos
Cost-benefit analysis of the risks of coastal flooding and erosion on infrastructures and properties in Prince Edward Island
Don Jardine, UPEI
Analyse coûts-avantages des options d’adaptation en zone côtière aux Îles-de-la-Madeleine
Ursule Boyer-Villemaire, Ouranos
Résultats intégrés et tendances des analyses coûts-avantages réalisées en zone côtière
Manon Circé, Ouranos

Panel Discussion

T3D: Climate Change Impacts and Land Use Planning in Northern Canada - Jenny Gleeson, Ontario Ministry of Natural Resources and Forestry (chair)

Far North of Ontario Climate Change Community Surveys
David Pearson, Laurentian University Living with Lakes Centre
Climate Change Ecosystem Vulnerability Assessment in the Hudson Bay Lowlands, Ontario
Jim McLaughlin, Ontario Ministry of Natural Resources and Forestry
Building Climate Change into Community-based Land Use Planning
Rachelle Lalonde, Ontario Ministry of Natural Resources and Forestry
Hazard Identification and Cost Adaptation in Infrastructure Planning
Alison Perrin, Yukon Northern Climate ExChange
Landscape Conservation Collaborative as a Network Approach
Brian Sieben, Government of Northwest Territories
### T3E: Best Practices in Climate Change Adaptation (Engineering) - Christine Callihoo, Associated Environmental (chair)

- **Engineering and Community Planning: Tools and processes to address the challenges posed by climate change**
  Christine Callihoo, Associated Environmental
- **APEGBC Guidance on the Evolving Responsibilities for its Members in a Changing Climate**
  Harshan Radhakrishnan, APEGBC
- **Integrating Climate Change Risks into Management: A Framework**
  Guy Félio, RV Anderson Associates Limited
- **Process, challenges and impediments to responding to Climate Change**
  Mark Porter, Associated Engineering
- **Case studies: Implementation of an adaptation plan in cities**
  Jean Luc Allard, SNC Lavalin

### T3F: Community Vulnerability Assessment Workshop - Ewa Jackson, ICLEI (chair)

- **Welcome and Workshop Overview**
- **Introduction of Workshop**
- **A First Look at Vulnerability Assessment – Sensitivity and Adaptive Capacity**
- **A First Look at Risk Assessment – Consequence and Likelihood**

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#### Wednesday April 13, 2016 / Mercredi 13 avril 2016

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#### W3A: How Provinces and Territories are Adapting to Climate Change - Caroline Larrivee, OURANOS (chair)

- **Thomas White**, British Columbia Government (TBC)
- **Catherine Gauthier**, Gouvernement du Québec
- **Jeff Hoyt**, New Brunswick Government
- **Rebecca World**, Yukon Government
- **Kathleen O’Neill**, Ontario Government
- **Bob Manteaw**, Alberta Government
- **Chad Blundon**, Newfoundland Government

#### W3B: Adapting Sustainable Forest Management using Embedded Scientists and Science-Management Partnerships - Vincent Roy, SCF, Natural Resources Canada (chair)

- **Forest Management Planning and Vulnerability Assessment: Opportunities for Integrating Climate Change Science into Sustainable Forest Management**
  Mark Johnston, Saskatchewan Research Council
- **Making Climate Change Adaptation Work in U.S. National Forests**
  David L. Peterson, United States Forest Service
- **Climate Change and the Forest Sector: Perception of Principal Impacts and of Potential Options for Adaptation**
  Daniel Houle, Ouranos
- **Adaptation in the Canadian Forest Products Sector: getting to action now**
  Ben Filewood, Forest Products Association of Canada
**W1C:** Using Projections of Extreme Precipitation to Support Infrastructure Design - Kevin Anderson, Environment and Climate Change Canada (chair)

- **Projected changes to temporal scaling properties of extreme precipitation over Canada**
  - Alex Cannon, Environment and Climate Change Canada
- **Can we provide robust advice to support infrastructure design?**
  - Francis Zwiers, PCIC
- **General Considerations as to How Future Projections of Extreme Precipitation could be Integrated into Infrastructure Design**
  - Alain Mailhot, INRS
- **Intensity-Duration-Frequency curve update for Newfoundland and Labrador**
  - Allyson Bingeman, GHD Ltd
- **Integrating Extreme Precipitation into Infrastructure Design**
  - Peter Nimmrichter, Amec Foster Wheeler

**W1D:** Adaptation in the Energy Sector - Drivers, Barriers and Policies - Kevin Behan, Clean Air Partnership (chair)

- **Community Energy Planning, Energy Utility Adaptation, and Smart Energy Networks**
  - Sarah Marchionda - QUEST – Quality Urban Energy Systems of Tomorrow
- **Demonstrating the Near to Long-Term Benefits of Harmonized Policy Development for Building Climate Change Resilience in the Canadian Energy Sector**
  - Ryan Hennessy, Yukon Energy Centre and Annette Morand, OCCIAR
- **Understanding the Current State of Awareness and Action on Adaptation in the Electricity Generation, Transmission and Local Distribution Sector**
  - Laura Zizzo - Zizzo Strategy Inc
- **Building Energy Sector Resilience to the New Normal – Overcoming Barriers to Adaptation**
  - Marco Braun, Ouranos

**W1E:** Maintaining Biodiversity and Ecosystem Services in the Face of Climate Change: A New Era of Conservation Planning - Diana Stralberg, University of Alberta (chair)

- **Data and Tools for Assessing Threats to Biodiversity and Ecosystems across North America**
  - Carlos Carroll, KCCR
- **Anticipated Shifts in Boreal Ecosystems and Characteristics of Climatic Refugia for Boreal Ecosystems and Species**
  - Diana Stralberg, University of Alberta
- **Simulating Spatio-Temporal Dynamics of Boreal Bird Habitats Under Natural and Anthropogenic Disturbances in a Climate-change Context**
  - Junior Tremblay, Environment and Climate Change Canada
- **Conservation Planning Case Studies in Northern Canada**
  - Justina Ray, Wildlife Conservation Society Canada

**W1F:** Innovation and Adaptation of Winter Ski Tourism in a Changing World - Stéphanie Bleau, OURANOS (chair)

- **Adapting the Winter Tourism of the Pyrenees to a Future Climate Change**
  - Dr. Marc Pons, Sustainability Observatory of Andorra (OSBA)
- **Anticipated Shifts in Boreal A Coupled Model of Ski Operations and Tourist Adaptation to Climate Variability and Change: Insights for the Ontario, Quebec and New England ski Markets**
  - Daniel Scott, University of Waterloo
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<td><strong>W2A:</strong></td>
<td>Private sector climate change risks and opportunities in a competitive world - Alain Bourque, Ouranos (chair)</td>
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<td><strong>Pascale Lagacé</strong>, Vice President, Environment and Climate Change, Resolute Forest Products</td>
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<td><strong>Claude Péloquin</strong>, Vice President, Finance and Administration, Ski Bromont</td>
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<td><strong>Joan Frain</strong>, Senior Manager, Water Resources, Ontario Power Generation (OPG)</td>
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<td><strong>Ben Chalmers</strong>, Vice President of Sustainable Development - Mining Association of Canada</td>
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<td><strong>Don McCabe</strong>, President, Ontario Federation of Agriculture</td>
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<td><strong>W2B:</strong></td>
<td>Preparedness to extremes and prevention – tools for public health - Céline Campagna, INSPQ (chair)</td>
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<td><strong>Real-Time Surveillance of Adverse Environmental Conditions and Associated Health Outcomes</strong></td>
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<td>Paul Belanger, Kingston, Frontenac and Lennox &amp; Addington (KFL&amp;A) Public Health, Kingston</td>
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<td><strong>Impacts organisationnels de SUPREME en surveillance des événements météorologiques extrêmes au Québec</strong></td>
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<td>Pierre Gosselin, INSPQ</td>
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<td><strong>Toward an Evidence-Based Approach for Wildfire Smoke Health Response in Canada</strong></td>
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<td>Jeff Eyamie, Health Canada</td>
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<td><strong>PROJET ILEAU (Interventions locales en environnement et aménagement urbain) à Montréal</strong></td>
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<td>Emmanuel Rondia, CRE-Mtl</td>
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<td><strong>La stratégie québécoise de réduction de l’herbe à poux et des autres pollens allergènes: perspective provinciale pour une gestion efficace et partagée</strong></td>
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<td>Isabelle Demers, INSPQ</td>
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<td><strong>W2C:</strong></td>
<td>Southern First Nations Adapting to Climate Change - Marie-Eve Néron, Indigenous and Northern Affairs Canada (chair)</td>
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<td><strong>Building adaptive capacity and climate change resiliency in indigenous communities</strong></td>
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<td>Brian Kotak, Canadian Model Forest Network</td>
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<td><strong>Climate Change Adaptation Planning with the Chippewas of Georgina Island First Nation</strong></td>
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Kerry-Ann Charles, Georgina Island First Nation
Réalisation du plan d'adaptation aux changements climatiques de Wôlinak et d'Odanak
Myriam Beauchamp, Grand Conseil de la Nation Waban-Aki
Community-based climate change cost-benefit analysis on infrastructure
Jean-Christophe (J-C) Amado, Senior Climate Risk and Resilience Specialist

W2D: Building the knowledge foundation through assessments; learning from the past and planning for the future - Fiona Warren, Natural Resources Canada (chair)

Linda Mortsch, University of Waterloo, IPCC Assessments
Kathy Jacobs, University of Arizona, US Science Assessments
Roger Street, UKCIP, UK Science Assessments
Don Lemmen, Natural Resources Canada, Canadian national-scale assessments
Hélène Coté, Ouranos, Canadian regional assessment (Quebec)

W2E: Strengthening Adaptive Capacity in Coastal Communities: Experiences from British Columbia - Eliana Chia, Fraser Basin Council (chair)

Province of BC’s Actions and New Guidelines on Climate Adaptation
Kari Tyler, Climate Action Secretariat, Government of British Columbia
Flood Management and Climate Adaptation in BC’s Lower Mainland
Jim Vanderwal, Fraser Basin Council
Adapting to a Changing Coastline in the City of Surrey
Carrie Baron, City of Surrey
Green Shores™ training for shoreline decision-makers in British Columbia
DG Blair, Stewardship Centre for BC
Video Series: Climate Change Adaptation and Water on the BC Coast
David Reid of Lanarc Consultants

W2F: Impact and adaptation responses in communities of place and practice to climate change: A tale of physics, phyto-plankton, fish and fisheries for salmon on the west coast of Vancouver Island, British Columbia - Kim Hyatt, Fisheries and Ocean Canada (chair)

Productivity responses of Barkley Sound salmon to climate variation and change impacts in the Pacific Ocean
Kim Hyatt, Fisheries and Oceans Canada
Pacific salmon responses to climate variation and change in freshwater ecosystems
Howard Stiff, Fisheries and Oceans Canada
Adaptation responses of fisheries and fisheries managers to climate induced impacts on sockeye salmon returns to Barkley Sound, British Columbia
Diana Dobson, Fisheries and Oceans Canada
Managing freshwater systems to meet the competing needs of salmon production, urban and industrial development in Port Alberni and the Somass watershed of British Columbia given historic to future risks of climate change
Barry Chilibeck, Northwest Hydraulic Consultants

12:00 pm – 1:30 pm
Lunch with Partners and Posters / Dîner avec les partenaires et les affiches

1:30 pm – 3:00 pm
Concurrent Sessions / Sessions parallèles

W3A: Challenges of private sector in helping Canada becoming more resilient - Al Douglas, Ontario Centre for Climate Impacts and Adaptation Resources (chair)

Jonathan Philipsborn, Director of Climate Adaptation - Americas at AECOM
Monika Federau, SVP & Chief Strategy Officer, Intact Financial Corporation
Gordon Beal, Chartered Professional Accountants Canada
Jean-Christophe (J-C) Amado, Senior Climate Risk and Resilience Specialist
W3B: Importance of shorelines for climate change adaptation - Danika Van Proosdij, Saint Mary’s University (chair)

Building the Case: Strategic Decision Making for Managed Realignment of Agricultural Marshlands
Danika Van Proosdij, Saint Mary’s University

The first 10 metres: Coastal flooding, climate change and the social vulnerability of populations in Nova Scotia
Patricia Manuel, Dalhousie University

L'impact du "coastal squeeze" sur les écosystèmes côtiers meubles québécois de l'estuaire et du golfe du Saint-Laurent dans le contexte de la hausse appréhendée du niveau de la mer
Jean-Pierre Savard, Ouranos

Living Shorelines: success stories from Nova Scotia
Robin Tress, Ecology Action Centre

W3C: Green Infrastructures and Climate Changes: Developing a Multiscale Strategy Based on the Complexity and Urban Resilience - Jérôme Dupras, Université du Québec en Outaouais (chair)

Strategies to Promote the Implementation of Green Infrastructures in Urban Areas
Jérôme Dupras, UQO

Designing a Network of Green Infrastructure for Greater Montreal
Andrew Gonzalez, McGill

Incorporating Biodiversity and Complexity into Urban Forestry
Christian Messier, UQAM-UQO

Balancing Ecosystem Services and Vulnerability Reduction in the Implementation of Green Stormwater Infrastructure
Danielle Dagenais, Université de Montréal

La Ceinture et Trame Verte et Bleue du Grand Montréal : Une démarche d’adaptation aux changements climatiques
Jean-François Dallaire, Nature-Action Québec

W3D: Understanding Flood Risk - Policies and programs to address flooding from extreme weather - Jo-Anne Rzadki, Conservation Ontario (chair)

Adapting Flood Risk Management - Preparing for an Unknown Future in Ontario
Ryan Ness and Fabio Tonto, Toronto Region Conservation Authority

Climate Change for the Bow River Watershed
Heather Auld, RSI

Addressing the greatest flooding risks in Nova Scotia - Responding to high tides, extreme sedimentation, ice jams and floodplain development
Alex Wilson, CBCL Ltd

Partners for Action – Advancing Flood Resiliency in Canada
Shawna Peddle, Partners for Action

W3E: Crossing the divide: The value of interdisciplinary approaches to mitigation and adaptation - Colleen Mercer-Clarke, Canadian Society of Landscape Architects (chair)

There's more to this than Sea Level Rise: The Role of Expert Teams, Research Partnerships and Community Involvement
Colleen Mercer Clarke, Canadian Society of Landscape Architects

What are we protecting? Valuing our Landscape rather than our Property
Hope Parnham, Atlantic Society of Landscape Architects

Green Synergy: The Role of Green Infrastructure in Adaptation and Mitigation
Nina Pulver, University of Waterloo
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<tr>
<td>3:00 pm – 3:30 pm</td>
<td>Break with Partners and Poster / Pause avec les partenaires et les affiches</td>
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<tr>
<td>3:30 pm – 5:30 pm</td>
<td>Concurrent Sessions / Sessions parallèles</td>
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</table>

**W3F:** Food Security and Climate Change in the North - Robert Siron and Stéphanie Bleau, Ouranos (chair)

- Climate Change and Food Security in Inuit Communities – Unique Challenges and Adaptations
  - Lauren Goodman and Eric Loring, Inuit Tapiriit Kanatami, Ottawa
- Naskapi Observations of the Impacts of Climatic Changes on the Traditional and Wildlife Food Security
  - Georges Guanish, Naskapi Nation of Kawawachikamach
- Indigenous People, Place, and Traditional Food in Changing Northern Environments
  - Murray Humphries, McGill University
- Impacts and Adaptations: Insights on Climate Change and Food Security from Canadian Arctic Indigenous Communities
  - Chris Furgal, Trent University

**W4A:** Bridging the Gap: Tools to Integrate Adaptation into Electricity Sector Investment Planning - Devin McCarthy, Canadian Electricity Association (chair)

- Climate Change Considerations in Future Hydro Power Project Developments
  - Kristina Koenig, Manitoba Hydro
- Probable Maximum Flood under Changing Climate Conditions for the Mattagami River Basin
  - John Perdikaris, OPG
- The (cQ)² Collaboration: a Task Force for Improved Assessment of Climate Change Impacts on Hydrology and Hydropower in Québec
  - Catherine Guay, Hydro-Québec
- Energy Sector Resilience to the New Normal – Outstanding Examples of Energy Sector Adaptation to Climate Change
  - Élyse Fournier, Ouranos
- Assessing Climate Change Impacts on Energy Demand in Canada
  - Mary-Ann Wilson, Catherine Marchand, Natural Resources Canada

**W4B:** Economic Study of the Potential Impacts of Low Water Levels in the St. Lawrence River and Adaptation Options in the Context of Climate Change - Pamela Kertland, NRCan (chair)

- Restoring Water Levels on Lake Michigan-Huron: A Cost Benefit Analysis (CBA)
  - M. Fisher, Council of the Great Lakes Region (CGLR)
- Étude économique des impacts potentiels des bas niveaux d’eau du fleuve Saint-Laurent
  - Nicolas Audet, Ouranos
- Étude économique régionale des impacts et de l’adaptation liés aux changements climatiques sur le fleuve Saint-Laurent : Volet eaux municipals
  - Chee Chan, AECOM
- Climate Change and Adaptation Strategies of Canadian Ports and Shipping
  - Claude Comtois, Université de Montréal
- La valeur économique de la pêche et des services écosystémiques au lac Saint-Pierre
  - Jie He, Université de Sherbrooke
**W4C**: Coastal Adaptation Tools: New Developments and Learnings at the Digital Era - Ursule Boyer-Villemaire, OURANOS (chair)

- **Projections of Relative Sea-level Change in Canada Based on the IPCC AR5**
  Thomas James, Natural Resources Canada

- **Impacts des changements climatiques sur le régime des tempêtes et les surcotes dans la région de la Baie d'Hudson et de la Baie James**
  Jean-Pierre Savard, Ouranos

- **Wave Climate in the Gulf of St-Lawrence and its Future Evolution**
  Urs Neumeier, ISMER-UQAR

Panel:

- Charles Gignac, INRS-ETE
- Adam Fenech, IPE
- Jeff Hoyt, Government of NB
- Trevor Bell, Memorial University, Newfoundland

**W4D**: Mobilizing Climate Adaptation Tools into Professional Practice - Devin Causley, Federation of Canadian Municipalities (chair)

- **Dan Sandink**, Institute of Catastrophic Loss Reduction
- **David Lapp**, Engineers Canada
- **Leah Carson**, Canadian Institute of Planners
- **Gordon Beal**, Chartered Professional Accountants Canada
- **Christina Schwantes**, ICLEI

**W4E**: Strengthening Transportation Networks in the Face of climate Change - Jean Andrey, University of Waterloo (chair)

- **Les défis de gestion des infrastructures aéroportuaires du ministère des Transports, de la Mobilité durable et de l'Électrification des transports du Québec dans l'Arctique québécois : De la recherche en adaptation aux changements climatiques à l'application**
  Anick Guimond, MTQ

- **Vulnerability Assessment Tools for Transportation Infrastructure**
  Cassandra Bhat, ICF International

- **Enhancing Climate Resilience for the Canadian Transportation System**
  Nicole Legault, Transport Canada

- **Resilience: Climate Change, Extreme Weather and Transportation Systems**
  Terry Zdan, Manitoba Infrastructure and Transport

- **The Metrolinx Climate Change Resiliency Study**
  Sue Sherman, AECOM

**W4F**: Levers to Mainstream Adaptation Effectively: Lessons and Best Practices from Western Canada - Henry David Venema, IISS and Johanna Wolf, BC Climate Secretariat (chair)

- **Danny Blair**, Climatologist, University of Winnipeg
- **Dave Sauchyn**, University of Regina
- **Virginia Wittrock**, Saskatchewan Research Council
- **Mark Johnston**, Saskatchewan Research Council
- **Dirk Nyland**, BC Ministry of Transportation and Infrastructure
- **Emily MacNair**, BC Agriculture Climate Action Initiative
### Thursday April 13, 2016 / Jeudi 14 avril 2016

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<tr>
<th>Time</th>
<th>Session A</th>
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<tr>
<td>7:30 am – 3:00 pm</td>
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<tr>
<td>8:30 am – 10:30 am</td>
<td><strong>Th1A:</strong> Biodiversity and People in a Changing Climate: Adaptation Imperatives for Enhancing Resilience - Steve Hounsell, Ontario Biodiversity Council (chair)</td>
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<td>Climate Change and Ecosystem-Based Adaptation Approaches: The Benefits to Economies, Health and Biodiversity - Deborah Harford, ACT, Simon Fraser University</td>
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<td>Positioning Natural Infrastructure and Climate Resilience as a Win for Canadian Economy - Natalia Moudrak, University of Waterloo</td>
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<td>Protecting and Enhancing Ecosystem Regulatory Services – The Role of Wetlands and Watershed Management in Flood Attenuation - Dr. Mark Gloutney, Ducks Unlimited Canada</td>
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<td>Planning Conservation Actions in a Changing Climate – Existing Information, Tools and Needs in Canada - Charles Latremouille, Nature Conservancy Canada</td>
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<td>Using Landscape Connectivity to Build Ecological Resilience - Jeff Bowman and Chad Cordes, Ontario Ministry of Natural Resources and Forestry / Trent University</td>
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**Th1B:** Zoonotic Risks from a Changing Climate: Impacts and Adaptation Strategies to Protect the Health of Canadians - Anne-Marie Lowe, INSPQ and Steven Sternthal, Public Health Agency of Canada (chairs)

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<tr>
<th>Time</th>
<th>Session B</th>
<th>Registration/Inscription</th>
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Th1C: The Northern Telegraph: Adaptation Messages from the North – Bronwyn Benkert and Alison Perrin, Yukon Research Centre, Yukon College (chairs)

Brian Sieben, Climate Change Adaptation Planning Specialist, Government of the Northwest Territories, representing the Pan-Territorial Adaptation Partnership (also serving as panel chair)

Rose Kushniruk, Vice-Chief, Champagne Aishihik First Nation, Yukon

Tim Soucie, Community-Based Researcher, Pond Inlet, Nunavut

Elise Foong, Senior Consultant, AECOM

Anne Kendrick, Senior Policy Advisor, Environment and Wildlife, Inuit Tapiriit Kanatami

Th1D: High Resolution Climate Data in Support of Adaptation/Mitigation in Ontario – Downscaling - John Liu, Ontario Ministry of Environment and Climate Change (chair)

Dynamically Downscaled Climate Change Projections for Ontario and the Great Lakes Basin with the US WRF model
Dr. Richard Peltier, University of Toronto

High-Resolution Regional Climate Projections on the Ontario Climate Change Data Portal
Dr. Gordon Huang, University of Regina

High resolution regional climate projections over Ontario with the Canadian Regional Climate Model (CRCM) at Ouranos
Anne Frigon, Ouranos

York University - High Resolution Regional Climate Projections over Ontario Using Ensemble Optimal Interpolation (ENOI) and Local Intensity Scaling (LOCI) Techniques
Dr. Xin Qiu and Prof. Huaiping Zhu – York University

Climate Change Projections for Ontario: An Updated Synthesis for Policymakers And Planners
Shannon Fera, Ontario Ministry of Natural Resources and Forestry

Climate Data Landscape in Ontario
Dana Krechowicz, Environmental Commissioner of Ontario

Th1E: Adaptation solutions and innovations from the South: How can climate communication and Canada-South collaboration inform adaptation at larger scales? - Dominique Charron, IDRC (chair)

Use of ICTs for Sharing Climate and Market Data with Smallholder Farmers in Uganda
Mr. Berhane Gebru, FHI360

Communication of Climate Risk in Vietnam’s Coastal Cities
Ms. Quynh Anh Nguyen, National Institute for Science and Technology Policy and Strategy Studies

Risk Mapping in Unplanned Settlements of Coastal Cities in Angola
Mr. Allan Cain, Development Workshop Angola

The use of Soil Moisture Sensors in Agriculture in to Conserve Water and Energy in India's Punjab Region
Mr. Kamal Vatta, Punjab Agricultural University

Ewa Jackson, Acting Director, ICLEI-Canada

David Sauchyn, Professor of Geography, University of Regina
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<tr>
<th>Time</th>
<th>Session/Activity</th>
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<tr>
<td>10:30 am</td>
<td>Th1F: Monitoring and Evaluation – Tracking adaptation at global to local scales</td>
<td>James D. Ford, McGill University (chair)</td>
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<td><strong>Participants:</strong> Michael Houle, ICLEI, Alexandra Lesnikowska, McGill, Hayley Price-Kelly, IISD, Tamara Levine, Tumanako Consulting, Jimena Eyzaguirre, ESSA</td>
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<td>11:00 am</td>
<td>Break with Partners and Poster / Pause avec les partenaires et les affiches</td>
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<td>11:00 am</td>
<td>Th2A: Extreme Precipitation and Stormwater Management - Peter Nimmrichter, AMECFW</td>
<td>Peter Nimmrichter, AMECFW (chair)</td>
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<td><strong>Immediate Adaptation Options for Short-Duration High-Intensity (SDHI) Rainfall Events in the GTA</strong> Simon Eng, Risk Sciences International</td>
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<td><strong>L'évaluation de la vulnérabilité aux changements climatiques du réseau de drainage unitaire de Montréal</strong> Rémi Haf, Ville de Montréal</td>
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<td><strong>Capacity Building Options for Municipal Stormwater Systems</strong> Peter Nimmrichter, AMECFW</td>
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<td><strong>Uncertainty in Water budget projections for the Mississippi-Rideau watershed region</strong> Sobhalatha Kunjikutty, Mississippi Valley Conservation Authority</td>
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</table>
| 11:00 am  | Th2B: Local, Regional and National Adaptation to the Health Impacts of Climate Change in Canada - Abderrahmane Yagouti, Health Canada (chair) | James D. Ford, McGill University  
L'évolution de l'adaptation en santé publique au Québec depuis 10 ans Céline Campagna, INSPQ  
Adapting to the Health Impacts of Climate Change in Ontario Vidya Anderson, Ontario Ministry of Health and Long Term Care  
Adaptation through Collaboration: Health Canada's Climate Change and Health Actions to Protect Canadians Carolyn Tateishi, Health Canada  
Faire d'une pierre deux coups : Retombées qualitatives et quantitatives de projets de lutte aux îlots de chaleur urbains Mélanie Beaudoin, INSPQ |
| 11:00 am  | Th2C: Strengthening social resilience and socio-cultural factors for more effective climate mainstreaming - Jennifer Graham, Nova Scotia Environment (chair) | Adaptation to Climate Change and Variability: Who Should Be Involved, Why and How? The Examples of Agriculture and Coastal Communities Christopher R. Bryant, University of Guelph  
Planning for climate impacts that's delivering results – Using behaviour change approaches to deliver far reaching reform Rohan Hamden, Rohan Hamden and Associates  
L'adaptation aux changements climatiques en zone côtière : une intégration difficile à l'action publique, regards croisés sur le Québec, le Nouveau-Brunswick et le Sénégal Melinda Noblet and Sebastian Weissenberger, UQAR |
Th2D: Urban Resiliency for a Changing Climate: Master Planning to a Resilient Design of the Built Environment - Paul Donahue, Dillon Consulting Limited (chair)

- Setting the Foundation for Resiliency in the Master Planning Process
  Kiran Chhiba, Dillon Consulting Limited
- Moving from Master Plan to Infrastructure Design: Community Scale and Project Specific Vulnerability Assessment using PIEVC
  David Lapp, Engineers Canada
- Resilient Communities - Adapting Existing Infrastructure - A City of Surrey BC Case Study
  Jeannie Lee, City of Surrey, B.C.
- Resilient Communities: Adapting Infrastructure Design to Rising Sea Levels
  Carrie Baron, City of Surrey, B.C.
- Enabling Policy for Resilience
  David Chernushenko, City of Ottawa

Th2E: Information and tools to support Adaptation of Sustainable Forest Management in Canada - Catherine Ste-Marie, Natural Resources Canada (chair)

- Climate Change and Sustainable Forest Management in Canada: A Guidebook for Assessing Vulnerability and Mainstreaming Adaptation into Decision Making
  Jason Edwards, Natural Resources Canada
- Forest Change – Information and tools from the Canadian Forest Service in support of forest sector adaptation
  Miren Lorente, Canadian Forest Service, Natural Resources Canada
- Future fire regime in Canada, potential effects on forest, forest sector and forest communities
  Sylvie Gauthier, Canadian Forest Service, Natural Resources Canada
- Integrating science and values into adaptation planning and implementation
  Chris Swanston, USDA Forest Service


- Economic and Legal Drivers to Consider Climate Change and the Business Imperative to Develop Climate-Smart Strategies
  Laura Zizzo, Zizzo Strategy Inc
- Economic and Technical Drivers to Adapt to Climate Change
  Blair Feltmate, University of Waterloo
- Director Duty of Care: Comparing US and China
  Carissa Wong, Bionomos Law Professional Corporation

12:30 pm – 1:30 pm
Lunch with Partners and Posters / Dîner avec les partenaires et les affiches

1:30 pm – 3:00 pm
Concurrent Sessions / Sessions parallèles

Th3A: Innovative Strategies for Resilient Watershed - Christine Zimmer, Credit Valley Conservation (chair)

- De la vulnérabilité à la résilience : Intégrer la variabilité climatique dans les plans directeurs de l'eau
  Antoine Verville, ROBVQ
- One Water Approach: Protecting Our Environment and Communities in the Face of Climate Change
  Christine Zimmer, Credit Valley Conservation
- Wetlands and Flood Mitigation in Ontario: Natural Adaptation to a Changing Climate
  Owen Steele, Ducks Unlimited
Using Community Effluent to Create High Value Heritage Woodlands and Protect Watersheds Under Climate Change in the Canadian Prairies

Norm Henderson, PARC

**Th3B:** Land use planning to protect health from climate change: What’s the recipe for success? - Jim Frehs, Health Canada (chair)

Mélissa Généreux, Université de Sherbrooke
Karina Richters, City of Windsor
Véronique Fournier, Centre d'écologie urbaine de Montréal
Gregory Richardson, Health Canada

**Th3C:** Canada's Protected Areas as Natural Solutions to Climate Change Adaptation: What Have We Learned and Where Should we Go - Patrick Nantel, Parks Canada (chair)

Protected Areas as Natural Solutions: Setting the Stage
Patrick Nantel, Parks Canada
Helping Species and Ecosystems Adapt to Climate Change in British Columbia
James Quayle, BC Parks
Vulnerability of Northern National Parks to Climate Change
Al Douglas, Ontario Centre for Climate Impacts and Adaptation Resources
How Parks can Plan for Climate Change
Marlow Pellat and Tara Sharma, Parks Canada
Panel discussion:
James Quayle, Al Douglas, Marlow Pellat, Tara Sharma, and Daniel Scott (University of Waterloo).

**Th3D:** Community Engagement in Adaptation Planning - Jeff Hoyt, Government of New Brunswick (chair)

Sabine Dietz, Aster Group
Ewa Jackson, ICLEI Canada
Laura Roddan, Powell River Regional District, BC
Rose Kushniruk, Champagne and Aishihik First Nations Council, Yukon Territory
Julien St-Laurent, Travaux publics, Trois-Rivières, Québec

**Th3E:** The Evolution of Disaster Risks in Canada: Prevention and Resilience - Matthew Godsoe, Defence R&D Canada (chair)

Canada's Evolving Disaster Risk Profile
Matthew Godsoe, Defence R&D Canada
Adaptation and Mitigation versus Disaster Risk Creation
Ian Burton, Emeritus Professor of Geography at the University of Toronto
Climate change disaster risk, financial stability and stress testing: Integrating climate disaster risks into accounting and financial decision making
David Greenall, PwC Sustainability

**Th3F:** Tooling up for Climate Change: Economic Instruments for Adaptation - Michelle Brownlee, Sustainable Prosperity (chair)

“Tooling Up for Climate Change”: sharing knowledge and policy findings to decision-makers across Canada on economic instruments for adaptation
Meg Ogden, Sustainable Prosperity
Economic Instruments for Adaptation to Climate Change in Forestry
Harry Nelson, University of British Columbia
Payments for Ecosystem Services and Other Economic Incentives to Encourage Adaptation
Jean-Pierre Revéret, Groupe Agéco
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<td>Break / Pause</td>
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<td>3:15 pm – 4:30 pm</td>
<td><strong>Closing Plenary / Plénière de clôture</strong></td>
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Roger Street, Technical Director, UKCIP  
Ian Burton, Professor Emeritus, University of Toronto  
Alain Bourque, Directeur Général, Ouranos  
Dominique Charron, Acting Director, Agriculture and Environment, IDRC  

**Closing Remarks / Fermeture du Symposium**  
Al Douglas  
Alain Bourque  

**Closing Prayer**  
Elder Josee Whiteduck, Kitigan Zibi First Nation
The Science/Policy Interface: Climate Assessment and Adaptation

Keynote address by Katharine Jacobs, Director Center for Climate Adaptation Science and Solutions, University of Arizona

Katharine Jacobs is the director of the Center for Climate Adaptation Science and Solutions (CCASS) and a professor in the department of soil, water and environmental science at the University of Arizona. From 2010 to 2013, Jacobs served as an assistant director in the U.S. Office of Science and Technology Policy (OSTP) in the Executive Office of the President. Jacobs was the director of the National Climate Assessment, leading a team of 300 authors and more than 1,000 contributors who wrote the Third NCA report. The report was published in May of 2014. Jacobs also was the lead advisor on water science and policy and climate adaptation within OSTP. Prior to her work in the White House, Jacobs was the executive director of the Arizona Water Institute from 2006-2009, leading a consortium of the three state universities focused on water-related research, education and technology transfer in support of water supply sustainability. She has more than 20 years of experience as a water manager for the Arizona's Department of Water Resources, including 14 years as director of the Tucson Active Management Area. Her research interests include water policy, connecting science and decision making, stakeholder engagement, use of climate information for water management applications, climate change adaptation, and drought planning. Jacobs earned her M.L.A. in environmental planning from the University of California, Berkeley. She has served on nine National Research Council panels and was chair of the NRC panel on Adapting to the Impacts of Climate Change and a member of the panel on America's Climate Choices.

Conférencière invitée : Katharine Jacobs, Directrice du Center for Climate Adaptation Science and Solutions, University of Arizona

Katharine Jacobs est directrice du « Center for Climate Adaptation Science and Solutions » (CLASS) de l'Université d'Arizona. De 2010 à 2013, Mme Jacobs a été directrice adjointe du bureau américain sur la politique scientifique et la technologie (OSTP), au sein du Bureau exécutif du Président. Mme Jacobs a dirigé le 3e rapport d'évaluation nationale sur le climat, à la tête d'une équipe de 300 auteurs et plus de 1 000 collaborateurs. Mme Jacobs a été conseillère principale science de l'eau et politique et adaptation aux changements climatiques au sein du OSTP. Ses intérêts de recherche incluent la politique de l'eau, la connexion entre la science et la prise de décision, l'engagement des parties prenantes, l'utilisation de l'information climatique pour la gestion de l'eau, l'adaptation aux changements climatiques et la planification de la sécheresse. Elle a siégé sur neuf panels du Conseil national de recherches, a présidé le comité sur l'adaptation aux impacts du changement climatique et a été membre du comité sur les choix climatiques de l'Amérique.
Sessions and Abstracts

Tuesday April 12, 2016 / Mardi 12 Avril, 2016

Symposium Opening Plenary / Plénière d'ouverture
– Simultaneous Interpretation (SI) available
Canada Hall 3

Official Opening of the Symposium / Ouverture officielle du Symposium
Elder Josee Whiteduck, Kitigan Zibi First Nation – opening prayer
Chief Jean Guy Whiteduck, Kitigan Zibi First Nation – opening greetings
Honourable Catherine McKenna, Minister of Environment and Climate Change Canada
Councillor David Chernushenko, City of Ottawa

Symposium Co-chair Welcome / Mot de bienvenue
Alain Bourque, OURANOS
Al Douglas, Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR)

KEYNOTE SPEAKER / CONFÉRENCIÈRE INVITÉE
Katharine Jacobs, Director Center for Climate Adaptation Science and Solutions, University of Arizona
The Science/Policy Interface: Climate Assessment and Adaptation

Indicates simultaneous interpretation was available for the session.
Indique la traduction simultanée était disponible pour cette session.
**Canada Hall 3**

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<tr>
<th>Time</th>
<th>Location</th>
<th>Presentation - T1A: Adaptation in the Energy Sector - Risks, Opportunities and Solutions / Adaptation du Secteur de l’énergie : risques, opportunités et solutions</th>
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<tr>
<td>10:30 am</td>
<td>Room/Salle 215</td>
<td>Dragon Braun, OURANOS – chair</td>
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<tr>
<td>10:45 am</td>
<td>Room/Salle 215</td>
<td>Toronto Hydro Electrical Distribution System Climate Change Vulnerability Assessment</td>
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<td>11:00 am</td>
<td>Room/Salle 215</td>
<td>Chee Chan, AECOM</td>
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<td>11:15 am</td>
<td>Room/Salle 215</td>
<td>Risk and Opportunities for the Oil and Gas Sector in a Changing Climate in Northeast BC</td>
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<td>11:30 am</td>
<td>Room/Salle 215</td>
<td>Jim Vandervall, Fraser Basin Council</td>
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<tr>
<td>11:45 am</td>
<td>Room/Salle 215</td>
<td>Estimating Future Probable Maximum Flood (PMF): a Case Study on Five Watersheds in Canada</td>
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<td>12:00 pm</td>
<td>Room/Salle 215</td>
<td>John Perdikaris, OPG</td>
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<td>12:15 pm</td>
<td>Room/Salle 215</td>
<td>Including Climate Projections into Hydropower Investment Decision-making</td>
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<td>12:30 pm</td>
<td>Room/Salle 215</td>
<td>David Huard, Ouranos</td>
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**Room/Salle 214**

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<tr>
<th>Time</th>
<th>Location</th>
<th>Presentation - T1B: Mainstreaming Adaptation: From Coast to Coast to Coast / Intégrer l’adaptation d’une côte à l’autre</th>
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<tr>
<td>10:30 am</td>
<td>Room/Salle 214</td>
<td>Building an adaptive culture: Nova Scotia Environment’s Adaptation Workplan</td>
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<td>10:45 am</td>
<td>Room/Salle 214</td>
<td>Jennifer Graham – Nova Scotia Government</td>
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<tr>
<td>11:00 am</td>
<td>Room/Salle 214</td>
<td>How Can We Make Adaptation Part of the Way we do Business? A Case Study from BC Ministry of Forests, Lands and Natural Resource Operations</td>
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<td>11:15 am</td>
<td>Room/Salle 214</td>
<td>Kathy Hopkins, Government of British Columbia</td>
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<tr>
<td>11:30 am</td>
<td>Room/Salle 214</td>
<td>Renforcement des capacités de gouvernance et de résilience des communautés côtières de l’estuaire et du golfe du Saint-Laurent à l’heure des changements climatiques</td>
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<tr>
<td>11:45 am</td>
<td>Room/Salle 214</td>
<td>Liette Vasseur, Brock University and Steve Plante, Université du Québec à Rimouski</td>
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<td>12:00 pm</td>
<td>Room/Salle 214</td>
<td>Adaptation in the Government of the Northwest Territories – Moving to the Mainstream</td>
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<tr>
<td>12:15 pm</td>
<td>Room/Salle 214</td>
<td>Brian Sieben, Government of Northwest Territories</td>
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**Room/Salle 213**

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<tr>
<td>10:30 am</td>
<td>Room/Salle 213</td>
<td>Nathalie Bleau, OURANOS – chair</td>
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<tr>
<td>10:45 am</td>
<td>Room/Salle 213</td>
<td>Analyse de la vulnérabilité territoriale aux inondations en milieu urbain dans le contexte des changements climatiques : Cas d’étude la Ville de Montréal</td>
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<tr>
<td>11:00 am</td>
<td>Room/Salle 213</td>
<td>Isabelle Thomas, University of Montreal</td>
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<tr>
<td>11:15 am</td>
<td>Room/Salle 213</td>
<td>Assessing Abilities of Policies to Reduce Vulnerability to Climate Change by using the Adaptool</td>
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<tr>
<td>11:30 am</td>
<td>Room/Salle 213</td>
<td>Livia Bizikova, IISD</td>
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<tr>
<td>11:45 am</td>
<td>Room/Salle 213</td>
<td>Infrastructure Climate Risk Assessment in Canada: An Engineering Strategy for Adaptation</td>
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<tr>
<td>12:00 pm</td>
<td>Room/Salle 213</td>
<td>David Lapp, Engineers Canada</td>
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<tr>
<td>12:15 pm</td>
<td>Room/Salle 213</td>
<td>The Infrastructure and Buildings Working Group - Part of the NRCan Adaptation Platform</td>
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<td>12:30 pm</td>
<td>Room/Salle 213</td>
<td>Paul Kovacs, ICLR</td>
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**Room/Salle 207**

