

National Assessment of Climate Change Prairies Chapter

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(with thanks to Don Lemmen, National Assessment Secretariat,
Natural Resources Canada)

**Inter-Department Climate change Group, Government of
Manitoba, Winnipeg, May 30, 2006**

What is the Assessment?

- *Scientifically objective* assessment of *existing knowledge* of the *risks and opportunities* that climate change presents to Canadians
- Moving forward - focus on adaptation and adaptation decision-making while informing mitigation issues
 - Understanding ability to adapt and limits to adaptation
 - Understand significance of rate of change
- Emphasize what we **DO KNOW**, as well as identifying knowledge gaps
- Policy relevant but not policy prescriptive.
- Complement global perspective of IPCC 4AR

What's Different (from the CCS, 1998)?

- Climate science input to, rather than subject of, the assessment
- Not building linear argument to define socioeconomic impacts, rather biophysical and socioeconomic impacts integrated to inform adaptation
- Driven by desire to inform adaptation policy processes, rather than mitigation policy processes (article 2 of UNFCCC)
- Economic analysis highly desirable, but not critical, component of the analysis.

Scope & Emphasis

Regional analysis

- raise profile of issue within political jurisdictions
- highlight inter-related nature of sectors
- place emphasis on collaboration within and between jurisdictions

Complimentary spatial scales

- primary focus on regions of Canada
- international and transboundary issues
- examples of local / community scale approaches

Synthesis

- What does climate change mean for Canada?

Broad Questions Being Addressed

- How does rate of change affect vulnerability?
- Can critical thresholds be identified?
- What is the potential for “surprises”?
- What projected changes would pose the greatest risks?
- What are the potential opportunities to be realized?
- What factors / characteristics increase vulnerability?
- What factors / characteristics enhance resilience?
- What is the potential for adaptation to reduce vulnerability?

Target Audiences

Senior Decision Makers

- government – multiple levels
- get/enhance adaptation on policy agenda
- industry and NGO awareness

Science / Policy Advisors

Media

International CC Science / Policy community

Research Community including students

Research Funding Organizations

General Public (through specialized products)

Products and Audiences

Synthesis Report

- senior decision-makers, media, international CC policy community, research funding organizations

Scientific Report (*full report*)

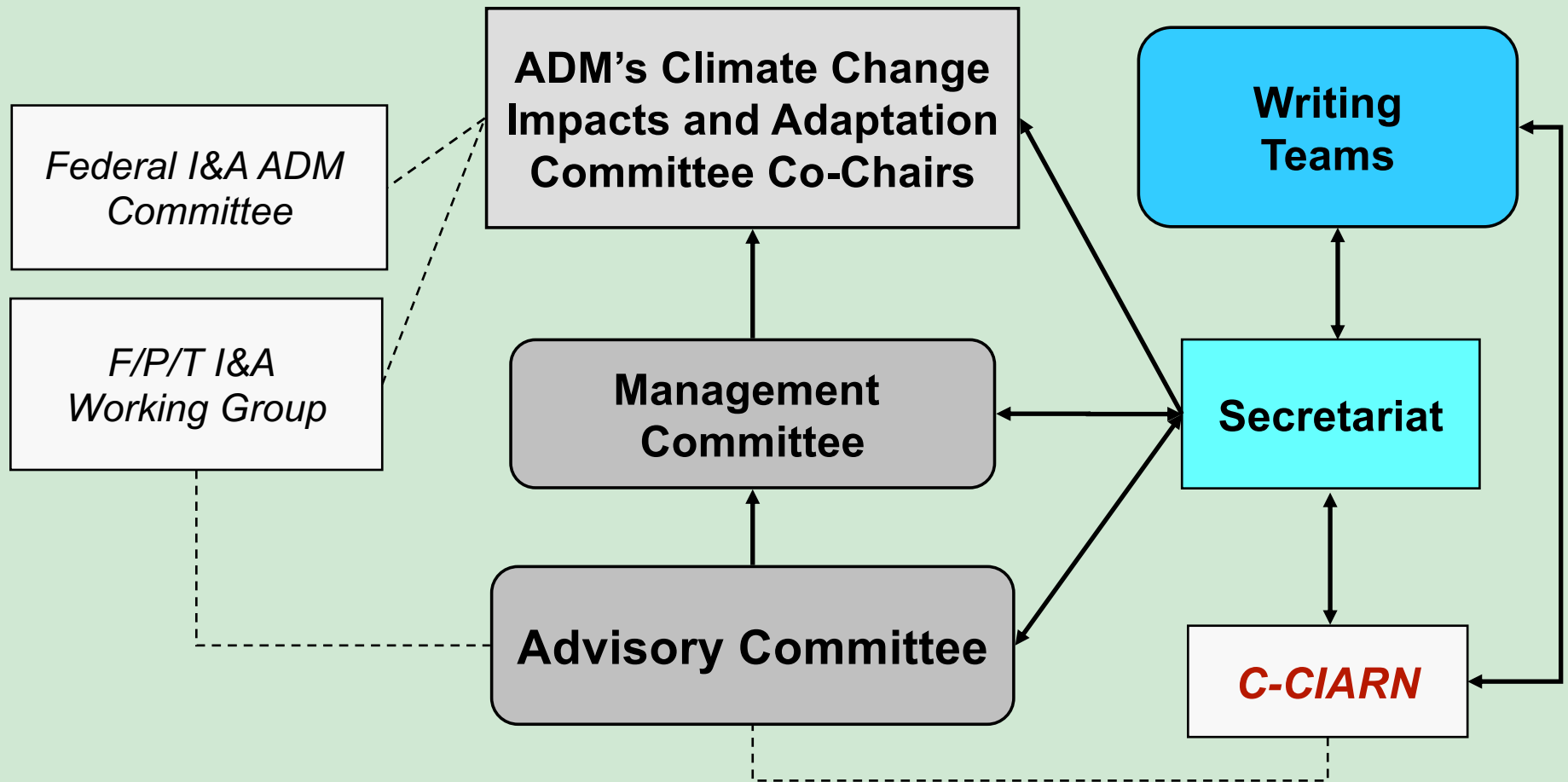
- science and policy advisors, research community, international CC science community

