Climate Change and Canadian Society

Social Science Research Issues and Opportunities

C-CIARN Symposium Report

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C-CIARN (Canadian-Climate Impact and Adaptation Research Network)

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On June 2, 2005, C-CIARN[1] sponsored an all-day symposium (entitled *Climate Change and Canadian Society*) during the Congress of the Humanities and Social Sciences, at the University of Western Ontario (London Ontario). A programme for the meeting is available in Appendix A. This document offers a summary of the presentations made during the symposium.

We gratefully acknowledge generous support from the Government of Canada through the Climate Change Impacts and Adaptation Program and Health Canada for both the symposium and the production of this document. Contributions from the Congress organizers, the Canadian Association of Geographers, and C-CIARN B.C. were also greatly appreciated. At the University of Guelph, we are thankful for resources in the Faculty of Environmental Sciences, the Global Environmental Change Program and the Department of Geography.

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[1] C-CIARN stands for: Canadian-Climate Impacts and Adaptation Research Network. For more information visit the web site at: http://www.c-ciarn.ca/

TABLE OF CONTENTS

Part IV
Methodological Approaches to Climate Change Research

Introduction

Background Information

This report summarizes the presentations and discussion from the C-CIARN 2005 symposium held during the Congress of the Humanities and Social Sciences at the University of Western Ontario in London, Ontario on June 2, 2005. The meeting was a follow-up to a similar event held in May, 2004 in conjunction with the Canadian Association of Geographers Annual General Meeting in Moncton, New Brunswick. In both cases the linkages among health, social and economic issues for climate change adaptation were featured.

As noted in the report on the 2004 meeting[1], there is a pronounced need in the field of climate change adaptation for methods that include social science perspectives and support interdisciplinary analysis and results. Policy-makers and researchers involved in climate change impacts and adaptation are looking for ways to integrate the outcomes from diverse relationships and interactions at different conceptual, spatial, and temporal scales. The purpose of this report is to provide insights from adaptation research that feature social science contributions. By doing so, the report not only offers a summary of recent findings but can also point out areas where substantial gaps exist. This is the case for both research and policy concerning climate change adaptation in Canada.

Since the U.N. Framework Convention on Climate Change was signed in 1992, interest in climate change has been increasing. While there is growing acceptance that the climate is changing and that it continues to be influenced by human activity, directions for future policy, programs and related actions are not always clear. Despite uncertainty on the policy level, the Canadian public appears to be interested in the issue. A 2005 EKOS Research poll on Canadians' perceptions of climate change indicates 87 per cent of the population is somewhat to very concerned about the issue and more than 70 per cent think the effects from climate change are already evident and overwhelmingly negative. When asked whether reducing greenhouse gas emissions should be a priority over adapting to impacts, 31 per cent favoured the latter while over 60 per cent feel the Canadian government has the most responsibility for responding to the effects.

A comprehensive report[2] detailing the impacts from drought conditions across Canada in 2001 and 2002 indicates why there is apprehension among Canadians regarding our level of preparedness for dealing with climate change impacts. According to the authors, there have been substantial social and economic implications from recent climatic events such as drought:

"...the drought years of 2001 and 2002 in Canada brought devastating impacts to many sectors of our economy, posed considerable adaptation challenges, and made history."

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[1] The report *From Silos to Synthesis* is at: http://www.c-ciarn.uoguelph.ca/documents/cciarn_silostosyn_0105.pdf

[2] The report is entitled, *Lessons Learned from the Canadian Drought Years* 2001 and 2002: Synthesis Report (SRC Publication No. 11602-46E03) http://www.agr.gc.ca/pfra/drought/info/11602-46E03.pdf

And, the repercussions were far-reaching:

- *Agricultural production* dropped an estimated $3.6 billion for the 2001 and 2002 drought years, with the largest loss in 2002 at more than $2 billion.
- The *Gross Domestic Product* fell some $5.8 billion for 2001 and 2002, again with the larger loss in 2002 at more than $3.6 billion.
- *Employment* losses exceeded 41,000 jobs, including nearly 24,000 jobs in 2002.
- *Water supplies* that were previously reliable were negatively affected, and several failed to meet the requirements. Water supplies considered included surface water such as streams, wetlands, dugouts, reservoirs and groundwater. Numerous adaptation measures were severely challenged.
- *Several government response* and safety net programs partially offset negative socioeconomic impacts of the 2001 and 2002 drought years. Crop insurance payments were very high in 2001 and 2002, especially in Saskatchewan and Alberta. Saskatchewan saw a large increase in payments from $331 million in 2001, to $1.1 billion the following year. In Alberta, crop insurance payments jumped from $274 million in 2001, to $790 million in 2002.

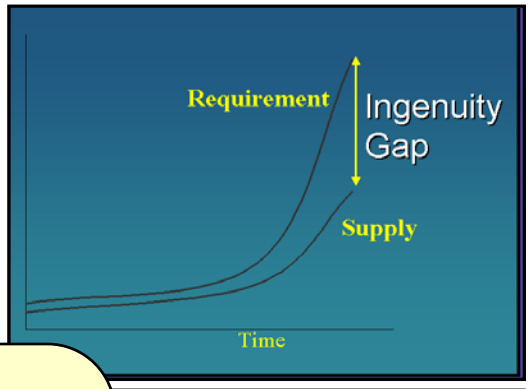
A study funded by Health Canada and conducted at the University of Alberta – *Climate Change, Extreme Weather and Health Effects in Alberta* – finds significant health problems, including morbidity, mental disorders and injury are associated with extreme weather. In addition, mental health impacts correspond closely with climate/weather related disasters that damage property and result in economic loss. With respect to drought in particular, this study reports an increase in the stress/distress experienced by farmers and their families as a result of crop losses or damage; elevated levels of dust in the atmosphere and associated respiratory illness; and an increased potential for fire damage and its associated respiratory health consequences.

These Canadian observations underline the wide range of health, social and economic impacts brought about by climate and weather conditions. Attention to the need for understanding and acting on climate change adaptation was emphasized at the December 2005 COP 11 meeting in Montreal. During the parallel event, **Living With Climate Change: Sharing Adaptation Experiences**[1]**,** all the presentations pointed to the need for adaptation in both developed and developing nations. Organizers noted: "it has become increasingly important to understand the nature of (climate) risks, particularly where natural and human systems are likely to be most vulnerable, and to share experiences of how these risks have successfully been reduced through adaptive responses." This was also the message at a related parallel event during COP 11, namely **Global Health Alert: Climate Change Risks Strategies and Solutions**[2]**.** Both events demonstrated how important social and health sciences are for research and policy on climate change adaptation.

[1] Presentations are available through http://www.c-ciarn.ca/index_e.asp?CaID=40&PgID=126

[2] Program available through http://www.c-ciarn.ca/health/app/filerepository/35A8EF5B6EEB42AF87F07611DCA8A2CC.pdf

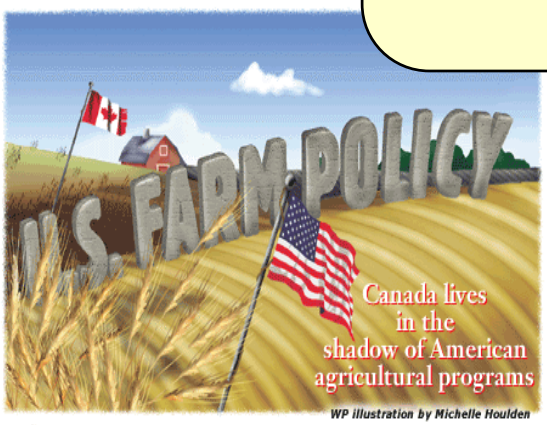
The document begins with an introductory section providing background and rationale for supporting social science research. This is followed with a summary of the eleven individual presentations making up the symposium. A commentary summarising the policy relevance of the presentations is offered as a conclusion.