<table>
<thead>
<tr>
<th>Time</th>
<th>Location</th>
<th>Presentation - T1E: State of Climate Change Science in the Great Lakes Basin</th>
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<tbody>
<tr>
<td>10:30 am</td>
<td>Room/Salle 207</td>
<td>Rachel Gagnon, Ontario Ministry of Natural Resources and Forestry – chair</td>
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<tr>
<td>10:45 am</td>
<td>Room/Salle 207</td>
<td>Edmundo Fausto, TRCA</td>
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<tr>
<td>11:00 am</td>
<td>Room/Salle 207</td>
<td>Using Water Balance Dynamics to Identify Vulnerabilities to Climate Change</td>
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<tr>
<td>11:15 am</td>
<td>Room/Salle 207</td>
<td>Dr. Robert Metcalfe, Ontario Ministry of Natural Resources and Forestry</td>
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<tr>
<td>11:30 am</td>
<td>Room/Salle 207</td>
<td>Risk Assessments of the Cumulative Effects of Climate Change, Human Movement and Water Connectivity and the Spread of Aquatic Invasive Species</td>
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<tr>
<td>11:45 am</td>
<td>Room/Salle 207</td>
<td>Shannon Fera, Ontario Ministry of Natural Resources and Forestry</td>
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<tr>
<td>12:00 pm</td>
<td>Room/Salle 207</td>
<td>How Quickly Can Populations Adapt to Climate Change? Genetic Responses to Thermal Physiology of Cold Water Fishes</td>
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<tr>
<td>12:15 pm</td>
<td>Room/Salle 207</td>
<td>Dr. Chris Wilson, Ontario Ministry of Natural Resources and Forestry</td>
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<tr>
<td>12:30 pm</td>
<td>Room/Salle 207</td>
<td>Lake Ontario Nearshore Fish Habitat Vulnerability Assessment</td>
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<td>12:45 pm</td>
<td>Room/Salle 207</td>
<td>Susan Doka, Fisheries and Oceans Canada</td>
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**Room/Salle 205**

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<tr>
<th>Time</th>
<th>Location</th>
<th>Presentation - T1F: Canadian Agricultural Adaptation: An Overview</th>
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<tbody>
<tr>
<td>10:30 am</td>
<td>Room/Salle 205</td>
<td>Sarah Kaffe, Agriculture and Agri-Food Canada</td>
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<tr>
<td>10:45 am</td>
<td>Room/Salle 205</td>
<td>A Research Program to Address Agricultural Stakeholders’ Concerns Regarding the Evolution of Crop Pests Associated with Climate Change</td>
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<tr>
<td>11:00 am</td>
<td>Room/Salle 205</td>
<td>Anne Blondlot, Ouranos</td>
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<tr>
<td>11:15 am</td>
<td>Room/Salle 205</td>
<td>Supporting Agricultural Adaptation to Climate Change: Programs, Projects and Progress in B.C.</td>
</tr>
<tr>
<td>11:30 am</td>
<td>Room/Salle 205</td>
<td>Emily MacNair, BC Agriculture &amp; Food Climate Action Initiative</td>
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<tr>
<td>11:45 am</td>
<td>Room/Salle 205</td>
<td>Managing Canada’s Soil Resource to Mitigate Climate Change and Provide Ecological Goods and Services</td>
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<td>12:00 pm</td>
<td>Room/Salle 205</td>
<td>Paul Thoroughgood, Soil Conservation Council of Canada</td>
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**Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR)**
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<tr>
<th>Room/Salle 215</th>
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<tbody>
<tr>
<td>Chee Chan, AECOM – chair</td>
<td>Standards as Tools for Adaptation&lt;br&gt;Kelly Montgomery, Standards Council of Canada</td>
<td>Integrated Water and Climate Monitoring for Climate Change Detection and Adaptation&lt;br&gt;Scott MacRitchie, Ontario Ministry of the Environment and Climate Change</td>
<td>James D Ford, McGill University&lt;br&gt;Ashlee Cunsolo Willox, Cape Breton University</td>
<td><strong>What Constitutes Extreme Weather?</strong>&lt;br&gt;Ruth Waldick, Agriculture and Agri-Food Canada/ Carleton University</td>
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<td><strong>UNISDR Disaster Resilience Scorecard</strong></td>
<td>Guidance for parking lots to reduce UHI: 2 years later, its current and future applications&lt;br&gt;Nathalie Bleau, Ouranos</td>
<td><strong>Addressing Climate Change Effects in Great Lakes-St. Lawrence River Water Level Regulation</strong>&lt;br&gt;Wendy Leger, Environment and Climate Change Canada</td>
<td><strong>History and Modelled Climate Data Issues with Extreme Weather</strong>&lt;br&gt;Neil Comer, Risk Sciences International</td>
<td><strong>Recent and Upcoming Developments in the Fifth Generation Canadian Regional Climate Model</strong>&lt;br&gt;Laxmi Sushama, UQAM</td>
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<td>Jon Philipsborn, AECOM</td>
<td><strong>Northern Infrastructure Standardization Initiative</strong>&lt;br&gt;Mike Burns, Government of NWT</td>
<td><strong>Augmenter les capacités de surveillance hydrologique du Québec comme moyen d’adaptation aux changements du régime des crues.</strong>&lt;br&gt;Richard Turcotte, Centre d’expertise hydrique du Québec (CEHQ)</td>
<td><strong>Extreme Weather: Envisioning Ontario Agriculture</strong>&lt;br&gt;Scott Mitchell, Carleton University</td>
<td><strong>Added Value of Very High-Resolution Regional Climate Model Simulations Compared to those of Commonly Used Intermediate Resolution</strong>&lt;br&gt;Philippe Lucas-Picher, UQAM</td>
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<td>Ewa Jackson, ICLEI</td>
<td><strong>Voluntary Standards for Climate Adaptation – through ISO and Beyond</strong>&lt;br&gt;Ira Feldman, GreenTrack</td>
<td><strong>Use of resilience in adaptation to climate-change caused natural disasters</strong>&lt;br&gt;Angela Peck, University of Western Ontario</td>
<td><strong>Adaptation to Extreme Weather Events in Agricultural Watersheds in Five Countries</strong>&lt;br&gt;David Sauchyn, University of Regina</td>
<td><strong>Post-processing and Bias Correction of Climate Models: Rationale, Assumptions, and a New Multivariate Approach</strong>&lt;br&gt;Alex Cannon, Environment and Climate Change Canada</td>
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<tr>
<td>Toronto’s Collaborative Multi-Sectoral Approach to Climate Adaptation</td>
<td><strong>L’adaptation aux changements climatiques à Montréal : du constat aux actions</strong></td>
<td><strong>Estimation of Crop Yields under Future Climate Extremes</strong>&lt;br&gt;Suren Kulshrestha, University of Saskatchewan</td>
<td><strong>Considering Adaptation to Climate Change as a Timescale Problem: Examples from the Tourism Industry</strong>&lt;br&gt;Dominique Paquin, Ouranos</td>
<td><strong>Considering Adaptation to Climate Change</strong>&lt;br&gt;Canada</td>
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<tr>
<td>David MacLeod, Energy and Environment Division, City of Toronto</td>
<td>Julie Guichetueau, Ville de Montréal</td>
<td><strong>James Snook Mayor, Happy Valley-Goose Bay/Executive Director for the Torngat Wildlife, Plants and Fisheries Secretariat</strong>&lt;br&gt;Derrick Pottle, Rigolet</td>
<td><strong>Extreme Weather: Envisioning Ontario Agriculture</strong>&lt;br&gt;Scott Mitchell, Carleton University</td>
<td><strong>Developing a Timescale Problem for Climate Change Adaptation</strong>&lt;br&gt;Brian McCann, Environment and Climate Change Canada</td>
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<td>L’adaptation aux changements climatiques à Montréal : du constat aux actions</td>
<td><strong>100 villes résilientes et Montréal</strong>&lt;br&gt;Louise Bradette, Ville de Montréal</td>
<td><strong>Augmenter les capacités de surveillance hydrologique du Québec comme moyen d’adaptation aux changements du régime des crues.</strong>&lt;br&gt;Richard Turcotte, Centre d’expertise hydrique du Québec (CEHQ)</td>
<td><strong>Evaluation of Extreme Weather Events in Agricultural Watersheds in Five Countries</strong>&lt;br&gt;David Sauchyn, University of Regina</td>
<td><strong>Presentations on the Role of Numerical Models in Climate Scenarios and Services</strong>&lt;br&gt;Patrick Grenier, OURANOS – chair</td>
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<td><strong>Panel- T2E</strong>&lt;br&gt; What constitutes extreme weather? Considerations and approaches for defining extreme weather at local scales to support adaptive planning in agricultural landscapes</td>
<td><strong>What Constitutes Extreme Weather?</strong>&lt;br&gt;Ruth Waldick, Agriculture and Agri-Food Canada/ Carleton University</td>
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<td>3:30pm</td>
<td>Presentation - T3A Producing Climate Information: for whom and for what purpose? / Produire l’information climatique : pour qui et dans quel but ?</td>
<td>Presentation - T3B Climate Change Adaptation in Aquatic Environments / Adaptation aux changements climatiques et environnements aquatiques</td>
<td>Panel - T3C Adaptation au changement climatique en milieu côtier : L’analyse coûts-avantages comme outil d’aide à la décision / Climate change adaptation and coastal zones: the cost-benefit analysis as a tool for decision makers</td>
<td>Panel - T3D Climate Change Impacts and Land Use Planning in Northern Canada</td>
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<tr>
<td>4:00pm</td>
<td>Climate Change and the Challenge of Delivering Information</td>
<td>Fisheries and Oceans Canada’s Climate Adaptation Program</td>
<td>Évaluation économique des répercussions des changements climatiques et analyse coûts-avantages des options d’adaptation en zone côtière – Survol méthodologique</td>
<td>Cost-benefit Analysis of Climate Change Adaptation Options for the Chignecto Transportation Corridor</td>
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<tr>
<td>4:20pm</td>
<td>Francis Zwiers, PCIC</td>
<td>Paul Lyon – Fisheries and Oceans Canada</td>
<td>Manon Circe, Ouranos</td>
<td>Sabine Dietz, Aster Group</td>
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<td>4:40pm</td>
<td>The Canadian Climate Data and Scenarios (CCDS) Website - An interface for Distributing Climate Change Information.</td>
<td>État des lieux des pêches et de l’aquaculture au Québec en lien avec les changements climatiques</td>
<td>Cost-benefit Analysis of the risks of coastal flooding and erosion on infrastructures and properties in Prince Edward Island</td>
<td>Climate Change Ecosystem Vulnerability Assessment in the Hudson Bay Lowlands, Ontario</td>
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<tr>
<td>5:00pm</td>
<td>Benita Tam, Environment and Climate Change Canada</td>
<td>Valérie Bourduas Crouhen, Ouranos</td>
<td>Laurent Da Silva, Ouranos</td>
<td>Jim McLaughlin, Ontario Ministry of Natural Resources and Forestry</td>
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<tr>
<td>5:20pm</td>
<td>High resolution climate models for Canada: methods, limits and applications.</td>
<td>Atlantic Impact and Vulnerability Assessments from the Aquatic Climate Change Adaptation Program</td>
<td>Cost-benefit analysis of the risks of coastal flooding and erosion on infrastructures and properties in Prince Edward Island</td>
<td>Building Climate Change into Community-based Land Use Planning</td>
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<td>5:40pm</td>
<td>Dan McKenney, Canadian Forest Service/Great Lakes Forestry Centre</td>
<td>Pierre Pepin, Fisheries and Oceans Canada</td>
<td>Don Jardine, UPEI</td>
<td>Rachelle Lalonde, Ontario Ministry of Natural Resources and Forestry</td>
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<tr>
<td>6:00pm</td>
<td>Adapting Ontario to an Uncertain Future: Making Climate Information Relevant to Local Decision-Makers</td>
<td>Cost benefit analysis of the risks of coastal flooding and erosion on infrastructure and properties at Tracadie Harbour, Prince Edward Island</td>
<td>Analyse coûts-avantages des options d’adaptation en zone côtière aux îles-de-la-Madeleine</td>
<td>Hazard Identification and Cost Adaptation in Infrastructure Planning</td>
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<td>6:20pm</td>
<td>Glenn Milner, Ontario Climate Consortium / Toronto and Region Conservation Authority</td>
<td>Hope Pamharn, DV8 Consulting</td>
<td>Ursule Boyer-Villaume, Ouranos</td>
<td>Alison Perrin, Yukon Northern Climate ExChange</td>
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<td>6:40pm</td>
<td>Atlantic Climate Change Data to Aid Adaptation in Resource Management</td>
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<td>Résultats intégrés et tendances des analyses coûts-avantages réalisées en zone côtière</td>
<td>Landscape Conservation Collaborative as a Network Approach</td>
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<td>7:00pm</td>
<td>Crossings: Enabling Decisions on Climate Change Adaptation</td>
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<td>Manon Circe, Ouranos</td>
<td>Brian Sieben, Government of Northwest Territories</td>
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<td>7:20pm</td>
<td>Stewart Cohen, Environment and Climate Change Canada</td>
<td>Panel Discussion</td>
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Abstracts: Sessions T1A-T1F

Session: T1A – Braun

Tuesday April 12 – 10:30am to 12:00 pm
Presentation Session Simultaneous Interpretation

Session Chair: Marco Braun, Ouranos

Toronto Hydro Electrical Distribution System Climate Change Vulnerability Assessment
Chee Chan, AECOM

Risk and Opportunities for the Oil and Gas Sector in a Changing Climate in Northeast BC
Jim Vanderwal, Fraser Basin Council

Estimating Future Probable Maximum Flood (PMF): a Case Study on Five Watersheds in Canada
John Perdikaris, OPG

Including Climate Projections into Hydropower Investment Decision-making
David Huard, Ouranos

Abstracts

Chee Chan, AECOM
Toronto Hydro Electrical Distribution System Climate Change Vulnerability Assessment

Toronto Hydro is the largest local power distribution company in Canada, owning over $3B worth of assets and serving over 730,000 customers in the City of Toronto. A climate change vulnerability assessment employing Engineers Canada’s PIEVC Protocol-five step methodology was applied for the first time to electrical distribution infrastructure. Climate projections to 2050 were developed for over 20 climate variables according to electrical distribution infrastructure specific damage thresholds. Impacts to a range of distribution assets across Toronto were evaluated, including transmission and distribution sub-stations, overhead and underground electrical feeders, and their supporting civil structures and mechanical equipment. Vulnerabilities to severe weather events were identified and mapped across the city. The project provides recommendations to addressing climate change related vulnerabilities in the electrical distribution sector and can serve as a template for vulnerability assessments by other electrical infrastructure owners. This presentation will provide an overview of the vulnerability assessment process, results, lessons learned, and areas for further analysis.

Jim Vanderwal, Fraser Basin Council
Risks and Opportunities for the Oil and Gas Sector in a Changing Climate in Northeast BC

Natural gas development in Northeastern British Columbia is dependent on a number of climate-sensitive resources and infrastructure, such as water, pipelines, drilling pads and roads. The sector adjusts operations in response to changes in extreme weather and other factors; the challenge now is to make specific plans to adapt to future changes in climate.

This assessment explores climate change in Northeastern BC and the related impacts, risks, opportunities and next steps for the oil and gas industry, based on interviews and focus group sessions with those inside and outside the sector. This report was prepared by the Fraser Basin Council, with support from Natural Resources Canada (Adaptation Platform), and from the BC Ministry of the Environment, Climate Action Secretariat.
John Perdikaris, OPG

**Estimating Future Probable Maximum Flood (PMF): a Case Study on Five Watersheds in Canada**

Accommodating the shifts in precipitation and runoff associated with climate change represents a significant challenge for the owners and operators of dams. Most dams are designed to operate for many decades, so understanding how climate change may impact extreme-rainfall and flood events is essential to ensuring that current and future dams can operate safely and efficiently well into the future. In Canada, dam safety is regulated at the provincial level; however, most provinces have legislation that incorporates standards inspired by or mirroring the Canadian Dam Association’s Dam Safety Guidelines. Most dams in Canada are classified in the lesser-hazard categories, although many large and important structures are in the extreme-hazard category, because of the potential consequences of failure. Dams in the extreme classification are required to safely accommodate an inflow equivalent to the probable maximum flood (PMF), which is estimated by forcing a hydrological model with extreme inputs such as the probable maximum precipitation (PMP). The main objective of this project was to review existing methods of PMP/PMF estimation, develop a methodology that owners and regulators can use to quantify potential climate change impacts on PMF estimates, and identify adaptation options available to manage the associated risks. Five Canadian watersheds with differing physiographic characteristics were included in this study to explore the variability of impacts across the country, with a focus on identifying climate change impacts for the 2050s future time horizon (2041-2070).

David Huard, Ouranos

**Including Climate Projections into Hydropower Investment Decision-making**

Hydropower infrastructures have a long life-cycle and their economic return is sensitive to climatic conditions, making them especially sensitive to uncertainties about future climate conditions. However, there are still few examples of hydroelectric investments using climate projections to assess their robustness to future climate conditions. One explanation may be that the large uncertainties around climate projections from multi-model ensembles may be perceived as an obstacle to their use in investment planning. In collaboration with Hydro-Québec and Manitoba-Hydro, Ouranos has developed decision-aiding tools for three case studies in the hydroelectricity sector that try to address this issue. The aim of these studies is to show-case how climate information from multi-model ensembles can be leveraged by decision-makers to identify robust decisions. The approach uses the “Robust Decision Making” framework and explores the sensitivity of different investment options to climate projection uncertainty; thousands of hydrological and energy production simulations are run in advance, whose results can be visualized and explored through a custom web-based application. Of particular interest in this framework is the role played by climate projections, where instead of defining future conditions through top-down scenarios, they play the role of optional expert advice. This fundamental switch in the interpretation and perception of climate projections may ease their integration into decision-making process by explicitly acknowledging their conditional nature.
Session: T1B – Sieben
Mainstreaming
Adaptation: From Coast
to Coast to Coast /
Intégrer l’adaptation
d’une côte à l’autre

Tuesday April 12 –
10:30am to 12:00 pm
Presentation Session
Simultaneous
Interpretation

Session Chair: Brian
Sieben, Government of
Northwest Territories

Building an adaptive culture:
Nova Scotia Environment’s
Adaptation Workplan

Jennifer Graham – Nova Scotia
Government

How Can We Make Adaptation
Part of the Way we do Business?
A Case Study from BC Ministry
of Forests, Lands and Natural
Resource Operations

Kathy Hopkins, Government of
British Columbia

Renforcement des capacités de
gouvernance et de résilience des
communautés côtières de
l’estuaire et du golfe du Saint-Laurent à l’heure des
changements climatiques

Liette Vasseur, Brock University
and Steve Plante, Université du
Québec à Rimouski

Adaptation in the Government
of the Northwest Territories –
Moving to the Mainstream

Brian Sieben, Government of
Northwest Territories

Abstracts

Jennifer Graham, Nova Scotia Government

Building an Adaptive Culture: Nova Scotia Environment’s
Adaptation Workplan

In the field of climate change adaptation, the transition from
understanding climate risks to implementing adaptation action is
crucial. This presentation discusses Nova Scotia Environment’s
approach to mainstreaming adaptation within the Nova Scotia
government through the Adaptation Workplan programme.

This presentation will cover:

- NS government research using an online software package
  (SenseMaker) as well as conventional survey tools to understand
  adaptive capacity within NS government. The surveys established
  (1) 54% of stories collected from NS government public servants
  were about failing to make progress on complex issues; and (2) 8
  cultural factors are associated with an increased likelihood of
  making progress.
- The ongoing implementation of the Adaptation Workplan
  designed to strengthen and enhance the 8 cultural factors
  associated with making progress on complex problems like
  climate change adaptation within NS government
- The preliminary findings from NSE’s current SenseMaker data
  collection and analysis.

Kathy Hopkins, Government of British Columbia

How Can We Make Adaptation Part of the Way we do Business? A
Case Study from BC Ministry of Forests, Lands and Natural
Resource Operations

Ten years ago, many people in BC were questioning whether the
climate was changing, if they thought about it at all. Today, the BC
Ministry of Forests, Lands and Natural Resource Operations (FLNR)
has started the process of embedding adaptation in our day-to day
business. What did it take to get to this point? We’ll take you on
a journey that explores the path we travelled: outlining the challenges
and triumphs, and some keys to our success. You’ll also get a peek at
where we’re going from here: our journey’s just beginning.

Climate is changing an order of magnitude faster than most forest
tree species can migrate or adapt. To compound the challenge faced
by forest managers, BC’s terrain, soils and vegetation are diverse,
from coastal fog belt Sitka spruce swamps to vast
mountain ranges, cactus-bearing drylands in the southern interior, and permafrost areas near the Yukon border.

The sea-change in FLNR policy thinking came as a result of the mountain pine beetle epidemic, modelling results showing maps projecting dramatic changes in the climates of forest ecosystem zones, and a strong provincial mandate in 2007 for emission reductions. What followed was research into adaptation and mitigation strategies, capacity building across the province, policy assessments and development, new tools, extension and outreach. The knowledge we gained, the partnerships we developed, the policies, strategies and tools we brought into play: all will be described as stepping stones towards resilience and adaptability.

Liette Vasseur, Brock University, and Steve Plante, Université du Québec à Rimouski

Renforcement des capacités de gouvernance et de résilience des communautés côtières de l’estuaire et du golfe du Saint-Laurent à l’heure des changements climatiques

Les écosystèmes côtiers sont vulnérables aux impacts des changements climatiques et plus spécifiquement des événements extrêmes.

Depuis 2010, l’« Alliance de recherche universités-communautés : défis des communautés côtières » travaille à renforcer les capacités de gouvernance et de résilience à la suite des Grandes marées de 2010 dans l’est canadien. Ce projet longitudinal a ciblé quatre communautés au Québec, et six au Nouveau-Brunswick. Dans ce projet, divers outils et stratégies ont été soit élaborés ou proposés afin d’accompagner les communautés dans leurs démarches d’adaptation. Pour répondre à leurs besoins, le développement de ces outils se base sur une collaboration étroite avec les chercheurs et les partenaires territoriaux et de pratique (acteurs municipaux, société civile et secteur économique). Parmi ces outils, mentionnons la trousse sur la planification de la résilience, l’analyse des réseaux sociaux pour les communautés, etc. Les notions de gouvernance, de risque, de vulnérabilité et de planification ont été intégrés dans les diverses activités. Dans cette communication, en plus du contexte des communautés, nous présentons les résultats obtenus sur la participation, la mobilisation, la perception de la résilience et des expériences par les femmes et les hommes face aux événements extrêmes. Plusieurs leçons ont été tirées des activités de construction et de coproduction (plan de résilience et d’adaptation) avec les différents partenaires de pratiques (Organismes de bassin, comité ZIP, ONG environnemental) et territoriaux (citoyen, membre du secteur économique et élus). Nous présentons des pistes de réflexions afin de favoriser l’émergence d’un itinéraire d’adaptation par les communautés côtières.

Brian Sieben, Government of Northwest Territories

Adaptation in the Government of the Northwest Territories – Moving to the Mainstream

The Northwest Territories is experiencing some of the most rapid warming in Canada. As a result, many impacts are being experienced including thawing permafrost causing thaw slumps, changing hydrology, coastal erosion, forest fires and drought. Government departments are mainstreaming adaptation into their operations. Projects undertaken to allow decision makers to consider climate change will be reviewed including hazard mapping and vulnerability assessment tools.
Session: T1C – Bleau

Tuesday April 12 – 10:30am to 12:00 pm
Presentation Session
Simultaneous Interpretation

Session Chair: Nathalie Bleau, Ouranos

Analyse de la vulnérabilité sociétale et territoriale aux inondations en milieu urbain dans le contexte des changements climatiques: Cas d’étude de la Ville de Montréal
Isabelle Thomas, University of Montreal

Assessing Abilities of Policies to Reduce Vulnerability to Climate Change by Using the Adaptool
Livia Bizikova, IISD

Infrastructure Climate Risk Assessment in Canada: An Engineering Strategy for Adaptation
David Lapp, Engineers Canada

The Infrastructure and Buildings Working Group - Part of the NRCan Adaptation Platform
Paul Kovacs, ICLR

Abstracts

Isabelle Thomas,Université de Montréal
Analyse de la vulnérabilité sociétale et territoriale aux inondations en milieu urbain dans le contexte des changements climatiques: Cas d’étude de la Ville de Montréal

L’un des principaux risques naturels pour le Sud du Québec, sous le climat actuel, concerne précisément les inondations, et ce risque pourrait s’aggraver dans le contexte des changements climatiques (CC). La prise de conscience et la compréhension des risques sont primordiales pour les parties intéressées au projet, d’autant plus que le Sud du Québec comporte de grandes zones aménagées. Les conséquences des inondations en milieu urbain peuvent être atténuées considérablement si les acteurs locaux connaissent bien ce phénomène sur leur territoire et sont informés de la vulnérabilité de celui-ci afin de prendre des décisions adéquates pour une planification adaptée et viable.

La méthode développée permet d’analyser la vulnérabilité sociétale et territoriale aux inondations en milieu urbain dans le contexte des CC. Les résultats permettent de déceler les populations, les activités et les secteurs qui sont et seraient particulièrement affectés. Ils permettent également l’établissement de priorités en matière de planification adaptive.

Livia Bizikova, IISD
Assessing Abilities of Policies to Reduce Vulnerability to Climate Change by Using the Adaptool

Currently, there is a strong focus on developing adaptation strategies to identify vulnerabilities and adaptation measures at the sectorial and/or municipal level. While these strategies play important role in guiding policy-makers in designing responses to climate change most of the actions in the specific sector and/or municipality are governed by policies currently in place. Therefore it is critical not only to know about our vulnerabilities and adaptation needs but we need to make sure that current policies can support these adaptation actions and assist stakeholders to improve their adaptive capacities. ADAPTool is designed to conduct such assessment and also to assist in identifying if the analysed policies contribute to increasing vulnerabilities and/or encourage mal-adaptations. The ADAPTool is an Excel-based tool developed by the International Institute for Sustainable Development and partners as a step-by-step process of interaction and deliberation to generate scores for policy or program adaptability to anticipated and unanticipated climate and other changes. The presentation will introduce key contributions of the
ADAPTool to adaptation policy assessment of current policies and will provide an overview of observed trends in adaptability of current policies in Canada based on the assessment of over 40 policies in five Canadian provinces.

David Lapp, Engineers Canada

Infrastructure Climate Risk Assessment in Canada: An Engineering Strategy for Adaptation

The Public Infrastructure Engineering Vulnerability Committee was created in August 2005 to conduct a technical assessment of the vulnerability of Canada’s public infrastructure to the impacts of climate change. PIEVC directs ongoing national efforts to identify and mitigate the engineering vulnerability of Canadian public infrastructure to the impacts and risks of the current and future climate. It facilitates the development of practices, guidelines and tools that engineers can use in their daily activities in design, construction, operation and maintenance of public infrastructure.

The Committee acts as an advisory body to Engineers Canada regarding changes, additions and changes to policies, processes, regulations, codes, standards and related instruments needed to address the vulnerability of Canada’s infrastructure to current and future climate. It contributes to the integration of climate risk assessment into decision making regarding existing and future infrastructures in order to improve their resilience to the impacts of current and future climate.

The presentation describes the principles of the Protocol, the tool developed by PIEVC to assess vulnerability to climate change infrastructures. Its use will be demonstrated through case studies of the application of this tool in several regions of Quebec and elsewhere.

Paul Kovacs, ICLR

The Infrastructure and Buildings Working Group – Part of the NRCan Adaptation Platform

The Infrastructure and Buildings Working Group (IBWG), part of the NRCan Adaptation Platform, was developed to assist in the production of tools and resources related to the adaptation of buildings and infrastructure to climate change impacts. IBWG objectives related to infrastructure include building capacity, generating evidence and providing outreach to increase the capacity of municipalities and their staff, engineering practitioners and other professionals, insurers, homebuilders, code officials, and other relevant stakeholders to adapt civil infrastructure and the built environment to climate change. Buildings-related objectives of the IBWG include building capacity, generating evidence and providing outreach to increase the capacity of municipalities, insurers, homebuilders, code officials, and other relevant stakeholders to adapt to climate change. The IBWG is co-chaired by Engineers Canada and the Institute for Catastrophic Loss Reduction, with participation from a variety of private and public sector stakeholders. This presentation will provide an overview of the IBWG, its goals and outputs to date.
Abstracts

Daniel Brown, Health Canada

Climate Change and Health Adaptation Program for Northern First Nations and Inuit Communities

Health Canada’s Climate Change and Health Adaptation Program for Northern First Nations and Inuit Communities (CCHAP) was developed to build capacity in research by funding community-based projects enabling communities to develop health-related adaptation or action plans and communication materials that will help in adaptation decision-making at the community, regional, national and international levels with respect to human health and a changing environment. Central to the program is the concept that communities determine the areas of research that are of greatest importance to them; develop the tools and methods to adapt to these changes; incorporate scientific, traditional and/or local knowledge; and engage their community in the results developed. Since 2008, the CCHAP has funded 95 projects across northern Canada focused on a range of issues common to most communities. Inuit and Northern First Nations communities are taking control of their own research agenda, and actively undertaking projects which meet the needs and priorities of their community in meaningful and locally-appropriate manners—research that moves from a community-based to a community-led framework. This allows communities to increase their overall research capacity, respond rapidly to research questions and needs that emerge, and actively create evidence-based health adaptation strategies to respond to the challenges of a rapidly changing climate. The CCHAP represents a significant Canadian contribution to the global effort by Indigenous communities to adapt to climate change. It is important to promote this research at all levels of government to empower communities to understand and make decisions on environmental changes that affect their health and livelihoods.

Anna Bunce

Building Local and Indigenous Knowledge Systems (Building LINKS): Community-led Environment and Health Surveillance for Adaptation

The Canadian Arctic is experiencing intense socio-cultural stresses as a result of climate change, resource extraction, contaminants, and associated shifts in environment. These changes present major challenges to health, with the most acute impacts experienced among Inuit populations reliant on the environment for sustenance and livelihoods. Indeed, Inuit across the Canadian North are
indicating that observed changes in weather, climate, and environment not only directly impact numerous facets of health and wellbeing, but also interact with other social determinants of health. It is anticipated that these environmental stressors will likely lead to increased negative impacts on physical and mental health issues across the North. Research, including our own, has uncovered many associations between environment and health outcomes; however, detecting cumulative environment-health outcomes and responding to them is an enormous challenge. The need for comprehensive, integrated, sustainable, and locally-appropriate surveillance systems is, then, a major priority across the North. Considering these gaps in the academic literature and in public health practice, government stakeholders, industry, health practitioners, and academics alike have called for approaches to surveillance strategies that integrate environmental and socio-economic factors, and provide management tools for decision-makers and communities. Responding to these needs and addressing the goals of the CHARS S&T Program, this program proposes to develop, implement, and pilot a community-based surveillance system in a sentinel site to track and respond to cumulative health impacts from multiple environmental stressors, while developing a scalable survey strategy that collects systematic, standardized environment-health data to support communities and decision-makers in adapting to environmental change.

In collaboration with Northern partners and programs, this program aims to integrate data from existing community-based monitoring systems with data from newly-created environment and health surveillance systems to contribute to the advancement of Canada’s knowledge of the Arctic. With the aim of strengthening surveillance in Northern Canada to track, attribute, and respond to environmental health impacts, there are two research goals of the Building LINKS program:

Goal 1) Develop and implement a community-based active sentinel surveillance system in close collaboration with Inuit communities to track, analyze, and respond to cumulative health impacts of climate change, resource development, and resulting socio-cultural and socio-economic shifts in Nunatsiavut.

Goal 2) Develop and pilot a survey tool that collects systematic and standardized environment and health data that are relevant, important, and useful for Inuit, governments, and industry across the Circumpolar North.

In presenting this project at ArcticNet we hope to introduce the ArcticNet community to the goals of our project and will be actively seeking out feedback and input on the direction of this research.

Trevor Bell, Memorial University of Newfoundland

**SmartICE: an Adaptation Tool to Support Sea-ice Travel Safety under Changing Arctic Climate and Shipping Conditions**

Arctic climate change will result in landfast ice that is thinner, forms later and breaks up earlier than before, resulting in increasingly more dangerous over-ice travel and less reliable traditional knowledge of safe routes based on past climatic conditions. Considering that the majority of residents in Arctic communities use sea ice to access country foods and maintain cultural and family activities, increased risk or fear of travelling on the ice has severe repercussions for food security and physical and mental health. At the same time, changes in sea-ice conditions are creating longer shipping seasons while natural resource economics are driving the demand for winter shipping.

Consequently, there is an urgent need to understand the emerging implications of changing shipping trends for local communities and local sea-ice users.

SmartICE (Sea-ice Monitoring And Real-Time
Information for Coastal Environments) is a community-academic-government-industry collaboration that seeks to address the limitations in technologies and services currently used to map coastal sea-ice conditions. The overall goal of SmartICE is to develop an integrated, near-realtime monitoring and dissemination system that informs decisions about coastal sea-ice travel and shipping, thereby improving safety.

We are currently piloting SmartICE technologies and operations in Nunatsiavut (Nain) and Nunavut (Pond Inlet). Although primarily designed to support ice-travel safety, SmartICE observations may also inform winter fishery and harvesting programs, search-and-rescue operations, climate change adaptation planning, ecosystem monitoring, and sea-ice technology validation. SmartICE directly involves Inuit in all aspects of its operation and most importantly strives to integrate Inuit Qaujimajatuqangit (knowledge) about sea-ice conditions.

Michel Allard, Centre d’études Nordiques, Université Laval
Life on Permafrost: Community Planning Empowerment

Arctic communities face the challenge of community planning on permafrost as the high need for housing and the modernization of infrastructures call for both renovations of existing infrastructure and construction of new developments.

Our goal is to make northern residents knowledgeable enough in basic permafrost science and engineering so that key persons (decision makers, managers, etc.) become able to exert leadership in regard to local and regional permafrost-related issues such as land management, construction and industrial projects, choice of appropriate foundations, maintenance of transportation infrastructures and environmental protection. The project helps to build up, among leaders and within the communities a fundamental understanding of how permafrost “works” as a climate-regulated phenomenon and how man-induced disturbances affect the functioning of the permafrost (i.e. the thermal regime). We run community consultations with regional governments for land use planning. A scholar teaching and training package was also designed (course material in ten lessons called “Learning and Evaluation Situation (LES)”) first in collaboration with Kativik School Board in Nunavut that we have begun to disseminate also in Nunavut with the Arctic College. This teaching package involves field exercises for students in recognition of permafrost landforms and soil properties. It also involves the use of a specifically designed computer training application called PermaSim that allows users to simulate permafrost thermal regime and active layer dynamics with climate data from their own community. Elders are participating in the process of training students, bridging traditional land knowledge with technical and mathematical learning.
**Abstracts**

Edmundo Fausto, TRCA  
**State of Climate Change Science in the Great Lakes Basin**

Climate change is perhaps the greatest environmental challenge facing the ecosystem health of the Great Lakes Basin. And experts have called from both an improved understanding of ecological vulnerability and a more strategic approach to achieving climate resilience. Given the importance of scientific knowledge and information as an input to adaptive management, a shared understanding of the state of the science, including current strengths, gaps and levels of confidence, is critical to identifying research priorities and co-operatively identify and respond to climate change impacts across the Great Lakes Basin. Recently a report was published which provides a firm foundation for future work in the Great Lakes basin, by identifying knowledge strengths, weaknesses, gaps, priorities and opportunities. It recognizes that the Great Lakes Basin consists of the aquatic ecosystems of the five Great Lakes themselves, as well as the watersheds that influence Basin-wide health. While the primary focus is on ecosystems, connections to economic activities and social well-being that are directly tied to the health of ecosystems are also considered, such as agriculture, nature-based tourism and human health. This presentation will discuss the findings within the report.

Dr. Robert Metcalfe, Ontario Ministry of Natural Resources and Forestry  
**Using Water Balance Dynamics to Identify Vulnerabilities to Climate Change**

Vulnerabilities to climate change include the degree to which physical systems respond to climate forcing. With respect to water, it relates to changes that we might expect to see in the hydrologic cycle of a watershed which we quantify using a water balance/budget. This includes changes in the water moving over land and through soil layers in a watershed which will in turn result in changes to the magnitude, timing, duration, and rate of changes of flow in streams and rivers draining watersheds into the Great Lakes. Changes to water balances of watersheds in the Great Lakes Basin, will inherently result in changes to the water balance of the Great Lakes themselves. Furthermore, changes to the relative contribution (quantity) of water balance components will be accompanied with associated changes in the quality of water entering the Great Lakes. Because of this connectivity there are consequences to biologic communities in both terrestrial and aquatic ecosystems in a watershed and biological...
communities will be at risk to changes in the hydrologic cycle. This research project is using standardized methods and data sets to characterise water balance components for selected watersheds across the Great Lakes 2. Understand within-watershed heterogeneity in the fluxes of water; and 3. Predict potential changes to a watershed’s water balance dynamics in response to a changing climate.

Shannon Fera, Ontario Ministry of Natural Resources and Forestry

Risk Assessments of the Cumulative Effects of Climate Change, Human Movement and Water Connectivity and the Spread of Aquatic Invasive Species

Building off current research on the influence of changing climate on aquatic invasive species (AIS) that have or are likely to become established in the Great Lakes Basin (Magnusson et al., 1997, Thorp et al., 1998, Rixon et al, 2005, Ricciardi 2006, Rahel and Olden, 2008, Kim and Yan, 2011), we aim to estimate potential distribution of current and listed aquatic invasive fish, invertebrates, and plants under projected IPCC scenarios. There are two main components to this research: (1) modelling the secondary spread of AIS already established in the Great Lakes using the Great Lakes as a source population for the basin, and (2) identifying the likelihood of establishment of all aquatic species on watch lists and those already considered of threat in the Great Lakes proper. This research will allow us to identify the relative habitat suitability and distribution of where AIS are likely to establish within the Great Lakes under future climate change scenarios.

Dr. Chris Wilson, Ontario Ministry of Natural Resources and Forestry

How Quickly Can Populations Adapt to Climate Change? Genetic Responses to Thermal Physiology of Cold Water Fishes

Assessing the adaptive potential (ecological and Basin, assess historical trends, and to investigate regional patterns. It is also developing and validating water balance models to: 1. Predict water balances in ungauged watersheds; functional genetics) of lake trout and brook trout by testing whether higher living temperatures of adult fish improve the temperature tolerance and performance of their offspring. This project is investigating whether the temperatures adults live at influence what genes are expressed in their offspring, potentially accelerating population-wide adaptive responses to climate change.

Susan Doka, Fisheries and Oceans Canada

Lake Ontario Nearshore Fish Habitat Vulnerability Assessment

Current management of Great Lakes’ fisheries and coastal habitats does not consider environmental variability expected from climate change. Resource managers recognize the need to evaluate the impact of a shifting climate, but uncertainty about the impacts on fisheries and fish habitats (e.g. coastal wetlands and shoals), and the long term nature of climate change, has prevented consideration of adaptation strategies. We integrate spatial and ecological databases, statistical and process-based models that link habitat supply with fish production in the nearshore zone of Lake Ontario using a variety of approaches. Spatial and temporal interactions among local elevation profiles, water level fluctuations, wetland distributions, and thermal regimes, coupled with habitat usage patterns, influence overall nearshore habitat supply and fisheries production. Both water temperatures and water levels in the Great Lakes are expected to change on average and in phenology. Water levels are projected to change because precipitation patterns and thus supplies are projected to change throughout the Great Lakes drainage basin. Changing winds, storm frequency and severity, and ice cover will also affect the sediment dynamics and thermal structure of coastal areas. Using the climate
projections from a range of GCM x RCM combinations, as well as down-scaled physical model output, existing trends, variation and cyclicity, we project average changes to nearshore habitat supply. Supplies are calculated for different thermal guilds of fishes currently in Lake Ontario based on ecological niche associations for different life stages. Relative fisheries production is projected for select species using a population modelling approach combined with bioenergetic relationships. The habitat supply for representative fishes was used to assess the long-term effects of habitat quality and quantity on population dynamics at whole-system and zone scales. Habitat and potential production changes were compared across space and time to address: Where would productive coastal habitats be located in the future, and what are the probable habitat availability and production trajectories for nearshore fisheries belonging to different thermal guilds? Results indicate that some coastal segments or habitat types, species and guilds are more sensitive to concomitant water level, temperature, and habitat changes than others. A nonlinear response between habitat supply and population responses suggests that lags and compensatory mechanisms may confound short-term responses, which has implications for monitoring impacts and strategic management. Key uncertainties and the prognosis for nearshore habitats and fishes given multiple stressors will be discussed.
Session: T1F – Kalff
An Overview of Agricultural Adaptation Activities in Canada

Tuesday April 12 – 10:30am to 12:00 pm
Presentation Session

Session Chair: Sarah Kalff, Agriculture and Agri-Food Canada

Canadian Agricultural Adaptation: An Overview

Jamie Hewitt, Agriculture and Agri-food Canada

A Research Program to Address Agricultural Stakeholders’ Concerns Regarding the Evolution of Crop Pests Associated with Climate Change

Anne Blondlot, Ouranos

Supporting Agricultural Adaptation to Climate Change: Programs, Projects and Progress in B.C.

Emily MacNair, BC Agriculture & Food Climate Action Initiative

Managing Canada's Soil Resource to Mitigate Climate Change and Provide Ecological Goods and Services

Paul Thoroughgood, Soil Conservation Council of Canada

Abstracts

Jamie Hewitt, Agriculture and Agri-food Canada

Canadian Agricultural Adaptation: An Overview

Canadian agriculture will be will be positively and negatively affected by climate change. Simultaneously, the world’s population is increasing and global food supplies need to keep pace with growth. These factors make adaptation paramount in ensuring agricultural production can flourish while minimizing environmental impacts.