Regional Impacts and Adaptation Posters

- general public, subgroups??

Other products to be determined (communications plan)

Supporting Structure



Secretariat and Management Committee

Secretariat

- located within CCIAD (Natural Resources Canada)
- responsible for delivering assessment
- works closely with writing teams

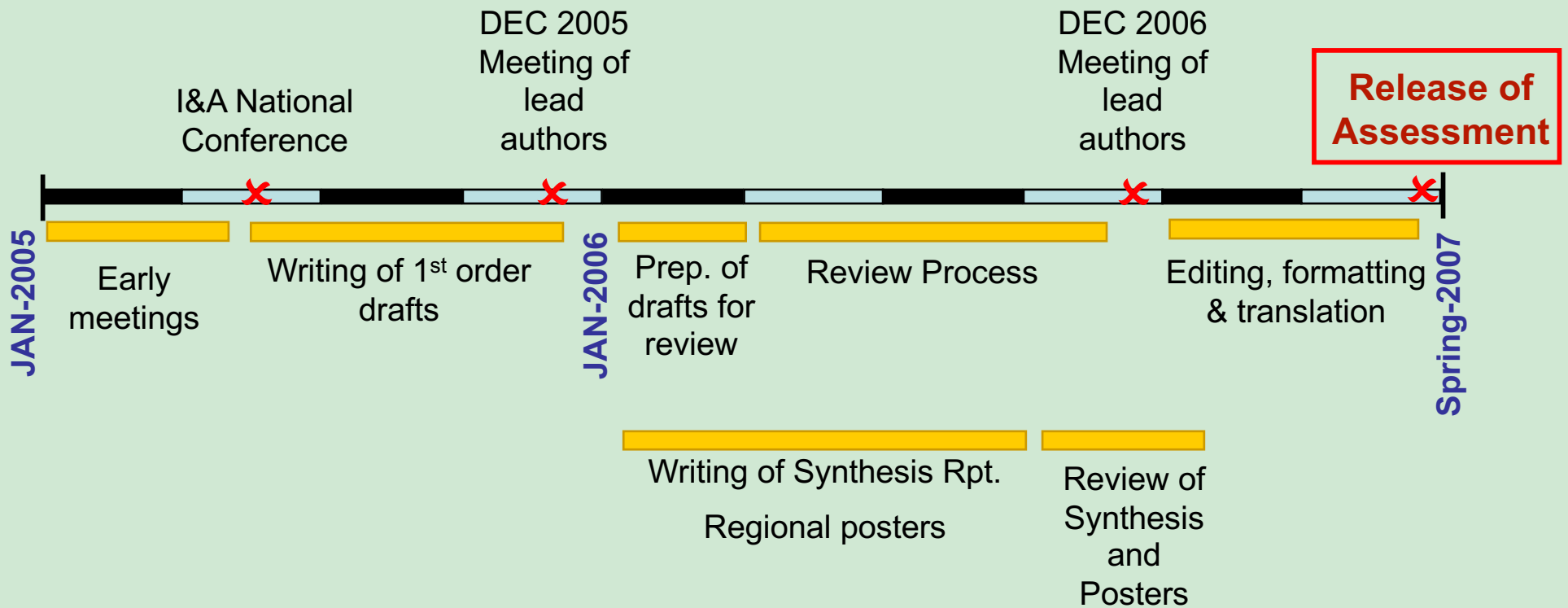
Management Committee

- five persons – federal and ex-federal experts
- decision making on operational and technical issues
- recommendations on strategic issues

Advisory Committee

- Sixteen individuals with experience in undertaking, communicating and using results of science assessments – governments, academia, industry
- Dynamic – what we want vs. what we can do
- Broad geographic distribution and varying sectoral expertise – range of issues and expectations.
- All hats to be left at the door – bring expertise, not representation of host organization or jurisdiction

Timeline





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Canadian Climate Change Impacts and Adaptation Assessment

The Climate Change Impacts and Adaptation Directorate at Natural Resources Canada is coordinating a national scale scientific assessment of climate change impacts and adaptation in Canada. This assessment will examine the existing and growing body of impacts and adaptation knowledge, to address key questions regarding Canada's vulnerability to climate change, as well as potential future opportunities. Leading Canadian experts from government, academia and the private sector are participating in the Assessment, committing their time and expertise, to help guide the process and author the chapters.



[A Canadian Perspective](#)

www.adaptation.nrcan.gc.ca

The main goals of the Assessment are:

- To assess the current state of knowledge regarding Canada's vulnerability to climate change.
- To provide Canadians with an up-to-date source of information that can be used to inform decision-making and policy development.
- To highlight what we know, and emphasize how much we've learned through research since the publication of the last national-scale assessment in 1998.
- To identify any knowledge gaps that need to be addressed.

Assessment Outline

Synthesis Report

1 - Introduction