Risk factors for extreme heat

- Aging population
- Health conditions
- Socio-economics
- Type of housing

Warning systems



Climate Change Adaptation Research and the Role of Social Science

Research into climate change adaptation has increased since it was identified as a topic of interest distinct from climate change mitigation in the early 1990s. The main concerns shaping early inquiry included identifying what adaptations would likely be employed to limit impacts from climate change. As well, adaptation issues were important for policy applications based on information about possible strategies and how to evaluate their merit.

Two complementary approaches

It is possible to identify two broad perspectives in recent scholarship for understanding climate change adaptation. The first is called the "standard approach" and is associated with the IPCC assessments in the early 1990s.[1] The IPCC recommended selecting and applying climate change scenarios so that an assessment of biophysical and socio-economic impacts could be made. Researchers would then suggest possible adaptation strategies and test their utility for limiting the projected effects from climate change. Such an approach is also called a "top-down" view of climate change impacts and adaptation given the pattern of starting with macro-scale conditions based on future projections and narrowing the focus to potential impacts on a particular region or phenomenon.

By contrast, "bottom-up" approaches for adaptation, which constitute an alternative perspective for understanding climate change adaptation, begin at a smaller scale, namely the system of interest. Research conducted through this approach uses current adaptive responses to a number of stresses, including weather and climate conditions, as the basis for understanding future capacity to adapt to climate. Some scholars call this view a "human development approach" to signify the social vulnerability implications from such a perspective.

Both top-down and bottom-up perspectives have a number of associated characteristics that render them complementary approaches for climate adaptation policy and research. Top-down perspectives are portrayed as moving from global to local levels of analysis and concentrate on future conditions for biophysical vulnerability. Bottom-up approaches often begin with an assessment of determinants of adaptive capacity (economic resources, infrastructure, information, etc.) based on past and present conditions. The resulting evaluation provides a basis for understanding levels of social vulnerability and points to areas that need improvement if the community of interest is to handle future stress successfully (including that from climate and weather conditions).

Each approach places different emphasis on biophysical and social sciences. The former tends to dominate top-down research while the latter guides most bottom-up work. Where the two intersect is a forum for effective policy analysis and development. The intersection also points to the value of inter-disciplinary studies for addressing questions about climate change adaptation. As noted in the section that follows, a concerted effort

[1] for more information see: Dessai, S. and M. Hulme (2004) Does climate adaptation policy need probabilities? *Climate Policy*, 4, 107-128.

is needed to integrate research processes and findings from different disciplines so that adaptation issues can be understood more fully.

The value of interdisciplinary studies for climate change adaptation research[1]

Among the influences raising the profile and value of interdisciplinary approaches are systems thinking and concern for sustainable development. Researchers and policy-makers alike recognize the need for new and more integrated methods if they are to find effective solutions for problems that transcend traditional disciplinary and sectoral boundaries. This is particularly true for cross-cutting issues such as climate change that have mutually interdependent environmental, health, economic, and social dimensions.

The term interdisciplinary refers to a number of different approaches based on the level of integration achieved. At one extreme, individual disciplines are nominally connected by virtue of their common presence in a department, program, or institution without having to work together on common projects. Some refer to this situation as multi-disciplinary. At the other extreme, interdisciplinary work involves a true melding of ideas and interpretation to create new insights that would otherwise be unattainable. The term trans-disciplinary has been used to describe this type of interdisciplinary effort.

The most common interpretation of the term however, lies somewhere between multi- and transdisciplinary approaches. In this case, interdisciplinary efforts involve close linkages between subjects without each discipline losing its separate character. By drawing on established scholarship, approaches, and methodologies within each discipline, researchers each fulfill a specific role in supplying research results. Examples include projects where data or information regarding one dimension of an issue is the input for analysis by other disciplines working on the same problem. For instance, climate modellers project possible future agro-climatic conditions so that crop scientists can determine potential consequences for yield. Land resource scientists can then suggest different management strategies, and agricultural economists can provide cost/benefit analyses. Together these researchers are able to generate an integrated assessment for potential climate and weather impacts on specific farming systems in a particular region.