This presentation will discuss agriculture adaptation in general and will highlight the anticipated climate changes and their effects on the sector. It will also provide a snapshot of current adaptation activities across the country based on information collected by the Agriculture Adaptation Working Group under the federal Adaptation Platform. A brief overview of agriculture adaptation initiatives by several other countries will help provide context.

The presentation will also summarize adaptation actions supported by Agriculture and Agri-Food Canada, including both policy and research initiatives.

Anne Blondlot, Ouranos

A Research Program to Address Agricultural Stakeholders’ Concerns Regarding the Evolution of Crop Pests Associated with Climate Change

Ouranos is a Quebec based consortium on regional climatology and adaptation to climate change. Ouranos makes the connection between science and the needs of end-users. Quebec agricultural stakeholders have expressed strong concerns about the risk of increased pressure from pests on crops in the context of climate change given the sensitivity of these organisms to climate variations.

Ouranos supported three research projects that shared expertise and climate change scenarios. Those projects combined several methodological approaches such as modeling, climate analogues, surveys and literature reviews. One of the projects highlighted the impact of climate change on crop pests already present in Quebec via case studies. Another project considered the future risk of establishment of invasive alien species in soybean crops. A third project analyzed the impact of global warming on the synchronization between the lifecycle of pests and their natural enemies. These projects confirmed that several actions proposed in the Quebec Pest Management Strategy 2011-2021 for agriculture...
also contribute to adapting to climate change. In addition, the results of the projects helped guide the Quebec Climate Change Action plan 2013-2020 towards activities to strengthen monitoring and to develop new diagnostic methods for crop pests. The projects also helped to build capacity and expertise in plant protection and climate change. The results of the projects were transferred to end-users in a number of agriculture conferences held in the province and many outreach products were disseminated on a website dedicated to agricultural expertise that is widely used in Quebec.

Emily MacNair, Canadian Agricultural Research & Development Corporation Managing Canada’s Soil Resource to Mitigate Climate Change and Provide Ecological Goods and Services

A high level summary of the collaborative planning and projects of the BC Agriculture & Food Climate Action Initiative (CAI) will be provided. CAI currently delivers two programs in B.C., one to develop and implement regional-scale adaptation plans for agriculture and one to support farm-level adaptation. How the programs were developed and are being delivered will be described, including the completion of a province-wide risk and opportunity assessment and a scan of farm practices and their relationship to adaptation.

Since 2013, in partnership with the Ministry of Agriculture, agricultural organizations and local governments, CAI has led the development of six regional plans for agricultural adaptation; including strategies and actions to address climate change impacts. The regional planning process will be summarized, along with progress on implementation of collaborative projects to strengthen knowledge and/or provide resources and tools for agricultural adaptation. The Farm Adaptation Innovator Program – which supports farm-level piloting, demonstration, evaluation and knowledge transfer to improve resilience to weather-related production risks and impacts – will also be explained, including the structure of the program and the types of projects underway.

Paul Thoroughgood, Soil Conservation Council of Canada

The Infrastructure and Buildings Working Group – Part of the NRCan Adaptation Platform

Canadian farmland falls under two primary categories; land for annual crops and land for perennial crops. The management of these lands will be impacted by climate change. Much of perennial cropland has either never been broken or is only cultivated on an infrequent basis.

Therefore these lands act as a major sink for greenhouse gasses (GHG). These lands also have a greater frequency of intact wetlands than lands under annual cultivation. Intact grasslands/wetlands provide some of the most productive ecological land in Canada and help to purify water and air. Annual cropland has a reduced capacity to sequester greenhouse gasses and provide ecological goods and services (EGS). How lands are managed impacts the ability of annual cropland to sequester GHGs and to produce EGS. The management of these lands may benefit by focusing on adaptive practices. Land managed under no-till production systems has increased capacity to sequester carbon making it a net sink for GHG that also supports more diverse soil biota. Including fall sown crops in crop rotations also has been demonstrated to provide improved nesting habitat for birds. Retaining wetlands and remnant upland habitat in landscapes dominated by annual crop production is also important from an EGS perspective. The most ecologically important habitats in cultivated landscapes are those not under cultivation. Employing modern science-based production practices including no-till, 4Rs of nutrient management, integrated pest management and GM technology can help meet the world’s demand for agricultural production without compromising the quantity/quality of Canada’s soil and water resources.
Abstracts: Sessions T2A-T2F

Session: T2A – Chan
Cities Becoming Climate Resilient: Examples of Available Tools and Canadian Cities Taking Action / Villes résilientes au climat: exemples d'outils disponibles et de villes qui passent à l'action

Tuesday April 12 – 1:30 pm to 3:00 pm
Presentation Session Simultaneous Interpretation

Session Chair: Chee Chan, AECOM

UNISDR Disaster Resilience Scorecard
Jon Philipsborn, AECOM

ICLEI Building Adaptive and Resilient Communities Program
Ewa Jackson, ICLEI

Toronto’s Collaborative Multi-Sectoral Approach to Climate Adaptation
David MacLeod, Energy and Environment Division, City of Toronto

L’adaptation aux changements climatiques à Montréal : du constat aux actions
Julie Guichetateau, Ville de Montréal

100 villes résilientes et Montréal
Louise Bradette, Ville de Montréal

Abstracts

Jon Philipsborn, AECOM
Practice UNISDR Disaster Resilience Scorecard

To help communities understand, communicate, and implement disaster risk reduction, a Disaster Resilience Scorecard (Scorecard) has been developed to support the United Nation’s implementation of the International Strategy for Disaster Reduction (UN ISDR) and measure a cities’ resilience to disasters. The Scorecard is based on UNISDR’s “Ten Essentials” of disaster management, including reviewing policy and planning; engineering, informational, organizational, financial, social and environmental aspects of disaster resilience. The Scorecard helps identify strengths and weaknesses across city systems and identify pathways to increase resilience. The panelist will help participants develop an understanding of the Scorecard as a tool to effectively assess a city’s disaster preparedness considering planning, response and recovery. Knowledge will also be shared on effective methods to engage with the many stakeholders to efficiently apply the Scorecard.

Ewa Jackson, ICLEI

ICLEI Building Adaptive and Resilient Communities Program

ICLEI BARC Program - The Building Adaptive & Resilient Communities (BARC) Program is Canada’s only national program on adaptation for local governments; the program offers a comprehensive way to respond to the impacts of climate change, develop and implement a community-wide adaptation plan while networking with other municipalities along the way. This presentation will present the BARC framework, the accompanying online tool, and highlight success stories from the past and present.

David T. MacLeod, Energy and Environment Division, City of Toronto

Toronto's Collaborative Multi-sectoral Approach to Climate Adaptation

Toronto was one of the early thought-leading large cities on urban climate adaptation movement, with planning formalized in 2007. Progress has been characterized by a multi-sectoral approach founded through collaboration at the middle management staff level reaching out to include non-city owned sectors which have helped sustain activity through a time of variable political support. Toronto staff will outline this journey which may hold useful lessons for other
Guicheteau, Ville de Montréal

L’adaptation aux changements climatiques à Montréal : du constat aux actions

Dans le cadre du Programme Climat municipalités, la Ville de Montréal a adopté son premier plan d’adaptation aux changements climatiques 2015-2020. L’élaboration de ce plan s’est faite en deux temps. Dans un premier temps, une analyse détaillée des aléas climatiques, de leurs impacts et de la vulnérabilité du territoire montréalais à ces impacts a été menée. Parmi les constats qui ressortent de cette analyse, on compte notamment une augmentation des vagues de chaleur et des pluies abondantes, ainsi que des impacts sur les infrastructures comme l’augmentation des nids-de-poule ou encore des impacts sur la santé comme l’augmentation des maladies vectorielles. Dans un second temps, les actions menées par les différentes unités administratives de l’agglomération montréalaise ont été listées pour dresser un portrait des mesures d’adaptation aux changements climatiques en cours ou à venir. À titre d’exemple, on peut citer la mise en place d’une réglementation sur l’aménagement durable des espaces de stationnement afin de minimiser les surfaces imperméables, ce qui permet de minimiser à la fois les îlots de chaleur et les inondations. La présentation sera axée sur les principaux résultats du volet analyse de l’étude, notamment l’analyse géographique de la vulnérabilité. Les défis rencontrés lors de l’élaboration de ce premier plan d’adaptation et les solutions apportées par le Service de l’environnement de la Ville de Montréal seront également abordés.

Louise Bradette, Ville de Montréal

100 villes résilientes et Montréal

The City of Montreal is undertaking the development of a Resilient City Strategy based on a high level multi-sector, multi-stakeholder approach to tackling shocks and stresses, including climate change impacts, on city infrastructure, services and vulnerable populations. This two year strategy development process employs various workshops, principles and visual tools to identify strengths and challenges to addressing key issues affecting the city. The presentation will describe the approach to resilience building and lessons learned from Montreal’s experience.
**Session: T2B – Montgomery**  
**Standards: A Foundation for Adaptation / Les normes: une des bases de l’adaptation**

Tuesday April 12 – 1:30 pm to 3:00 pm  
Presentation Session  
Simultaneous Interpretation

**Session Chair:** Kelly Montgomery, Standards Council of Canada  
**Standards as Tools for Adaptation**  
Kelly Montgomery, Standards Council of Canada

**Guide normatif BNQ 3019-190**  
Lutte contre les îlots de chaleur urbains : 2 ans plus tard, con application et quelles suites envisagées

Nathalie Bleau, Ouranos

**Northern Infrastructure Standardization Initiative**  
Mike Burns, Government of NWT

**Voluntary Standards for Climate Adaptation – through ISO and Beyond**  
Ira Feldman, GreenTrack

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**Abstracts**

**Kelly Montgomery, Standards Council of Canada**  
**Standards as tools for Adaptation**

Effort to mitigate, and adapt to, a changing climate must take place on a global scale. As work needs to occur at the international, national and local level, it is necessary to establish a common language from which the collective can benchmark their respective progress and actions using a transparent and accountable process. Standards themselves provide this mechanism by translating scientific research, compiling best practices that have been vetted by experts and undergone public review into tangible guidance for practitioners.

But the usefulness of standards in the fight against a changing climate goes beyond the standard itself; the value can be found in the development process and the implementation of the standard. These standardization activities provide important and effective mechanisms to build capacity, exchange ideas, and engage those on the “front lines” of adaptation. The implementation of standards enables practitioners to strengthen the resiliency of infrastructure, health and safety, and the economy.

**Nathalie Bleau, Ouranos**  
**Guide normatif BNQ 3019-190**  
Lutte contre les îlots de chaleur urbains : 2 ans plus tard, con application et quelles suites envisagées

- Le Guide a suscité un intérêt important;  
- Plusieurs projets d’aménagement, de modifications aux règlements et d’activités de promotion/diffusion/référencement ont été recensés.

- L’adoption des pratiques du Guide par voie réglementaire favoriserait l'implantation d’aires de stationnement plus performants (réduction des ICU);  
- La lutte contre les ICU par l’aménagement des aires de stationnements en encore méconnue;  
- Une diffusion plus large du Guide et un accroissement de la compréhension des principes véhiculés permettraient son utilisation plus répandue dans les projets d'aménagement;  
- L’obligation par tous les établissement publics de mettre en pratique les principes du Guide;
Il semble qu'il soit un peu tôt pour la mise en place d'un mécanisme de reconnaissance de la performance des aires de stationnement... mais ce serait une excellente mesure incitative.

Mike Burns, Government of NWT
Northern Infrastructure Standardization Initiative

The objectives of the Northern Infrastructure Standardization Initiative (NISI) were to establish a Northern Advisory Committee, focus on priority infrastructure issues affected by climate change, create new standards and a sustainable process to support the incorporation and implementation of these new standards, and build capacity amongst Northern practitioners to implement and be involved in the development of standards. The initiative is broken down into 3 phases:

1. Establishing Foundations
2. Developing the Standards
3. Building Capacity

NISI priority areas include:
- Thermosyphon foundations
- Managing changing snow load risks
- Effects of permafrost degradation on existing buildings
- Community drainage system planning
- Geotechnical site investigations for building foundations in permafrost

The presentation provided an overview of the initiative.

Ira Feldman, GreenTrack
Voluntary Standards for Climate Adaptation – through ISO and Beyond

Within ISO -- the International Organization for Standardization -- there are several technical committees developing standards relating to climate adaptation and resilience. As the Adaptation Coordinator for ISO TC207/SC7, I have been leading the development of a climate adaptation standards "roadmap" for the subcommittee, a plan that contemplates a suite of adaptation standards in SC7 to complement the subcommittee's longstanding work on GHG management (or mitigation) standards. During the summer of 2015 I chaired the SC7 Climate Adaptation Task Force (ATF), a diverse group of leading adaptation experts and stakeholders, whose members contributed to the development of the roadmap and also fielded a survey on perceived adaptation standards needs to their respective networks. At the TC207 meetings in New Delhi in September 2015, SC7 reviewed the ATF survey results and authorized the drafting of several New Work Items Proposals (NWIPs). In addition to a pending NWIP for a "high-level framework standard" for adaptation, three other adaptation NWIPs are anticipated: Vulnerability Assessment; Monitoring & Evaluation; and an Adaptation Planning standard to focus on a specific context such as coastal zone or local governments. Symposium delegates will become familiar with the SC7 process and will be encouraged to participate in standards development activities through various available mechanisms.
Session: T2C – Mortsch
The Role of Data in Water Management / Le rôle des données dans la gestion de l’eau

Tuesday April 12 – 1:30 pm to 3:00 pm
Presentation Session
Simultaneous Interpretation

Session Chair: Linda Mortsch, University of Waterloo

Integrated Water and Climate Monitoring for Climate Change Detection and Adaptation
Scott MacRitchie, Ontario Ministry of the Environment and Climate Change

Addressing Climate Change Effects in Great Lakes-St. Lawrence River Water Level Regulation
Wendy Leger, Environment and Climate Change Canada

Augmenter les capacités de surveillance hydrologique du Québec comme moyen d’adaptation aux changements du régime des crues.
Richard Turcotte, Centre d’expertise hydrique du Québec (CEHQ)

Use of resilience in adaptation to climate-change caused natural disasters
Angela Peck, University of Western Ontario

Abstracts

Scott MacRitchie, Ontario Ministry of the Environment and Climate Change
Integrated Water and Climate Monitoring for Climate Change Detection and Adaptation

Effects of a changing climate will be seen in changes to the water cycle. The water cycle is studied by a group of related but different disciplines that are having to take more holistic approaches to address climate change. Integrated monitoring can facilitate collaboration between disciplines and provide a platform for more efficient and effective collection of data. Integrated monitoring can also occur at different spatial scales and across agency or administrative boundaries. Case studies to be presented include co-location of climate and water monitoring stations in the Great Lakes Basin for climate change detection and adaptation. The development of a “hydro-climatic” network for climate change, drought and flood monitoring will also be presented.

Wendy Leger, Environment and Climate Change Canada
Addressing Climate Change Effects in Great Lakes-St. Lawrence River Water Level Regulation

Water released from Lake Superior through dams on the St. Marys River and from Lake Ontario through the St. Lawrence River is regulated in accordance with water regulation plans issued by the International Joint Commission (IJC). Over the years, and often driven by extreme water levels, the IJC has looked at ways for improving these regulation plans. The most recent studies being the International Upper Great Lakes Study and the Lake Ontario-St. Lawrence River Study. However, the current approach of conducting a few years of study followed by long (decadal) gaps in data gathering may not be the most efficient and effective way of addressing climate changes. In early 2015, in response to requests from the Lake Superior, Niagara and St. Lawrence River Boards of Control to implement adaptive management practices into the ongoing reviews and evaluations of their respective regulations of water levels and flows, the IJC established the Great Lakes-St. Lawrence River Adaptive Management (GLAM) Committee. Reporting to the three control boards, the Committee is to undertake the required monitoring, modelling and assessment related to the on-going evaluation of the regulation plans and address other questions that may arise due to changing conditions in consultation with the Boards. Issues to be addressed include the accuracy of and trends in water supply estimates and the on-going assessment of the impacts of changing water levels. As more is
Les changements climatiques affecteront le cycle de l'eau. La complexité et le caractère transversal des enjeux qui en découlent doit simultanément s'appuyer sur des données pertinentes qui favorisent une prise de décision éclairée et sur des approches qui permettent de faire progresser la démarche d'adaptation en s'appuyant sur les nombreux intervenants impliqués dans la gestion de l'eau.

Ouranos est un consortium québécois en climatologie régionale et en adaptation aux changements climatiques dont l’un des programmes porte sur la Gestion de l’eau. Il vise à appuyer l’adaptation aux changements climatiques de la gestion intégrée des ressources en eau sur les bassins versants du Québec méridional et le fleuve Saint-Laurent. La Direction de l'Expertise hydrique (DEH) du ministère du Développement durable, de l'Environnement et de la lutte contre les Changements climatiques du Québec est directement impliquée dans le support scientifique en hydrologie et en hydraulique dans plusieurs activités gouvernementales. Ces deux organisations collaborent étroitement pour faire progresser l’adaptation dans le domaine.

L’un des axes de partenariat entre ces deux organisations porte sur la production de données quantifiant l’impact des changements climatiques sur le régime hydrique des cours d’eau du Québec. Ceci a conduit à la réalisation de l’Atlas hydroclimatique du Québec méridional, l’un des produits phares de cette collaboration. L’Atlas est destiné aux nombreux acteurs de l’eau du Québec et a pour but de soutenir l’adaptation de leurs pratiques de gestion.

L’Atlas permet, entre autres, de constater que l’intensité et le volume des crues les plus fortes ainsi que leur moment d’apparition dans l’année pourraient se modifier à l’horizon 2050. Ceci aura pour effet de diversifier les situations pouvant conduire à des inondations. Dans ce contexte changeant, le renforcement de la surveillance hydrologique est un moyen d’adaptation concret pour soutenir les interventions sur le territoire lorsque des crues surviennent. Elle est le pendant hydrométéorologique de l’Atlas hydroclimatique et la production opérationnelle de données qui en découle est une mesure du plan d’action québécois sur les changements climatiques.

La présentation servira à exposer certains éléments de la collaboration entre Ouranos et la DEH autour de la production de données. Elle permettra ainsi de décrire brièvement l’Atlas hydroclimatique tout en convergent vers l’exemple de la surveillance hydrologique comme outil d’adaptation. Les travaux d’analyse des besoins des clients quant au niveau de service nécessaires en surveillance seront exposés. Trois aspects de la surveillance hydrologique des inondations seront discutés : la mesure en temps réel du débit d’eau s’écoulant dans une rivière, la prévision de l’évolution de ce débit pour les prochains jours et l’utilisation de cartes de zones d’inondation pour faire le lien entre les débits et les secteurs risquant d’être inondés et les profondeurs d’inondations.

Les changements climatiques affecteront le cycle de l’eau. La complexité et le caractère transversal des enjeux qui en découlent doit simultanément s’appuyer sur des données pertinentes qui favorisent une prise de décision éclairée et sur des approches qui permettent de faire progresser la démarche d’adaptation en s’appuyant sur les nombreux intervenants impliqués dans la gestion de l’eau.
Use of resilience in adaptation to climate-change caused natural disasters

An original space-time dynamic resilience measure (STDRM) is designed to capture the relationships between the main components of resilience; one that is theoretically grounded in systems approach, open to empirical testing, and one that can be applied to address real-world problems in various communities. The quantitative resilience measure, presented here has two qualities: inherent (functions well during non-disaster periods); and adaptive (flexibility in response during disastrous events) and can be applied to physical environment (built and natural), social systems, governance network (institutions and organizations), and economic systems (metabolic flows). Three examples are selected to briefly present the utility of STDRM in disaster management. The first example presents the resilience of a community to climate change-caused flooding. The second one focuses on the resilience of reservoir to water scarcity. The third example addresses the resilience of complex network infrastructure to natural disasters.
Session: T2D– Ford
Adapting to climate change in the Canadian Arctic

Tuesday April 12 – 1:30 pm to 3:00 pm
Panel Session
Session Chair: James Ford, McGill University

Panel members:
James D Ford, McGill University
Ashlee Cunsolo Willox, Cape Breton University
Sherilee Harper, University of Guelph
Jamie Snook Mayor, Happy Valley-Goose Bay/Executive Director for the Torngat Wildlife, Plants and Fisheries Secretariat
Derrick Pottle, Rigolet

Abstract

The Canadian Arctic is on the front lines of our changing climate, with temperatures increasing in excess of 4°C in the last 30 years in some regions. These changes are having far reaching implications for Inuit, with the most pronounced climate change globally projected in the circumpolar north. Focusing on adaptation offers a proactive approach for managing climate-related risks—one that views Inuit populations not as passive victims of climate change but as active agents in planning and responding at household, community, and regional levels. As such, adaptation can direct attention to the root causes of climate vulnerability and emphasize the importance of traditional knowledge regarding environmental change and adaptive strategies. An evidence base on adaptation options and processes for Inuit regions is slowly emerging, building upon the traditional knowledge of Inuit communities and research which has examined what makes communities vulnerable and resilient to the impacts of climate change. This panel session will bring together researchers and thought-leaders who have been at the forefront of the human dimensions of Arctic change research to reflect on the challenges, opportunities, and experiences of adaptation among Inuit communities. Each panelist will have 5 minutes to present, with half the session a moderated discussion focusing on key questions facing adaptation in the North.

Panel members

James D Ford, McGill University
Ashlee Cunsolo Willox, Cape Breton University
Sherilee Harper, University of Guelph
Jamie Snook Mayor, Happy Valley-Goose Bay / Torngat Wildlife, Plants and Fisheries Secretariat
Derrick Pottle, Rigolet
Abstracts

Ruth Waldick, Agriculture and Agri-Food Canada / Carleton University

What Constitutes Extreme Weather?

The impacts of climate change and weather extremes are widely referenced, particularly in terms of future agricultural production. The concept of an extreme is an important one but is also nebulous; it differs according to the question and issue of interest, as well as the time scale of relevance. The importance of characterizing and capturing extremes for use in adaptive planning is introduced from a pragmatic perspective by users of these data.

Neil Comer, Risk Sciences International

Historical and Modelled Climate Data Issues with Extreme Weather

Although agricultural indicators calculated from mean change in climate parameters are useful (such as change in growing degree days), increasingly more interest has been expressed about extreme events and their effects on agriculture. Unfortunately, the very models used to generate future climate possibilities are mostly ill-suited to address such extreme conditions going forward. There is a broad range of uncertainty in such future projections related to the nature of model formulation and scale. Therefore, the perhaps rosy picture of future agricultural production related to a warmer climate is premature.

Scott Mitchell, Carleton University

Extreme Weather: Envisioning Ontario Agriculture

We have been spending significant efforts trying to understand and bridge the differences in emphases, approaches and needs between information one can get from climate records and models, versus information needs by those working in agriculture and rural communities. We have certainly not solved all of these issues! However, we do have some lessons learned to share, and this presentation will briefly explain some of our resulting choices, including scenario-based modelling, and a focus on weather event identification with respect to critical crop phenological stages.

Suren Kulshrestha, University of Saskatchewan

Estimation of Crop Yields under Future Climate Extremes

David Sauchyn, University of Regina

Adaptation to Extreme Weather Events in Agricultural Watersheds in Five Countries

Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR)
David Sauchyn, University of Regina

**Adaptation to Extreme Weather Events in Agricultural Watersheds in Five Countries**

Research on the exposure of agricultural communities to climate change and extreme events is a major component of the international research project: “Vulnerability and Adaptation to Climate Extremes in the Americas” (VACEA). This project is very much interdisciplinary; with social and natural science providing context and direction for research in the other realm of scholarship, producing insights that very likely would not arise from a more narrow disciplinary perspective. A large number of interviews with local actors revealed that agricultural producers and local officials recognize their high degree of exposure and sensitivity to climate variability and extreme weather events, although they generally do not associate this exposure with climate change.

These perceptions of local actors are consistent with the nature of the regional hydroclimatic regimes. In six study regions in five countries, climate variability between years and decades masks any regional expression of global climate change. These modes of periodic variability dominate the paleoclimate of past centuries and the recorded hydroclimate of recent decades. Indicators of exposure to climate variability and extremes, inducing indices of stream flow, snowpack, and water excess and deficit, vary in coherence with the characteristic frequencies of large-scale ocean-atmosphere circulation patterns. These results raise issues about the capacity of climate models to simulate climate extremes and the challenge of expressing and communicating this uncertainty.

Suren Kulshrestha, University of Saskatchewan

**Estimation of Crop Yields under Future Climate Extremes**

Assessment of future economic vulnerability of producers to climate extremes (dry events) requires information on crop, forage, and beef cattle physical production as well as other economic parameters. In the context of crop production this entails estimation of yields of various crops typically grown by producers. In this study the FAO AquaCrop model was used for this estimation using climate change scenario “RCM3.CGCM3.A2”. Results indicate that the yields under the future (2041-2070) climate would be significantly higher than the current level. Using spring wheat as an example, yields in both Pincher Creek site in Alberta and Swift Current site in Saskatchewan would be more than double the current (baseline 1971-2000) period. Although identifying reasons for such increases requires further investigation, a preliminary list might include: inclusion of CO2 fertilization effect, assumption of unlimited availability of plant nutrients, exclusion of effect of weeds, air and soil quality, plant acclimation, and management limitations.
Session: T2F – Grenier
The Role of Numerical Models in Climate Scenarios and Services

Tuesday April 12 – 1:30 pm to 3:00 pm
Presentation Session

Session Chair: Patrick Grenier, Ouranos

Recent and Upcoming Developments in the Fifth Generation Canadian Regional Climate Model
Laxmi Sushama, UQAM

Added Value of Very High-Resolution Regional Climate Model Simulations Compared to those of Commonly Used Intermediate Resolution
Philippe Lucas-Picher, UQAM

Post-processing and Bias Correction of Climate Models: Rationale, Assumptions, and a New Multivariate Approach
Alex Cannon, Environment and Climate Change Canada

Considering Adaptation to Climate Change as a Timescale Problem: Examples from the Tourism Industry
Dominique Paquin, Ouranos

Abstracts

Laxmi Sushama, UQAM
Recent and Upcoming Development in the Fifth Generation Canadian Regional Climate Model

In this presentation we will summarize the fifth generation Canadian Regional Climate Model (CRCM5) related recent developments that have contributed to extending the capability of the Canadian high-resolution climate-change projection system, and perspectives for the future. In particular, the range and physical realism of surface processes represented in CRCM5 have been significantly improved, within the framework of the Canada Research Chair in Regional Climate Modelling and the NSERC-CCAR funded Canadian Network for Regional Climate and Weather Processes (cnrcwp.uqam.ca), through interactive modelling of permafrost, dynamic vegetation, dynamic glaciers, lakes and rivers.

The developed system was further used to investigate the impact of lakes, permafrost and vegetation on the regional climate and hydrology and their interactions with the atmosphere and related feedbacks. These developments have led to improved simulation of near surface climate by CRCM5, which is an important achievement since high quality regional surface and sub-surface climate simulations at high resolution are key to many impact and adaptation studies. The developed system was also applied in transient climate change simulations, and the impacts of a changing climate on hydro-meteorological extremes such as droughts, floods and hot/cold spells studied. Upcoming version of the model will include many new features, such as a fully coupled system with the oceans and large lakes represented with a 3-D ocean model, improved representation of urban regions, land-use change, surface-groundwater interactions.

Philippe Lucas-Picher, UQAM
Added Value of Very High-Resolution Regional Climate Model Simulations Compared to those of Commonly Used Intermediate Resolution

Regional climate models (RCMs) have been increasingly used for the past 25 years in the hope of adding value to coarse-mesh global climate models (GCMs) simulations and projections. While the average grid mesh of GCMs participating to century-long climate projections in IPCC AR5 was about 300 km, the standard grid mesh of RCMs participating to CORDEX was about 50 km. In parallel to the development of RCMs, investigations regarding the benefits of using RCMs have been taking place; this quest came to be called “the
added value issue” and the RCM modelling community is still struggling with this issue. In this presentation we compare RCM simulations over North America made with grid meshes of 0.44°, 0.22° and 0.11°, with a focus on several regional climate features such as snowbelts around the Great Lakes, wind roses in the St. Lawrence River Valley, and summer land-sea breezes. The results show that distinct added value is present in RCM simulations, but only when some minimum required resolution is exceeded, which depends on the specific scale of the phenomenon of interest. These results may explain why the quest for added value in 50-km RCM simulations has baffled the RCM community for so long.

Alex J. Cannon, Environment Canada
Post-processing and Bias Correction of Climate Models: Rationale, Assumptions, and a New Multivariate Approach

Climate models are representations of the coupled atmosphere-ocean-land-cryosphere system. Despite continued improvements in the simulation of relevant physical processes, systematic biases remain, e.g., models may be too hot or cold, wet or dry, etc. Development of statistical bias correction techniques for climate model outputs has thus become an active area of research. By definition, all bias correction algorithms blend information from a climate model with historical observations. In a sense, the choice of algorithm sets the state of ‘knobs’ that control whether marginal distributions, inter-variable/spatial dependence structure, and temporal sequencing are informed more by the climate model or observations. The majority of algorithms, such as quantile mapping, are univariate in nature. They are used to correct systematic biases in a single climate model variable at a time. Inter-variable dependence structure is typically ignored, which can have an impact on subsequent calculations that depend on multiple climate variables (e.g., fire weather indices, hydrological models, and others). Furthermore, some algorithms may modify future projected trends from the underlying climate model without a physical basis. As a means of illustrating some of these assumptions/characteristics, a new multivariate bias correction (MBC) algorithm - a multidimensional analogue of univariate quantile mapping - is discussed. MBC corrects (rank) correlation dependence structure, with marginal distributions constrained to match observed distributions via quantile mapping.

Following previous work, the quantile mapping corrects systematic distributional biases relative to historical observations and, to the extent possible subject to this correction, preserves projected future trends from the climate model.

Dominique Paquin, Ouranos
Considering Adaptation to Climate Change as a Timescale Problem: Examples from the Tourism Industry

As climate change adaptation is increasingly discussed and becoming a mainstream concept, different kinds of users are asking themselves if and when they should develop an adaptation strategy, often not knowing where to begin. Climate experts, on the other hand, have access to an enormous amount of data that could be useful to users but often do not know how to translate it into something practical. Both users and experts can be connected through two timescales, the system lifespan and climate vulnerability. While the system lifespan relies on the user’s estimation of planning timeframe, the climate vulnerability is estimated from climate model projections and observations. We propose a simple tool to relate user and climate expert knowledge by combining the two timescales. To be reliable, the interconnection implies a dialogue to identify sensitive climate variable that will impact the system and a measure of how it will impact it. Climate data can then be used to identify the section of a simple graph where the system is located and help the users to position themselves about the urgency of adaptation. The concept has been presented to the tourism industry, and applied for ski.
Abstracts: Sessions T3A-T3F

Session: T3A - Charron
Producing Climate Information: for whom and for what purpose? / Produire l’information climatique : pour qui et dans quel but ?

Tuesday April 12 – 3:30 pm to 5:30 pm
Presentation Session
Simultaneous Interpretation

Session Chair: Isabelle Charron, Ouranos

Climate Change and the Challenge of Delivering Information
Francis Zwiers, PCIC

The Canadian Climate Data and Scenarios (CCDS) Website - An interface for Distributing Climate Change Information.
Benita Tam, Environment and Climate Change Canada

High resolution climate models for Canada: methods, limits and applications.
Dan McKenney, Canadian Forest Service/Great Lakes Forestry Centre

Adapting Ontario to an Uncertain Future: Making Climate Information Relevant to Local Decision-Makers
Glenn Milner, Ontario Climate Consortium / Toronto and Region Conservation Authority

Spatial Climate Change Data to Aid Adaptation in Resource Management
Francis Zwiers, PCIC

Crossing Boundaries: Enabling Decisions on Climate Change Adaptation
Stewart Cohen, Environment and Climate Change Canada

Abstracts

Francis Zwiers, PCIC
Climate Change and the Challenge of Delivering Information

- Climate change is real and largely irreversible
- Humans are responsible for a substantial part
- Limiting further change will be difficult
- Copious amounts of information will be needed to adapt
- Delivering data, and extracting information from it, are difficult challenges that involve climate science, software engineering, advanced geospatial concepts and approaches
- An important partner will be PAVICS (Power Analytics and Visualization for Climate Science)

Benita Tam, Environment and Climate Change Canada
The Canadian Climate Data and Scenarios (CCDS) Website – An interface for Distributing Climate Change Information

Impact assessments and adaptation planning require quantitative information about historical and future climate, along with robust assessments of the uncertainty inherent in such information. The Canadian Climate Data and Scenarios (CCDS) site, provided by Environment Canada, aims to address such needs through the provision of easy access to historical climate data and scenarios of future climate change. The CCDS website provides a range of information, including multi-model ensemble results from the Fifth Coupled Model Intercomparison Project (CMIP5) used in the IPCC Fifth Assessment Report (AR5). One of the unique aspects of the CCDS website is that it provides access to CMIP5 output specific to a Canadian context. This information is in NetCDF and geoTiff format, graphics of various kinds, and tabular summaries. The CCDS website also provides data prepared for use in statistical downscaling schemes. This presentation will focus on an overview of the information that is currently available on the CCDS website and summarize future plans for expanding the suite of information available.

Dan McKenney, Canadian Forest Service / Great Lakes Forestry Centre
High Resolution Past Climate and Future Projections for Canada using Thin Plate Smoothing Splines
For over 2 decades we have been developing spatial climate models that cover both Canada and the continental United States utilizing the thin plate smoothing splines algorithms as implemented in ANUSPLIN. This work is in partnership with The Australian National University, Environment Canada and the U.S. NOAA National Climate Data Center. Time steps range from historical monthly models from prior to 1900, daily models from 1950 and high resolution interpolations of climate change projections for a broad range of parameters.

Thin plate splines should not be confused with simple univariate cubic splines. They can be thought of as a non-parametric, multi-dimensional curve fitting technique for application to noisy multi-variante data. ANUSPLIN is a leading methodology for climate modeling used world-wide. ANUSPLIN offers an operationally efficient means to develop spatially continuous climate models (“surfaces”). The models are useful for mapping climate and generating point estimates at specific locations such as research plots or field locations. The models have been adopted by 100s of users inside and outside government in both the US and Canada and have been applied in fields ranging from ecology to human health. In this talk I will provide an overview of the methods, some data quality issues, adoption, accessibility and future directions.

Francis Zwiers, PCIC
Spatial Climate Change Data to Aid Adaptation in Resource Management

Historic climate and climate change databases come in various spatial and temporal resolutions that need to be converted to scales meaningful for the user. Short temporal and fine spatial resolution is necessary for many applications; however, British Columbia has a sparse network of weather monitoring stations. Our research has addressed this through the development of methods for interpolating numerous climate variables, and the provision of a range of products. Our guiding principle is to make access as easy as possible for users with a wide range of computer skills and climate knowledge.

Consequently, data are available through interactive web sites, standalone software for PCs and as written material. We have achieved this through partnerships between government, university and the private sector and by obtaining extensive feedback from users. Our products are used extensively in ecology, hydrology, forestry, agriculture, and urban planning. Users include university researchers, consultants, government
planners and industry managers. Examples of products include the ClimateBC, and ClimateNA standalone and web-based software for interpolating historical and climate change data; the Plan2Adapt web-based tool for providing regionally-based data, maps and impact assessments to aid planners; web access to historic data and downscaled climate change projections; user guides; and written descriptions of regional climate projections.

Stewart Cohen, Environment and Climate Change Canada
**Crossing Boundaries: Enabling Decisions on Climate Change Adaptation**

For more than 30 years, global climate change scenarios have been used as the basis for projections of regional-scale climate change impacts on ecosystems, water resources, forestry, agriculture, transportation, health, and other sectors in Canada, and worldwide. This translation of climate information into impacts information has contributed to the framing of climate change as an issue of risk. Adaptation has become part of the portfolio for long term management of climate change risk. Managing the flow of climate change information across disciplines and scales is necessary for this exercise in translation to be carried out in an effective manner. But this is not easy. Although awareness of climate change has increased, and the construction of strategies and plans has increased, implementation of decisions has been slow.

There is a need for mechanisms that can support cross-boundary flow of climate change information. This would include climate trend and scenario indicators, impact and risk assessments, and results from simulations of proposed adaptation responses. One concept that has been suggested in this regard is the ‘boundary organization’, a bridging institution
Session: T3B – Greenan
Climate Change Adaptation in Aquatic Environments / Adaptation aux changements climatiques et environnements aquatiques

Tuesday April 12 – 3:30 pm to 5:30 pm Presentation Session Simultaneous interpretation

Session Chair: Blair Greenan, Fisheries and Oceans Canada

Fisheries and Oceans Canada’s Climate Adaptation Program
Paul Lyon - Fisheries and Oceans Canada

État des lieux des pêches et de l’aquaculture au Québec en lien avec les changements climatiques
Valérie Bourduas Crouhen, Ouranos

Atlantic Impact and Vulnerability Assessments from the Aquatic Climate Change Adaptation Program
Pierre Pepin, Fisheries and Oceans Canada

Cost benefit analysis of the risks of coastal flooding and erosion on infrastructure and properties at Tracadie Harbour, Prince Edward Island
Hope Parnham, DV8 Consulting

Abstracts

Paul Lyon, Oceans and Fisheries Canada
Fisheries and Oceans Canada’s Climate Adaptation Program

The objective of the Aquatic Climate Change Adaptation Services Program (ACCASP) is to assess the risks that climate change poses to the delivery of the Department of Fisheries and Oceans’ mandate across diverse aquatic ecosystems and assist managers in making evidence-based decisions that enable adaptation. The primary components of the Program have consisted of the assessment of climate change risks, vulnerabilities, and impacts in four of Canada’s large aquatic basins, as well as the establishment of two competitive funding envelopes to: 1) develop a more comprehensive science-based understanding of the impacts of climate change on Canada’s oceans and in-land waters and 2) develop applied tools to enable adaptation across the Department’s program-activities and three strategic outcomes. The presentation will summarize the results of the risk assessments and highlight achievements arising from the research and tool development activities.

Valérie Bourduas Crouhen, Ouranos
État des lieux des pêches et de l’aquaculture au Québec en lien avec les changements climatiques

Cette présentation aura pour sujet un état des lieux des connaissances et des expertises sur les vulnérabilités, les impacts et l’adaptation aux changements climatiques des secteurs des pêches et de l’aquaculture du Québec. Cette présentation permettra de dresser un portrait biophysique et socio-économique des secteurs d’activité (pêches et aquaculture commerciales, pêche de subsistance, pêche récréative) dans les régions concernées au Québec.

par rapport aux enjeux identifiés et permettra de cibler les actions de recherche et développement appliquées devant être adressées prioritairement par la programmation Vulnérabilités, Impacts et Adaptation d’Ouranos et ses partenaires.

Pierre Pepin, Fisheries and Oceans Canada  
**Atlantic Impact and Vulnerability Assessments from the Aquatic Climate Change Adaptation Program**

We used trends and projections of oceanographic variables to identify climate change risks to Northwest Atlantic ecosystems under the Fisheries and Oceans Canada (DFO) Aquatic Climate Change Adaptation Program (ACCASP). The goal was to identify which sectors will be affected most by climate change, and how to minimize those risks. Long term trends in temperature are well monitored projected throughout the region, which allowed comprehensive evaluation of warming impacts on marine life. In contrast, long term trends in pH (acidification) and dissolved oxygen were only available in some areas. We describe a recently implemented DFO pH monitoring program that provides us with a spatial pH field, and will eventually provide a long term perspective. We used established relationships between growth and dissolved oxygen to assess potential impacts of declining oxygen. We present three research examples that provide adaptation planning options. The first assessed key species vulnerability to warming, initiated with DFO sectors, to identify which species will lose, stay neutral or profit. Sectors can now prioritize species for stock assessments and Marine Protected Area planning. The second example uses a modelled spatial field of dissolved oxygen to assess how wolffish (Species at Risk) habitat will be affected. In the final example, we demonstrate how the widespread impact of changes in thermal habitat availability on crab recruitment provides a multi-year forecast of stock productivity for management and industry planning. These examples illustrate how combining environmental forecasts with validated environmental driver-response relationships have served to inform the governmental decision making process.

Hope Parnham, DV8 Consulting  
**Cost benefit analysis of the risks of coastal flooding and erosion on infrastructure and properties at Tracadie Harbour, Prince Edward Island**

Coastal infrastructure and property is increasingly forced to withstand more frequent and extreme weather events, and changes in climate norms. In Prince Edward Island, the coastal area is particularly vulnerable to accelerated erosion rates and coastal flooding caused by sea level rise and storm surge events. These impacts will continue and will likely become more severe, threatening public and private assets at great economic cost. There is a need for further investigation into the economic impacts of climate change risks and adaptation options.