2 - Climate and Climate Change In Canada

3 - Regional Chapters:

*Atlantic, Quebec, Ontario, **Prairies**, British Columbia, North*

4 - Canada in an International Context

5 - Addressing Climate Change at the Local Level

6 - Impacts and Adaptation Research: Capacity,
Tools and Moving Forward

Framework for Regional Chapters

- 1 – Synthesis
 - 2 – Regional description
 - 3 – Socio-economic trends and projected futures
 - 4 – Climatic trends and projected futures
 - 5 – Sensitivities to current climate
 - 6 – Key vulnerabilities to climate change
 - 7 – Key uncertainties and knowledge gaps
- Case studies used as appropriate throughout chapter



PRAIRIE ADAPTATION RESEARCH COLLABORATIVE

- Partners
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- Research Professors
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- Awards
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National Assessment
Prairies Chapter

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<http://www.parc.ca>

The **Prairie Adaptation Research Collaborative** is a partnership of the governments of Canada, Alberta, Saskatchewan and Manitoba mandated to pursue climate change impacts and adaptation research in the Prairie Provinces. Our objective is to generate practical options to adapt to current and future climate change. We are also charged with fostering the development of new professionals in the emerging science of climate change impacts and adaptation.

PARC also hosts:

- **C-CIARN Prairies**, part of the national Canadian Climate Impacts and Adaptation Network.
- **National Assessment on Climate Change - Prairies Chapter**

Climate models generally forecast drier and warmer conditions and increased climate variability for the Prairie Provinces. This implies stress on agriculture, reduced river and stream flows, increased fires and pathogen stress in our forests, and impacts on biodiversity, to highlight a few challenges. Since its inception in 2000, PARC has been involved in dozens of interdisciplinary projects to address climate change impacts and adaptation issues. Explore our site to view our research projects and reports and learn about our support for graduate researchers and interns. Climate change affects all of us in some way - how does it affect you?

NEW!