Results of an interdisciplinary workshop hosted by University of Toronto and Health Canada in November 2004[2], highlight several important characteristics for climate change studies involving natural, social, and health sciences. Included in the recommendations for such inquiry are:

1) It must be transdisciplinary. It must lead to the asking of new research questions which any given discipline, by itself, could not ask and answer.

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[1] This is based on an excerpt from the 2004, C-CIARN Agriculture report*: From Silos to Synthesis* http://www.c-ciarn.uoguelph.ca/documents/cciarn_silostosyn_0105.pdf. A table from this report, summarizing strategies to enhance inter-disciplinary research , is found in Appendix B

[2] Presentations from this workshop are available at: http://www.utoronto.ca/envstudy/socioeconomic/

2) The agenda needs a broad epistemology, combining qualitative and quantitative methods, stories and numbers, lay and expert knowledge.
3) It must help build research capacity, training the next generation of researchers.
4) It must develop new research tools and models.
5) The agenda must be a multi-stakeholder enterprise.
6) The agenda must be based on a broad definition of health.
7) The agenda must recognize 3 types of vulnerability that flow from group composition (*e.g*. age, economic status), from spatial context (*e.g*. rural v. urban) and from the national collective as well as internal regions and groupings (*e.g*. The North)
8) It must include the study of mobilization and how knowledge leads to action.

These recommendations present a major challenge and a laudable goal for the research community working in climate change adaptation field. Social sciences are uniquely qualified to address contextual questions related to meaning, values and behaviour. They have much to contribute to the research process, both through the type of data collected and the methods used for gathering them. This is especially true for engaging stakeholders in research projects where their knowledge and perspective is increasingly needed if the results are going to contribute meaningfully to climate change adaptation policy and programs.

Overview of the 2005 C-CIARN Symposium
The goal for the Symposium was to raise awareness of climate change issues and encourage engagement of social scientists in climate change research that relates to health and social impacts, risk perception, community vulnerability, adaptive capacity and resilience, governance, and policy. The event brought together university researchers from social science disciplines such as geography, sociology and anthropology, economics, environmental studies, and political science. Attendees were exposed to potential opportunities for being involved in climate change research and made aware of research examining adaptation to the social, economic, and health impacts of climate change in both the public and private sectors.

The day-long session had four parts:

1. Introduction to Climate Change Impacts And Adaptation
2. Climate Change and Health and Well-Being
3. Climate Change and Resource Management
4. Methodological Approaches to Climate Change Research

The first provided overviews on the topic of climate change adaptation. Thomas Homer-Dixon (Director of the Trudeau Centre for Peace and Conflict Studies, University of Toronto) made a strong case for how serious climate change is as an environmental and social problem. He pointed to the need for increasing human's adaptive innovation as a way to narrow the ingenuity gap relevant for climate change impacts. Barry Smit (Canada Research Chair in Global Environmental Change at the University of Guelph) based his overview of research to date on the two seminal questions:

- ***How serious is climate change?***
- ***and, what can be done about it?***

Six of the presentations that followed offered different ways to address either or both of these questions. Each points to the necessity of social science inquiry to handle such basic questions, whether in the field of health or resource management. The session on health began with Terry Rolfe who pointed to the value of ecosystem approaches for going beyond short term isolated responses to climate related stress. Pierre Gosselin then provided a summary of work being completed in Quebec, some of which points to how serious potential climate change might be on Quebeckers' health status. Other Quebec projects will give insights on public perceptions and could lead to more effective policy and programs. John Parkins ended this session by focusing on community health issues and illustrating his points with details from British Columbian forest communities. These cases offer additional insights when residents' views on vulnerability are incorporated.

Resource management issues were addressed in the next session, which began with Cynthia Neudoerffer, reporting on early findings from research in Manitoba rural communities. As she points out and demonstrates with her preliminary observations, questions regarding what can be done about climate change need to take past adaptive behaviour into account. Ben Bradshaw drew our attention to factors influencing adaptive

behaviour among agricultural producers who face multiple sources of risk (or opportunity) while dealing with changing weather conditions and climate. Social science enables analysts to take these potentially competing forces into account when assessing possible strategies for adaptation. Diane Dupont presented results from economic analyses of how people value drinking water, a resource that will be under increased stress from climate change impacts.