As part of a larger regional economic study across the Atlantic region, a methodology was developed for conducting climate change adaptation cost–benefit analyses (CBA) for coastal infrastructure and property over a 50 year timeframe (2015–2064). Tracadie Harbour, PEI, was one of six case study locations selected to pilot the methodology in Atlantic Canada. The small craft harbour is home to both an inshore fishery and aquaculture industry. Harbour assets, infrastructure, and wharf access were found to be particularly vulnerable to the impacts of sea level rise, storm surge and erosion. The CBA assessed a range of adaptation options, including coastline stabilization, rebuilding and raising infrastructure, and relocation of assets. The results of the CBA indicate that proactive adaptation strategies to mitigate the risks of coastal flooding are warranted in this area. The analysis presented here suggests that the CBA methodology would be appropriate for sector-specific, multi-site analyses, which could help to establish regional adaptation priorities for small craft harbours.
Session: T3C - Desjarlais
Adaptation au changement climatique en milieu côtier: L’analyse coûts-avantages comme outil d’aide à la décision
Climate change adaptation and coastal zones: the cost-benefit analysis as a tool for decision makers

Tuesday April 12 – 3:30 pm to 5:30 pm
Panel Session
Simultaneous Interpretation

Session Chair: Claude Desjarlais, Ouranos

Panel Members:
Jonathan Rosborough, St. Francis Xavier University
Manon Circé, Ouranos
Sabine Dietz, Aster Group
Laurent Da Silva, Ouranos
Don Jardine, UPEI
Ursule Boyer-Villemaire, Ouranos

Abstract

Face à l’accélération du phénomène d’érosion et à l’augmentation de la récurrence des épisodes de submersion en zones côtières, les décideurs ont besoin d’outils leur permettant d’identifier les solutions d’adaptation les plus efficaces techniquement et les plus avantageuses économiquement et environnementalement. La session proposée présente les résultats d’une large étude qui a eu recours à l’analyse coûts-avantages (ACA) pour comparer différentes mesures d’adaptation pour le littoral du Québec et des provinces atlantiques. Compte tenu des particularités des neuf sites étudiés, il est proposé de consacrer une session double à cette thématique.

La deuxième session débutera par la présentation de deux études de cas, soit North Cape à l’Île-du-Prince-Édouard et les Îles-de-la-Madeleine au Québec. Ces sites sont peu élevés par rapport au niveau de la mer et sont donc très vulnérables au rehaussement marin ainsi qu’à l’érosion. Les communautés qui y vivent seront confrontées à d’importants défis au cours des prochaines années et les résultats de l’étude proposent des pistes de solution.

La session vise également à susciter la discussion sur les conclusions et les leçons apprises lors de la réalisation des ACA. Une courte présentation des résultats intégrés des études de cas et des tendances observées lancera la discussion. Ensuite, sous forme de panel, les participants seront invités à échanger avec les équipes du Québec et de l’Atlantique concernant la possibilité d’appliquer les approches méthodologiques développées ainsi que les résultats obtenus à des cas similaires au Canada. Les défis potentiels seront abordés afin d’identifier des avenues de solution.

Panel members

Jonathan Rosborough, St-Francis Xavier University & Manon Circé, Ouranos
Evaluation économique des répercussions des changements climatiques et analyse coûts-avantages des options d’adaptation en zone côtière – Survol méthodologique

Sabine Dietz, Aster Group
Cost-benefit Analysis of Climate Change Adaptation Options for the Chignecto Transportation Corridor

Laurent Da Silva, Ouranos
Analyse coûts-avantages des options d’adaptation en zone côtière à Percé
Don Jardine, UPEI
Cost-benefit analysis of the risks of coastal flooding and erosion on infrastructures and properties in Prince Edward Island

Ursule Boyer-Villemaire, Ouranos
Analyse coûts-avantages des options d’adaptation en zone côtière aux Îles-de-la-Madeleine

Manon Circé, Ouranos
Résultats intégrés et tendances des analyses coûts-avantages réalisées en zone côtière
Session: T3D – Gleeson
Climate Change Impacts and Land Use Planning in Northern Canada

Tuesday April 12 – 3:30 pm to 5:30 pm
Panel Session

Session Chair: Jenny Gleeson, Ontario Ministry of Natural Resources and Forestry

Panel Members:
David Pearson, Laurentian University
Jim McLaughlin, Ontario Ministry of Natural Resources and Forestry
Rachelle Lalonde, Ontario Ministry of Natural Resources and Forestry
Alison Perrin, Yukon Northern Climate ExChange
Brian Sieben, Government of Northwest Territories

Abstract

The purpose of the session is to learn about approaches to consider climate change impacts and adaptation in land use planning in northern regions, from science and planning perspectives. Case studies and experiences will be presented from the Far North of Ontario and the Yukon Territory.

Panel members

David Pearson, Laurentian University
Far North of Ontario Climate Change Community Surveys

Jim McLaughlin, Ontario Ministry of Natural Resources and Forestry
Climate Change Ecosystem Vulnerability Assessment in the Hudson Bay Lowlands, Ontario

Rachelle Lalonde, Ontario Ministry of Natural Resources and Forestry
Building Climate Change into Community-based Land Use Planning

Alison Perrin, Yukon Northern Climate ExChange
Hazard Identification and Cost Adaptation in Infrastructure Planning

Brian Sieben, Government of Northwest Territories
Landscape Conservation Collaborative as a Network Approach
Session: T3E – Callihoo
Best Practices in Climate Change Adaptation

Tuesday April 12 – 3:30 pm to 5:30 pm
Presentation Session

Session Chair: Christine Callihoo, Associated Engineering

Engineering and Community Planning: Tools and processes to address the challenges posed by climate change

Christine Callihoo, Associated Environmental

APEGBC Guidance on the Evolving Responsibilities for its Members in a Changing Climate

Harshan Radhakrishnan, APEGBC

Integrating Climate Change Risks into Management: A Framework

Guy Félio, RV Anderson Associates Limited

Process, challenges and impediments to responding to Climate Change

Mark Porter, Associated Engineering

Case studies: Implementation of an adaptation plan in cities

Jean Luc Allard, SNC Lavalin

Abstracts

Christine Callihoo, Associated Engineering

Engineering and Community Planning: Tools and processes to address the challenges posed by climate change

Planning and engineering practitioners often work hand-in-hand to assist communities in addressing projected climate change impacts. As a means to ensure ongoing best practices and practically demonstrate the implementation of climate change professional guidelines put forward by the Canadian Institute of Planners and the Association of Professional Engineers & Geoscientists of BC, Associated Engineering (AE) has invested significant resources into internal climate change training including the following:

1. Development of a 10 module climate change curriculum
2. Climate Change adaptation and mitigation lunch-and-learn webinar series
3. Establishing the SWOT Team – group of discipline-based climate change professionals to serve on an as-needed basis to provide guidance (i.e. land use planning, infrastructure, water treatment, etc.)

The session will detail the AE climate change capacity development journey, including where impediments to learning and application have been identified to date, seeking the input / guidance of the session participants as to how to potentially address said impediments. The approach applied by AE can be adapted and applied by other professional services providers thus also contributing to best practices in climate adaptation.

Harshan Radhakrishnan, APEGBC

APEGBC Guidance on the Evolving Responsibilities for its Members in a Changing Climate

APEGBC recognizes that the climate is changing and is committed to raising awareness about and providing information and assistance concerning climate change as it relates to professional engineering and geoscience practice.

The session will detail APEGBC ‘Guidelines on Incorporating Climate Resilience in the Design of Public Infrastructure in British Columbia’ (Climate Resilience Guidelines). These guidelines establish the standard of care and multi- stakeholder approach that engineering and geoscience professionals should apply when designing and retrofitting public infrastructure in BC.
Guy Félio, RV Anderson Associates Limited

**Integrating Climate Change Risks into Management: A Framework**

Infrastructure vulnerability to climate change assessments constitute the first steps in preparing adaptation plans and mitigation measures. These assessments, in addition to climate projections in a form that align with engineering design parameters, require an-in-depth knowledge of the current and projected infrastructure condition and performance. This information resides in asset management strategies and plans, which usually span the whole life cycle of the infrastructure assets and cover the time horizons during which the expected changes in climate will occur. Unfortunately, at present, the links between vulnerability assessments, climate change risks and asset management have been weak.

This presentation describes an innovative asset management framework within which climate change risks are fully integrated into the decision making and financial planning processes. Traditionally, infrastructure performance—and thus risk, in asset management systems—is defined in terms of physical condition and capacity. By introducing the concept of functionality during an extreme event as a performance measure, the asset manager can therefore assess the resiliency of the assets and identify investments needed to meet the risk mitigation measures. An example of the application of this framework will be presented.

Mark Porter, Associated Engineering

**Process, Challenges and Impediments to Responding to CC**

The session will detail three of AE’s climate change projects of note, including where impediments to learning and application have been identified to date, seeking the input / guidance of the session participants as to how to potentially address the identified project impediments. The approach applied by AE can be adapted and applied by other professional services providers thus also contributing to best practices in climate change adaptation.

The case studies are as follows:

1. Infrastructure Risk Evaluation Tool, Yellowknife, NT
2. Assessment of the Engineering Building's Vulnerability to Climate Change, University of Saskatchewan, SK

Jean-Luc Allard, SNC Lavalin

**Case studies: Implementation of an adaptation plan in cities**

SNC-Lavalin has been mandated to perform adaptation plans in several cities.

This presentation will address the steps covered in SNC-Lavalin’s mandates:

- Analysis of the local context, past and future weather trends
- Impact assessment of climate change specific to the region
- Assessment of associated risks
- Prioritization of adaptation measures and action to be implemented
- Specific examples of results will be presented to the audience
Session: T3F – Jackson
Community Vulnerability and Risk Assessment Workshop

Tuesday April 12 – 3:30 pm to 5:30 pm
Workshop Session

Chair: Ewa Jackson, ICLEI

Objective: This workshop, targeted at communities early on in their adaptation effort, aims to help share information on vulnerability and risk assessment, educate about climate change impacts, and build capacity to increase the integration of risk information into existing strategies and actions. The workshop will run participants through identifying climate change related impacts and assessing their associated vulnerabilities and risks.

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<thead>
<tr>
<th>TIME</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>5 minutes</td>
<td>Welcome &amp; Workshop Overview</td>
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<tr>
<td>10 minutes</td>
<td>Introduction of Workshop Participants</td>
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<tr>
<td>45 minutes</td>
<td><strong>A First Look at Vulnerability Assessment – Sensitivity and Adaptive Capacity</strong> Participants will identify the extent to which climate change impacts will affect the functionality of a fictive municipality and assess its ability to accommodate these changes with little cost or disruption. They will then discuss and rank the impacts based on their respective sensitivity and adaptive capacity ratings.</td>
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<tr>
<td>15 minutes</td>
<td><strong>A First Look at Risk Assessment – Consequence and Likelihood</strong> Participants will evaluate the consequences of climate change impacts against five criteria (i.e. public safety, local economy and growth, community and lifestyle, environment and sustainability, public administration) and determine likelihood. They will then identify the risk score of each impact for assessment.</td>
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<tr>
<td>10 minutes</td>
<td><strong>Report Back</strong> Participants will summarize their discussions and report the highest ranking risks, surprising findings and highlights of the conversation.</td>
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<tr>
<td>5 minutes</td>
<td><strong>Wrap Up</strong></td>
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<tr>
<td><strong>Panel - W1A</strong></td>
<td><strong>How Provinces and Territories are Adapting to Climate Change / Comment les provinces et les territoires s’adaptent-ils aux changements climatiques</strong></td>
<td><strong>Presentation - W1B</strong></td>
<td><strong>Presentation - W1C</strong></td>
<td><strong>Presentation – W1E</strong></td>
<td><strong>Presentation - W1F</strong></td>
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<tr>
<td><strong>Caroline Larrivee, OURANOS – chair</strong></td>
<td><strong>Adapting Sustainable Forest Management using Embedded Scientists and Science-Management Partnerships / Adapter la gestion durable des forêts avec partenariat scientifiques et gestionnaires</strong></td>
<td><strong>Using Projections of Extreme Precipitation to Support Infrastructure Design / Projections de précipitations extrêmes et conception d’infrastructures</strong></td>
<td><strong>Kevin Behan, Clean Air Partnership – chair</strong></td>
<td><strong>Community Energy Planning, Energy Utility Adaptation, and Smart Energy Networks</strong></td>
<td><strong>Adapting the Winter Tourism of the Pyrenees to a Future Climate Change</strong></td>
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<tr>
<td><strong>Thomas White, British Columbia Government (TBC)</strong></td>
<td><strong>Vincent Roy, SCF, Natural Resources Canada – chair</strong></td>
<td><strong>Alex Cannon, Environment and Climate Change Canada – chair</strong></td>
<td><strong>Kevin Anderson, Environment and Climate Change Canada</strong></td>
<td><strong>Community Energy Planning, Energy Utility Adaptation, and Smart Energy Networks</strong></td>
<td><strong>Stéphanie Bleau, OURANOS – chair</strong></td>
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<tr>
<td><strong>Catherine Gauthier, Gouvernement du Québec</strong></td>
<td><strong>Projecting changes to temporal scaling properties of extreme precipitation over Canada</strong></td>
<td><strong>Can we provide robust advice to support infrastructure design?</strong></td>
<td><strong>Francis Zwers, PCIC</strong></td>
<td><strong>Anticipated Shifts in Boreal Ecosystems and Characteristics of Climatic Refugia for Boreal Ecosystems and Species</strong></td>
<td><strong>Al Douglas, OCCIAR – chair</strong></td>
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<tr>
<td><strong>Jeff Hoyt, New Brunswick Government</strong></td>
<td><strong>Mark Johnston, Saskatchewan Research Council</strong></td>
<td><strong>General Considerations as to How Future Projections of Extreme Precipitation could be Integrated into Infrastructure Design</strong></td>
<td><strong>Alain Mailhot, INRS</strong></td>
<td><strong>Simulating Spatio-Temporal Dynamics of Boreal Bird Habitats Under Natural and Anthropogenic Disturbances in a Climate-Change Context</strong></td>
<td><strong>Selected Industries and Extreme Climatic Variability: Adaptable or Vulnerable?</strong></td>
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<tr>
<td><strong>Kathleen O’Neill, Ontario Government</strong></td>
<td><strong>Climate Change and the Forest Sector: Perception of Principal Impacts and of Potential Options for Adaptation</strong></td>
<td><strong>Temporal Scaling of Extreme Forest Disturbances in a Changing World</strong></td>
<td><strong>Alain Mailhot, INRS</strong></td>
<td><strong>Temporal Scaling of Extreme Forest Disturbances in a Changing World</strong></td>
<td><strong>An Assessment of the Costs and Benefits of Climate Change Adaptation</strong></td>
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<tr>
<td><strong>Bob Manteau, Alberta Government</strong></td>
<td><strong>Forest Management Planning and Vulnerability Assessment: Opportunities for Integrating Climate Change Science into Sustainable Forest Management</strong></td>
<td><strong>Spatio-Temporal Scaling of Extreme Forest Disturbances in a Changing World</strong></td>
<td><strong>Annette Morand, OCCIAR</strong></td>
<td><strong>Spatio-Temporal Scaling of Extreme Forest Disturbances in a Changing World</strong></td>
<td><strong>Sean Capstick, Goldier Associates</strong></td>
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<tr>
<td><strong>Randall Shymko, Manitoba Government (TBC)</strong></td>
<td><strong>Climate Change and the Forest Sector: Perception of Principal Impacts and of Potential Options for Adaptation</strong></td>
<td><strong>Understanding the Current State of Awareness and Action on Adaptation in the Electricity Generation, Transmission and Local Distribution Sector</strong></td>
<td><strong>Laura Zizzo – Zizzo Strategy Inc.</strong></td>
<td><strong>Understanding the Current State of Awareness and Action on Adaptation in the Electricity Generation, Transmission and Local Distribution Sector</strong></td>
<td><strong>Environmental Assessments as a Mechanism to Influence Climate Change Adaptation - Best Practices</strong></td>
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<tr>
<td><strong>Chad Blundon, Newfoundland Government</strong></td>
<td><strong>Adaptation in the Canadian Forest Products Sector: getting to action now</strong></td>
<td><strong>Integrating Extreme Precipitation into Infrastructure Design</strong></td>
<td><strong>Peter Nimmrichter, Amec Foster Wheeler</strong></td>
<td><strong>Integrating Extreme Precipitation into Infrastructure Design</strong></td>
<td><strong>Erik Sparling, Risk Sciences International</strong></td>
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<tr>
<td><strong>Ben Filewood, Forest Products Association of Canada</strong></td>
<td><strong>Adaptation in the Canadian Forest Products Sector: getting to action now</strong></td>
<td><strong>Building Energy Sector Resilience to the New Normal – Overcoming Barriers to Adaptation</strong></td>
<td><strong>Marco Braun, OURANOS</strong></td>
<td><strong>Building Energy Sector Resilience to the New Normal – Overcoming Barriers to Adaptation</strong></td>
<td><strong>Case Studies of Climate Change Adaptation in Canadian Mining Companies</strong></td>
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<tr>
<td><strong>Allyson Bingeman, GHD Ltd</strong></td>
<td><strong>Adaptation in the Canadian Forest Products Sector: getting to action now</strong></td>
<td><strong>Conservation Planning Case Studies in Northern Canada</strong></td>
<td><strong>Justina Ray, Wildlife Conservation Society Canada</strong></td>
<td><strong>Conservation Planning Case Studies in Northern Canada</strong></td>
<td><strong>Bob Purdy, Fraser Basin Council</strong></td>
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<tr>
<td><strong>Panel – W2A</strong></td>
<td><strong>Presentation - W2B</strong></td>
<td><strong>Presentation -W2C</strong></td>
<td><strong>Panel - W2D</strong></td>
<td><strong>Presentation – W2F</strong></td>
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<tr>
<td><strong>Private sector climate change risks and opportunities in a competitive world / Perspectives du secteur privé sur les risques et les opportunités climatiques dans un monde compétitif</strong></td>
<td><strong>Preparation pour les extrèmes et prévention – des outils pour la santé publique / Preparedness to extremes and prevention – tools for public health</strong></td>
<td><strong>Southern First Nations Adapting to Climate Change / Adaptation aux changements climatiques des communautés autochtones du sud</strong></td>
<td><strong>Building the knowledge foundation through assessments; learning from the past and planning for the future</strong></td>
<td><strong>Impact and adaptation responses in communities of place and practice to climate change: A tale of physics, phytoplankton, fish and fisheries for salmon on the west coast of Vancouver Island, British Columbia</strong></td>
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<tr>
<td>Alain Bourque, Ouranos - chair</td>
<td>Céline Campagna, INSPQ – chair</td>
<td>Marie-Eve Néron, Indigenous and Northern Affairs Canada – chair</td>
<td>Fiona Warren, Natural Resources Canada – chair</td>
<td>Kim Hyatt, Fisheries and Ocean Canada - chair</td>
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<tr>
<td>Pascale Lagacé, Vice President, Environment and Climate Change, Resolute Forest Products</td>
<td>Real-Time Surveillance of Adverse Environmental Conditions and Associated Health Outcomes</td>
<td>Building adaptive capacity and climate change resiliency in Indigenous communities</td>
<td>Linda Mortsch, University of Waterloo, IPCC Assessments</td>
<td><strong>Productivity responses of Barkley Sound salmon to climate variation and change impacts in the Pacific Ocean</strong></td>
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<tr>
<td>Joan Frain, Senior Manager, Water Resources, Ontario Power Generation (OPG)</td>
<td>Impacts organisationnels de SUPREME en surveillance des événements météorologiques extrêmes au Québec</td>
<td>Climate Change Adaptation Planning with the Chipewyas of Georgina Island First Nation</td>
<td>Roger Street, UKCIP, UK Science Assessments</td>
<td>Pacific salmon responses to climate variation and change in freshwater ecosystems for salmon on the BC Coast</td>
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<tr>
<td>Ben Chalmers, Vice President of Sustainable Development - Mining Association of Canada</td>
<td>Pierre Gosselin, INSPQ</td>
<td>Kerry-Ann Charles, Georgina Island First Nation</td>
<td>Don Lemmen, Natural Resources Canada, Canadian national-scale assessments</td>
<td>Howard Stiff, Fisheries and Oceans Canada</td>
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<tr>
<td>Don McCabe, President, Ontario Federation of Agriculture</td>
<td>Toward an Evidence-Based Approach for Wildfire Smoke Health Response in Canada</td>
<td>Réalisation du plan d’adaptation aux changements climatiques de Wôlinak et d’Odanak</td>
<td>Hélène Coté, Ouranos, Canadian regional assessment (Québec)</td>
<td>Adaptation responses of fisheries and fisheries managers to climate induced impacts on sockeye salmon returns to Barkley Sound, British Columbia</td>
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<td>Jeff Eyamie, Health Canada</td>
<td>Myriam Beauchamp, Grand Conseil de la Nation Waban-Aki</td>
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<td>Diana Dobson, Fisheries and Oceans Canada</td>
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<td>Community-based climate change cost-benefit analysis on infrastructure</td>
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<td>Managing freshwater systems to meet the competing needs of salmon production, urban and industrial development in Port Alberni and the Somass watershed of British Columbia given historic to future risks of climate change</td>
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<td>Jean-Christophe (J-C) Amado, Senior Climate Risk and Resilience Specialist</td>
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<td>Barry Chilibeck, Northwest Hydraulic Consultants</td>
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<td>Panel – W3A</td>
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<td><strong>1:30 pm to 3:00 pm</strong></td>
<td><strong>Presentation - W3B</strong></td>
<td><strong>Presentation - W3C</strong></td>
<td><strong>Panel - W3D</strong></td>
<td><strong>Panel – W3E</strong></td>
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<tr>
<td>Challenges of private sector in helping Canada becoming more resilient / Rôle et capacité du secteur privé pour bâtir la résilience du Canada</td>
<td>Importance of shorelines for climate change adaptation / L’importance des côtes dans l’adaptation aux changements climatiques</td>
<td>Infrastructures vertes et changements climatiques : développer une stratégie multi-échelle basée sur la complexité et la résilience urbaine / Green Infrastructures and Climate Changes: Developing a Multiscale Strategy Based on the Complexity and Urban Resilience</td>
<td>Understanding Flood Risk Policies and programs to address flooding from extreme weather</td>
<td>Crossing the divide: The value of interdisciplinary approaches to mitigation and adaptation</td>
</tr>
<tr>
<td>Al Douglas, Ontario Centre for Climate Impacts and Adaptation Resources – chair</td>
<td>Danika Van Proosdij, Saint Mary’s University – chair</td>
<td>Jérôme Dupras, Université du Québec en Outaouais – chair</td>
<td>Jo-Anne Rzadki, Conservation Ontario – chair</td>
<td>Colleen Mercer-Clarke, Canadian Society of Landscape Architects – chair</td>
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<tr>
<td>Jonathan Philipsborn, Director of Climate Adaptation - Americas at AECOM</td>
<td>Building the Case: Strategic Decision Making for Managed Realignment of Agricultural Marshlands</td>
<td>Strategies to Promote the Implementation of Green Infrastructures in Urban Areas</td>
<td>Adapting Flood Risk Management – Preparing for an Unknown Future in Ontario</td>
<td>There’s more to this than Sea Level Rise: The Role of Expert Teams, Research Partnerships and Community Involvement</td>
</tr>
<tr>
<td>Monika Federau, SVP &amp; Chief Strategy Officer, Intact Financial Corporation</td>
<td>Danika van Proosdij, Saint Mary’s University</td>
<td>Jérôme Dupras, UQO</td>
<td>Ryan Ness and Fabio Tonto, Toronto Region Conservation Authority</td>
<td>Colleen Mercer Clarke, Canadian Society of Landscape Architects</td>
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<tr>
<td>Gordon Beal, Chartered Professional Accountants Canada</td>
<td>The first 10 metres: Coastal flooding, climate change and the social vulnerability of populations in Nova Scotia</td>
<td>Designing a Network of Green Infrastructure for Greater Montreal</td>
<td>Climate Change for the Bow River Watershed</td>
<td>Climate Change in the North</td>
</tr>
<tr>
<td>Jean-Christophe (J-C) Amado, Senior Climate Risk and Resilience Specialist</td>
<td>Patricia Manuel, Dalhousie University</td>
<td>Andrew Gonzalez, McGill</td>
<td>Heather Auld, RSI</td>
<td>Georges Guanish, Naskapi Nation of Kawachikamach</td>
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<tr>
<td>Jean-Pierre Savard, Ouranos</td>
<td>L’impact du “coastal squeeze” sur les écosystèmes côtiers meubles québécois de l’estuaire et du golfe du Saint-Laurent dans le contexte de la hausse appréhendée du niveau de la mer</td>
<td>Incorporating Biodiversity and Complexity into Urban Forestry</td>
<td>Addressing the greatest flooding risks in Nova Scotia – Responding to high tides, extreme sedimentation, ice jams and floodplain development</td>
<td>Indigenous People, Place, and Traditional Food in Changing Northern Environments</td>
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<tr>
<td>Living Shorelines: success stories from Nova Scotia</td>
<td>Christian Messier, UQAM-UQO</td>
<td>Balancing Ecosystem Services and Vulnerability Reduction in the Implementation of Green Stormwater Infrastructure</td>
<td>Alex Wilson, CBCL Ltd</td>
<td>Impacts and Adaptations: Insights on Climate Change and Food Security from Canadian Arctic Indigenous Communities</td>
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<tr>
<td>Robin Tress, Ecology Action Centre</td>
<td>Danielle Dagenais, Université de Montréal</td>
<td>Daniella Dagenais, Université de Montréal</td>
<td>Partners for Action – Advancing Flood Resiliency in Canada</td>
<td>Community-wide Implementation of Green Stormwater Infrastructure - Policies and Strategies for Local Action</td>
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<td>La Ceinture et Trame Verte et Bleue du Grand Montréal : Une démarche d’adaptation aux changements climatiques</td>
<td>Jean-François Dallaire, Nature-Action Québec</td>
<td>Shawna Peddle, Partners for Action</td>
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<tr>
<td>Time</td>
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| 3:30 pm - 5:30 pm | Room/Salle 215 | **Bridging the Gap: Tools to Integrate Adaptation into Electricity Sector Planning**  
                 |                 | Devin McCarthy, Canadian Electricity Association - chair                           |
|              |                | **Assessing Climate Impacts on Energy Demand in Canada**                           |
|              |                | Mary-Ann Wilson, Catherine Marchand, Natural Resources Canada                      |

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<th>Presentation - W4B</th>
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</table>
|              |                | **Economic Study of the Potential Impacts of Low Water Levels in the St. Lawrence River and Adaptation Options in the Context of Climate Change**  
                 |                | Élyse Fournier,  
                 |                | Annelies Allard,  
                 |                | ICLEI Quebec - chair |
                 |                | M. Fisher, Council of the Great Lakes Region (CGLR)  
                 |                | Nicole Auclair,  
                 |                | ICLEI Quebec - chair |
|              |                | **Impacts des changements climatiques sur le régime des tempêtes et les surcotes dans la région de la Baie d'Hudson et de la Baie James**  
                 |                | Jean-Pierre Savard,  
                 |                | Ouranos - chair |
|              |                | **Wave Climate in the Gulf of St-Lawrence and its Future Evolution**  
                 |                | Urs Neumeier,  
                 |                | ISMER-UQAR - chair |
|              |                | **Climate Change and Adaptation Strategies of Canadian Ports and Shipping**  
                 |                | Claude Comtois,  
                 |                | Université de Montréal - chair |
|              |                | **The value économique de la pêche et des services écosystémiques au lac Saint-Pierre**  
                 |                | Jie He, Université de Sherbrooke - chair |

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<th>Time</th>
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| 5:00 pm - 5:30 pm | Room/Salle 214 | **Coastal Adaptation Tools: New Developments and Learnings at the Digital Era / Outils d'adaptation des côtes: nouveau développement à l'ère digitale**  
                 |                | Élyse Fournier,  
                 |                | Annelies Allard,  
                 |                | ICLEI Quebec - chair |
|              |                | **Projections of Relative Sea-level Change in Canada Based on the IPCC AR5**  
                 |                | Thomas James,  
                 |                | Natural Resources Canada - chair |
|              |                | **Impacts des changements climatiques sur le régime des tempêtes et les surcotes dans la région de la Baie d'Hudson et de la Baie James**  
                 |                | Jean-Pierre Savard,  
                 |                | Ouranos - chair |
|              |                | **Wave Climate in the Gulf of St-Lawrence and its Future Evolution**  
                 |                | Urs Neumeier,  
                 |                | ISMER-UQAR - chair |
|              |                | **Climate Change and Adaptation Strategies of Canadian Ports and Shipping**  
                 |                | Claude Comtois,  
                 |                | Université de Montréal - chair |
|              |                | **The value économique de la pêche et des services écosystémiques au lac Saint-Pierre**  
                 |                | Jie He, Université de Sherbrooke - chair |

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| 5:30 pm - 6:00 pm | Room/Salle 207 | **Mobilizing Climate Adaptation Tools into Professional Practice**  
                 |                | Devin Causley,  
                 |                | Federation of Canadian Municipalities - chair |
|              |                | **Les défis de gestion des infrastructures aéroportuaires du ministère des Transports, de la Mobilité durable et de l'Électrification des transports du Québec dans l'Arctique québécois : De la recherche en adaptation aux changements climatiques à l’application**  
                 |                | Anick Guimond,  
                 |                | Ministère des Transports, de la Mobilité durable et de l'Électrification des transports du Québec - chair |
|              |                | **Vulnerability Assessment Tools for Transportation Infrastructure**  
                 |                | Cassandra Bhat,  
                 |                | ICF International - chair |
|              |                | **Enhancing Climate Resilience for the Canadian Transportation System**  
                 |                | Nicole Legault,  
                 |                | Transport Canada - chair |
|              |                | **Resilience: Climate Change, Extreme Weather and Transportation Systems**  
                 |                | Terry Zdan,  
                 |                | Manitoba Infrastructure and Transport - chair |
|              |                | **The Metrolix Climate Change Resiliency Study**  
                 |                | Sue Sherman,  
                 |                | AECOM - chair |
Abstract

Provincial and territorial governments play a central role in adapting to climate change through the mandates they are responsible for. Despite significant climatic, geographic, social and economic differences between the provinces/territories, it has been observed that in Canada, this level of government often acts as an important driver for adaptation to climate change.

The panel will offer an update concerning the actions of provincial and territorial governments that sets the table for a discussion on the range of challenges they face. What actions or strategies can be implemented by this level of government? Where are these jurisdictions most effective in terms of the actions needed to adapt? Must institutional changes be considered to promote adaptation practices while avoiding maladaptation? In which ways can the provinces/territories encourage an active and relevant participation of stakeholders while maintaining a more global outlook on development (regional scales and links with neighboring regions)? How can they spark coherent and coordinated action with communities, private stakeholders and NGOs? What would be the key factors behind a better use of science and knowledge for decisions made at provincial/territorial-level governments?

This session will benefit from the combined experience of several provincial and territorial governments to explore various options and avenues to overcome the major challenges associated with adaptation to climate change.

Panel members

Thomas White, British Columbia Government
Catherine Gauthier, Gouvernement du Québec
Jeff Hoyt, New Brunswick Government
Rebecca World, Yukon Government
Kathleen O’Neill, Ontario Government
Bob Manteaw, Alberta Government
Chad Blundon, Newfoundland Government
Abstracts

Mark Johnston, Saskatchewan Research Council
Forest Management Planning and Vulnerability Assessment: Opportunities for Integrating Climate Change Science into Sustainable Forest Management

Climate change vulnerability assessment (VA) provides a structured process for determining how climate change will affect forest ecosystems and forest management systems, and for identifying and implementing adaptation options as part of Sustainable Forest Management (SFM). However, VA requires a commitment of financial resources, human resources and in some cases additional scientific expertise. The key to successful VA is to incorporate the work into existing planning processes and decision making – i.e. mainstreaming VA into SFM. Many jurisdictions in Canada require long-term forest management plans that are done by either forest companies or by government. These plans typically have relatively long time horizons (e.g. 20 years) and are exercises in which organizations think and plan at the strategic level. These planning exercises provide an ideal vehicle for mainstreaming climate change vulnerability assessment into SFM at an appropriate temporal and spatial scale. In addition, since forest management plans are often required under regulations, organizations typically have budget and human resources already allocated for these exercises. We provide several case studies illustrating how VA can be incorporated into forest management plans. We also show how the process of incorporating VA into SFM has evolved since the mid-2000s, from ad hoc individual efforts to a well-developed methodology that includes a framework, supporting technical tools and a practitioner’s guidebook. We also present a compendium of forest climate change adaptation activities from across Canada. All of these tools result from a large forestsector-wide effort to develop practitioner support for VA, done under the auspices of the Canadian Council of Forest Ministers.

David L. Peterson, United States Forest Service
Making Climate Change Adaptation Work in U.S. National Forests

The U.S. Forest Service uses science-management partnerships to (1) provide education for resource specialists, (2) conduct vulnerability assessments, (3) develop adaptation options, and (4) implement climate-smart principles in management and planning. Using an all-lands approach, assessments are conducted at the scale of millions of hectares and for a broad range of resources including vegetation, water, fisheries, wildlife, recreation, cultural resources, and ecosystem services. Partnerships include federal and state agencies,
Native American tribes, non-governmental organizations, and universities. To date, assessments for 40 national forests and 7 national parks in the western United States are complete or in process. Assessments and adaptation strategies are increasingly being incorporated in national forest land management plans and ecological restoration projects, including on-the-ground activities. Although many of the projected gradual changes in ecosystems can be addressed through various adaptation strategies and tactics, the increasing frequency and magnitude of ecological disturbances (drought, insects, wildfire) provide major challenges for building resilience across large landscapes. Increased organizational capacity to address climate change and monitoring of the effectiveness of adaptation options are needed to reduce negative outcomes and transition ecosystems to a warmer climate.

Expected impacts and adaptation measures were grouped according to biomes and sectors. Prioritized impacts included increases in extreme meteorological events and natural disturbances. Impacts were also expected for human or economic systems such as reductions in wood volume and quality, difficulties in accessing forests, and additional costs for forest operations. Adaptation was perceived to come from new policies, a greater awareness, and local and regional adjustments to forest operations and management. Identified barriers to adaptation included lack of knowledge or understanding of CC impacts, lack of scientific support and knowledge transfer, and lack of leadership in CC issues at a regional scale. This synthesis will help orient future needs in climate-sensitive forest management planning and identify ways to increase adaptive capacity of the forest sector.

Ben Filewood, Forest Products Association of Canada
Adaptation in the Canadian Forest Products Sector: getting to action now

Canada’s forests are located in the rapidly warming northern hemisphere and subject to strong temperature controls on growth and disturbance. The forest products sector and the lands it manages are at the front lines of global climate change, with transformational impacts expected in the near term and some already recorded. Proactive adaptation on these time scales requires working within the complex framework of regulation, economic options and social licence that defines Canada’s unique brand of sustainable forest management. Adaptation in the forest sector must therefore recognize the importance of cross-cutting linkages from forest to marketplace in mapping paths to ecological sustainability. The Canadian Boreal Forest Agreement, by area the world’s largest conservation deal, is of singular importance to efforts to adapt to climate change in Canada’s most northern forests, offering both future opportunity and important lessons about the value of multi-stakeholder collaboration.
Finding options that work for multiple stakeholders with varied management goals is possible when common principles guide discussion, but decision-making with often inconclusive scientific evidence requires expert guidance, technical education for policy-makers, and a shared approach to risk management.
Session: W1C – Anderson
Using Projections of Extreme Precipitation to Support Infrastructure Design / Projections de précipitations extrêmes et conception d’infrastructures

Wednesday April 13 – 8:30 am to 10:00 am
Panel Session
Simultaneous Interpretation

Session Chair: Kevin Anderson, Environment Canada

Abstracts

Alex Cannon, Environment and Climate Change Canada
Projected changes to temporal scaling properties of extreme precipitation over Canada

This presentation provided an overview of the IPCC AR5 key messages for extreme precipitation, sub-daily precipitation extremes and IDF curves (are common stationarity assumptions valid?), and an example of daily to sub-daily temporal scaling (i.e. slope of IDF curves, fidelity of sub-daily scaling in climate model simulations, and future changes (robustness in multiple models)).

Francis Zwiers, PCIC
Can we provide robust advice to support infrastructure design?

- Understanding of the impact of anthropogenic forcing on extremes remains limited, but it is safe to conclude that stationarity is dead
- Projected changes are large (emissions scenario, time horizon and model dependent)
- We do not yet know much about accumulation periods shorter than 1-day
- If we could produce robust, complete future IDF curves, would we know what to design for?
  - Average 2% annual probability of failure over a 50-year design lifetime?
  - Maximum 2% probability of failure in any year of a 50-year design lifetime?

Stationarity is dead, but we don’t yet have a good approach for dealing with non-stationarity.

Alain Mailhot, INRS
General Considerations as to How Future Projections of Extreme Precipitation could be Integrated into Infrastructure Design

Intense-Duration-Frequency curve update for Newfoundland and Labrador
Allyson Bingeman, GHD Ltd

Integrating Extreme Precipitation into Infrastructure Design
Peter Nimmrichter, Amec Foster Wheeler

General Considerations as to How Future Projections of Extreme Precipitation could be Integrated into Infrastructure Design

It is now recognized that extreme precipitation will be more intense in future climate even if available projections from climate models remain uncertain on the amplitude of these changes especially at small spatial and temporal scales. Considering that the design of water infrastructures is based on statistical analysis of historical rainfall records, an increase in the intensity and frequency of extreme rainfall events will result in more frequent and intense flooding. Revision of infrastructure design and criteria design are therefore essential in a context of evolving climate. From now on the following information need to be integrated into infrastructure design: 1)

1)
available climate projections for extreme rainfall over the region under consideration; 2) mean expected level of performance or acceptable level of risk; and 3) expected lifetime of the infrastructure/system. The resulting design criterion must ensure that the service level remains above the selected “acceptable” level over a predefined portion of the infrastructure lifetime. New design criteria should also be part of a global adaptation strategy combining various measures to maintain an acceptable level of service in a long-term perspective. Defining this level of service is however a challenge in a context where uncertainties on projected changes in intense rainfall are still important.

Allyson Bingeman, GHD Ltd

**Intensity-Duration-Frequency curve update for Newfoundland and Labrador**

Global Climate Models (GCMs) predict increased frequency and intensity of future extreme precipitation events. Engineers, planners, and policy makers utilize rainfall Intensity Duration Frequency (IDF) curves to describe precipitation characteristics for municipal planning and infrastructure design. However, in Canada, a number of the climate stations used to produce IDF curves are no longer active. The resulting IDF curves do not reflect recent trends in precipitation, with potentially significant impacts on public safety. Furthermore, future predictions of precipitation also depend on a clear understanding of current precipitation trends. Therefore, it is vital to obtain up-to-date IDF curves for inactive stations. An IDF update was performed for the province of Newfoundland and Labrador, where 13 of the 19 IDF curves were produced from inactive stations. Recent precipitation data were available, but the combination of data from multiple stations and/or measurement gauges has implications on the accuracy of the resulting IDF curve. Therefore, it is necessary to test the data to ensure that the new data source(s) are homogeneous with the existing IDF curve data. This presentation will focus on the methodology developed and used for the IDF curve update in Newfoundland and Labrador. Future climate IDF curves were produced with the Intensity-Duration-Frequency under a Changing Climate (IDF_CC) tool, which uses GCM predictions to estimate the future precipitation characteristics. The result of the analysis was updated current and future climate IDF curves for the province, providing up-to-date tools for climate change preparedness and adaptation.

Peter Nimmrichter, Amec Foster Wheeler

**Integrating Extreme Precipitation into Infrastructure Design**

This presentation provided examples of:

1. what data AMEC Foster Wheeler is using in infrastructure design:
   - Return Period Rainfall/IDF curves
   - Recorded Rainfall Events
   - Radar
   - Projected Daily Data
   - Projected IDF
   - Current and Future Probably Maximum Precipitation
2. Case studies showing how they use the data
   - Coronation Blvd, Cambridge, ON
   - Welland, ON – CCVA
   - Flood risk Maps, Newfoundland
   - Tottenham Airfield
3. Challenges

**Existing Data**
   - Data accessibility
   - Common platform
   - Standard measurement protocol
   - Need for more stations
   - Research into inter-station interpolation methods
   - More frequent updating of IDF data

**Projected Data**
   - Understanding of different methods/tools
   - Better interoperability amongst tools
   - Understanding of models best suited to circumstances or location
   - Need for research into potential impacts of climate change on PMP.
Session: W1D - Behan
Adaptation in the Energy Sector – Drivers, Barriers and Policies

Wednesday April 13 – 8:30 am to 10:00 am
Presentation Session

Session Chair: Kevin Behan, Clean Air Partnership

Community Energy Planning, Energy Utility Adaptation, and Smart Energy Networks
Sarah Marchionda - QUEST – Quality Urban Energy Systems of Tomorrow

Demonstrating the Near to Long-Term Benefits of Harmonized Policy Development for Building Climate Change Resilience in the Canadian Energy Sector
Ryan Hennessey, Yukon Energy Centre and Annette Morand, OCCIAR

Understanding the Current State of Awareness and Action on Adaptation in the Electricity Generation, Transmission and Local Distribution Sector
Laura Zizzo - Zizzo Strategy Inc.