Feature: » [Climate Scenarios for Alberta](#)



National Assessment - Prairies Chapter



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Key Findings - Socio-economic trends

- There are differential levels of vulnerability among regions related not only to environmental diversity but also to an uneven distribution of population and resources. A concentration of population and wealth in parts of Alberta leaves other regions with lesser human and institutional resources for programming for adaptation to climate change. Migration patterns may develop putting more strains on the socio-economic fabric of the region.
- A gradual population shift from rural areas to large urban areas reduces the viability of many rural communities and may put pressure on cities.
- Population trends indicate an increase of sectors of the population that could be highly vulnerable to climate change. These groups include recent immigrants, the elderly and aboriginal people.
- Agriculture, mining and energy production are major economic drivers. Climate change could create significant direct and indirect impacts. Shifts in ecozones could result in significant shifts in economic structure. Energy production may become vulnerable to reduced water availability.

Key Findings - Past and Future Climate

- The communities and economies of the Prairie Provinces are exposed to a dry climate and climate variability, among seasons and years that is as large as any place on earth.
- Instrumental and proxy climate records show significant recent warming consistent with the forecasts from global climate models (GCMs).
- Paleoclimate records indicate that the drought is often of longer duration than the experience and observations of the 20th century suggest.
- GCMs forecast a median annual increase of 2 to 5 degrees in temperature and 2-12% in precipitation; with the exception of a few scenarios for the 2020s, all models forecast climates that are outside the range of natural variability.
- Much of the increase in temperature and precipitation will occur in winter and spring in both forest and grassland regions, with increases of close to 4 degrees and 15% in winter.

Key Findings - Water

- Changes in the availability of water resources represent the most serious climate risk. The prairies are Canada's major dryland.
- Recent trends and future projections include lower summer stream flows, falling lake levels, retreating glaciers; and increasing soil and surface water deficits, as more water is lost by evaporation and from plants.
- Water management (e.g. irrigation) has been and will continue to be a major adaptation to climate change and variability. This includes water-pricing regimes to more accurately reflect the real costs of water treatment and supply and to ensure that an increasingly scarce resource is properly allocated.
- Higher forest, grassland and crop productivity from increased heat and CO₂ could ultimately be limited by available soil moisture.
- Water scarcity is a constraint on all sectors and communities. In addition to the agricultural sector it could constrain other rapid economic growth in Alberta, such as the investment of \$87 billion in oil sands by 2010.

Key Findings - Ecosystems/Biodiversity

- Major ecosystem changes are expected as warming and drying continue. Aquatic habitats will be very stressed: various fish species may be extirpated and some waterfowl populations will decline substantially.
- Change in terrestrial systems will be most visible in isolated forests and forest fringe areas, where trees will give way to shrub or grassland landscapes. Major loss of forests in the southern boreal forest is possible. More intensive forest management and the introduction of non-native tree species adapted to changed conditions might allow for forest retention (albeit with different species).
- Previously non-native plants and animals will appear on the landscape. Some native species will decline or disappear entirely. Other species already present will increase in numbers or geographic distribution. Providing connectivity will encourage this.
- We will see new and unprecedented ecosystems develop

Key Findings - Soil Landscapes

- In the Rocky Mountains, an increased frequency of catastrophic geomorphic events is probable, given the current and future trends of more rain especially in winter, rapid snow melt, and the shrinking glaciers.
- Increased drought and aridity will most likely result in more widespread wind erosion and sand dune activity, and possibly erosion and shallow failure of valley sides, if as tentatively projected rainfall is less frequent but more intense.
- The degradation of farmland can be prevented but soil conservation will be challenged by scenarios of more frequent drought.

Key Findings - Agriculture

- Agriculture is inherently sensitive to climate.
- Net impacts are currently unclear, and depend on the models (e.g. climate, yield, and economic), adaptation measures and their effectiveness, and assumptions used. A source of uncertainty is lack of impact and adaptation model development.
- Shifts of agro-climatic zones are occurring now and these changes will accelerate. New or changed threats and opportunities are becoming more likely. An example of a new threat is the increased probability of drought in regions where frost or excess moisture, for example, currently are greater threats. Shifts of disturbances (e.g. insect, disease, and fire) are accompanying climate change and are important stresses to agricultural production.
- More attention needs to be paid to threats posed by important climatic extremes, especially droughts, which can limit opportunities of the changing climate and pose difficulties for adaptation. Current adaptations have limitations during extreme conditions.
- Socio-economic analysis of climate impacts on the prairie economy has not been a favoured topic of past studies.
- In spite of lack of knowledge, it is safe to conclude that economic effects of climate change will result from reduced soil moisture (affecting economics of dryland farming); reduced surface water supplies (restricting the development of irrigation); and shifts of agro-climatic zones (necessitating a major change in the nature of farming, cultural practices and enterprise combination).