Building Energy Sector Resilience to the New Normal – Overcoming Barriers to Adaptation
Marco Braun, Ouranos

Abstracts


Impacts from a changing climate have exposed critical energy distribution infrastructure to significant risks in recent years. These impacts have led to adverse outcomes leaving millions of Canadian homes and businesses without power, heating or cooling for extended periods of time. The interruption or loss of energy distribution is not only a serious public health and safety risk; it can have long term negative impacts on economic activity, energy distribution rates, public confidence, and utility reputation.

The Resilient Pipes and Wires project undertakes to:
- Identify the level of awareness of climate change risks within the energy distribution sector and describe the actions energy distributors are taking to adapt to extreme weather events;
- Identify federal, provincial and local policies relevant to adaptation actions;
- Demonstrate how government policies are acting as drivers or barriers to adaptation in the energy distribution sector; and
- Recommend measures to address identified barriers and leverage drivers to
- enable adaptation and enhance resilience in the energy distribution sector

Ryan Hennessey, Yukon Energy Centre
Demonstrating the Near to Long-Term Benefits of Harmonized Policy Development for Building Climate Change Resilience in the Canadian Energy Sector

The Canadian energy sector is in a period of rapid transition. Canada is currently looking to the energy sector to provide low-cost and reliable energy and infrastructure to support economic development. At the same time, the energy sector must meet ever increasing levels of demand from rising numbers of customers, address aging infrastructure and infrastructure shortfalls resulting from a changing climate, respond innovatively to emerging technologies, reduce a large carbon footprint during a period of expansion, and manage all changes in a socially and environmentally responsible manner. Meeting all of these objectives requires a cost-effective and supportive policy framework. We argue that a harmonized approach to policy development can yield significant short- and long-term
benefits. We demonstrate these benefits by examining six case studies from Canada and five from other countries around the world.

Laura Zizzo, Zizzo Strategy Inc
Understanding the Current State of Awareness and Action on Adaptation in the Electricity Generation, Transmission and Local Distribution Sector

Climate change has the potential to do costly damage, not just to electricity generation and transmission assets, but also to the broader Canadian economy that depends on them. A coordinated effort must be undertaken to ensure electricity systems remain reliable and grid resilience is protected in light of changing circumstances. There are ample opportunities to assist the Canadian electricity generation and transmission sectors in improving their climate preparedness, building resilience and ensuring a sustainable electricity future. The first step in this process is to understand what electricity companies are already doing (or not doing) to prepare for a new climate reality.

Marco Braun, Ouranos
Building Energy Sector Resilience to the New Normal – Overcoming Barriers to Adaptation

Climate parameters like temperature and precipitation are of great relevance in a large number of elements of the energy sector value chain. Transmission lines, hydropower generation, demand forecast or the cooling requirements of thermal energy generation are only a few examples where climate and weather are integral parts of management. As climate change is modifying these parameters at various spatial and temporal scales it seems apparent that current practices may need revision. While some businesses have started to adapt to new normal conditions and increased their climate resilience, others are reluctant to address the issue, which often is a consequence of barriers they encounter in doing so.

In a study at the Ouranos Consortium that researched adaptation case studies in the energy sector we put a focus on identifying these barriers on the way of building climate resilience through adaptation. This presentation discusses the source and nature of such barriers, the difficulties they represent and how businesses managed to overcome them in their adaptation process.
Session: W1E – Stralberg
Maintaining Biodiversity and Ecosystem Services in the Face of Climate Change: A New Era of Conservation Planning

Tuesday April 12 – 8:30 am to 10:00 am
Presentation Session

Session Chair: Diana Stralberg, University of Alberta

Data and Tools for Assessing Threats to Biodiversity and Ecosystems across North America
Carlos Carroll, KCCR

Anticipated Shifts in Boreal Ecosystems and Characteristics of Climatic Refugia for Boreal Ecosystems and Species
Diana Stralberg, University of Alberta

Simulating Spatio-Temporal Dynamics of Boreal Bird Habitats under Natural and Anthropogenic Disturbances in a Climate-Change Context
Junior Tremblay, Environment and Climate Change Canada

Conservation Planning Case Studies in Northern Canada
Justina Ray, Wildlife Conservation Society Canada

Abstract

Session abstract: Anthropogenic climate change threatens to rapidly reshuffle the biodiversity arena, resulting in new challenges for land management and the conservation of species and ecosystems. Consequently, robust adaptation strategies for biodiversity and ecosystem services conservation require a re-evaluation of planning, prioritization, and monitoring approaches. Given the scale of climate change and its indifference to provincial and international boundaries, collaborative planning perspectives are needed at scales beyond those governing most traditional planning approaches. This session provides an overview of climate-smart, data-driven approaches to conservation planning and prioritization in Canada, with an emphasis ranging from planning processes to spatial datasets and tools.

Presenters

Data and Tools for Assessing Threats to Biodiversity and Ecosystems across North America
Carlos Carroll, KCCR

Anticipated Shifts in Boreal Ecosystems and Characteristics of Climatic Refugia for Boreal Ecosystems and Species
Diana Stralberg, University of Alberta

Simulating Spatio-Temporal Dynamics of Boreal Bird Habitats under Natural and Anthropogenic Disturbances in a Climate-Change Context
Junior Tremblay, Environment and Climate Change Canada

Conservation Planning Case Studies in Northern Canada
Justina Ray, Wildlife Conservation Society Canada
Session: W1F – Bleau Innovation and Adaptation of Winter Tourism in a Changing World

Wednesday April 13 – 8:30 am to 10:00 am
Presentation Session

Session Chair: Stéphanie Bleau, OURANOS

Abstracts

Dr Marc Pons, Sustainability Observatory of Andorra (OBSA)
Adapting the Winter Tourism of the Pyrenees to a Future Climate Change

The Pyrenees is one of the most important winter tourism regions in Europe after the Alps comprising the south of France, north of Spain and the small country of Andorra. Among all the winter activities, alpine ski is the most important one in this region in terms of visitors and revenues. Enclosing 49 alpine ski resorts, this region receives around 11 million of skiers per year, having a huge impact in the economy of the mountain communities. A high geographic variability at very short distances is observed in the vulnerability level of the Pyrenean ski resorts to future climate change.

This heterogeneity, due to both the physical and the socioeconomic specificities of each ski resort, leads to different challenges and the necessity of differentiated adaptation strategies for each case. However, the industry and the public administrations tend to assume that the same mainstream measures and strategies are suited for all ski resorts leading to a misadaptation or a lack of response/inaction in many cases.

Dr Daniel Scott, Waterloo University
A Coupled Model of Ski Operations and Tourist Adaptation to Climate Change Variability and Change: Insights for the Ontario, Quebec and New England Ski Markets

Studies in over 15 countries consistently project decreased reliability of natural snow cover, shortened and more variable ski seasons, as well as increased snowmaking requirements and costs, with attendant implications for community tourism and economic development, including altered ski tourism revenues and seasonal employment, as well as declining real-estate values of vacation properties.

Understanding the differential adaptive capacity of ski operators and the simultaneous demand-side responses to changes in ski conditions are essential to assess the long-term resilience of regional ski tourism markets.
This study developed a coupled ski tourism supply and demand model for the Ontario market utilizing a survey of over 2400 skiers, daily operations data from ski resorts over the last 10 years, climate station data, an updated SkiSim operations model, and an agent-based model. The coupled SkiSim-ABM model was run with historical weather data for seasons representative of an anomalously cold, average and the record warm winter in the region and then validated against reported visitation levels. The impact on total skier visits and the geographic distribution of skier visits within the market were compared, and implications for crowding and visitor satisfaction during anomalously warm winters was an important finding. The coupled model was then used to explore the potential implications of socio-economic and climatic change on this ski tourism market. Ski industry market development projections (trend and intervention scenarios) were used to compare the range of anticipated business conditions acting on the ski tourism industry in this region through the 2040s. The implications of further technical adaptation through snowmaking were also explored. The model reveals the spatial dynamics of climate-driven market shifts in the context of broader market dynamics, identifying areas of likely market contraction and market-share gains, and the importance of market development as an adaptation strategy.

Future warm seasons were particularly devastating for ski visits and overcrowding conditions, emphasizing the limits of technical adaptation and the need to invest in additional peak capacity at strategic destinations to build resilience in the regional ski tourism market. Comparisons with the Quebec and New England ski markets will also be made.

Claude Péloquin, Ski Bromont.

L'adaptation aux changements climatiques et l’industrie du ski au Québec

This presentation will highlight the importance of alpine skiing for the economy. His talk will focus on how the ski industry is coping with changes and how adaptation measures can help reduce operational risks linked to seasonal climate conditions. Insights on how researchers, government bodies and the ski sector can work together to reduce financial impacts will also be discussed.

Kate Germain, ESG UQAM & Laurent DaSilva, Ouranos

Moving Forward with Ski Operators in Quebec to Measure Adaptation

The nature-based and snow depended winter sports provided by tourist operations play a crucial role in regional and local economies. Climate Change can thus be considered a threat, and tourism managers and operators should plan accordingly to reduce their exposure. Interests now focus on feasible adaptation responses to the current effects and projected climate, along with its interrelated socioeconomic risks. Moreover, growing concerns among tourism stakeholders relate to the need to better understand how and what will be the cost of adaptation solutions if combined to other significant business challenges. This presentation will discuss briefly of the overall research framework for the Tourism sector within Ouranos scientific program. Also, a new project in the works and designed in collaboration with some major ski resorts in Quebec will be featured. This project aims to produce action research that will help stakeholders to make decisions on forecasting horizons that are consistent with the nature of their activities.
Session: W1G – Douglas From Policies to Operations: Adaptation in the Mining Sector

Wednesday April 13 – 8:30 am to 10:00 am
Presentation Session

Session Chair: Al Douglas, OCCIAR

Selected Industries and Extreme Climatic Variability: Adaptable or Vulnerable?
Virginia Wittrock, Saskatchewan Research Council

An Assessment of the Costs and Benefits of Climate Change Adaptation
Sean Capstick, Golder Associates

Case Studies of Climate Change Adaptation in Canadian Mining Companies
Bob Purdy, Fraser Basin Council

Abstracts

Virginia Wittrock, Saskatchewan Research Council

Selected Industries and Extreme Climatic Variability: Adaptable or Vulnerable?

Climate extremes can result in unexpected impacts and associated costs to industry. Appropriate industry risk management strategies have the capability and the potential of benefiting from the positive impacts and coping with the negative impacts of extreme climatic events by understanding the scope and nature of the future changing climatic conditions.

Multiple extreme climatic events, including record setting droughts and floods in southeastern Saskatchewan and southwestern Manitoba have occurred in the last 30 years and the future appears to be at least more of the same and likely greater extreme events in term of intensity, extent and duration. Three industries (potash, electrical generation and oil and gas) were impacted both negatively and positively in the past by these extreme events. With these industries/plants/rigs expecting to be in production for the next 30 to 80 years, there is a potential of them to be impacted physically and economically by the changes in the extreme events and changes to the average climatic regime.

This presentation will examine how these industries were impacted by recent extreme events, what risk management strategies have been implemented to offset historic negative impacts (reactive adaptation) and potential future adaptation strategies or vulnerabilities that still exists based on future climatic variability information.

Sean Capstick, Golder Associates

An Assessment of the Costs and Benefits of Climate Change Adaptation

This presentation will present methods and results from a cost-benefit analysis for climate change for a mining Canadian mining company.

Bob Purdy, Fraser Basin Council

Case Studies of Climate Change Adaptation in Canadian Mining Companies

This presentation will summarize methods and outcomes from Canadian mining companies who are adapting to climate change.
Abstracts: Sessions W2A-W2F

Session: W2A – Bourque
Private sector climate change risks and opportunities in a competitive world / Perspectives du secteur privé sur les risques et les opportunités climatiques dans un monde compétitif

Wednesday April 13 – 10:30 am to 12:00 pm
Panel Session
Simultaneous interpretation

Panel Members:

Pascale Lagacé, Vice President, Environment and Climate Change, Resolute Forest Products

Claude Péloquin, Vice President, Finance and Administration, Ski Bromont

Joan Frain, Senior Manager, Water Resources, Ontario Power Generation (OPG)

Ben Chalmers, Vice President of Sustainable Development - Mining Association of Canada

Don McCabe, President, Ontario Federation of Agriculture

Session Chair: Alain Bourque, OURANOS
Session: W2B – Campagna Préparation pour les extrêmes et prévention – des outils pour la santé publique / Preparedness to extremes and prevention – tools for public health

Wednesday April 13 – 10:30 am to 12:00 pm
Presentation Session
Simultaneous interpretation

Session Chair: Céline Campagna, INSPQ

Real-Time Surveillance of Adverse Environmental Conditions and Associated Health Outcomes
Paul Belanger, Kingston, Frontenac and Lennox & Addington (KFL&A) Public Health, Kingston

Impacts organisationnels de SUPREME en surveillance des événements météorologiques extrêmes au Québec
Pierre Gosselin, INSPQ

Toward an Evidence-Based Approach for Wildfire Smoke Health Response in Canada
Jeff Eyamie, Health Canada

PROJET ILEAU (Interventions locales en environnement et aménagement urbain) à Montréal
Emmanuel Rondia, CRE-Mtl

La stratégie québécoise de réduction de l’herbe à poux et des autres pollens allergènes : perspective provinciale pour une gestion efficace et partagée
Isabelle Demers, INSPQ

Abstracts

Paul Belanger, KFL&A Public Health
Real-Time Surveillance of Adverse Environmental Conditions and Associated Health Outcomes

Kingston, Frontenac and Lennox & Addington (KFL&A) Public Health has pioneered the Public Health Information Management System (PHIMS) to enhance real-time situational awareness and assist with evidence-informed decision-making. Geographic information system (GIS) applications are increasingly being used to provide visual tools (e.g., maps, graphs, tables) for public health surveillance. PHIMS displays maps layered with environmental data, population-based indicators, and health outcomes, enabling the observation of events in real time, detection of potential emergency situations, and identification of areas with vulnerable populations. PHIMS collects and compiles environmental and demographic data from various sources (e.g., Statistics Canada, Environment Canada, Ministry of the Environment, U.S. Geological Survey), and uses web-based mapping applications, spatial analytic functionality, and third-party libraries to achieve map visualizations of the information collected. Users can choose from several base maps, and apply environmental and demographic layers which allow for colour-coded geographic visualization. Real-time environmental information that can be visualized include weather radar data, weather conditions, stream gauges, and heat information. Pertinent public health data are also available, such as forest fires, wildfire smoke forecasts, well water uranium levels, nuclear reactor locations, earthquake information, Air Quality Index, wind strength and direction, as well as plume dispersion of pollutants and toxins. Users can view where the most vulnerable populations reside, and thus prepare and prioritize resources in the event of a public health emergency. By displaying available, real-time, environmental data from multiple partners through PHIMS, public health events can be identified earlier to better prevent, prepare for, and respond to emergencies.

Pierre Gosselin, Institut national de santé publique du Québec (INSPQ) Impacts organisationnels de SUPREME en surveillance des événements météorologiques extrêmes au Québec

Depuis 2010, le système SUPREME a mis à disposition des utilisateurs des directions régionales de santé publique (DSP) du Québec de l’information concernant les événements météorologiques extrêmes
ÉME) pour soutenir la surveillance et la prévention des impacts sanitaires associés. Le système SUPREME comporte trois composantes : les Avertissements, le volet Surveillance et le Géo portail. Depuis son implantation, SUPREME a eu une influence importante dans le développement organisationnel des DSP. Les DSP ont pu, par exemple, établir des justifications rigoureuses des interventions lorsque les données météorologiques signalent un risque élevé d’un ÉME. Ces protocoles, harmonisés pour toute la province, facilitent l’échange entre les régions. SUPREME a aussi favorisé la planification des mesures à prendre avant les saisons à risque pour un aléa et la réalisation de bilans des impacts et interventions à la fin de la saison. Les échanges entre utilisateurs de SUPREME ont permis d’améliorer certains concepts comme la définition des seuils d’avertissements, la définition précise des ÉME, l’utilité des données cartographiques, des guides d’intervention et des formations continues.

SUPREME a aussi permis un rapprochement notable entre les professionnels d’Environnement Canada et ceux de la santé publique et ainsi, la validation des mesures de prévention et d’adaptation aux changements climatiques chez tous les participants. Les résultats détaillés de ces évaluations sont présentés et pourront s’avérer utiles aux organisations qui implantent de tels systèmes d’alerte et de surveillance des ÉME comme outil d’adaptation.

Emmanuel Rondia, CRE-Montréal
PROJET ILEAU (Interventions locales en environnement et aménagement urbain) à Montréal

Le projet ILEAU vise à modifier des pratiques et à améliorer un territoire qui a souffert d’une industrialisation lourde, d’un déficit nature et de barrières comme les autoroutes : on y trouve beaucoup d’îlots de chaleur urbains (ICU), une forte minéralisation et des quartiers isolés. Le projet est réalisé avec un grand nombre de partenaires pour améliorer les milieux de vie des résidents, patients, écoliers et travailleurs. Les objectifs sont : réduire les ICU pour les plus vulnérables, améliorer l’accès aux espaces verte et bleue active et sa biodiversité. 15 000

Jeff Eyamie, Health Canada
Toward an Evidence-Based Approach for Wildfire Smoke Health Response in Canada

Climate change is predicted to cause a significant increase in the frequency and severity of wildfires. The impact to human health from wildfire smoke has become increasingly prevalent in Canadian society. New methods of predicting wildfire smoke (e.g. Bluesky, Firework) have created the potential for an evidence-based approach to health risk management from wildfire smoke events. The health evidence guiding the need to explore interventions including shelter-in-place and community evacuations is further informed by emerging asthma surveillance and epidemiology linking health outcomes to smoke from wildfires. Growing public awareness around air quality and health combined with the implementation of the Air Quality Health Index, have given rise to a growing national and international research community and the development of tools to assist decision-makers in providing health protection interventions that are appropriate to mitigate the impacts of wildfire smoke.

Smoke health protection adaptations will be described alongside an overview of the management of recent Canadian events. Although historically interventions have used a mix of qualitative and quantitative evidence, new approaches are required to take advantage of burgeoning technologies in a milieu of growing pressures to adapt. This overview will touch on the latest advances in smoke forecasting technology, smoke health science, and adaptation tools from across Canada to cope with smoke events in new, more sophisticated ways.

Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR)
végétaux seront plantés sur 100 sites. Parallèlement, les décideurs publics sont interpellés pour participer à l’effort collectif. ILEAU s’inscrit dans une approche d’adaptation aux changements climatiques basée sur les écosystèmes, et s’appuie sur un comité d’experts et un comité d’organismes partenaires (40) pour définir zones prioritaires, outils, actions et mobilisation. Plus de la moitié du budget est dédié au verdissement (végétaux, semences indigènes, plans, plantations, encadrement des bénévoles, entretien, enlèvement d’asphalte) et aux incitatifs pour les propriétaires fonciers qui participent (ex. table à pique-nique, nichoirs, mangeoires, bacs...). L’évaluation des impacts du projet sera à la fois quantitative pour les ICU et qualitative au niveau de la perception des citoyens et partenaires. Collaboration, créativité, innovation et synergie sont donc au rendez-vous pour faire une différence visible sur ce territoire défavorisé et devenir un exemple à suivre pour le reste de Montréal et du pays.

Isabelle Demers, Institut national de santé publique du Québec (INSPO)

La stratégie québécoise de réduction de l’herbe poux et des autres pollens allergènes : perspective provinciale pour une gestion efficace et partagée

Les changements climatiques ont pour effet d’accroître la concentration atmosphérique de certains pollens. Par conséquent, la prévalence des allergies a augmenté mondialement au cours des dernières décennies et continuera vraisemblablement de croître aussi au Québec. Dans ce contexte, il devient incontournable d’adapter les pratiques d’entretien à l’échelle municipale pour contrôler les pollens allergènes, principalement celui de l’herbe à poux. Ce dernier constitue la plus importante cause de rhinite allergique saisonnière dans tout le nord-est de l’Amérique du Nord et entraîne des coûts de plus de 200 millions de dollars annuellement pour le Québec.

Des recherches ont permis de valider que la mobilisation d’acteurs locaux ciblés peut réduire la présence de l’herbe à poux. Les résultats ont démontré que l’action concertée et simultanée a permis une amélioration de la santé des personnes allergiques due à la diminution de la densité de plants d’herbe à poux et des concentrations de pollens dans l’air. C’est une approche simple et peu coûteuse qui peut être généralisée à d’autres territoires. C’est sur ces résultats probants que se base la Stratégie québécoise de réduction de l’herbe à poux et des autres pollens allergènes. Cette stratégie vise à mobiliser les ministères et organismes ainsi que les municipalités et arrondissements afin qu’ils contribuent à la réduction des impacts sanitaires associés aux pollens allergènes, principalement celui de l’herbe à poux. Cette stratégie est une initiative du MSSS en collaboration avec l’INSPO et d’autres partenaires interministériels.

Session: W2C – Néron Southern First Nations Adapting to Climate Change / Adaptation aux changements climatiques des communautés autochtones du sud

Wednesday April 13 – 10:30 am to 12:00 pm
Presentation Session
Simultaneous interpretation available

Session Chair: Marie-Eve Néron, Indigenous and Northern Affairs Canada

Building adaptive capacity and climate change resiliency in indigenous communities

Brian Kotak, Canadian Model Forest Network

Climate Change Adaptation Planning with the Chippewas of Georgina Island First Nation

Kerry-Ann Charles, Georgina Island First Nation

Réalisation du plan d’adaptation aux changements climatiques de Wôlinak et d’Odanak

Myriam Beauchamp, Grand Conseil de la Nation Waban-Aki

Community-based climate change cost-benefit analysis on infrastructure

Jean-Christophe (J-C) Amado, Senior Climate Risk and Resilience Specialist

Abstracts

Brian Kotak, Canadian Model Forest Service

Building adaptive capacity and climate change resiliency in indigenous communities

Canadian Indigenous communities tend to have lower adaptive capacity to address climate change risks than non-indigenous communities. To address this, Black River First Nation in Manitoba undertook a 3-year project to address risks to the community and their traditional area posed by climate change. The community used a process and guidebook developed by the Canadian Model Forest Network. The project involved a community core team which documented their observations of changes in climate and its impact on the community and traditional area over the last 50 years, developed historic and current climate profiles from meteorological data in the region, used climatic global circulation models to predict changes in climate in their traditional area to the year 2080 and assessed current and future risks. Based on the vulnerability assessment, the community developed an action plan to adapt to current and future changes in climate. Actions included updating their emergency preparedness and response plan, developing wildfire protection plans for the community and a nearby cottage subdivision they are planning, and upgrades to community infrastructure (drinking water and sewage treatment), among others.

Kerry-Ann Charles, Georgina Island First Nation

Climate Change Adaptation Planning with the Chippewas of Georgina Island First Nation

Delivered collaboratively by the Chippewas of Georgina Island First Nation (Project Lead) and the Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) (Project Partner) the Community Climate Change Adaptation Project (2012-2015) increased the expertise and capacity within the community of Georgina Island, the largest island on Lake Simcoe in southern Ontario, to deal with current and future impacts of climate change. The project combined both local traditional and cultural knowledge obtained from community members through a Traditional Ecological Knowledge (TEK) survey and climate change science to assess current and future impacts of climate change and develop adaptation actions to reduce the risks associated with these impacts. This presentation would provide an overview of the 3 year project, and an update on implemented adaptation actions.
Myriam Beauchamp, Grand Conseil de la Nation Waban-Aki

Réalisation du plan d'adaptation aux changements climatiques de Wôlinak et d'Odanak

En 2014 et 2015 le Grand Conseil de la Nation Waban-AKI a réalisé un plan d'adaptation aux changements climatiques pour les communautés abénakis de Wôlinak et d'Odanak. Par l'entremise d'entrevues avec les porteurs de savoirs (aînés, chasseurs, pêcheurs, cueilleurs, conseil de bande, etc.) ainsi qu'une recherche scientifique sur le climat de la région, un plan visant à supporter les communautés face aux changements de climat majeurs des dernières décennies fût rédigé. De ce plan ressortit un grand nombre d'aléas climatiques et leurs conséquences respectives sur le territoire et son utilisation par les abénakis. Par la suite, une évaluation des risques fût posée et un total de dix mesures d'adaptation concrètes et propres à Wôlinak et Odanak furent présentées.

L'année 2015-2016 fût consacrée à une mesure en particulier, soit l'intégration du PACC aux plans de mesures d'urgence des deux communautés, grâce à un soutien financier du Ministère des Affaires autochtones et Développement du Nord Canada. Des démarches constantes sont entreprises pour la réalisation des autres mesures d'adaptation, dans un futur à moyen-long terme.

Jean-Christophe Amado, Deloitte

Community-based climate change cost-benefit analysis on infrastructure

Climate change is already impacting the land and infrastructure in many communities, due to increased coastal erosion, permafrost degradation, and extreme weather events. Infrastructure plays a key role in communities, influencing education, economic development and social well-being. Existing infrastructure may be at risk of damage or destruction from climate changes, challenging First Nation communities to consider how to better rebuild or relocate roads, schools, community buildings, water/wastewater treatment systems and houses. Communities can also consider climate change during the development and design of new infrastructure to increase its lifespan and resilience. Understanding the potential intensity, frequency and scope of existing and future climate change impacts on the built environment can help a community develop a wider range of adaptation options and better allocate scarce resources towards a successful, long-term response.

A key tool to assist communities in this process will be the development of an accessible, easy-to-use methodology to conduct reliable cost-benefit analysis. As communities identify infrastructure that is vulnerable to the impacts of climate change they can use the cost-benefit analysis to identify whether potential adaptation measures are cost-effective, at what time and scale they should be implemented, and how they compare to the potential costs and benefits of other adaptation measures. Cost-benefit analysis forms one input into the decision-making process and infrastructure decisions will also need to be informed by community values, traditional land uses, and the parameters of various funding options.
Session: W2D – Warren
Building the knowledge foundation through assessments: learning from the past and planning for the future

Wednesday April 12 –
10:30 am to 12:00 pm
Panel Session

Session Chair: Fiona
Warren, Natural Resources Canada

Panel members

Linda Mortsch, IPCC Assessments
Kathy Jacobs, US Science Assessments
Roger Street, UK Science Assessments
Don Lemmen, Canadian national-scale assessments
Hélène Côté, Canadian regional assessment (Québec)
Session: W2E – Chia
Strengthening Adaptive Capacity in Coastal Communities:
Experiences from British Columbia

Wednesday April 13 –
10:30 am to 12:00 pm
Panel Session

Session Chair: Eliana Chia,
Fraser Basin Council

Province of BC’s Actions and
New Guidelines on Climate Adaptation
Kari Tyler, Climate Action Secretariat, Government of British Columbia

Flood Management and Climate Adaptation in BC’s Lower Mainland
Jim Vanderwal, Fraser Basin Council

Adapting to a Changing Coastline in the City of Surrey
Carrie Baron, City of Surrey

Green Shores™ training for shoreline decision-makers in British Columbia
DG Blair, Stewardship Centre for BC

Abstract

In the face of a changing climate, communities along British Columbia’s shorelines are facing increasing coastal hazards such as sea level rise, flooding, erosion, and the transformation of coastal habitats. This intensification of coastal risks has generated a movement to support municipal decision-makers and industry professionals in coastal adaptation planning. This panel session highlights resources and collaborative initiatives that are working towards building adaptive capacity and addressing coastal risks in BC.

Panel members

Kari Tyler, Climate Action Secretariat, Government of British Columbia
Province of BC’s Actions and New Guidelines on Climate Adaptation

Jim Vanderwal, Fraser Basin Council & Carrie Baron, City of Surrey
Flood Management and Climate Adaptation in BC’s Lower Mainland

Carrie Baron
Adapting to a Changing Coastline in the City of Surrey

DG Blair, Stewardship Centre for BC
Green Shores™ training for shoreline decision-makers in British Columbia

David Reid, Lanarc Consultants
Video Series: Climate Change Adaptation and Water on the BC Coast
Session: W2F – Hyatt
Impact and adaptation responses in communities of place and practice to climate change: A tale of physics, phytoplankton, fish and fisheries for salmon on the west coast of Vancouver Island, British Columbia

Wednesday April 13 – 10:30 am to 12:00 pm
Presentation Session

Session Chair: Kim Hyatt, Fisheries and Oceans Canada

Productivity responses of Barkley Sound salmon to climate variation and change impacts in the Pacific Ocean
Kim Hyatt, Fisheries and Oceans Canada

Pacific salmon responses to climate variation and change in freshwater ecosystems
Howard Stiff, Fisheries and Oceans Canada

Adaptation responses of fisheries and fisheries managers to climate induced impacts on sockeye salmon returns to Barkley Sound, British Columbia
Diana Dobson, Fisheries and Oceans Canada

Managing freshwater systems to meet the competing needs of salmon production, urban and industrial development in Port Alberni and the Sossum watershed of British Columbia given historic to future risks of climate change
Barry Chilibeck, Northwest Hydraulic Consultants

Abstracts

Kim Hyatt, Fisheries and Oceans Canada

Productivity responses of Barkley Sound salmon to climate variation and change impacts in the Pacific Ocean

Salmon populations that make sea entry into the northern California Current upwelling system along the eastern rim of the Pacific exhibit variations in marine survival that co-vary with alternations in cold and warm ocean conditions. The observation that ENSO variations induce periodic oscillations in salmon marine survival in particular has served as the conceptual basis for a highly successful forecasting method (the survival stanza method or SStM) that has been used to predict variations in marine survival and annual returns of Barkley Sound sockeye salmon for more than twenty years. Sea-entry years associated with La Nina-like conditions (“cold ocean”) result in above average survival while those associated with El Nino-like conditions (“warm ocean”) result in below average survival. The cause and effect mechanisms behind these survival changes are now reasonably well understood and relate to ecosystem re-organization within the California Current system under warm versus cold ocean conditions. Of particular importance here, the resultant salmon survival variations are so large that total returns of Barkley Sound sockeye may vary by more than an order of magnitude within intervals as short as 2-3 years. Consequently, First Nations, recreational and especially commercial fisheries have exhibited a decadal-scale, “boom-to-bust” character over most of their recent history. Although models of ENSO behavior under future climate regimes have not yet reached consensus, both empirical evidence and credible model projections suggest that the frequency and magnitude of El Nino-like, warm-ocean events are likely to increase with obvious implications for elevated, management challenges that Barkley Sound salmon fisheries will face within the coming decades.

Howard Stiff, Fisheries and Oceans Canada

Pacific salmon responses to climate variation and change in freshwater ecosystems

Recent investigations in British Columbia and the Pacific Northwest have demonstrated regional temperature shifts of about +0.8°C over the past century, with projected temperature increases of 1.5-3.2°C in near-future decades. Temperature effects on migrating adult Sockeye salmon (Oncorhynchus nerka) have been well documented in many Pacific Northwest river systems. Temperatures in the range of 21-24°C can be lethal, and water temperatures in excess of 28°C affect migration speed, cause timing delays, and result in secondary
effects such as increased disease, pre-spawn mortality, reduced gamete viability, and decreased egg-to-fry survival rates.

Seasonal precipitation has also changed markedly in the recent past, and future projections point to wetter winters and drier summers, with a high likelihood that extreme events will become more frequent. Associated changes in stream discharge levels may result in physical limits to fish passage during low flows, while high flows may generate velocity barriers that reduce or prohibit upstream migration at key locations along the migratory route (such as canyons, rapids and falls, but also man-made fish-ways and weirs). Interacting temperature and discharge stressors exert annual to decadal-scale influences on economically valuable salmon stocks returning to Sproat and Great Central lakes in the Somass River system on the west coast of Vancouver Island. Historically challenging locations for upstream passage at Sproat Falls and Stamp Falls have been largely mitigated by fish-way construction projects since 1927, but recent studies indicate that daily transit rates through these fish-ways are still influenced by seasonal variations in environmental conditions. Extreme high early summer flows appear to delay onset of upstream migration, while daily mean water temperatures exceeding 19-21°C may impede or even stop migration. The latter climate induced effects are associated with an increased frequency and magnitude of pre-spawn mortality, especially during extended elevated temperature and low flow periods. Climate change projections point to an increase in the frequency and duration of extreme flow and high temperature conditions, with negative implications for the sustainable production of Somass Sockeye salmon beyond 2050. Mitigation via human intervention (e.g., engineering of “cold-water” release structures for the Somass, Stamp and Sproat rivers and/or creation of additional water storage) will most certainly be necessary to ensure future migration success, high productivity and sustainable fisheries for adult Sockeye salmon originating from this B.C. watershed.

Diana Dobson, Fisheries and Oceans Canada Adaptation responses of fisheries and fisheries managers to climate induced impacts on sockeye salmon returns to Barkley Sound, British Columbia

Sockeye salmon populations in Barkley Sound, British Columbia are at the southern end of their range and are experiencing climate induced changes in both their freshwater and marine environment. Implementation of the precautionary approach to fisheries management is a key response to address the problem of over-fishing and sustainable fisheries. However, the application of the precautionary approach in responding to the potential impacts of climate change is limited by uncertainty around fishery reference points that may not be robust to future climate-induced changes in productivity. Managing for a sustainable fishery may fail without proper consideration of uncertainty and a wider range of ecological interactions and outcomes induced by climate-change. Further, when socio-economic factors are not considered in developing fishery objectives and management plans, implementation failure through lack of incentive may occur. Successful adaptation by the fishery system to future climate change impacts will require: assessments of an expanded range of information on salmon and ecosystem interactions and outcomes, effective communication to build shared understanding among stakeholders and increased flexibility of fishery governance systems. In our experience, a flexible governance system and integrated assessment approach to Barkley Sound fisheries has enabled the fishers and resource managers to adapt to historic impacts of climate induced changes on the sockeye returns there. Some of these adaptations are deliberate; such as reducing harvest in the early part of the run or changing fishing plans in response to various environmental indicators. Other adaptations result from development of a co-management process that includes: sound planning, a shared decision making process that promotes accountability, consensus-building to stabilize fishery access for local First Nations and
commitments to stewardship by all stakeholders. Upholding principles of inclusivity, transparency and flexibility are basic features of the co-management process that enable success. Notwithstanding the success of the process, many challenges remain. These challenges include: issues related to scale, both in terms of governance and scientific analysis; institutional resistance to devolving authority in a co-management process; analytical problems related to integrating information from different sources; and defining potential management responses to increasing uncertainty and complexity. Resolving these issues will require change in fishery governance systems at higher levels and also continued development of integrated assessment approaches to support adaptive decision-making.

Barry Chilibeck, Northwest Hydraulic Consultants

Managing freshwater systems to meet the competing needs of salmon production, urban and industrial development in Port Alberni and the Somass watershed of British Columbia given historic to future risks of climate change

The BC Conservation Foundation and its partners have developed a Somass Watershed Plan in response to serious concerns arising from historic climate variation and change events and future impacts of climate change on economically and culturally important salmon stocks native to the basin. The planning process and investigations to date have involved federal and provincial agencies, local and regional government, two First Nations, private sector interests and the stewardship community. Funding has come from the BC Living Rivers Trust, NRCan and DFO with in-kind support from local stakeholders and agencies. Because of the location and nature of the watershed at the head of a deep inlet on the west coast of Vancouver Island, watershed-specific climate and water temperature monitoring was to be upgraded to improve environmental observations for use in climate impact analyses. Engineering feasibility assessments and stream modelling were undertaken and a number of possible adaptation infrastructure and management alternatives were developed - all designed to reduce high water temperature and low flow impacts on migrating sockeye salmon and to potentially provide benefits for other species as well. Our paper focuses primarily on existing in-stream infrastructure (both privately and government owned) including three DFO fishways and a major salmonid enhancement facility as well as two privately owned dams at the outlets of two large lakes into which sockeye salmon need to migrate upstream - often under stress-inducing temperature and flow conditions. One of these dams at the outlet of Great Central Lake is no longer required by its owner for its intended purpose of increasing low flows for diluting pollutants. Re-purposing this dam, which is vital for maintaining fish flows, requires new ownership and/or a management contract with sources of capital and operational funding. One option was to provide for hydro power at this facility, but the studies undertaken in this planning process were not encouraging. However as a result of this initiative a secondary dam also on Great Central Lake owned by the private sector was rebuilt. By 2012 the plan was finalized with a series of recommendations for developing both short and longer term adaptations, but substantial legal, institutional and financial obstacles still remain. Independent research indicates that climate change places important economic and social values associated with sustainable salmon production from this watershed at serious risk of loss. Consequently, the paper outlines areas where more interdisciplinary technical work urgently needs to be done as well as collaborative leadership and innovation in addressing the obstacles preventing progress in moving forward.
Panel – W3A - Douglas
Challenges of private sector in helping Canada becoming more resilient / Rôle et capacité du secteur privé pour bâtir la résilience du Canada

Wednesday April 13 – 1:30 pm to 3:00 pm
Simultaneous Interpretation Panel Session

Session Chair: Al Douglas, Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR)

Jonathan Philipsborn, Director of Climate Adaptation - Americas at AECOM

Monika Federau, SVP & Chief Strategy Officer, Intact Financial Corporation

Gordon Beal, Chartered Professional Accountants Canada

Jean-Christophe (J-C) Amado, Senior Climate Risk and Resilience Specialist

Panel Session

As communities, sectors of the economy and businesses themselves become more and more aware of climate related risks, they seek information and support services to properly address such risks. Tools, frameworks, data and information can enable climate-sensitive and climate-smart decisions which will help maintain competitiveness in the private sector and safeguard people and property in communities across Canada. Businesses around the world face threats from climate change, both in their domestic operations, but also in their supply and value chains that stretch internationally. More and more businesses are seeking ways to assess those risks, both for the purpose of managing them and reducing the liability (and threats to the bottom line), but also to disclose them when government regulators or shareholders request it. Many businesses claim that risks from climate change are becoming more material and reporting or disclosing those may introduce disadvantages when it comes to competition.

The context of the panel was to discuss the private sector’s role in accelerating adoption of climate change adaptation and appropriate climate risk management in Canada’s economic sectors. What is the role of experts and professionals from engineering, finance, or insurance help Canada become more resilient, and what are opportunities for these sectors? The objective of the session was to provide, for a diverse audience of industry, public sector representatives and policy makers, a strong understanding how that private sector’s capacity, through these services, can be leveraged to accelerate and advance climate adaptation and resilience in all sectors of Canadian communities and economies, and to discuss opportunities in Canada and internationally

Panel Members

Jonathan Philipsborn, Director of Climate Adaptation - Americas at AECOM

The requirements for resilience-building in communities is significant. As an example, in NYC, fully implementing the resilience plan would cost $19B. AECOM has a role to play in helping to build resilient communities. As a company of nearly 100,000 people, AECOM’s CEO sees climate change as a pressing issue which signals to the entire company that AECOM will contribute to climate change solutions, which also presents a business opportunity. In the business
community, there is a significant mismatch between awareness of the impacts of extreme weather and the state of preparedness, and insured and uninsured losses are rising. AECOM is responding to customers calls for engineering services in areas of supply of essential utilities (water, electricity and gas), inundation and erosion from sea level rise, and in northern communities threatens not only infrastructure, but also traditional lifestyles. AECOM is also working collaboratively with partners to develop tools such as Disaster Resilience Scorecards and economic tools to address climate change impacts.

Monika Federau, SVP & Chief Strategy Officer, Intact Financial Corporation

Monika presented insights into the catastrophic losses in Canada over the past 20 years and accompanying impacts on the property and casualty insurance environment. This has led to significant payouts from the disaster financial assistance arrangements as paid out by the Government of Canada to support provinces and territories in the event of large-scale natural disasters. There are examples of adaptation that demonstrates economic costs avoided (e.g. Red River spillway in Manitoba) and good long term planning. The opportunities for the insurance sector include offering education for the public on how to build resilience at the home level, development of innovative insurance products that serve the needs of customers and to help change behaviour of individuals when it comes to high risk activities and decisions. Intact has supported work on climate change adaptation for many years and is now supporting the Intact Centre for Climate Adaptation at the University of Waterloo. The Centre will focus on 3 main project areas: home adaptation assessment program, the natural infrastructure adaptation program and the corporate-specific adaptation program.

Gordon Beal, Chartered Professional Accountants Canada

The Canadian CPA is the pre-eminent, globally respected business and accounting designation, which sets the context for CPA Canada as an organization. The work that they have done on climate change adaptation represents the commitment to building tools to support CA’s in their work that pertains to climate change. The CPA Canada has harnessed leanings from past work on environment and sustainability, and is preparing its members for new and evolving issues, including climate change. The World Economic Forum’s 2016 Global Risks report highlighted “Failure of climate change mitigation and adaptation” as the highest impact risk, and the third most likely to occur, which signals to the business community that financial losses stand to be significant. Other global risks such as “extreme weather events”, “water crises”, “food crises” and “biodiversity loss and ecosystem collapse are interconnected with “Failure of climate change mitigation and adaptation”. That relationship further highlights the importance of addressing climate change, both by reduction of GHGs and adaptation. There have been a series of estimates on the cost of inaction, including those from Citigroup and the Parliamentary Budget Officer, and accountants have a role to play in demonstrating the business case for climate change adaptation. The financial markets have been slow to pick up on climate risks, and when they do, it may be too late. There is an adaptation imperative for the private sector which includes a recognition of the importance of innovation for adaptation; that there are implications for competitive and economic success and strategic planning is required for mitigating risks and capitalizing on opportunities. In conclusion, cross-functional collaboration is essential for progress in the area of climate change adaptation (for both private and public sector); CPA Canada’s project with NRCan focused on the role of CPAs in supporting Canadian businesses to increase resilience and competitiveness in a changing climate and that being successful in the private sector will require a shift in mindset competitive and economic success.
Jean-Christophe (J-C) Amado, Senior Climate Risk and Resilience Specialist

The presenter focused his comments on the opportunities to export Canadian adaptation knowledge and services to other parts of the world. The value of adaptation requirements around the world is very high - close to $30 trillion. Exporting of adaptation can be viewed as intentional (through specific projects e.g. Coastal protection), or unintentional (naturally through sharing of ideas, concepts and tools). At current, 4 main areas of adaptation export are being evaluated: forestry, water and waste technology, ocean technology and coastal infrastructure. Adaptation in Canada can be scaled up to provide process models for developing countries, thus a connection to international development. In this sense, Canada can play a role, but that could also be seen as a duty in the international context.
Session: W3B – Van Proosdij
Importance of shorelines for climate change adaptation / L’importance des côtes dans l’adaptation aux changements climatiques

Wednesday April 13 – 1:30 pm to 3:00 pm
Presentation Session
Simultaneous Interpretation

Session Chair: Danika Van Proosdij, Saint Mary’s University

Building the Case: Strategic Decision Making for Managed Realignment of Agricultural Marshlands

Danika van Proosdij, Saint Mary’s University

The first 10 metres: Coastal flooding, climate change and the social vulnerability of populations in Nova Scotia

Patricia Manuel, Dalhousie University

L’impact du “coastal squeeze“ sur les écosystèmes côtiers meubles québécois de l’estuaire et du golfe du Saint-Laurent dans le contexte de la hausse appréhendée du niveau de la mer

Jean-Pierre Savard, Ouranos

Living Shorelines: success stories from Nova Scotia
Robin Tress, Ecology Action Centre

Abstracts

Danika Van Proosdij, Saint Mary’s University
Building the Case: Strategic Decision Making for Managed Realignment of Agricultural Marshlands

Dykes and adjacent marshlands are of strategic importance for climate change adaptation as they provide the first line of defense for many coastal communities from storm surge, sea level rise and erosion hazards. Globally, managed realignment or strategic relocation has been identified as a viable adaptation method to current and future risks associated with climate change. However, while practical implementation of this approach has been limited in Canada, efforts have begun to stimulate discussion between public, private and academic sectors relating to tools, policies and standards to improve decision making related to agricultural marshes. The includes the development and application of a geospatial marshlands atlas, engineering standards and management plan to prioritize protection and/or abandonment of agricultural marshes.

Patricia Manuel, Dalhousie University
The first ten metres: Coastal flooding, climate change and the social vulnerability of populations in Nova Scotia

Most Nova Scotians live at or near the coast in an environment at risk of flooding, a risk that is increasing with climate change. Furthermore, there is varying social vulnerability among the population, affecting the ability to adapt to climate change impacts. We calculated an index to measure social vulnerability - SVI, by Dissemination Area (DA) - using Statistics Canada 2011 National Census and National Household survey data; classified the results from low to high SVI; and mapped the distribution. We overlaid the SVI distribution with a map of proxy coastal extreme flood elevations of 5 and 10 m. We also mapped residences within these flood zones. Projections to 2100 for Nova Scotia suggest extreme flood scenarios up to 5 m along the Atlantic and Northumberland Strait coasts and up to 10 m along the Bay of Fundy coast. We developed the proxy flood elevation mapping using the best available terrain mapping data: LiDAR, the provincial 20 m DEM, and 2 m pictometry data. The resulting seamless 5 and 10 m elevation contours are suitable proxies for the worst case flood projections and can support land use planning and other applications to manage climate change impacts on populations. We found that 18 percent of DAs lying within the proxy flood zones have populations with higher than average social vulnerability. The digital map product is applicable to both provincial and municipal adaptation policy and planning, particularly for identifying
vulnerable populations relative to the extent of current and emerging coastal hazards.

Jean-Pierre Savard, Ouranos
L’impact du "coastal squeeze" sur les écosystèmes côtiers meubles québécois de l’estuaire et du golfe du Saint-Laurent dans le contexte de la hausse appréhendée du niveau de la mer

Les écosystèmes côtiers s’ajustent à la hausse du niveau de la mer en migrant vers les terres. Or, dans les zones sujettes à une accélération de la montée du niveau de la mer et à un déficit sédimentaire, des contraintes naturelles (falaise) ou d’origine anthropique (routes, structures de protection) présentent sur la côte, peuvent freiner cette dynamique naturelle et entrainer une perte de la superficie de l’écosystème, processus nommé « coastal squeeze ». Afin de savoir si les écosystèmes côtiers de l’estuaire et du golfe du Saint-Laurent (EGSL) ont l’espace nécessaire pour se déplacer vers l’intérieur des terres dans un contexte de hausse du niveau de la mer, leur distance de migration potentielle a été évaluée.

La présente étude révèle que 57% des écosystèmes meubles, ont un potentiel de migration inférieur à 30 mètres. Les contraintes artificielles sont susceptibles de freiner leur déplacement dans 52% des cas et plus des ¾ sont situés à moins de 30 mètres de leur limite supérieure. L’impact du "coastal squeeze" pourrait être préoccupant tant pour les écosystèmes sableux et les marais maritimes qui occupent 74% et 27% de la superficie du territoire.

L’amorce d’une réflexion sur l’espace de migration des écosystèmes de l’EGSL est essentielle afin d’augmenter leur capacité de résilience face aux changements environnementaux.

For coastal provinces like Nova Scotia, effective adaptation invariably includes coastal planning, management, and conservation. Living Shorelines is a method of coastal management and erosion reduction that embraces natural coastal processes and ecosystems as reliable erosion and flood reduction systems. Using coastal plants, logs, branches, oyster reefs, and other natural materials, Living Shorelines seek to return erosion rates to natural levels and build back lost wetlands and coastal ecosystems that provide critical flood mitigation services. The Ecology Action Centre has four Living Shoreline demonstration sites, which have shown incredible results in erosion reduction, habitat quality, education, and community engagement. Living Shorelines are taking off across the US – research has been ongoing for decades, and large- and small-scale projects are being implemented across the coastal states. Federal agencies are actively implementing Living Shorelines and offering support and guidance to partnering and subsidiary organizations in order to see this coastal adaptation technique grow. Living Shorelines are just starting to gain traction in Canada. NGOs and private companies are leading the charge, but there are many barriers to implementing Living Shorelines in Canada – barriers that can be removed by both federal and provincial level governments. This presentation will present the experiences and lessons learned from implementing Living Shorelines in Nova Scotia, name barriers to widespread implementation in Canada, and suggest actions to be taken by provincial and federal government agencies to support Living Shorelines growth in our coastal communities.

Robin Tress, Ecology Action Center
Living Shorelines: success stories from Nova Scotia
Session: W3C – Dupras
Infrastructures vertes et changements climatiques :

développer une stratégie multi-échelle basée sur la complexité et la résilience urbaine
/Green Infrastructures and Climate Changes:
Developing a Multiscale Strategy Based on the Complexity and Urban Resilience

Wednesday April 13 – 1:30 pm to 3:00 pm
Presentation Session
Simultaneous Interpretation

Session Chair: Jérôme Dupras,
Université du Québec en Outaouais

Strategies to Promote the Implementation of Green Infrastructures in Urban Areas
Jérôme Dupras, UQO

Designing a Network of Green Infrastructure for Greater Montreal
Andrew Gonzalez, McGill

Incorporating Biodiversity and Complexity into Urban Forestry
Christian Messier, UQAM-UQO

Balancing Ecosystem Services and Vulnerability Reduction in the Implementation of Green Stormwater Infrastructure
Danielle Dagenais, Université de Montréal

La Ceinture et Trame Verte et Bleue du Grand Montréal : Une démarche d’adaptation aux changements climatiques
Jean-François Dallaire, Nature-Action Québec

Abstracts

Jérôme Dupras, Université du Québec en Outaouais
Strategies to Promote the Implementation of Green Infrastructures in Urban Areas

Through the analysis of semi-structured interviews held with key actors involved in the planning of the Greater Montreal region and documentary analysis, we seek to understand the conditions that could lead to the establishment of a multiscale green infrastructure for the city to mitigate the impacts of climate changes. This conference first describes the region’s environmental and political context and the management and planning processes that have led to important deterioration of natural assets over the past decades. We then review the ongoing or planned programs, tools and actions that have been undertaken in the region to favour the implementation of green infrastructures, such as payment programs for ecosystem services, agro-environmental practices and new approaches in conservation policies. Finally, we analyze the opportunities, constraints, advantages and disadvantages in the implementation of this type of project in this region based on our expert survey. We conclude that experts favor an approach leading to ecological connectivity, but they underline several obstacles that could hinder its implementation.

Andrew Gonzalez, McGill University
Designing a network of green infrastructure for Greater Montreal

The capacity of ecosystems and human society to adapt to ongoing climate change will depend on our ability to create sustainable landscapes with diverse and resilient socio-ecological networks. To achieve their conservation goals for biodiversity and ecosystem sustainability the Quebec government requested research to develop a methodological framework and the identification of an ecological network for Greater Montreal. I present the results of our project that addressed three major objectives: 1) to use network theory to design ecological connectivity in order to maintain species diversity and ecological services over the coming century; 2) to ensure resilience to ongoing regional land use and climate change; 3) promote the crossing of Saint Laurence lowlands during latitudinal migration of species responding to climate change. Our methodological framework draws upon research in ecology, evolution, computing, remote sensing and GIS, network theory, and field studies. Scenario modeling out to 2050 has allowed us to identify priority components of the network to be protected and restored under business as usual scenarios of land use change. Our project has created a partnership
between government, health institutes, NGOs, and private landowners. We will present early examples of the implementation of this network; in particular, in inner city Montreal where joint social and ecological needs must be met.

Christian Messier, Université du Québec à Montréal and Université du Québec en Outaouais

Incorporating biodiversity and complexity into urban forestry

City trees and parks provide numerous ecological, economic and social benefits to its inhabitants. However they are subjected to an increasingly diverse set of natural and human-induced stress which make them less resilient. The challenge today therefore is not just to increase or maintain the arboreal presence in our city, but to design approaches to do so in an efficient and inexpensive way. In this presentation, I will review the current knowledge stemming from the natural world about the importance of maintaining diverse and complex ecosystems in order to maintain their adaptability and increase their resilience to change. Analyses done in different Canadian and American cities show that although diversity of tree species tend to be high compared to their natural immediate forest counterparts, their functional diversity is lower and their spatial arrangement much more scattered which could lower their ability to resist new and old disturbances. Based on knowledge about how our natural systems work, new approaches are proposed for the management of our city trees and parks to increase their resilience to an increasingly diverse set of detrimental biotic and abiotic conditions.

Danielle Dagenais, Université de Montréal

Balancing ecosystem services and vulnerability reduction in the implementation of Green Stormwater Infrastructure

Green Stormwater Infrastructure are now being implemented at a large-scale in cities to control stormwater quantity and quality and increase resilience climate change. To help cities choose the best sites for Green Stormwater Infrastructure, a participatory decision support tool was developed to identify sites to implement Green Stormwater Infrastructure that could meet technical performance targets, yield ecosystem services while reducing climate change vulnerability. The testing of the tool on a neighbourhood of Quebec City including a participatory design workshop highlighted potential synergies and trade-offs in the provision of various ecosystem services and reduction of social and territorial vulnerability at the site level. Based on a landscape design and urban planning perspective, various strategies are envisioned to take advantage of the synergies and overcome the trade-offs.

Jean-François Dallaire, Nature-Action Québec

La Ceinture et Trame Verte et Bleue du Grand Montréal : Une démarche d’adaptation aux changements climatiques

Bien plus qu’un courant de pensée, la Ceinture et Trame Verte et Bleue du Grand Montréal est un projet rassembleur qui vise à favoriser la connectivité des milieux naturels tout en permettant une cohabitation harmonieuse de ceux-ci avec les milieux agricoles et urbains. Ainsi, la Ceinture et Trame Verte et Bleue est devenue un projet de société incontournable lorsqu’il est question d’aménagement du territoire, d’adaptation aux changements climatiques et du maintien de la biodiversité et des services écologiques qui en découlent. La conférence abordera tout d’abord la situation et l’historique des ceintures vertes dans le monde, avec des exemples d’époques où les milieux naturels étaient encore peu affectés, et d’autres plus récents, où une trame a été protégée. Puis, le contexte économique, social et environnemental de la Ceinture et Trame Verte et Bleue du Grand Montréal sera abordé, avec un regard sur les enjeux que soulève ce projet et l’historique des actions menées pour arriver à sa concretisation. Afin de déployer cette dernière, un accent sera
mis sur les actions déjà en place, et ce à travers 7 chantiers d’intervention, soit : la restauration, la sensibilisation et la mobilisation citoyennes, la protection, l’aménagement du territoire, les pratiques agro-environnementales, la foresterie durable et l’accessibilité aux milieux naturels. Avec ces exemples, les gestionnaires du territoire et les citoyens sont appelés à s’approprier leur région et à mettre en œuvre ce projet afin de préserver, restaurer et mettre en valeur leurs milieux naturels.
Session: W3D – Rzadki
Understanding Flood Risk - Policies and programs to address flooding from extreme weather

Wednesday April 13 – 1:30 pm to 3:00 pm
Panel Session

Session Chair: Jo-Anne Rzadki, Conservation Ontario

Adapting Flood Risk Management - Preparing for an Unknown Future in Ontario

Ryan Ness and Fabio Tonto, Toronto Region Conservation Authority

Climate Change for the Bow River Watershed

Heather Auld, RSI

Addressing the greatest flooding risks in Nova Scotia - Responding to high tides, extreme sedimentation, ice jams and floodplain development

Alex Wilson, CBCL Ltd

Partners for Action – Advancing Flood Resiliency in Canada

Shawna Peddle, Partners for Action

Abstracts

Ryan Ness & Fabio Tonto, Toronto Region Conservation Authority
Adapting flood risk management - preparing for an unknown future in Ontario

Flood risk management in Ontario is, as elsewhere, a family of practices that traditionally has been based on assumptions of climate stationarity and quantifiable risk. Climate change fundamentally undermines those foundational assumptions and necessitates a different management paradigm. The presentation will describe the challenges in applying traditional approaches to flood risk management in a non-stationary, changing climate with specific reference to two tools commonly used in flood risk assessment and mitigation: rainfall intensity-duration-frequency curves and hydrological watershed models. The implications of these challenges to management practice are discussed, including the need to adapt existing approaches as well as to develop new ones.

Heather Auld, RSI
Climate Change for the Bow River Watershed

The City of Calgary and neighboring municipalities were severely impacted by flooding in June 2013. To date, this flooding event represents Canada's most expensive disaster ever recorded.

Given that the risks of future flooding under climate change are likely to exceed this event, there is an urgent need to improve resiliency and public safety within the City and to guide these measures with future climate change scenarios and trends for flood, drought, and other climate hazards within the Bow River watershed.

The paper will report on the City initiative to tackle this challenge. The first phase consists of researching and evaluating a variety of options for the integration of downscaled climate change scenarios into the City's decision-making frameworks with a focus on hydrologic modeling, water risk management, and improved understanding of future extreme event types and frequencies. Research is being undertaken by a consulting team of experts, with additional input from an academic advisory panel. It incorporates the following key activities:

1. A scan of existing approaches from Canadian and international jurisdictions on downsampling of climate change information, application to hydrologic modeling and mountainous areas, and methodologies for decision-making under uncertainty;
2. A review of existing local hydrologic models, downsampling
3. approaches that include mountainous areas, and future climate datasets, with a focus on identifying sources of uncertainty;
4. Consultation with internal and external stakeholders to determine their climate change information needs, experience, and potential partnership opportunities; and
5. Analysis of options for moving forward with localized climate change information.

Alex Wilson, CBCL Ltd

Addressing the greatest flooding risks in Nova Scotia - Responding to high tides, extreme sedimentation, ice jams and floodplain development

The Town of Truro is notorious for being subject to the most frequent flood events of any developed area in Atlantic Canada, having been flooded up to 5 times in a given year (1979). All previous assessments had pointed to the difficulty in resolving the extremely complex interaction between the highest tides in the world, very large runoff flows, river sedimentation and recurring ice jams.

The Truro Flood Risk Study is the most comprehensive flood study ever undertaken in the Atlantic Canadian region. One of its main goals was to incorporate the latest computer techniques, built upon the most detailed information recently available (Lidar mapping for the entire watershed, aerial photography, bathymetric surveys, and satellite imagery). One-D, 2D and 3D hydrodynamic and ice jam models were used to study the relative influence of extreme rainfall, the highest tides in the world, sedimentation in the estuary and ice jams, which all play a role in creating relentless risks of flooding in the area. Climate Change impacts will create even greater risks, with the newly developed floodlines clearly departing from previous flood study results. With each of these models, more than 40 flood mitigation options were evaluated. Based on the extensive stakeholder consultations held at the beginning of the project, each option was ranked by its ability to cost-effectively protect the vulnerable areas that were vital to each of the stakeholders.

Shawna Peddle, Partners for Action

Partners for Action – Advancing Flood Resiliency in Canada

Across Canada, damage from extreme weather has cost taxpayers and insurers almost $10 billion since 1998. It has been estimated that 1.8 million Canadian households are at very high risk for flood, and federal assistance to flood victims is expected to reach $3.4 billion by 2021. Water-related damage is now the leading cause of home-insurance claims in many communities, large and small. Municipal, indigenous, federal and provincial governments, the insurance industry, researchers, and the public are coming together to better understand what we can do to lower our future risk, and focus on preventing flood damage, rather than cleanup.

Partners for Action (P4A) is a multi-year applied research network advancing flood preparedness in Canada in the face of a changing climate and extreme weather. P4A is rooted in a collaborative approach that brings together a diverse set of stakeholders to create and share knowledge, address information needs, and drive action. P4A is based out of the Faculty of Environment, University of Waterloo, with founding support provided by the Co-operators Group Ltd. and Farm Mutual Reinsurance Plan (FMRP). A major hurdle to successful adaptation is meshing the needs and capacity of diverse stakeholders, assessing data gaps and research opportunities, and channeling funding and resources towards implementation. P4A’s objectives are to better understand flood risk, and make sound decisions to reduce risk through facilitating collaboration, identifying innovative and practical research, sharing results and best practices, and educating Canadians about their flood risk, actions they can take to reduce their risk, and opportunities for risk transfer.
Session: W3E – Mercer-Clarke
Crossing the divide: The value of interdisciplinary approaches to mitigation and adaptation

Wednesday April 13 – 1:30 pm to 3:00 pm
Presentation Session

Session Chair: Colleen Mercer-Clarke, Canadian Society of Landscape Architects

There’s more to this than sea level rise: The role of expert teams, research partnerships and community involvement
Colleen Mercer-Clarke, Canadian Society of Landscape Architects

What are we protecting? Valuing our Landscape rather than our Property
Hope Parnham, Atlantic Society of Landscape Architects

Green Synergy: The Role of Green Infrastructure in Adaptation and Mitigation
Nina Pulver, University of Waterloo

Thriving with Water: The Possibilities and Practicalities of Amphibious
Elizabeth English, Associate Professor of Architecture, University of Waterloo

Community-wide Implementation of Green Stormwater Infrastructure - Policies and Strategies for Local Action
Sharyn Inward, Green Communities Canada

Abstracts

Colleen Mercer-Clarke, Canadian Society of Landscape Architects
There’s more to this than sea level rise: The role of expert teams, research partnerships and community involvement
For the past 15 years, the knowledge base on the causes and effects of a global warming has evolved and grown. As Canada's environment is increasingly affected by climate change and severe weather, many of the standards for best practice in planning and design are becoming at best inadequate and at worst, invalid. Much new information on existing and anticipated changes in the physical and ecological environment is publically available in peer reviewed journals and in texts edited by respected scientists. Innovative new tools are being developed, to collect new data, and to collate that data into useful information. However, across the country, professionals in practice are increasingly challenged to provide rational planning and design alternatives that will address changes in design storms, snow loads, appropriate plant species, and anticipated safe levels for discharges of contaminants and nutrients. While there is an immediate need to integrate new information in needed renovation to existing structures and practices, there is also a pressing need to mobilize knowledge on climate change so that professionals can introduce needed changes in the planning and design of new infrastructure, the sustainability of community systems and in the protection of cultural and ecological assets.
Throughout Canada and internationally, interdisciplinary teams are working collaboratively across the divides that have traditionally separated academia, government, community, and practice.

Hope Parnham, Atlantic Society of Landscape Architects
What are we protecting? Valuing our landscape rather than our property
When properties are at risk of being lost or damaged, owners are likely to take the necessary measures—within financial reason—to protect their investment. But how, and at what cost do these protective measures impact landscapes, ecosystems and the natural evolution of an otherwise dynamic coastline? The coastal properties of Prince Edward Island are highly desirable for development; however, the features that make them attractive landscapes also make them vulnerable. The changing climate will increase the rate of erosion and the extent of coastal flooding due to sea level rise and an increasing frequency and intensity of storm surge events. Most Island residents are well aware that the coastline has changed over time. However, their desire to develop this landscape has not changed.
Planning and design professionals have a responsibility to not only educate their clients on the potential risks of climate change, but also on the reciprocal impacts that development can have on this landscape and on responsible alternatives for adaptation. Examples will be shared to demonstrate how hard protection measures that started with the best intentions have altered coastlines, harbours, and industries, and how an absence of policies and regulations has allowed development to continue in areas of high risk. Climate change adaptation is no longer an issue for long-term planning. It requires the immediate attention of multidisciplinary teams, ranging from engineers to ecologists, economists, and emergency responders.

Nina Pulver, University of Waterloo
Green Synergy: The role of green infrastructure in adaptation and mitigation

An integrated and balanced combination of adaptation and mitigation strategies is essential for addressing current and future impacts of climate change. Green infrastructure includes a range of strategic interventions that often lie at the confluence of adaptation and mitigation planning, such as urban canopy, rain gardens, and urban agriculture, and provides further social, environmental, and economic benefits that contribute to societal well-being. As such, it is seen as a “no-regrets” strategy that is increasingly being integrated into policy and planning statements. At the same time, green infrastructure is still a somewhat nebulous term that is generally understood to refer to stormwater management but is applicable on a much broader scale. Further, green infrastructure interventions that address adaptation, such as increased tree canopy or permeable surfaces, may conflict with other land use mitigation strategies such as intensification for reduced automobile travel. In order to capitalize fully on the benefits provided by green infrastructure, as well as evaluate trade-offs required in its deployment, a comprehensive understanding of green infrastructure as a multifunctional system providing a range of services is necessary. This presentation will describe case studies of exemplary green infrastructure projects that target a range of adaptation, mitigation, and related services across multiple scales, and highlight the importance of interdisciplinary collaboration throughout their execution.

Elizabeth English, University of Waterloo
Thriving with Water: The Possibilities and Practicalities of Amphibious Construction

Amphibious housing presents intriguing possibilities in the quest for sustainable responses to the impending global climate change crisis. Suitable new housing types are needed for populated regions where sea-level rise and heightened storm activity are expected to intensify flooding. Amphibious foundation systems refer to new or retrofit construction that allows a house to remain close to the ground with the appearance of an ordinary house, but to rise with rising floodwater and float on the surface until the flood recedes, at which time it settles back exactly into its original position.

In environmentally sensitive locations, amphibious construction suggests how to sit lightly on the land and live WITH the flooding, temporarily, when it occurs. Amphibious strategies accept the presence of floodwater but prevent it from causing significant damage. Amphibious architecture works in synchrony with natural cycles of flooding, allowing water to flow rather than attempting to control it. Since the height to which an amphibious building rises will vary with the depth of the water, amphibious structures can take both changing sea levels and land subsidence in stride.

The amphibious approach encourages recognition of the beneficial aspects of the occasional presence of water: we need not merely learn to live with water, we can thrive with water. This is a strategy that has great potential to benefit vulnerable indigenous
populations that are currently facing the difficult choice between leaving their traditional homelands or living with the disruption and devastation that severe flooding and lengthy evacuations can have on their communities.

Sharyn Inward, Green Communities Canada

**Community-wide implementation of green stormwater infrastructure – policies and strategies for local action**

The argument for green infrastructure is convincing: it’s effective, it’s cost-effective, and it comes with a wide range of co-benefits. But how does a community transform itself into a green infrastructure leader? Green Communities Canada has developed a policy/program toolkit targeted at local decision makers and community champions, to showcase strategies for making green infrastructure the “new normal”. This easy-to-read guide, informed by conversations with a range of practitioners and stakeholders as well as extensive research, is designed to inspire communities to take action, moving beyond demonstration and pilot projects to community-wide implementation. This presentation will provide an overview of the toolkit and highlight some of its contents, including stormwater user fees, community-wide green infrastructure targets, green streets policies, incentives for projects on private property, policies for new development, community engagement, and more. The presentation will include examples from cities and towns where they have been implemented, and insights from practitioners about what works and what doesn’t. Attendees will be invited to provide feedback on the toolkit content, during the session and afterwards via an online platform.
Abstracts

Lauren Goodman & Eric Loring, Inuit Tapiriit Kanatami

Climate Change and Food Security in Inuit Communities – Unique Challenges and Adaptations

Climatic changes are having a profound impact on Inuit communities and their surrounding environments. The health of wildlife has been directly influenced by recent climate shifts and anthropogenic forces. Changes to the environment have also altered the ability for Inuit to access these traditional foods. The resulting decreased availability, accessibility and quality of traditional food has negative implications not only for Inuit food security and nutritional status, but also the health and cultural well-being of the population. Inuit communities have concerns, perspectives and knowledge related to the changing climate and its impact on food security that are unique to their environment and culture. Multiple initiatives are occurring throughout Inuit communities to mitigate these challenges. In order to effectively address the issues of climate change and food security in Inuit communities, approaches need to be multi-sectoral and represent a collaborative effort with Inuit and other stakeholders.

Georges Guanish, Naskapi Nation of Kawawachikamach

Naskapi Observations of the Impacts of Climatic Changes on the Traditional and Wildlife Food Security

This presentation explores the effects of climatic changes and human disturbances on habitat and populations of caribou (*Rangifer tarandus*). Caribou has always been very important to the Naskapi Nation of Kawawachikamach. Still today the Naskapis depend on caribou for meat and other traditional subsistence food source. Moreover any impacts of climatic changes on caribou can have a big effect on food security. The Naskapi has developed a community-based geospatial information tools to collect field data on caribou migration and habitat changes. Findings indicate impacts on use of disturbed habitat by caribou, on migration routes, and northern livelihoods. Access to caribou is not only difficult but their body conditions have deteriorated. Other changes causes by human activity such as mining and outfitting are also discussed. Diverse actions have been taken to improve food security and adapt to changes such as: the creation of a climate change working group, the use of a community-based caribou monitoring using Cyber Tracker, encouraging the use of other food source such as moose or fish, furbearing animals, goose and waterfowls, ptarmigan, and finally discussion with other native group to find solutions to monitor and protect caribou herds (using scientific and traditional knowledge) and maintain this vital connection with the Naskapi identity.
Murray Humphries, McGill University

**Indigenous People, Place, and Traditional Food in Changing Northern Environments**

My presentation will focus on the importance of northern biodiversity to traditional food security and the forms of environmental and social change that threaten traditional food security. I will spend some time focused on what traditional food systems look like, including the major plant and wildlife species involved, harvest calendars, and the food, nutrient, and cultural values of traditional foods. Most of my talk will focus on forms of change that threaten traditional food security including climate change, resource development, pollution, poverty, wage economies, market foods, etc. I will focus on environmental and ecological drivers of traditional food security for the most part, but will certainly make mention of all the social, economic, and political components that are also critical determinants of food security.

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Chris Furgal, Trent University

**Impacts and Adaptations: Insights on Climate Change and Food Security from Canadian Arctic Indigenous Communities**

The Canadian Arctic is home to Indigenous peoples who are already reporting some of the earliest and most severe impacts associated with climate change and variability. Further, research has shown the levels of food insecurity in Nunavut, for example, are among the highest for an Indigenous population outside of the developing world. The recently published Council of Canadian Academies Expert Panel Assessment on Northern Food Security referred to the state of the issue as a “crisis”. However, in many cases communities are already responding to the challenges being faced. This presentation draws upon work conducted under the Expert Panel Assessment, an analysis of food security impacts of the 2009-10 El Nino winter along the Nunatsiavut coast, and other research on impacts and response strategies implemented in some Inuit communities to climate change.
Abstracts: Sessions W4A-W4G

Session: W4A – McCarthy
Bridging the Gap: Tools to Integrate Adaptation into Electricity Sector
Investment Planning / Comblé le fossé : des outils pour intégrer l’adaptation dans la planification des investissements du secteur électrique

Wednesday April 13 – 3:30 pm
to 5:30 pm Presentation Session
Simultaneous Interpretation
Session Chair: Devin McCarthy, Canadian Electricity Association

Climate Change Considerations in Future Hydro Power Project Developments
Kristina Koenig, Manitoba Hydro

Probable Maximum Flood under Changing Climate Conditions for the Mattagami River Basin
John Perdikaris, OPG

The (cQ)² Collaboration: a Task Force for Improved Assessment of Climate Change Impacts on Hydrology and Hydropower in Québec
Catherine Guay, Hydro-Québec

Energy Sector Resilience to the New Normal – Outstanding Examples of Energy Sector Adaptation to Climate Change
Élyse Fournier, Ouranos

Assessing Climate Change Impacts on Energy Demand in Canada
Mary-Ann Wilson, Catherine Marchand, Natural Resources Canada

Abstracts

Kristina Koenig, Manitoba Hydro
Climate Change Considerations in Future Hydro Power Project Developments

The Keeyask Hydropower Limited Partnership considered the potential influence of future climate changes on their proposed Keeyask Generation Project which is a 695MW hydroelectric generating station on the lower Nelson River in northern Manitoba, Canada. In undertaking the environmental analysis the Partnership considered CEAA Guidance on how to incorporate Climate Change Considerations into Environmental Assessment. In general, the Environmental Impact Statement (EIS) considered three aspects of climate change: (1) the effect of the environment, including climate, on the Project; (2) the effect of the Project on the environment, including GHG emissions and (3) the sensitivity of the effects assessment to climate change. While the first two are requirements of the federal EIS Guidelines the latter was done by the Partnership as a precautionary approach to assess whether the environmental assessment conclusions hold for future climate conditions. An analysis of economic effects of climate change looked at the potential impacts of future streamflow on projections of average revenue under various development plans. Manitoba Hydro employed GCM runoff data to assess potential future changes to annual water availability in the Nelson-Churchill watershed under a changing climate using an ensemble of GCM simulations. These simulations were inputted into a system model to determine the long-term operations of Manitoba Hydro’s system under the various development plans. In general, the projections of GCMs indicated that it is more likely there will be an increase in average annual streamflow as approximately 70% of projections show an increase in runoff. On July 2, 2014 the Province of Manitoba issued an Environmental Act License for the Keeyask Generation Project proposed by the Keeyask Hydropower Limited Partnership.

John Perdikaris, OPG
Probable Maximum Flood under Changing Climate Conditions for the Mattagami River Basin

For dams whose failure may cause significant loss of life and/or economic losses the Probable Maximum Precipitation (PMP) and the Probable Maximum Flood (PMF) are two criteria used in their safety risk analyses.
Analysis of the observed climate records and future model projections indicate that the occurrence and frequency of extreme precipitation events such as the PMP are increasing. Four separate scenarios were developed and applied to the Mattagami River basin to assess the performance of future PMF to projected changes in climate parameters: present climate conditions (reference parameters for PMP, 100-year snowpack depth and critical temperature sequence); projected change in spring PMP to reference PMP; projected change in spring PMP and 100-year snowpack depth to reference PMP and 100-year snowpack depth; and projected change in spring PMP, 100-year snowpack depth and critical temperature sequence to reference climate parameters. The following hydrograph parameters of the PMF were evaluated as part of the sensitivity analysis including: the runoff volume, peak flow, time-to-peak and time for flood waters to recede. The methodology used to generate the PMF and the results of the sensitivity analysis will be presented along with a discussion on adaptation options. In addition, there will also be a discussion on the risk analysis procedure that is currently being adopted to assess the suitability of the design and the safety of the dam.

Mary Anne Wilson & Catherine Marchand, Natural Resources Canada
Assessing Climate Change Impacts on Energy Demand in Canada

This presentation highlights key results from Canada’s first study exploring the potential impacts of projected climate change temperature trends on energy demand at national and regional scales (using the Energy 2020 model). The results show that temperature changes are expected to cause seasonal shifts in energy demand and peak load, affecting economic sectors and fuel sources differently. This study brings together the collaborative efforts of federal agencies, provinces and territories, electricity agencies and companies, along with leading climate and energy modelling organizations.

Elyse Fournier, Ouranos
Energy Sector Resilience to the New Normal – Outstanding Examples of Energy Sector Adaptation to Climate Change

The generation of energy is of paramount importance for the prosperity of societies and economies around the world. Within the energy value chain, a large number of elements are sensitive to weather and climate. As such, long-term changes in climate and increased climate variability add a new source of unknowns for the energy sector. Utilities, regulators and governments will need to balance their existing challenges against the cost of future climate risks, and take robust and cost-effective measures.

While there are good examples of building climate resilience, energy sector adaptation remains far from being an integral part of energy business for most Canadian companies. Furthermore, most of the efforts have concentrated on understanding impacts on hydroelectric generation and there is delay in leveraging the existing data and information in business strategy, planning, asset management, project design, opportunity management, compliance and reporting.

At the Ouranos Consortium in collaboration with Deloitte Sustainability we took a look into adaptation projects around the globe to gather examples of state-of-the-art adaptation to challenges of a changing climate. Novel ideas were researched to feed the reflection on climate adaptation needs, how climate services can be delivered and what is required for this information to spur adaptation actions.

As the results of this study, we present a selection of excellent practices of climate change adaptation. These adaptation examples take stock of energy sector initiatives on climate change vulnerability, risk, opportunity and adaptation assessment, and on building climate
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Catherine Guay, Hydro-Québec

The (cQ)² Collaboration: a Task Force for Improved Assessment of Climate Change Impacts on Hydrology and Hydropower in Québec

The (cQ)² collaboration aims at sharing best practices in hydrological impact studies in order to deliver a concerted and robust message to water resources managers and decision makers about the potential impacts of climate change on Québec’s hydrology. The collaboration brings together key actors in hydropower generation and water resources management in the province, namely Hydro-Québec, MDDELCC, Rio Tinto, and Ouranos.

We provide an overview of the study framework adopted in the first phase (2012-2013) of the collaboration and how it evolved in the second phase (2014-2015) to include latest available data and findings from the first phase of the program. The framework includes the use of a large climatic ensemble based on simulations from global and regional climate models, different RCP emission scenarios, and multiple post-processing methods. The hydrological simulations were carried out using HSAMI, a lumped and conceptual model, applied to over 300 Québec river basins. As an outcome to this study, the expected change in hydrological variables such as floods and droughts, seasonal flow, evapotranspiration, and snow water equivalent, is presented. The potential change in those variables is critical for mid-term and long-term planning of future water resources, generating station refurbishment and reservoir management. Uncertainties in the projected changes are also considered and discussed, as well as the impact of methodological choices along the modeling process.
Session: W4B – Kertland
Economic Study of the Potential Impacts of Low Water Levels in the St. Lawrence River and Adaptation Options in the Context of Climate Change / Étude économique des impacts potentiels des bas niveaux d’eau du fleuve Saint-Laurent

Wednesday April 13 – 3:30 pm to 5:30 pm
Presentation Session
Simultaneous Interpretation

Session Chair: Pamela Kertland, Natural Resources Canada

M. Fisher, Council of the Great Lakes Region (CGLR)
Restoring Water Levels on Lake Michigan-Huron: A Cost Benefit Analysis (CBA)

Water levels in the Great Lakes are in a constant state of flux. This is good. Natural fluctuations are essential to a healthy ecosystem. But sustained periods of extreme water levels are potentially costly, both for the economy and the environment. The presentation will provide an overview of the first comprehensive CBA of proposals to restore water levels on Lake Michigan-Huron. The focus on Michigan-Huron is not arbitrary. It was the hardest hit of the Great Lakes during the low-water spell of 1999 to 2013 and arguably in the greatest need, therefore, of restoration.

Nicolas Audet, Ouranos
Étude économique des impacts potentiels des bas niveaux d’eau du fleuve Saint-Laurent et d’options d’adaptation dans un contexte de changements climatiques

Au Québec, les impacts potentiels des changements climatiques sur le fleuve Saint-Laurent et sur ses usages sont une source de préoccupations pour de nombreux acteurs économiques et décideurs. Le transport maritime, la navigation de plaisance, l’approvisionnement en eau potable et le rejet des eaux usées de plusieurs municipalités, la production hydroélectrique au barrage de Beauharnois, la pêche et les services écologiques, ainsi que la valeur foncière de propriétés riveraines sont autant de secteurs qui peuvent être sensibles aux fluctuations des débits et des niveaux d’eau du Saint-Laurent. En 2014 et 2015, Ouranos a réalisé avec plusieurs partenaires une évaluation économique des impacts potentiels de bas niveaux d’eau sur six secteurs d’activités sur la base de scénarios ‘what if’ de fluctuations des débits en contexte de changements climatiques. Des analyses coûts-avantages (ACA) de diverses options d’adaptation ont également été réalisées. Cette présentation offre un survol de l’étude et de ses principaux résultats, en complément aux trois volets spécifiques qui font l’objet de présentations dans le cadre de la session.

Chee Chan, AECOM
Étude économique régionale des impacts et de l’adaptation liés aux changements climatiques sur le fleuve Saint-Laurent: Volet eaux municipales
Many of the climate change impacts affecting ports around the world will inevitably affect Canadian ports. However, within Canada there is an extensive system of inland ports where sea level rise will not be felt, but where a range of other climate factors come into play. The St. Lawrence-Great Lakes system has a dual character, transporting goods between ports within the inland network, and exchanging freight between inland ports and the outside world. This communication is divided into three sections. The first examines the economic importance and trade flows of the system. The second section considers two major climate change impacts, one, the challenge of low water for the ports and the system as a whole; and second, extending the navigation season due to global warming. Predicting the magnitude and scope of future changes due to climate change are shown to be extremely difficult. The third section discusses adaptation measures that are being considered to ensure the commercial viability of ports and shipping on the system. An assessment is made of the difficulties in measuring the cost and operational effectiveness of adaptation measures.

Jie He, Université de Sherbrooke

La valeur économique de la pêche et des services écosystémiques au lac Saint-Pierre

La valeur économique de la pêche et des services écosystémiques au lac Saint-Pierre : analyse coûts-avantages des stratégies d’adaptation aux changements climatiques. L’étude vise à analyser les coûts et les bénéfices des stratégies d’adaptation dans un contexte de changements climatiques, où les coûts réfèrent à la mise en œuvre des stratégies d’adaptation et les bénéfices à la valeur de services écosystémiques clés, soit la qualité des habitats pour la biodiversité (i.e. poissons et oiseaux), la qualité de l’eau, l’accès au Lac Saint-Pierre pour des activités récréotouristiques (i.e. la condition des rives) et l’importance culturelle du Lac. Afin d’estimer les coûts de mise en œuvre des mesures d’adaptation, la méthode des prix de marché a été utilisée. Pour mesurer les bénéfices, une combinaison de quatre méthodes d’évaluation économique des biens environnementaux par préférences exprimées a été retenue, soit les retombées économiques, le comportement contingent, l’évaluation contingente et les choix multi-attributs. Nos résultats montrent que dans tous les scénarios de non-intervention analysés, le statu quo entraînera des pertes économiques considérables pour la région et la mise en œuvre de mesures d’adaptation est économiquement rentable. Plus spécifiquement, notre étude permet d’obtenir des informations sur les différents composants des bénéfices pour les activités de pêche, une activité centrale sur le Lac Saint-Pierre (un secteur du fleuve Saint-Laurent). Jie He, professeure en économie de l’environnement et des ressources naturelles (Université de Sherbrooke), se spécialise depuis une dizaine d’années dans le domaine d’évaluation des biens et services non-marchands à travers une série de projets d’évaluation économique des services écosystémiques, des services publics et du bien-être de la population.

En 2013, elle a collaboré avec OURANOS pour la rédaction d’un guide méthodologique d’évaluation économique des biens non-marchands en apportant principalement son expertise sur la méthode des choix multi-attributs.
Abstracts

Thomas James, Natural Resources Canada

Projections of Relative Sea-level Change in Canada Based on the IPCC AR5

Relative sea-level projections are provided for Canada through the 21st century, relative to 1986-2005. The projections are based on the Representative Concentration Pathway (RCP) scenarios of the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC AR5). Vertical land motion, largely arising from glacial isostatic adjustment and measured by Global Positioning System, plays a prominent role in determining projected relative sea-level change. On the east coast, crustal subsidence, combined with dynamic oceanographic changes, generates relative sea-level projections that are similar to or larger than the global mean projections in large parts of Atlantic Canada.