Key Findings - Forestry

- Primary impacts are likely to be increased disturbance (insect and fire) and more frequent and severe droughts, particularly along the forest-grassland interface.
- Longer-term impacts include changes in productivity and changes in species composition.
- In general, adaptive capacity is expected to be moderate to high. This is due to the application of adaptive management principles and guidance from the Canadian Council of Forest Ministers Criteria and Indicators of Sustainable Forest Management. However, these mechanisms have not been rigorously tested with respect climate change impacts and adaptation.
- Primary barriers to adaptation include lack of financial capacity among some companies, lack of understanding of climate change among government forestry managers, and existing policies that may prevent the implementation of adaptive measures.
- Primary research and implementation needs include the development of integrated assessment models that directly link biophysical and socio-economic impacts, and stronger linkages between the science and practitioner communities

Key Findings - Communities

- Rural communities, particularly those with limited economic diversity and/or are isolated, are most at risk due to limited emergency response capacity and sensitive economic sectors (agriculture, forestry). Saskatchewan and Manitoba both have higher proportions of population living in rural areas than the national average.
- Rural Aboriginal communities will experience the vulnerabilities listed above, in addition to threats to subsistence-based livelihood resources.
- Cities will be vulnerable to flooding, heat stress, and disease outbreaks.
- Individuals falling into low socio-economic status, minorities, Aboriginals, and recent immigrants, will likely have the lowest adaptive capacity.
- Members of the above groups, including children, the elderly, and those already dealing with health problems will be most sensitive to the health implications of climate change, such as heat stress and disease outbreaks.

Key Findings - Health

- Increased heat-related morbidity and mortality, adverse health effects of air pollution and associated incidence of foodborne illnesses.
- Drought-like conditions will enhance dust production, forest fire frequency, and decrease crop yields, which can negatively affect health and well being by initiating respiratory illnesses, depression, and stress.
- Extreme hydrological events and flooding have the potential to increase waterborne disease outbreaks, and intensify stress and anxiety in individuals forced to evacuate or that have lost property.
- Changing ecosystems will make the habitats of disease carrying vectors, such as West Nile Virus and Hantavirus Pulmonary Syndrome, more hospitable, or vice versa.
- Vulnerable populations include the elderly, children, those with underlying health problem, those with lower socio-economic status or are homeless, family farmers, and First Nations.
- Economic vulnerability often precedes negative health outcomes associated with extreme weather.
- Future vulnerability assessments, with respect to human health, require a firm understanding of current vulnerability to climate sensitive diseases.

Key Findings - Adaptation

- Any effort to improve the adaptive capacity must deal with the institutional context in which the system exists. Governance institutions are fundamental in developing adaptive capacity.
- Social capital mobilizes resources to ensure the well-being of communities, and deal with the uncertainties and instabilities that climate change creates, complementing and even substituting government's efforts. There has been a continuous adaptation to climate given variability and short history and the impact of drought.
- Adaptations include more efficient irrigation – small improvements represent large savings of water; diversification of the agriculture sector – but may involve regional specialization and increased vulnerability;; urban water conservation (Regina - static demand since early 1990s); Winnipeg floodway redesign; soil conservation; and sustainable forest management practices and long-term forest management plans.
- BUT generally these adaptations were for reasons other than climate change or to sequester carbon (e.g. permanent cover and agroforestry programs)

Key Findings - strengths/weaknesses of adaptive capacity

Determinant	Strength	Weakness
Economic resources	Major, especially Alberta and urban centres.	Remote rural communities lack economic diversification; individuals versus corporations. (e.g. family vs. corporate farms)
Technology	Alternative energy and GHG emission reduction technology.	Less adaptation (e.g. water conservation) technology
Information and skills	Various climate change research programs associated with universities and government agencies	Cutbacks in climate and water monitoring programs. Poor understanding of the social dimensions of climate change.
Infrastructure	Well developed in populated areas. Some current designs are addressing climate change (e.g. Winnipeg floodway); delays in upgrading and replacing infrastructure provide opportunities to consider future climate	Vast area (e.g. SK has more road than any other province). Deficits from budget constraints in the 1990s.
Institutions	Engaged in building capacity and assessment of vulnerability (e.g. AB Vulnerability Assessment).	Focus on mitigation. Only beginning to develop adaptive strategies.
Equity	Social programs.	Vulnerable populations : First Nations, rural communities and especially remote settlements, elderly and children more vulnerable to health impacts,