On the west coast, most relative sea-level projections are smaller than the global means, although some sites in southern British Columbia feature relative sea-level projections similar to the global values. The largest variation in projected relative sea-level rise occurs in northern Canada, owing to the very large spatial differences in present-day crustal uplift due to glacial isostatic adjustment. Here, projected relative sea-level at 2100 varies from around 1 m of sea-level fall (median values) where land is rising quickly on Hudson Bay, while it reaches about 70 cm of sea-level rise on the Beaufort coast where the land is subsiding. The projections presented here are incorporated into an NRCan report “Canada’s Marine Coasts in a Changing Climate” to be published in spring 2016.

Jean-Pierre Savard, Ouranos

Impacts des changements climatiques sur le régime des tempêtes et les surcotes dans la région de la Baie d’Hudson et de la Baie James

Un problème courant qui affecte les communautés et les infrastructures côtières le long des côtes de la baie d’Hudson et de la baie James est la pénurie de données fiables sur les niveaux d’eau extrêmes. De plus, les changements climatiques auront un impact important sur les tempêtes et le niveau moyen de la mer dans cette région. L’objectif de ce projet est d’améliorer la compréhension des impacts des changements climatiques sur le régime des tempêtes et sur les niveaux d’eau actuels et futurs pour certains sites sélectionnés le long des côtes de la baie James et de la baie d’Hudson.
Ce projet a produit des séries temporelles (période 1979-2013) et des statistiques sur les niveaux d'eau (particulièrement des statistiques sur les niveaux extrêmes) qui seront rendues disponibles pour 21 communautés côtières le long des côtes de la baie James et de la baie d'Hudson et du détroit d'Hudson, en partenariat avec le milieu. Ainsi, des renseignements de base importants ont été obtenus afin d'informer la population des risques potentiels pour la sécurité. Les résultats de ce projet fourniront des statistiques de valeurs extrêmes (surcotes et décotes) vitales pour les concepteurs d'infrastructure et ingénieurs. Ce projet contribuera également à conscientiser davantage les communautés crient inuites quant aux impacts des changements climatiques sur les niveaux d'eau et le régime des tempêtes, afin qu'elles puissent adapter leurs infrastructures et adapter leur modes de transport maritime et de gestion des côtes afin de diminuer leurs vulnérabilités.

Urs Neumeier, ISMER-UQAR

Wave Climate in the Gulf of St-Lawrence and its Future Evolution

Waves are the main controlling factor for coastal erosion and an aggravating factor for coastal submersion. The wave climate in the Estuary and Gulf of St. Lawrence (EGSL) is characterized by winter sea-ice, which effectively blocks wind waves and reduces coastal erosion during the cold season. Waves and ice cover have been measured with ADCPs in the EGSL since 2010, including the winter season. The results show a reduced sea ice period, which in some winters only starts in February. Major storms between December and April produced the highest waves. Most waves were generated within the EGSL. The damage capacity of storm waves was modulated by water level, which depends on daily and monthly tidal cycles and on storm surges. Future climate changes may affect the wave climate by modifying the wind regime and by reducing the period of sea-ice cover. Waves were simulated in the EGSL for 1981-2100 with the parametric wave model GENER using wind simulations from the Canadian Regional Climate Model based on greenhouse gas emission scenario A2. Wave attenuation by sea ice was computed from (1) ice cover projection from the Regional Oceanic Model at ISMER, (2) estimate of ice cover from empiric formulae using freezing degree days. The results suggest that future wind variations will not significantly change the wave climate in the EGSL. However, attenuation of offshore waves by sea ice will become negligible between 2060 and 2100 (timing varying for different EGSL regions) leading to an increase of wave energy and a slight increase of storm waves. Nevertheless, nearshore sea-ice may still be present in some sectors and influence waves reaching the shore.

Panel members

Charles Gignac, INRS-ETE  Adam Fenech, IPE
Jeff Hoyt, IPE
Trevor Bell, Memorial University of Newfoundland
Session: W4D – Causley
Mobilizing Climate Adaptation Tools into Professional Practice

Wednesday April 13 – 3:30 pm to 5:00 pm
Panel Session

Session Chair: Devin Causley, Federation of Canadian Municipalities

Abstract

Tools and resources to assist communities in assessing their risk to climate change and identifying needed responses are now widely available and ready for use. Despite these tools being available, action within communities is still limited and only in the awareness building and initial planning stages. Over the last three years a collaborative between the Federation of Canadian Municipalities, Canadian Institute of Planners, Engineers Canada, ICLEI and Institute of Catastrophic Loss reduction has been established with a collective interest to see these tools mobilized.

The unique perspectives of these five national organizations actively engaged in this topic will illustrate the need to appropriately connect the user and the tool. Drawing upon their experience in running a series of cross Canada workshops and consultations the panel will discuss the challenges and opportunities for mainstreaming these tools into application across different practitioner groups.

Panel members

Dan Sandink, Institute of Catastrophic Loss Reduction
David Lapp, Engineers Canada
Leah Carson, Canadian Institute of Planners
Gordon Beal, Chartered Professional Accountants Canada
Christina Schwantes, ICLEI
W4E – Andrey
Strengthening Transportation Networks in the Face of Climate Change

Wednesday April 13 – 3:30 pm to 5:30 pm
Presentation Session

Session Chair: Jean Andrey, University of Waterloo

Les défis de gestion des infrastructures aéroportuaires du ministère des Transports, de la Mobilité durable et de l’Électrification des transports du Québec dans l’Arctique québécois : De la recherche en adaptation aux changements climatiques à l’application

Anick Guimond, MTQ

Vulnerability Assessment Tools for Transportation Infrastructure

Cassandra Bhat, ICF International

Enhancing Climate Resilience for the Canadian Transportation System

Nicole Legault, Transport Canada

Resilience: Climate Change, Extreme Weather and Transportation Systems

Terry Zdan, Manitoba Infrastructure and Transport

The Metrolinx Climate Change Resiliency Study

Sue Sherman, AECOM

Abstracts

Anick Guimond, Ministère des Transports du Québec
Les défis de gestion des infrastructures aéroportuaires du ministère des Transports du Québec dans l’Arctique québécois: De la recherche en adaptation aux changements climatiques à l’application

Le réchauffement climatique qui se produit depuis le début des années 1990 dans l’Arctique québécois a induit une vulnérabilité pour plusieurs infrastructures aéroportuaires du ministère des Transports, de la Mobilité durable et de l’Électrification des transports du Québec (MTMDET) au Nunavik. Depuis le début des années 2000, un endommagement prématuré de certaines infrastructures, notamment causé par le dégel du pergélisol est observé. La durée de vie utile de certaines infrastructures peut donc être diminuée si certaines interventions ou pratiques ne sont pas adaptées à cette nouvelle réalité. Au cours des douze dernières années, le Ministère a confié différents mandats de recherche visant notamment à documenter la vulnérabilité de ces infrastructures en région de pergélisol dans un contexte de changements climatiques (CC) et à expérimenter des solutions d’adaptation. Bien que le développement de la connaissance doit se poursuivre afin de préciser, notamment, les critères de conception qui prennent en compte les CC, les recherches menées au cours des dernières années, ont permis au MTMDET d’adapter ses interventions. Les concepteurs et gestionnaires d’infrastructures doivent maintenant intégrer cette nouvelle connaissance en adaptation aux CC au fur et à mesure qu’elle évolue, ce qui représente un défi de taille.

Cassandra Bhat, ICF International
Vulnerability Assessment Tools for Transportation Infrastructure

In January 2015, the U.S. Federal Highway Administration (FHWA) released four tools to help state and local transportation agencies complete climate change vulnerability assessments. This presentation will provide an overview of the tools, a summary of how they have been used, and potential applications for their use in Canada. The first tool, the Guide to Assessing Criticality in Transportation Adaptation Planning provides guidance and example criteria to help an agency determine which components of its system are the most critical. The second tool, the Transportation Climate Change Sensitivity Matrix, documents how 11 different climate stressors affect 28 different types of transportation infrastructure and operations. This tool helps agencies understand how climate changes could affect their system.
The third tool, the CMIP Climate Data Processing Tool, provides an easy way for agencies to gather and process downscaled climate model data, and “translates” that data into information relevant to transportation engineers and planners. The fourth and final tool, the Vulnerability Assessment Scoring Tool (VAST), provides an easy-to-apply spreadsheet-based framework for assessing vulnerability in a transparent, cost-effective way. These tools can help transportation agencies move quickly and efficiently through the vulnerability assessment phase so they can move on to taking actions to improve resilience. The tools were tested, used, and adapted by dozens of agencies prior to their release.

Nicole Legault, Transport Canada
Enhancing Climate Resilience for the Canadian Transportation System

Canadians depend on transportation services for day-to-day travel, and for the movement of resources and goods vital to the economy. Industries such as manufacturing, energy, mining and agriculture, and services such as healthcare and retail trade, all depend on the reliable functioning of the transportation system. Adapting to a changing climate and emerging environmental conditions remains a relatively new area of focus for the Canadian transportation sector. This presentation will present the current state of knowledge about climate risks and adaptation practices for the sector in Canada, and discuss Transport Canada’s efforts to better understand and address current and future climate risks to transportation infrastructure and operations.

Terry Zdan, Manitoba Infrastructure and Transport
Resilience: Climate Change, Extreme Weather and Transportation Systems
Climate change is resulting in greater variability in weather conditions. Resilient transportation systems will need to adjust or adapt to this increased variability. Resilience will be defined in alignment with the International Panel on Climate Change and discussed within a systems context. Transportation systems include: fixed node infrastructure; fixed route infrastructure; vehicles and equipment; and, people, institutions, laws, policies, and information systems. Examples of extreme weather events impacting Canadian and international transportation systems will be illustrated. The presentation will conclude with a discussion of cross-cutting agency and jurisdictional implications for transportation infrastructure and service providers and users challenges with climate change and extreme weather. References and acknowledgements will be documented.

Sue Sherman, AECOM
The Metrolinx Climate Change Resiliency Study

In 2015 Metrolinx developed a Five Year Strategy (2015-2020) which included the provision for a Corporate Climate Adaptation Plan to be established by 2018. The urgency for its development was partly driven by a record precipitation and flood event that occurred on July 8th, 2013, when an intense storm caused extensive flooding to key transportation assets and services in the Greater Toronto and Hamilton Area. This event, and other stresses caused by a changing climate, have raised questions about the vulnerability of the regional transit system, and the need for the development and implementation of a resiliency and adaptation plan. While Metrolinx currently manages about $11 Billion in assets, the need to consider vulnerability and risk to future climate is further heightened in consideration of an additional $16 Billion - $50 Billion in transit investment that is expected over the next 10-20 years through the implementation of various projects in the early planning stages. Understanding and effectively planning for increased vulnerability and risk to extreme weather and climate change is thus essential in terms of managing its existing and future operations and assets. In the first year of the Strategy, Metrolinx created a new Senior Advisor position in resiliency and adaptation, and
established an internal Resiliency Working Group. It also engaged a consultant team to apply the Public Infrastructure Engineering Vulnerability Committee (PIEVC) Protocol to a selection of six key critical assets, including two rail corridors, two rail stations, and two maintenance facilities. This PIEVC implementation, the first application of PIEVC to a transit operator, will serve as a pilot study for a system-wide analysis of Metrolinx assets. This paper will describe the application of PIEVC to the selected Metrolinx assets, including methodology, findings and recommendations.
Session: W4F – Venema
Levers to Mainstream Adaptation Effectively: Lessons and Best Practices from Western Canada

Wednesday April 13 – 3:30 pm to 5:00 pm
Panel Session

Session Chair: Henry David Venema, IISD & Johanna Wolf, BC Climate Secretariat

Panel members

Danny Blair, University of Winnipeg
Provided an overview of the Prairie Climate Atlas – Visualizing climate change projections for the Canadian Prairie provinces

Dave Sauchyn, University of Regina
Discussed adaptation planning in the agriculture and water sectors in Western Canada

Virginia Wittrock, Saskatchewan Research Council
Shared lessons and best practices on effective adaptation for selected industries focusing on water.

Mark Johnston, Saskatchewan Research Council
Discussed mainstreaming climate change into sustainable forest management

Dirk Nyland, BC Ministry of Transportation and Infrastructure
Shared lessons and best practices from the transportation sector in Western Canada

Emily MacNair, BC Agriculture Climate Action Initiative
Discussed the evolution of the Climate Action Network, shared some of their current programming, and provided comment around momentum and mainstreaming in policy.
Session: W4G – Thistlethwaite
Economic Approaches to Support Community Adaptation Planning

Wednesday April 13 – 3:30 pm to 5:00 pm
Presentation Session

Session Chair: Jason Thistlethwaite, University of Waterloo

Financial Tools to Support Adaptation: The Development and Implementation of Stormwater Charges and Fees
Victoria Kramkowski, City of Mississauga

Municipalities are struggling to pay for their stormwater infrastructure needs, particularly in light of a changing climate. As a result, many municipalities are examining different financing mechanisms in order to better maintain, upgrade, and adapt their stormwater infrastructure to the extreme weather they are currently experiencing and expect to face. Such mechanisms increasingly include a stormwater charge. To date, the City of Mississauga is the largest city in Canada to introduce a stormwater charge. This presentation will outline the process of how Mississauga determined the most appropriate and fair type of stormwater charge for its residents and businesses, challenges in developing and implementing the charge, common themes in the public response, and how the City has responded to make the charge both accepted and effective. The presentation will further outline how a credit system was developed, how its format and eligible properties were chosen, and how the public was educated on the credit application process.

Sustaining Insurance in The Era of Climate Change: The Viability of Coastal Flood Insurance as Climate Loss and Damage Policy
Jason Thistlethwaite, University of Waterloo

Insurance companies recently introduced flood coverage to Canadian homeowners for the first time, but its viability in coastal communities as a mechanism for managing climate change risk is unknown. Flood insurance has emerged as a debated policy mechanism for managing climate loss and damage and pricing exposure to flood risk and transferring liability for loss and damage to a pool of policyholders, flood insurance is considered an efficient and effective mechanism for reducing socioeconomic vulnerability to climate change risk. At the same time, there is evidence that climate change could limit the availability and affordability of insurance thereby increasing socio-economic vulnerability to flooding. Research that assesses the viability of flood insurance as policy capable of managing climate loss and damage and promoting adaptation remains scarce. This paper addresses this research gap in two ways. First, the need for a new insurance model is demonstrated by presenting insurance availability and unaffordability issues in properties exposed to coastal flooding in Atlantic Canada. Insurance flood models already adopted by the U.S., U.K. and Germany will be then applied to the Canadian landscape using Geographic Information Systems (GIS) to assess their capacity to manage climate

Abstracts

Victoria Kramkowski, City of Mississauga
Financial Tools to Support Adaptation: The Development and Implementation of Stormwater Charges and Fees

Era of Climate Change: The Sustaining Insurance in The Sustaining Insurance in The Era of Climate Change: The Viability of Coastal Flood Insurance as Climate Loss and Damage Policy
Jeff Wilson, Green Analytics

Economic Approaches to Support Community Adaptation Decision-making

There have been a number of high profile economic cost assessments of climate change at global and national levels. Much less attention has been paid to the economic implications at a community and municipal level. Without suitable economic tools community adaptation planning tends to rely on asset and human risk assessments. While essential, these approaches do not capture the economic trade-offs between different adaptation strategies in the face of changing climate and weather uncertainty. Through the use of case studies and research conducted by Green Analytics, this presentation with highlight what can be and has been done to help communities (i) understand what their potential economic risks (i.e. costs) are associated with a changing climate; (ii) the degree to which adaption actions mitigate these costs, and (iii) how these can be integrated with traditional asset and human risk assessments to better support adaption planning.

Yves Guérard

Role of Actuaries in Climate Change Adaptation

The presentation provided an overview of the role of actuaries, from the individual to the professional body in climate change adaptation. The Actuaries Climate Index (ACI) is a tool to developed by actuarial organizations in North America to educate actuaries and the public about climate change.
### Thursday April 14, 2016 / Jeudi 14 avril 2016

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<td>Ms. Quynh Anh Nguyen, National Institute for Science and Technology Policy and Strategy Studies</td>
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<td><strong>Shannon Fera, Ontario Ministry of Natural Resources and Forestry</strong></td>
<td><strong>Mr. Kamal Vatta, Punjab Agricultural University</strong></td>
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<td>Planning Conservation Actions – Existing Information, Tools and Needs in Canada</td>
<td><strong>Les effets potentiels des changements climatiques sur la rage du renard au nord du 55e parallèle : comment s’adapter au Nunavik?</strong></td>
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<td>Charles Latremouille, Nature Conservancy Canada</td>
<td>Audrey Simon, Ph.D., Faculté de médecine vétérinaire de l’Université de Montréal</td>
<td><strong>Dr. Xin Qiu and Dr. Gordon Huang, University of Regina</strong></td>
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<td>Using Landscape Connectivity to Build Ecological Resilience</td>
<td><strong>Une solution d’adaptation innovante : l’Observatoire multipartite québécois sur les zoonoses et l’adaptation aux changements climatiques</strong></td>
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<td><strong>Climate Data Landscape in Ontario</strong></td>
<td><strong>Ewa Jackson, Acting Director, ICLEI-Canada</strong></td>
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<td>Jeff Bowman and Chad Cordes, Ontario Ministry of Natural Resources and Forestry / Trent University</td>
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Abderrahmane Yagouti, Health Canada – chair

Immediate Adaptation Options for Short-Duration High-Intensity (SDHI) Rainfall Events in the GTA

Simon Eng, Risk Sciences International

L’évaluation de la vulnérabilité aux changements climatiques du réseau de drainage unitaire de Montréal

Rémi Haf, Ville de Montréal

Capacity Building Options for Municipal Stormwater Systems

Peter Nimmrichter, AMECFW

Uncertainty in Water budget projections for the Mississippi-Rideau watershed region

Sobhalatha Kunjikutty, Mississippi Valley Conservation Authority

| Peter Nimmrichter, AMECFW – chair |

11:00 am to 12:30 pm

Thursday April 14, 2016 / Jeudi 14 avril 2016

قد تحتوي الملاحظة على بعض الخطأ باللغة الفرنسية والإنجليزية. يرجى التحقق من الدقة عند قراءة النص.

Presentation – Th2C Tracking Adaptation to the Health Effects of Climate Change

James D. Ford, McGill University

L’évolution de l’adaptation en santé publique au Québec depuis 10 ans

Céline Campagna, INSPQ

Adapting to the Health Impacts of Climate Change in Ontario

Vidya Anderson, Ontario Ministry of Health and Long Term Care

Adaptation through Collaboration: Health Canada’s Climate Change and Health Actions to Protect Canadians

Carolyn Tateishi, Health Canada

Faire d’une pierre deux coups : Retombées qualitatives et quantitatives de projets de lutte aux îlots de chaleur urbains

Mélanie Beaudoin, INSPQ

Peter Nimmrichter, AMECFW – chair

Setting the Foundation for Resiliency in the Master Planning Process

Jennifer Graham, Nova Scotia Environment – chair

Adaptation to Climate Change and Variability: Who Should Be Involved, Why and How? The Examples of Agriculture and Coastal Communities

Christopher R. Bryant, University of Guelph

Planning for climate impacts that’s delivering results – Using behaviour change approaches to deliver far reaching reform

Rohan Hamden, Rohan Hamden and Associates

L’adaptation aux changements climatiques en zone côtière : une intégration difficile à l’action publique, regards croisés sur le Québec, le Nouveau-Brunswick et le Sénégal

Melinda Noblet and Sebastian Weissenberger, UQAR

Panel – Th2C Strengthening social resilience and socio-cultural factors for more effective climate mainstreaming / Renforcement de la résilience sociale et des facteurs socio-culturels pour intégrer le climat plus efficacement

Paul Donahue, Dillon Consulting Limited – chair

Setting the Foundation for Resiliency in the Master Planning Process

Kiran Chhiba, Dillon Consulting Limited

Moving from Master Plan to Infrastructure Design: Community Scale and Project Specific Vulnerability Assessment using PIEVC

David Lapp, Engineers Canada

Resilient Communities - Adapting Existing Infrastructure - A City of Surrey BC Case Study

Jeenie Lee, City of Surrey, B.C.

Resilient Communities: Adapting Infrastructure Design to Rising Sea Levels

Carrie Baron, City of Surrey, B.C.

Enabling Policy for Resilience

David Chernushenko City of Ottawa

Kelly Froese, Zizzo Strategy Inc - chair

Climate Change and Sustainable Forest Management in Canada: A Guidebook for Assessing Vulnerability and Mainstreaming Adaptation into Decision Making

Jason Edwards, Natural Resources Canada

Forest Change – Information and tools from the Canadian Forest Service in support of forest sector adaptation

Miren Lorente, Canadian Forest Information and Communication Foundation for Climate Change and Adaptation

Adaptation Can

Laura Zizzo, Zizzo Strategy Inc - chair

Economic and Legal Drivers to Consider Climate Change and the Business

Laura Zizzo, Zizzo Strategy Inc

Economic and Technical Drivers to Adapt to Climate Change

Blair Felton, University of Waterloo

Director Duty of Care: Comparing US and China

Carissa Wong, Bionomos Law Professional Corporation

Future fire regime in Canada, potential effects on forest, forest sector and forest communities

Sylvie Gauthier, Canadian Forest Service, Natural Resources Canada

Integrating science and values into adaptation planning and implementation

Chris Swanston, USDA Forest Service
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De la vulnérabilité à la résilience : Intégrer la variabilité climatique dans les plans directeurs de l’eau
Antoine Verville, ROBVQ

One Water Approach: Protecting Our Environment and Communities in the Face of Climate Change
Christine Zimmer, Credit Valley Conservation

Wetlands and Flood Mitigation in Ontario: Natural Adaptation to a Changing Climate
Owen Steele, Ducks Unlimited

Using Community Effluent to Create High Value Heritage Woodlands and Protect Watersheds Under Climate Change in the Canadian Prairies
Norm Henderson, PARC
**Abstracts: Sessions Th1A-Th1F**

**Session: Th1A – Hounsell**
Biodiversity and People in a Changing Climate: Adaptation Imperatives for Enhancing Resilience / Biodiversité et changements climatiques : Résilience, adaptation et état de la biodiversité au Canada

Thursday April 14 - 8:30 am to 10:30 am
Panel Session
Simultaneous Interpretation

Session Chair: Steve Hounsell, Ontario Biodiversity Council

**Panel Members**

Climate Change and Ecosystem-Based Adaptation Approaches: The Benefits to Economies, Health and Biodiversity
Deborah Harford, Executive Director, ACT (Adaptation to Climate Change Team), Simon Fraser University

Positioning Natural Infrastructure and Climate Resilience as a Win for Canadian Economy
Natalia Moudrak, University of Waterloo

Protecting and enhancing ecosystem regulatory services – the role of wetlands and watershed management in flood attenuation
Dr. Mark Gloutney, Director of Regional Operations, Ducks Unlimited Canada

Planning conservation actions in a changing climate – existing information, tools and needs in Canada.
Charles Latremouille, Nature Conservancy Canada

Using landscape connectivity to build ecological resilience
Jeff Bowman and Chad Cordes, Ontario Ministry of Natural Resources and Forestry / Trent University
Session: Th1B- Lowe  
CC et zoonoses : quels sont les impacts et comment s’y adapter pour protéger la santé des Canadiens ? Zoonotic Risks from a Changing Climate: Impacts and Adaptation Strategies to Protect the Health of Canadians  
Thursday April 14 – 8:30 am to 10:30 am  
Presentation and Panel Session  
Simultaneous Interpretation  
Session Chair: Anne-Marie Lowe, INSPQ and Steven Sternthal, Public Health Agency of Canada

Abstracts

Nick H. Ogden, Public Health Agency of Canada  
Vector-borne diseases and zoonoses: Predicting current and future risk associated with climate change

In this presentation Dr Nick Ogden will describe the integrated program used for assessing impacts of climate on vector-borne disease (VBD) and zoonoses occurrence and risk. This involves i) laboratory and field study to parameterise mathematical models, ii) model simulations to quantify climate-risk associations that account for the complexity of climate-independent determinants of zoonosis/VBD risk; iii) prediction of current and (using global/regional climate model outputs) future risk; iv) visualisation using risk mapping, and v) validation by analysis of surveillance data. This will be illustrated using examples of Lyme disease and other tick-borne diseases, and exotic mosquito-borne diseases such as Chikungunya and Zika virus. The integration of these assessments into public health policies, programs and vulnerability assessments will be discussed.

Craig Stephen, Canadian Wildlife Health Cooperative  
Finding zoonotic risk signals at the nature-society interface: Wildlife health as strategic early warning for climate change

The growing recognition that our response to infectious diseases is typically reactive and too late has promoted a shift in emphasis from detection and outbreak response to prevention of infections at source. Given the uncertainties associated with climate change it is critical to systematically scan the environment for early warning signals that could alert public health in advance of human harms.

Changing probabilities of human exposures to pathogens, parasites and pollutants due to climate change will be mediated though changing wildlife movement, migration, food webs and human-wildlife interactions.
Integrating wildlife health events into early warning systems as regular activities is the first step towards better disease intelligence and risk assessment at the animal/human/ecosystem interface that will improve early warning and support response when relevant. Wildlife connects the environment with community and public health to improve local anticipation and preparedness for changes in endemic and emerging diseases associated with climate change. Wildlife disease surveillance and use of wildlife information in risk assessments can inspire early action to reduce human exposure to environmental pathogens and parasites.

Michel Delgat, Public Health Agency of Canada

Climate change adaptation is a new reality for which public health practitioners at all levels must consider when dealing with emerging vector-borne diseases as 75% of emerging infectious agents are zoonotic. The complex ecology of zoonotic infections poses both a challenge to, and opportunities for, surveillance, control, and public communication. A list of ten non-enteric zoonotic diseases of high-risk of emergence in Canada was established by provincial and territorial public health stakeholders in Canada in 2013, among which Lyme disease and West Nile virus were at the top of the list. Research on the ecology and public health impact of vector-borne diseases has resulted in increased diagnostic capacity and predictive ability to identify areas at risk of disease emergence. Further research is still needed, however, to fill critical knowledge gaps on the ecology and burden of these diseases, which in turn will assist in public health decision-making.

Ariane Adam-Poupart, Institut national de santé publique du Québec

L’adaptation du Québec à l’émergence de la maladie de Lyme

La maladie de Lyme est une zoonose émergente au Québec. Elle est causée par la bactérie *Borrelia burgdorferi* qui est transmise par la piqûre d’une tique *Ixodes scapularis* infectée. Dans le contexte des changements climatiques, il est prédit que les hausses des températures accélèrent le cycle de vie de ces tiques vectrices et favorisent l’expansion de leur aire de distribution. Au Québec, la maladie de Lyme est à déclaration obligatoire depuis 2003. Les premiers cas signalés à la santé publique touchaient initialement des personnes ayant contracté l’infection lors d’un séjour à l’étranger. Le premier cas de maladie de Lyme ayant acquis l’infection au Québec a été rapporté en 2006. Par la suite, la proportion de personnes ayant acquis l’infection au Québec a augmenté. En 2014, 125 cas de maladie de Lyme ont été déclarés, dont plus de 50% avaient acquis leur infection localement, essentiellement dans le sud-ouest de la province. Face à cette nouvelle problématique de santé publique, le Québec s’est adapté en se dotant d’un système de surveillance intégré de la maladie de Lyme, qui combine des données de surveillance humaine et acarologique. L’intégration de ces données a d’ailleurs permis de développer la première carte de risque provincial d’acquisition de la maladie de Lyme consécutif à une piqûre de la tique *Ixodes scapularis*. Cette carte permettra de suivre l’évolution de la maladie sur le territoire et fournira des connaissances aux autorités de santé publique pour orienter leurs interventions.

Audrey Simon, Faculté de médecine vétérinaire de l’Université de Montréal

Les effets potentiels des changements climatiques sur la rage du renard au nord du 55e parallèle : comment s’adapter au Nunavik?

Les effets potentiels des changements climatiques sur la rage du renard au nord du 55e parallèle : comment s’adapter au Nunavik? La rage est un enjeu majeur de santé publique dans le Nord du Canada, incluant le Nunavik, situé au nord du 55e parallèle au Québec.
L'épidémiologie de la rage dans l'Arctique est peu documentée. Le principal hôte réservoir dans ces régions est le renard arctique (*Vulpes lagopus*) qui est infecté par un variant unique du virus de la rage : le variant du virus de la rage arctique (VVRA). Le VVRA circule aussi dans les populations de renards roux (*Vulpes vulpes*). Au Nunavik, plusieurs cas d'infections par le VVRA chez des animaux domestiques et sauvages sont documentés chaque année, pouvant mener à des traitements préventifs coûteux en cas d'exposition humaine. Les changements climatiques devraient modifier l'écologie de la rage au Nunavik, principalement via leurs effets sur les populations de renards. Après une brève synthèse des connaissances sur les dynamiques de rage dans les populations de renards des écosystèmes arctiques, les impacts potentiels des changements climatiques menant ultimement à un changement dans l'exposition humaine au VVRA seront expliqués. Les lacunes dans les connaissances seront présentées ainsi que les informations nécessaires pour améliorer la compréhension des conséquences potentielles des changements climatiques sur la propagation du VVRA dans les écosystèmes nordiques. Un exemple d'adaptation sera présenté : un outil pour modéliser la rage dans les populations de renards du Nunavik. Cette mesure, en plus d'améliorer les connaissances, devrait permettre de tester différentes stratégies de prévention et de contrôle, voire même de prédire les épizooties de rage au Nunavik.

2020 est constitué de 30 priorités financées par le Fonds vert du Gouvernement du Québec, qui s'articulent autour de deux grands objectifs : la réduction des émissions de gaz à effet de serre et l'adaptation aux changements climatiques. Dans le cadre de son mandat de gestion, d'implantation et de coordination scientifique des actions spécifiques au volet santé du PACC 2013-2020, l'INSPO a mis en place un Observatoire multipartite sur les zoonoses et l'adaptation aux changements climatiques, en partenariat avec la Faculté de médecine vétérinaire de l'Université de Montréal. Cette initiative vise l'application de l'approche « Une santé » et fait le pont entre les décideurs de politiques publiques, la santé publique et l'expertise scientifique. Unique au Canada, cette solution d'adaptation innovante sera présentée, comme étant le lieu où se rallient les disciplines de santé humaine, animale et environnementale afin d'offrir une vue d'ensemble sur la problématique des zoonoses liées aux changements climatiques.

Prioriser les objets de surveillance et d'analyse de risque, maintenir et renforcer les systèmes et activités de veille scientifique, développer les collaborations et le réseautage, ainsi qu'assurer la diffusion d'information et de transfert de connaissances sont au cœur de ce projet porteur et rassembleur.

Anne-Marie Lowe, INSPQ

**Une solution d’adaptation innovante:**

l’Observatoire multipartite québécois sur les zoonoses et l’adaptation aux changements climatiques

Le Québec s’est engagé à poursuivre des efforts pour lutter contre les changements climatiques et renforcer la résilience de la société québécoise par l’adoption de la Stratégie gouvernementale aux changements climatiques 2013-2020 et du Plan d’action 2013-2020 sur les changements climatiques (PACC 2013-2020). Le PACC 2013-
Session Th1C – Benkert

The Northern Telegraph: Adaptation Messages from the North / Le Télégraphe du Nord: messages du Nord sur l’adaptation

Thursday April 14 – 8:30 am to 10:30 am
Panel Session Simultaneous Interpretation

Session Chairs: Bronwyn Benkert and Alison Perrin, Yukon Research Centre, Yukon College

Abstract

Northern communities are on the forefront of climate change, and we are actively, and sometimes intuitively, planning to adapt to this change. This session convenes a panel of northerners and practitioners working in the North who will talk candidly about their experiences in climate change adaptation, with a focus on communities. They will talk about challenges and best practices, successes and failures, capacity, competing priorities, community fatigue, logistics, data availability, partnership, and funding. Session participants will leave the conversation with a greater appreciation of the shared challenges and opportunities associated with the practical aspects of adaptation planning in the North, increased knowledge of key organizations and partnership groups across the territories, and a window on the world of northern communities living in the world of climate change and adaptation.

Panelists:

Brian Sieben, Climate Change Adaptation Planning Specialist, Government of the Northwest Territories, representing the Pan-Territorial Adaptation Partnership (also serving as panel chair)

Rose Kushniruk, Vice-Chief, Champagne Aishihik First Nation, Yukon

Tim Soucie, Community-Based Researcher, Pond Inlet, Nunavut

Elise Foong, Senior Consultant, AECOM

Anne Kendrick, Senior Policy Advisor, Environment and Wildlife, Inuit Tapiriit Kanatami
Abstracts

Prof. Dick Peltier, University of Toronto
Dynamically Downscaled Climate Change Projections for Ontario and the Great Lakes Basin with the US WRF model

- A new dynamical downscaling climate change pipeline has been developed and applied to the Great Lakes Basin and the Province of Ontario
- Accuracy of the downscaling results depends strongly on coupling an explicit model of lake influence to the regional climate model (WRF)
- Dynamically downscaled results have proven to provide an excellent means of analysing the impact of warming on extreme events in the region, including those associated with lake effect snowfall
- For Ontario, the ensemble of downscaled results has recently been enriched to include results for an initial condition ensemble of CESM1 integrations and a set of global simulations produced by other global model projections of global warming based upon the use of a set of models from the CMIP5 archive
- The procedure has also been applied to Western Canada (Erler and Peltier, J. Climate, 2015) and is currently being applied to the Tibetan Plateau region as well.

Prof. Gordon Huang, University of Regina
High-Resolution Regional Climate Projections on the Ontario Climate Change Data Portal

In Canada the climate is changing – severe floods have frequently struck its major cities and caused billions of dollars in damage. Our design of critical infrastructure, city water systems, building codes, and water rights is based on the past; however, such an assumption of stationarity may not be appropriate in the context of climate change.

The presentation provided:

- Methodology for high-resolution regional climate projections
- Highlights of future climatic changes for Ontario
- Ontario Climate Change Data Portal
- Future work
Dr. Xin Qiu and Prof. Huaiping Zhu – York University

High Resolution Regional Climate Projections over Ontario Using Ensemble Optimal Interpolation (ENOI) and Local Intensity Scaling (LOCI) Techniques

This presentation shared the methodology used for the projections, the high resolution regional climate projections over Ontario, data dissemination (public data portal), and future work.

Anne Frigon, OURANOS

High Resolution Regional Climate Projections over Ontario with the Canadian Regional Climate Model (CRCM)

Ouranos is a consortium on regional climatology and adaptation to climate change with the mission to acquire and develop knowledge on climate change, and to provide the information and scientific support required for vulnerabilities, impacts, and adaptation studies. Within the organization, the Climate Simulation and Analysis Group has the responsibility to produce regional climate simulations and projections that will serve as a basis for climate impact projects at Ouranos. Over the past decade, the group has produced numerous climate change simulations with version 4 of the Canadian Regional Climate Model (CRCM4) at a 45-km resolution. Moreover, Ouranos' participation in the North American Regional Climate Change Program (NARCCAP) has provided access to a larger ensemble of RCMs, which is essential to help define the confidence levels for the projected variables. This presentation will focus on hydro-climatic projections over Ontario watersheds, complemented with some results over the Great Lakes. These analyses are based on NARCCAP Regional Climate Model (RCM) simulations, as their finer resolution allows better representation of many local processes compared to Global Climate Models (GCMs). The limited size of RCM ensembles requires that we find ways to consider information from the GCMs to get an overall picture in order to be more informative to decision-makers. The latest generation model, the CRCM5, developed by UQAM (Université du Québec à Montréal) in collaboration with Environment Canada, and recently adopted as Ouranos' operational model, will be also introduced.

Adam Hogg, Ontario Ministry of Natural Resources and Forestry

Climate Change Projections for Ontario: An updated synthesis for policymakers and planners

- Ontario is getting warmer, wetter, and experiencing less precipitation as snow
- Wildlife, forests and fish are all impacted by this change
- MNRF summarized, analyzed and interpreted CFS climate projections to inform the government and the public about potential impacts of climate change
- Focus should now be on:
  - Improving the monitoring station network
  - Frost projections
  - Using improved precipitation models to generate MNRF relevant information

Dana Krechowicz, Environmental Commissioner of Ontario

Climate Data Landscape in Ontario

Relevant and understandable climate data and projections are key inputs for adaptation planning. Currently in Ontario, those who need climate data, including policymakers, business people and farmers, have difficulty accessing the information they need to move forward on adaptation, for a variety of reasons. Drawing on extensive stakeholder engagement in Ontario, including a roundtable in January 2015, Dana from the Environmental Commissioner of Ontario will discuss the current state of access to climate data in the province, and options for how the current challenges could be addressed.
Session: Th1E - Charron
Adaptation solutions and innovations from the South: How can climate communication and Canada-South collaboration inform adaptation at a larger scale

Thursday April 14 – 8:30 am to 10:30 am
Presentation and Panel Session

Session Chair: Dominique Charron, IDRC

Panel Members

Berhane Gebru, FHI360
Use of ICTs for Sharing Climate and Marjet Data with Smallholder Farmers in Uganda

Quynh Anh Nguyen, National Institute for Science and Technology Policy and Strategy Studies
Communication of Climate Risk in Vietnam’s coastal cities

Allan Cain, Development Workshop Angola
Risk mapping in unplanned settlements of coastal cities in Angola

Mr. Kamal Vatta, Punjab Agricultural University
The use of soil moisture sensors in agriculture in to conserve water and energy in India’s Punjab region
**Abstract**

Adaptation tracking seeks to systematically characterize, monitor, and compare general trends in climate change adaptation over time and across jurisdictions. Recognized as essential for evaluating adaptation progress, there have been few attempts to develop systematic approaches for tracking adaptation. This is reflected in polarized opinions, contradictory findings, and lack of understanding on the state of adaptation. Yet the need for adaptation tracking studies has been widely articulated. At the global level, for instance, the Adaptation Committee of the UNFCCC has called for the development of better tools and indicators for examining adaptation progress; a call repeated by many national and regional government who want information on what is currently being done to adapt to climate change. Presentations in this session will: assess how adaptation tracking studies can inform monitoring and evaluation objectives of across scales, including through the UNFCCC; outline key conceptual and methodological considerations necessary for adaptation tracking research to produce systematic, rigorous, comparable, and usable insights that can capture the current state of adaptation at local, regional and global scales; and profile diverse examples of tracking projects that have been conducted, including work focusing on global cites, OECD nations, public health in Canada, and Parties to the UNFCCC.

**Panel Members**

Michael Houle, ICLEI
Alexandra Lesnikowski, McGill
Haley Price-Kelly, IISD
Tamara Levine, Tumanako Consulting
Jimena Eyzaguirre, ESSA
Abstracts: Sessions Th2A-Th2F

Session: Th2A-
Nimmrichter
Extreme Precipitation and Stormwater Management / Précipitation extrême et gestion des eaux pluviales

Thursday April 14 – 11:00 am to 12:00 pm
Presentation Session Simultaneous Interpretation

Session Chair: Peter Nimmrichter, AMECFW

Immediate Adaptation Options for Short-Duration High-Intensity (SDHI) Rainfall Events in the GTA
Simon Eng, Risk Sciences International

Over the course of the past decade, several short-duration, high-intensity (SDHI) rainfall events have resulted in significant impacts to the Greater Toronto Area, with individual storms generating $100’s of millions to well over $1 billion in damages to both private property and public infrastructure. These events have recently been investigated further as part of an integrated vulnerability assessment of the Cooksville Creek watershed. Due to the localized, rapid onset, and short duration character of these events, a number of parallels can drawn between SDHI rainfall cases and other severe thunderstorm hazards. These include challenges associated with reporting and population biases, paralleling similar challenges well documented in studies of tornadoes (e.g., Cheng et al., 2013), potentially leading the under-characterization of risk. Recent, well publicized SDHI events (e.g., July 8, 2013, Aug 19, 2005) were mapped alongside so-called “near-miss” cases to provide a better illustration of the geographical distribution of SDHI rainfall occurrences in the region. Similar adaptation strategies to those used to respond to tornadoes are also proposed, including the development of forecast and “nowcast” based warning systems, post-event forensic investigations, and public outreach measures, all of which can be readily integrated into ongoing activities undertaken by Ontario’s conservation authorities. And while a direct link between multiple recent SDHI events in the GTA and climate change remains elusive, they have clearly demonstrated an already present vulnerability, highlighting the need for immediate implementation of adaptation actions.

Capacity Building Options for Municipal Stormwater Systems
Peter Nimmrichter, AMECFW

L’évaluation de la vulnérabilité aux changements climatiques du réseau de drainage unitaire de Montréal
Rémi Haf, Ville de Montréal

À Montréal, les changements climatiques risquent de soumettre les infrastructures de l’eau à des situations pour lesquelles elles n’ont pas été conçues à l’origine et de compromettre le niveau de service attendu par la population. Le Service de l’eau a utilisé le Protocole du comité sur la vulnérabilité de l’ingénierie des infrastructures publiques (CVIIP) d’ingénieurs Canada afin d’effectuer une évaluation de la vulnérabilité aux changements climatiques des infrastructures.
de son réseau d’égout unitaire qui dessert approximativement les deux tiers du territoire. Une attention était aussi portée aux aménagements de surface qui font cheminer le ruissellement jusqu’à ce réseau.

La démarche du Protocole a permis une meilleure compréhension du fonctionnement du réseau de drainage et ses interdépendances avec le milieu urbain qu’il dessert au regard des changements climatiques. Les résultats ont mis en évidence un certain nombre de constats selon trois grandes considérations importantes pour le Service de l’eau: l’intégrité structurelle des infrastructures, leur fonctionnalité ainsi que les opérations et l’entretien. Quelques éléments d’infrastructures se sont révélés potentiellement vulnérables face à certains aléas climatiques à l’horizon 2050. La présentation s’attardera en particulier sur les recommandations qui découlent de cette évaluation et montrera, à l’aide d’exemples concrets, comment cette démarche a contribué à rapprocher différents services municipaux dans la réalisation de certaines des mesures d’adaptation préconisées dans le rapport d’évaluation.

Peter Nimmrichter, AMECFW
Capacity Building Options for Municipal Stormwater Systems

Amec Foster Wheeler on behalf of the City of Welland, Ontario, assessed the resiliency of the City’s stormwater/combined sewer systems and the wastewater treatment plant, in 2013, to potential climate change impacts using the Public Infrastructure Engineering Vulnerability Committee (PIEVC) vulnerability assessment protocol. The outcomes of that assessment have been supporting City staff to better manage infrastructure risks, by increasing the understanding of uncertainty related to infrastructure planning and design.

The City has used outcomes from the PIEVC assessment to examine options related to updating storm sewer design criteria, modifying design performance levels and evaluating the potential impacts to future capital expenditures. This detailed review was founded on an analytical assessment using traditional storm sewer design approaches for two existing residential developments in Welland. The analyses concluded that projected climate change impacts will have direct consequences to infrastructure performance. Further, adaptation decisions may differ for various stormwater infrastructure and adaptation need not be financially prohibitive.

This presentation focuses on the next phase of the climate change impact assessment which is founded on dynamic modelling of the major/minor stormwater systems contributing to a stormwater management facility in the City which is presently experiencing performance issues. The objective of the modelling is to investigate how changing future precipitation patterns may exacerbate current problems and specifically identify if more frequent surcharging events will manifest as more frequent at ground or on street flooding. This assessment examines various infrastructure adaptation considerations, notably to either “offset” the projected rainfall increases or to convey more runoff.

Sobhalatha Kunjikutty, Mississippi Valley Conservation Authority
Uncertainty in Water Budget projections for the Mississippi-Rideau watershed region

Uncertainties always exist in climate projections and might result in less confidence on the likely effect of such change in climate on hydrology and water resources. This study, to project water budget parameters for the Mississippi Rideau watershed region ‘is a sub-project of regions’ climate change vulnerability assessment. The main objective of the study was to compare climate projections from different GCM scenarios and to generate water budget components for the region to estimate the uncertainty pertaining to climate change on the hydrology. The study uses multi-modal, multi-scenario climate projections using the delta method in assessing
the uncertainty in hydrologic components linked to the future climate.

The average annual temperature in the region projected 1.30°C, 2.50°C, and 4.10°C increase from a baseline temperature of 5.70°C in Mississippi and 2.00°C, 2.40°C, and 4.10°C increase from 6.10°C in Rideau, for the 2020s, 2050s, and 2080s. Highest increase was projected in the winter and is crucial influencing most of the changes in runoff, such as increased winter runoff, reduced capacity of snow storage infiltration and soil storage. Similar to other studies, average annual precipitation projected 10% increase, but in summer it projected 2-6% decrease. Similarly, annual average runoff projected 0-6% increase, but in spring and summer it decreased to 13 to 42% and 20 to 65%, respectively. Soil moisture deficit increased consistently in all months except in winter. The drop in runoff, precipitation and the increase in soil moisture deficit in summer is challenging to meet water demands during the low flow season.
Abstracts

James Ford, McGill University

**Tracking adaptation to the health effects of climate change**

Adaptation tracking seeks to characterize, monitor, and compare trends in climate change adaptation. Recognized as essential for evaluating adaptation progress, there have been few attempts to develop systematic approaches for tracking adaptation, particularly at global to regional scales. This presentation will first outline key methodological considerations necessary for adaptation tracking research to produce systematic, rigorous, comparable, and usable insights that can capture the current state of adaptation, provide the basis for characterizing and evaluating adaptations taking place, and can underpin the monitoring of change in adaptation over time. We then apply this approach to examine what Canadian federal, provincial, territorial and municipal jurisdictions are doing to adapt to the health effects of climate change, drawing upon publically available information. Federal health adaptation initiatives emphasize capacity building and gathering information to address general health, infectious disease and heat-related risks. Provincial and territorial adaptation is varied, with Quebec emerging as a leader that is addressing almost all risks posed by climate change in the province, and having implemented various adaptation types. Meanwhile, all other Canadian provinces and territories are in the early stages of health adaptation. Based on publically available information, reported adaptation also varies greatly by municipality. The six sampled Canadian regional health authorities (or equivalent) are not reporting any adaptation initiatives.

Céline Campagna, McGill University, Institut national de santé publique (INSPQ)

**L’évolution de l’adaptation en santé publique au Québec depuis 10 ans**

Le gouvernement du Québec lançait en 2007 un plan d’action contre les changements climatiques avec un important volet d’adaptation en santé publique. Les principales réalisations du plan de 2008-2013 incluent : 1) l’implantation dès 2010 pour tout
Adaptation through collaboration: Health Canada’s climate change and health actions to protect Canadians

Many Canadians are vulnerable to the health impacts of climate change. National science assessments which included information on growing health risks from climate change were released in 2008 (Health Canada) and 2014 (Natural Resources Canada). To help prepare Canadians for climate change the Health Portfolio is working with a range of provincial/territorial and local partners to address risks from extreme heat events, vector-borne diseases and special challenges facing northern Canadians.

This presentation provides an overview of the multi-year initiative Health Canada launched in 2007 to Develop Heat Resilient Individuals and Communities in Canada. Information about

Le Québec d’un système d’alerte et surveillance en temps réel pour tous les extrêmes météorologiques, incorporant 40 indicateurs et cartes en ligne; 2) des guides et normes pour les établissements de santé, écoles, garderies et municipalités en matière de verdissement, bâtiments et stationnements; 3) quarante projets pilote en réduction des îlots de chaleur urbains et leur évaluation pour la réduction de la chaleur et la qualité de vie; 4) quinze projets de recherche sur les risques en qualité de l’air, chaleur, fractures et verglas, allergies à l’herbe à poux, seuils de température, maladies zoonotiques, air intérieur, espaces verts, populations défavorisées, cartographie du pergélisol pour les établissements nordiques; 5) un effort majeur de dissémination pour le grand public et les professionnels.

L’approche de mise en œuvre a été ouverte et participative, basée sur les données scientifiques et axée sur les besoins des utilisateurs. Une évaluation de programme externe a souligné le grand succès du plan auprès des clientèles visées. L’une des clés du succès était le financement multi-annuel permettant une planification adéquate et une mobilisation des partenaires.


Vidya Anderson, Ministry of Health and Long Term Care, Ontario

Adapting to the health impacts of climate change in Ontario

Climate change is the defining issue of our time and must be recognized and dealt with as a multi-disciplinary and cross-sectoral problem. Bridging the divide between the human health and environmental impacts of climate change is the key to effective adaptation in this changing world in order to promote healthy environments – both natural and built, improve health outcomes and reduce social costs. Public health units are uniquely positioned to bridge this divide and reduce public health vulnerability to climate change through risk assessment, preparation and public communication. To effectively address the climate change challenge, climate change information and adaptation considerations need to be integrated into operational processes. In addition, cross-sectoral engagement and collaboration on new and existing programs and services must be enhanced.

The Environmental Health Climate Change Framework for Action for Ontario provides a comprehensive suite of tools and resources for public health units to support resilient and adaptive communities. This presentation will showcase the Framework for Action and share key tools specifically developed for public health units. The tools include the new Ontario Climate Change and Health Vulnerability and Adaptation Assessment Guidelines developed for Ontario’s 36 public health units based on the Health Canada and WHO methodology and a climate modelling study to project the health impacts of climate change across Ontario’s 36 public health units.

Carolyn Tateishi, Health Canada

Adaptation through collaboration: Health Canada’s climate change and health actions to protect Canadians

Many Canadians are vulnerable to the health impacts of climate change. National science assessments which included information on growing health risks from climate change were released in 2008 (Health Canada) and 2014 (Natural Resources Canada). To help prepare Canadians for climate change the Health Portfolio is working with a range of provincial/territorial and local partners to address risks from extreme heat events, vector-borne diseases and special challenges facing northern Canadians.

This presentation provides an overview of the multi-year initiative Health Canada launched in 2007 to Develop Heat Resilient Individuals and Communities in Canada. Information about
temperature-mortality associations and engagement with a broad range of community stakeholders to address key vulnerability factors are needed to support the development of effective Heat Alert and Response Systems (HARS).

Community based measures should also include preventative urban design actions that reduce local heat exposures before they occur. Under this initiative, Health Canada worked with provincial and local health sector and emergency management officials and community groups to better understand heat-health risks to Canadians and increase awareness and knowledge of risks among health professionals. To facilitate the expansion of HARS to at-risk communities across Canada it created guidance for developing these systems and enhanced the capacity of stakeholders to take needed actions at local and regional levels. Key learnings from this health adaptation initiative will be shared with session participants.

Mélanie Beaudoin, INSPQ

Faire d’une pierre deux coups : Retombées qualitatives et quantitatives de projets de lutte aux îlots de chaleur urbains

Dans le cadre du Plan d’action 2006-2012 sur les changements climatiques du Gouvernement du Québec, l’Institut national de santé publique du Québec a lancé des appels de propositions afin de mettre en place des projets de démonstration de lutte aux îlots de chaleur urbains (ICU) dans des quartiers où habitent des populations vulnérables. Les projets subventionnés devaient effectuer différentes mesures d’adaptation : toiture verte ou blanche, verdissement, aménagement de cours d’école, etc. Des évaluations ont été réalisées par des partenaires. D’abord, des images thermiques satellitaires, une modélisation numérique de surface et une campagne de mesures de la température ont permis de comparer les températures de surface avant et après la réalisation des projets. Ensuite, une évaluation qualitative a mesuré les effets des projets sur la qualité de vie des citoyens.

L’évaluation a examiné des dimensions de qualité de vie qui ont été dégagées par une revue de la littérature et par des consultations auprès des projets participants. Des questionnaires et entrevues ont été administrés, portant notamment sur la dimension esthétique de l’aménagement, la sécurité des lieux et le gain de fraîcheur. Quarante projets ont été complétés. Les évaluations réalisées ont permis de mesurer la réduction effective de l’effet d’ICU et d’apprécier l’amélioration de la qualité de vie des citoyens. Au-delà du gain de fraîcheur, ces projets ont aussi eu des retombées sociales, notamment par la revitalisation des quartiers, la solidarité sociale ou la sécurité alimentaire. Les résultats d’évaluation ont mené à une réorientation de nos actions en la matière.
Session Th2C – Graham
Strengthening social
cultural factors for more
effective climate
mainstreaming /
Reinforcement de la
résilience sociale et des
facteurs socio-culturels
pour intégrer le climat
plus efficacement

Thursday April 14 – 8:30
am to 10:30 am
Panel Session
Simultaneous
Interpretation

Session Chair: Jennifer
Graham, Nova Scotia
Environment

Abstract

Many private, government, and public institutions and associations are working to imbed climate change adaptation into their work through planning, policies, capacity building, and resourcing adaptation efforts. In some situations, these mainstreaming efforts are adopted and implemented. In others, there is resistance and slow uptake. Why do similar approaches lead to different results in different contexts? What is the role of social cultural factors in enhancing or hinder climate mainstreaming? There is growing interest, and emerging research on the role of culture in mainstreaming climate change adaptation. This session will present ongoing work and research from Canadian cities (Vancouver) provincial government (Nova Scotia, British Columbia) regions (Quebec, New Brunswick), sectors (agriculture and fisheries), and agricultural and international perspectives (Australia, Senegal).

Panelist Members

Jennifer Graham, Senior Policy Analyst, Nova Scotia Environment

Christopher Bryant “Adaptation to Climate Change and Variability: Who Should Be Involved, Why and How? The Examples of Agriculture and Coastal Communities”

Rohan Hamden “Planning for climate impacts that’s delivering results – Using behaviour change approaches to deliver far reaching reform”

Mélanie Noblet and Sébastien Weissenberge “intégration difficile à l'action publique, regards croisés sur le Québec, le Nouveau-Brunswick et le Sénégal”
Session Th2D – Donahue
Urban Resiliency for a Changing Climate: Master Planning to a Resilient Design of the Built Environment

Thursday April 14 – 8:30 am to 10:30 am
Panel Session

Session Chair: Paul Donahue, Dillon Consulting Limited

Abstract

The impact of a changing climate is affecting communities all across Canada. The current performance of urban infrastructure previously designed and constructed in the past is more and more found to be compromised by extreme weather. The resulting impacts have included increased risk of flooding, disruption to critical services, and deterioration of infrastructure. Local service providers responsible for providing the high levels of service that we are accustomed to, are now faced with the new reality that it is not business as usual. Consequently, updating our understanding of the current environment and being prepared for an uncertain future is at the forefront. This session will present case studies and investigations focused on the adaptation efforts of key infrastructure and services across the country.

Panel Members

Setting the Foundation for Resiliency in the Master Planning Process
Kiran Chhiba, Dillon Consulting Limited

Moving from Master Plan to Infrastructure Design: Community Scale and Project Specific Vulnerability Assessment using PIEVC
David Lapp, Engineers Canada

Resilient Communities - Adapting Existing Infrastructure - A City of Surrey BC Case Study
Jeannie Lee, City of Surrey, B.C.

Resilient Communities: Adapting Infrastructure Design to Rising Sea Levels
Carrie Baron, City of Surrey, B.C.

Enabling Policy for Resilience
David Chernushenko City of Ottawa
Session: Th2E – Ste-Marie
Information and tools to support Adaptation of Sustainable Forest Management in Canada

Thursday April 14 –
11:00am to 12:30 pm
Presentation Session

Session Chair: Catherine Ste-Marie, Natural Resources Canada

Climate Change and Sustainable Forest Management in Canada: A Guidebook for Assessing Vulnerability and Mainstreaming Adaptation into Decision Making
Jason Edwards, Natural Resources Canada

Forest Change – Information and tools from the Canadian Forest Service in support of forest sector adaptation
Miren Lorente, Canadian Forest Service, Natural Resources Canada

Future fire regime in Canada, potential effects on forest, forest sector and forest communities
Sylvie Gauthier, Canadian Forest Service, Natural Resources Canada

Integrating science and values into adaptation planning and implementation
Chris Swanston, USDA Forest Service

Abstracts

Jason Edward, Natural Ressources Canada
Climate Change and Sustainable Forest Management in Canada: A Guidebook for Assessing Vulnerability and Mainstreaming Adaptation into Decision Making

Climate change presents opportunities as well as significant challenges to Canada's forests, forest industries, and the livelihoods of many Canadians. Understanding the impacts of a changing climate on Canada’s forestry resources and operations, and implementing proactive and effective adaptation are essential to maintaining a vibrant and resilient forest sector with forest industries that are competitive in a global market place. Through the Canadian Council of Forest Ministers (CCFM), the Canadian Forest Service (CFS) collaborated with provinces and territories to develop new knowledge and innovative tools for adapting Canada’s forest sector to climate change, including a guidebook for mainstreaming climate change into sustainable forest management decision making. Targeted at forest resource professionals, the guidebook provides a structured, scalable vulnerability assessment (VA) framework for proactive decision making under uncertainty. Using the guide will lead to well-defined and implementable adaptation actions that capitalize on opportunities and minimize threats from a changing climate. The guide has been endorsed by the CCFM, is available for free, has been tested on a new forest management plan by the Province of Manitoba, and is being considered for use in a number of upcoming forest management agreement renewals.

Costs of implementing the guidebook and the VA process are scalable and flexible to various forest management contexts. It is expected that through the use of this guide, Canada’s forest sector will be better prepared for an uncertain future driven by a changing climate, thus maintaining or enhancing Canada’s forest sector competitiveness.

Miren Lorente, Natural Ressources Canada
Forest Change – Information and tools from the Canadian Forest Service in support of forest sector adaptation

Forest Change is the Canadian Forest Service contribution to the Adaptation theme of the Government of Canada’s Clean Air Agenda. Since 2011, Forest Change has been generating a wide range of knowledge products and tools designed to inform adaptation decision making. The Forest Change website is a science synthesis and integration portal that includes information syntheses, graphs,
maps, guidebooks, decision-support systems, databases, references and related links. It provides a series of key indicators (e.g., climate moisture index, start of fire season) of past trends and future projections of forest changes across Canada. Projections are based on the Representative Concentration Pathways 2.6, 4.5 and 8.5 of the 5th Assessment Report of the Intergovernmental Panel on Climate Change for three timelines (short-, medium- and long-term).

Along with these indicators, adaptation tools and resources are provided to help forest managers understand and address the impacts of climate change on Canada’s forests. For instance, SeedWhere is a tool that helps users match seed sources to planting sites under the current or a future climate. The website also informs the reader about functional traits that influence tree sensitivity to climate change and their capacity to migrate. Another example is a database with the details and status of many provenance trials across Canada, which provides information on the vulnerability of tree species to changing climate conditions. The objective of this presentation is to introduce the information and tools included in the Forest Change website.

Sylvie Gauthier, Natural Resources Canada

**Future fire regime in Canada, potential effects on forest, forest sector and forest communities**

Fire is a natural disturbance affecting the dynamics of Canadian forest. Under future climate change projection, the climate is expected to be more conducive to fires. For instance, the annual area burn is projected to increase considerably in the country, with large regional variation. This change in fire regime will have impacts not only on the forest itself, but also for the forest sector and the forest communities. In this presentation we will show the future projection of fire regime (number of fire, area burned and seasonality) across the country. We will then illustrate the potential impacts of these changes on the ability to maintain the current harvesting levels in the forest, using a simple model. An evaluation of the cost of fire protection under these circumstances will also be presented. We will then discuss how this type of information could be used to further assess the impact of fire for other sectors or forest communities (habitat availability, damage to infrastructure, risk of evacuation or health problems) in order to start the adaptation process.

Chris Swanston, USDA Forest Service

**Integrating science and values into adaptation planning and implementation**

The Climate Change Response Framework (CCRF; www.forestadaptation.org) in the United States spans 20 states in the upper Midwest and Northeast and was launched in 2009 to help people meet their land stewardship goals while minimizing climate risk. The emphasis of the CCRF on stewardship goals represents a subtle but important shift in focus to people and their values, as opposed to climate change and its effects. It has involved thousands of people and over 100 organizations, and published six ecoregional vulnerability assessments with more than 130 authors. The CCRF developed a climate planning tool, the Adaptation Workbook (www.adaptationworkbook.org), for use along with ecosystem vulnerability assessments and a diverse “menu” of adaptation strategies to generate site-specific adaptation actions that meet the explicit conservation objectives of the landowner or resource manager. These tools have been integrated into an Adaptation Planning and Practices workshop that leads organizations through this structured process of designing adaptation tactics for their projects and plans. This approach has generated more than 175 intentional adaptation demonstrations in real-world land management projects on federal, state, tribal, county, conservancy, and private lands. In each case, landowners and resource managers pursued adaptation actions that reflected their own values, needs, constraints, and opportunities. This presentation will consider lessons learned in moving from information to implementation with diverse stakeholders across a diverse landscape.

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Ontario Centre for Climate Impacts and Adaptation Resources (OCIIAR)
Abstract

Dramatic changes in climate and investor expectations are impacting business and investment in Canada. Corporate decision-makers are being called upon to make strategic business decisions in a rapidly changing climate context with new attendant risks and opportunities. Recent extreme weather events have caused unprecedented infrastructure damage and other economic losses.

Insured losses related to extreme weather events continue to rise and the industry is increasingly concerned about liability exposure. Understanding and preparing for climate change impacts is a business imperative, presenting economic opportunities to those who make smart investments and develop forward-thinking strategies. This panel session will explore the economic and policy drivers to incorporate climate change into business planning and management (e.g. corporate securities, corporate governance) and discuss the growing need to measure, disclose and manage climate change risks associated with investments and portfolios.

Presenters

Economic and Legal Drivers to Consider Climate Change and the Business Imperative to Develop Climate-Smart Strategies
Laura Zizzo, Zizzo Strategy Inc

Economic and Technical Drivers to Adapt to Climate Change
Blair Feltmate, University of Waterloo

Director Duty of Care: Comparing US and China
Carissa Wong, Bionomos Law Professional Corporation
Abstracts: Sessions Th3A-Th3F

Session: Th3A – Zimmer
Innovative Strategies for Resilient Watersheds / Stratégies novatrices pour des bassins versants résilients

Thursday April 14 – 1:30pm to 3:00 pm
Presentation Session
Simultaneous Interpretation

Session Chair: Christine Zimmer, Credit Valley Conservation

De la vulnérabilité à la résilience : Intégrer la variabilité climatique dans les plans directeurs de l'eau
Antoine Verville, ROBVQ

One Water Approach: Protecting Our Environment and Communities in the Face of Climate Change
Christine Zimmer, Credit Valley Conservation

Wetlands and Flood Mitigation in Ontario: Natural Adaptation to a Changing Climate
Owen Steele, Ducks Unlimited

Using Community Effluent to Create High Value Heritage Woodlands and Protect Watersheds under Climate Change in the Canadian Prairies
Norm Henderson, PARC

Abstracts

Antoine Verville, ROBVQ
De la vulnérabilité à la résilience : Intégrer la variabilité climatique dans les plans directeurs de l'eau

Cette présentation fera état de la démarche entreprise par les organismes de bassins versants (OBV) du Québec afin d'intégrer la variabilité climatique à leurs plans directeurs de l'eau (PDE), réalisés en concertation avec des acteurs de secteurs d'activité diversifiés. Une boîte à outils sur l'intégration de la variabilité climatique dans les PDE a été développée au cours des dernières années avec le soutien des OBV, de chercheurs universitaires et de partenaires institutionnels. L'approche retenue propose 11 questions à répondre au cours du développement d'un plan directeur de l'eau et est basée sur l'identification des vulnérabilités à l'échelle du bassin versant.

En plus de cette démarche par questions, des outils complémentaires ont été développés dans le cadre d'un collaboration avec l'Alliance de recherche Universités-communautés sur les défis des communauté côtières (ARUC-DCC). Ces outils seront brièvement abordés. Il concerne d'abord la prospective, ou la capacité des communautés affectées de se projeter dans l'avenir, les capacités de résilience des communautés et des socio-écosystèmes, l'analyse de réseau social, l'utilisation des savoirs locaux en l'absence de savoirs "scientifiques", etc.

Finalement, les obstacles à l'adaptation des acteurs de l'eau seront aussi évoqués, dont notamment la gestion sectorielle, le manque de vision territoriale intégrée et l'absence de ressources, tant financières qu'en matière d'information.

L'ensemble des outils proposés par le ROBVQ se distinguent en raison de leur approche de type “bottom-up”, basée sur l'engagement des acteurs locaux pour solutionner des problèmes d'adaptation. Les scénarios climatiques et l'évaluation des risques viennent donc agir en appui à la démarche proposée mais leur absence n'entrave en aucun cas la réalisation du processus d'adaptation.

La boîte à outils est disponible ici: https://robvq.qc.ca/guides/changements_climatiques
Christine Zimmer, Credit Valley Conservation
One Water Approach: Protecting Our Environment and Communities in the Face of Climate Change

Much of the country’s infrastructure is in need of repair and replacement, and the cost for water supply, wastewater, stormwater and road infrastructure stock is mounting to an estimated $171.8 billion (CCA et. al., 2012). This estimate does not take into consideration the need for new infrastructure within existing urban areas that do not currently have flood control or stormwater quality treatment. To bring older developments across the nation to today’s standards, the Federation of Canadian Municipalities (FCM) estimates it would cost an additional $56.6 billion (FCM, 2007). This figure assumes conventional practices are feasible and does not include land acquisition costs, which in growth areas around Toronto can be three or four times that of infrastructure costs. Building cost-effective resiliency into existing urban areas is complex and requires a holistic approach, identifying not just vulnerable infrastructure, but also the linkages stormwater infrastructure has on vulnerable populations, critical infrastructure, emergency services, sanitary system, wastewater by-pass, receiving streams and drinking water supply. CVC will share their lessons learned, and tools to adopting a one water approach that allows decision makers to identify impacts and benefits of water infrastructure investments on the collective system to adapt to climate change, demonstrating that integrating watershed approach can help identify cost-effective solutions, with multiple benefits.

Owen Steele, Ducks Unlimited
Wetlands and Flood Mitigation in Ontario: Natural Adaptation to a Changing Climate

Wetlands are often recognized for their flood control value, but little research exists specific to Ontario, where extreme weather in the form of flooding poses ever-greater threats to urban areas. Ducks Unlimited Canada, in partnership with Credit Valley Conservation, has undertaken new research to better understand the role of wetlands in storing and slowing flood waters in an urban/rural watershed. This research uses hydrologic modelling to address the questions of where and how wetlands are most effective at storing water; what consequences further wetland loss may have on flooding; and what potential wetland restoration could have to improve flood storage within a watershed. This presentation will feature initial findings from the research, and how this may help inform adaptation actions.

Norm Henderson, PARC
Using Community Effluents to Create High Value Heritage Woodlands and Protect Watersheds under Climate Change in the Canadian Prairies

The challenges of managing municipal wastewater effluent are particularly acute in Prairies Canada, where waterbodies are often stressed by low flows, slow flows, and nutrients from farm runoff. A warming Prairies climate, and increasing frequency and severity of extreme climate events, makes water quality a still more pressing issue. Effluent released to a watercourse may cause quality deterioration, algal blooms and eutrophication. But community effluent may be a resource, instead of a disposal problem. One option to protect watersheds from excessive nutrient inflows is to apply effluent on land. Trees such as fast-growing poplars or willows maximize water and nutrient uptake. Effluent irrigation can also support a multi-species forest, including pine, spruce, larch, oak, elm, ash, maples, and other species. As cities and towns in Prairies Canada often do not have access to a nearby recreational forest, this may create a much-appreciated community asset. To field test the options, about 3000 trees of various species were planted on a test site just south of Moose Jaw, Saskatchewan. Varying rates of effluent irrigation were applied. Five years of test site operations confirm that both options are...
possible: a poplar or willow woodlot, or a diverse mixed wood forest intended for eventual recreational use as a Heritage Forest. The next step is to disseminate knowledge about this adaptation option for effluent management to community leaders. Where soil conditions are suitable, perhaps many communities across the Prairies may eventually have their own community woodlot or Heritage Forest.
**Session Th3B**  
Land use planning to protect health from climate change: What's the recipe for success? /  
Aménagement du territoire pour protéger la santé face aux changements climatiques : recette d’un succès

Thursday April 14 – 1:30 pm to 3:00 pm  
Panel Session  
Simultaneous Interpretation  

Session Chair: Jo Frehs,  
Health Canada

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**Abstract**

Complex problems like climate change often require intersectoral action. The public health response to climate change can only be effective if it acts in synergy with other sectors including, for example, housing, transportation, infrastructure, energy, agriculture and tourism. Bold and innovative measures are needed to integrate, engage and mobilize officials from key sectors to prepare for climate change. Health-oriented actions and adaptations (through leadership, planning, guidance, regulation, etc.) can be a strategic tool to drive intersectoral collaborations to build safe, vibrant and resilient communities in the face of climate change.

This panel session will bring together adaptation practitioners to explore promising solutions for forging the link between public health and other sectors critical for building climate resilient communities. Panelists and Symposium delegates will have the opportunity to discuss and debate on:

- What role should public health play in urban planning and built environment adaptation to climate change in communities?
- How can public health leadership increase multi-sectoral collaboration, increase public awareness and support for action and foster champions needed to move forward? What examples can you share?
- How do public health officials best support the achievement of synergies among diverse urban planning and built environment climate change adaptations (e.g., UHI, drought, water, air pollution, etc.) to promote healthy living and maximize human health co-benefits at least cost?
- How can we evaluate the progress made and the success of land planning intervention on public health?

**Panel Members**

Mélissa Généreux, Université de Sherbrooke  
Karina Richters, City of Windsor  
Véronique Fournier, Centre d’écologie urbaine de Montréal.  
Gregory Richardson, Health Canada
Session Th3C - Nantel
Canada's Protected Areas as Natural Solutions to Climate Change Adaptation: What have we learned and where should we go?
/ Les aires protégées canadiennes comme solution naturelle et adaptation aux changements climatiques : leçons apprises et voie à suivre

Thursday April 14 – 1:30 pm to 3:00 pm
Panel Session
Simultaneous Interpretation

Session Chair: Patrick Nantel, Parks Canada

Abstract

Canada's national, provincial and territorial parks, and other types of protected areas, including marine protected areas, help strengthen the resilience of Canada's environment to climate change by providing safe havens for plants and animals that enable them to move and respond to changing conditions. As protected area agencies and their partners continue to protect lands and waters, restore degraded lands, and connect fragmented landscapes, this will help wildlife and human communities adapt to climate change, and increase carbon storage. Parks and other protected areas also increase the resilience of Canadian communities in a number of ways, including by providing vital services like clean drinking water, and by reducing the effects of natural disasters like droughts and floods. Finally, when visiting protected areas, people learn about the role of these places in responding to climate change which helps to inspire individual action and shared stewardship, and contributes to long-term support for conservation. This session will provide case studies of different types of protected areas as natural solutions to climate change adaptation. Representatives of protected areas agencies from across Canada will present examples of achievements; a panel discussion at the end will focus on lessons learned and future needs and initiatives.

Panel Members

Patrick Nantel, Parks Canada
Protected areas as natural solutions: setting the Stage

James Quayle, BC Parks
Helping species and ecosystems adapt to climate change in British Columbia

Al Douglas, Ontario Centre for Climate Impacts and Adaptation Resources:
Vulnerability of northern national parks to climate change

Marlow Pellat, Parks Canada
How parks can plan for climate change

Panel discussion: Are Canada's protected areas well-positioned to contribute to climate change adaptation?

James Quayle, Al Douglas, Marlow Pellat, Tara Sharma, Daniel Scott
Session: Th3D – Hoyt
Community Engagement in Adaptation Planning

Thursday April 14 – 1:30pm to 3:00 pm
Panel Session

Session Chair: Jeff Hoyt, Government of New Brunswick

Abstract

Communities play an important and central role in planning for climate change adaptation. Across the country a significant amount of effort has been spent engaging communities on how they can increase their adaptive capacity. A great deal of this work happens regionally and we don’t often get to share our lessons learned and challenges outside of the region even though there are a lot of common elements that cross geographical borders. The purpose of this session is to share and learn from our collective experience. The session will bring together representatives from across the country to share our experience in engaging communities in adaptation planning, to highlight best practices and lessons learned, and to identify some of the challenges that exist and potential solutions. This session will focus specifically on small and medium sized communities.

Panel Members

Sabine Dietz, Aster Group

Ewa Jackson, ICLEI Canada

Laura Roddan, Powell River Regional District, BC

Rose Kushniruk, Champagne and Aishihik First Nations Council, Yukon Territory

Julien St-Laurent, Travaux publics, Trois-Rivières, Québec
Session: Th3E – Godsoe
The evolution of disaster risks in Canada: prevention and resilience

Thursday April 14 – 1:30pm to 3:00 pm
Panel Session

Session Chair: Matthew Godsoe, Defense R&D Canada

Panelists

Matthew Godsoe, Defense R&D Canada
Canada’s Evolving Disaster Risk Profile

Ian Burton, Emeritus Professor of Geography at the University of Toronto Adaptation and Mitigation versus Disaster Risk Creation. Discussion of “cure to damage ratio”

David Greenall, PwC Sustainability
Climate change disaster risk, financial stability and stress testing: Integrating disaster risks into accounting and financial decision making
Panel Members

Meg Ogden, Sustainable Prosperity

“Tooling Up for Climate Change”: Sharing knowledge and policy findings to decision-makers across Canada on economic instruments for adaptation

“Tooling Up for Climate Change” is a project led by SP to share knowledge and policy findings to decision-makers across Canada on economic instruments for adaptation. The objectives are:

- Broadly: to increase the evidence-based, action-oriented information available to decision-makers about the importance of adaptation and the roles of economic instruments
- Specifically: to communicate research findings from the Economics Working Group of Canada’s Adaptation Platform on economic instruments for adaptation in a broader climate change policy framework, to a policy and thought leader audience
- SP’s role as Canada’s leading green economy think tank helps to situate this work in a broader green economy and climate policy context

Harry Nelson, University of British Columbia

Economic Instruments for Adaptation to Climate Change in Forestry

The nature of forest management in Canada, where many management decisions are delegated to the private sector that also carries out most of the operational activities, means that the private sector will play a significant role in adaptation. Moving forward on adaptation requires understanding how to best engage the private sector. Economic instruments offer an alternative to command and control approaches; where properly designed, previous experience has shown that they can provide more efficient and cost-effective ways of meeting environmental objectives. We undertook three case studies oriented around specific climate-change related risks: 1) increased wildfire risk on the landscape; 2) increased fire risk at the wildland-urban interface; and 3) increasing maladaptation, where trees and forests become less resilient to a changing climate. The case studies illustrated how these risks have different temporal aspects and involve different parties. They also illustrate a clear divergence between the objectives of private parties and the Provincial government, due to the split incentives under the current system. Central to facilitating adaptation actions is addressing these split incentives, removing disincentives, developing new mechanisms for risk-sharing and funding actions, while also reassessing policies to
recognize where some risks are now becoming endogenous (i.e. due to existing policies amplifying these risks). Clear recommendations emerge for the different levels of government (local, provincial and federal) on how they can better catalyze and mobilize private sector activity but also where these levels of governments have key roles to play that the private sector cannot.

Jean-Pierre Reveret, Groupe Agéco

Analyse d’incitatifs économiques en lien avec l’adaptation aux changements climatiques

Contexte de l’étude:

1. La réalité des changements climatiques
   - D’ores et déjà, les territoires font face aux conséquences des changements climatiques et ressentent le besoin d’améliorer leur résilience.

2. Les plans d’action en matière d’adaptation...
   - Adoptés par les gouvernements, ils intègrent notamment des mesures visant à réduire la vulnérabilité des populations, des infrastructures et des écosystèmes aux changements climatiques (normes, éducation, sensibilisation, etc.).

3. ...Intègrent peu l’utilisation d’incitatifs économiques permettant de mobiliser les agents économiques.
   - Les initiatives fleurissent, notamment au niveau municipal.
   - Mais la compréhension de ce type d’incitatif est encore insuffisante.

4. Pourtant, ces incitatifs économiques, en complément des mesures réglementaires et éducatives, font partie intégrante d’une stratégie efficace d’adaptation.

Objectifs de l’étude:

1. Identifier le type de mesures incitatives pouvant s’inscrire dans un plan d’adaptation aux changements climatiques
2. Obtenir un recueil d’expériences via l’analyse de mesures expérimentées au niveau de territoires et les paramètres qui ont conditionné leur réussite ou leur échec
3. Permettre aux gouvernements de faciliter la mise en œuvre de tels mesures par les autorités municipales et régionales
Closing Plenary / Plénière de clôture
Canada Hall 3

3:15 pm to 4:30 pm

Roger Street, Technical Director, UKCIP
Ian Burton, Professor Emeritus, University of Toronto
Alain Bourque, Directeur Général, Ouranos
Dominique Charron, Acting Director, Agriculture and Environment, IDRC

Closing Remarks / Clôture du symposium
Al Douglas
Alain Bourque
Closing Prayer
Elder Josee Whiteduck, Kitigan Zibi First Nation
Closing Plenary

Thursday April 14 – 3:15pm to Panel Session

Panelists
Roger Street, Technical Director, UKCIP
Ian Burton, Professor Emeritus, University of Toronto
Alain Bourque, Directeur Général, Ouranos
Dominique Charron, Acting Director, Agriculture and Environment, IDRC

Key Points:

Roger Street, UKCIP

- There are strong linkages between adaptation, disaster risk reduction, mitigation and sustainable development. They result in similarities and synergies (co-benefits and dividends). Adaptation is about more than reducing risks.
- Incremental adaptation measures are prominent because we don’t like change, but also because of the high economic costs associated with adaptation as well as uncertainty in the nature of changes being experienced. We need to build the capacity in society and institutions to move beyond incremental adaptation. However, are we preparing society and institutions to address these changes?
- Do we have the science and knowledge to do adaptation planning? We have to move from “supply-driven and user informed” to “decision or user driven and science informed”.

Ian Burton

- Work on adaptation began back in 1993, when the Environment Canada adaptation group was developed.
- Adaptation is going on at the grass roots level, but we have a revolution here – there’s an expansion of what we mean by ‘adaptation’. Adaptation used to be considered ‘local’, but it’s more systematic. We need to think about adaptation strategically.
- We need to think about climate change in other parts of the world, and how cascading effects will affect Canada.
- We need to do more place-based, specific work, bringing different people into the fold. We need to scale-up all ramifications.
- We can begin to change the thought pattern of it.
- We need to consider mitigation as part of adaptation.
- Ended with a quote from Maurice Strong (Rio Summit, 1992) – “No place on the planet can remain an island of affluence in a sea of misery. We’re either going to save the whole world or no-one will be saved. We must from here on in all go down the same path. One country cannot stabilize its climate in isolation. No country can unilaterally preserve its biodiversity. One part of the world cannot live an orgy of unrestrained consumption while the rest destroys its environment just to survive. Neither is immune from the effects of the other.”
It is important to think about those living in high vulnerability/high impact areas (i.e. semi-arid regions, glacier fed communities, populated deltas, etc.) with populations that are disproportionately affected. These populations rarely possess the resources to deal with risks. It is estimated that 100,000,000 people will be displaced in the next century.

The immediacy of these issues demands solutions that work now.

Strategies are developed but not taken up – that’s our challenge right now.

We need social change. We need a revolution in international cooperation.

Alain Bourque – Ouranos

There is a lot of effort, funding, and incorporation of adaptation taking place. There are many adaptation tools available.

Adaptation is a process and we will have to revisit it on an ongoing basis. There is also a need to measure progress.

There are some challenges. For example, are some adaptation measures actually increasing vulnerability?

We need to pick up the momentum to get adaptation to a higher profile. We should be bringing adaptation to conferences in other fields (e.g. transportation).

Adaptation is context specific, but we are re-inventing the wheel a lot! There are lots of positive things happening, but adaptation needs to have more structure.

We also need to connect much more. We need to connect across jurisdictions (e.g. federal, provincial, municipal, etc.), key groups (e.g. managers, practitioners, decision makers, etc.), sectors (e.g. water, public safety, health, etc.) and R&D disciplines (e.g. geography, economics, social sciences, etc.).

We need more structure, but how? Maybe a three year symposium cycle (year 1 = national symposium, year 2 = regional conference, and year 3 = local gathering).

There aren’t enough incentives to work with other groups and co-invest on adaptation projects – we need to partner more. We need a “climate change adaptation network” – a network of centres of excellence (e.g. Waterloo and Ouranos are partnering on a project).
Al Douglas, Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR)

Final comments

1. All estimates suggest that risks and costs of climate change are significant, and will continue to rise. Market mechanisms, regulations and policy will mobilize adaptation and management of climate change risks.
2. With a focus on larger, urban municipal and development-stressed areas, conservation of natural assets is an ideal way to adapt to climate change and has other important benefits including biodiversity conservation.
3. Data, information and research is present in varying forms, of varying quality and in differing levels of accessibility. This must continuously evolve and improve to inform good adaptation.
4. We have made great progress on tools and information, but need to continue advancing dissemination and gauging uptake to inform course corrections, detect gaps and inform the next generation of information that will make Canada resilient to climate change.
5. Mainstreaming concepts and practices of adaptation into enterprise and other risk management processes, whether in businesses or communities, still require the help of a variety of agents including financial and other professional services, as well as boundary and extension organizations.
6. The need to demonstrate advances in adaptation and resilience remains, thus the requirement for more work on monitoring, evaluation and establishing baselines in a variety of different contexts.
7. Either in an attempt to expand our adaptation business opportunities or simply as part of our civic duty as Canadians, we have much to share with the rest of the world on adaptation, and we can help stimulate adaptation and resilience in areas of the world that have significantly lower levels of resources and capacity.
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### Concurrent Session Breakdown

**Tuesday April 12, 2016 / Mardi 12 avril, 2016**

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### Chair/Président

- Erika L. Rowland
- Genevieve Brisson
- Christine Calliho
- Alison Perrin
- Jolène Labbé
- Marianne Falardeau Coté
- Simon van Bellen
- Louise LEMYRE
- Anthony Voisard
- Beatriz Osorio
- Richard Fernandes
- Jonas Roberts
- Isabelle Mayer-Jouanjean
- Simon Ricard

### Title

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