Presentations in the final session of the Symposium focused on different methodological issues for climate change adaptation research that incorporates social science. Doug Macdonald began this component of the symposium with an exploration of the challenge faced by policy makers relying on adaptation research based in a systems perspective. He notes that problems can arise because most policy is intended to change the behaviour of individuals or individuals in the aggregate, not human systems. Johanna Wandel then elaborated on aspects of the vulnerability approach, using rich examples from research in the Arctic as illustrations.

Pamela Kertland concluded the Symposium with a commentary on the challenges of getting social science researchers interested in the topic of climate change adaptation. Her acknowledgement of the value of such research provided a fitting conclusion to a session highlighting social science contributions.

Summaries of the eleven presentations that took place during the Symposium follow.

PART 1 INTRODUCTION TO CLIMATE CHANGE IMPACTS AND ADAPTATION

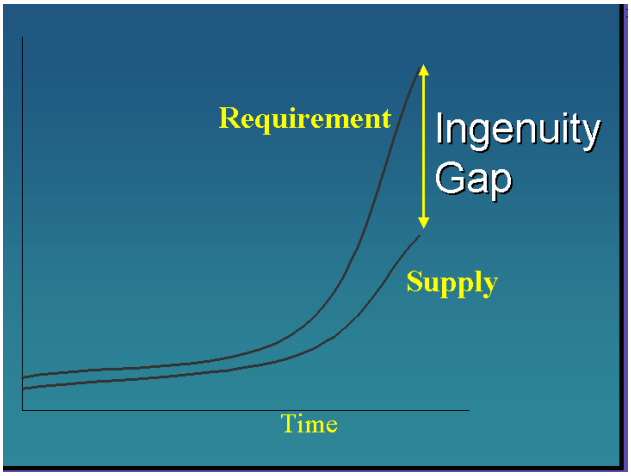
Adaptive Capacity and Resilience: How to Meet the Challenges from Climate Change

Thomas Homer-Dixon (University of Toronto)

Homer-Dixon uses ingenuity theory to support his claim that human societies can adapt or build resilience for dealing with global climate change. According to this theory, humans are pragmatic problem solvers; our ingenuity (defined as "sets of instructions that tell us how to arrange our physical and social worlds in ways that help us achieve our goals") allows us to generate and implement practical ideas. It is a key factor in understanding why some people, societies, or organizations are good at solving problems while others are less so.

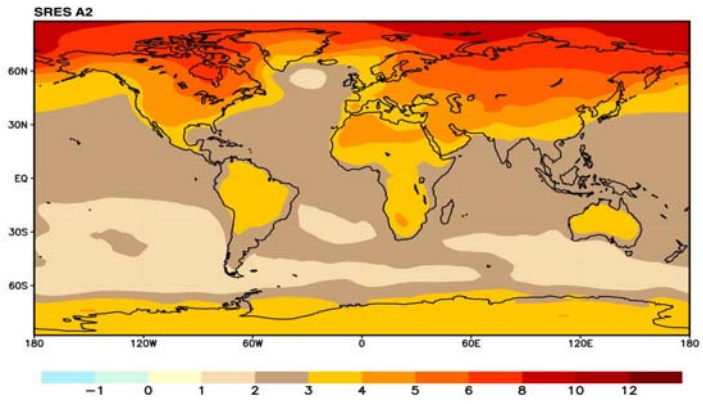
There are two types of ingenuity, technical and social. Technical ingenuity consists of recipes for reconfiguring matter resulting in material developments, while social ingenuity consists of instructions for arranging or managing people to form key organizations and institutions like court systems and parliamentary democracies. Homer-Dixon emphasizes that it is social ingenuity that is more important, for it is a prerequisite for technical ingenuity. However, it seems that human beings are better at producing technical rather than social ingenuity.

When people, societies, or organizations cannot supply enough ingenuity at the right times, an 'ingenuity gap,' or the difference between ingenuity requirement and supply, is created. This perspective, one of the model's keystone concepts, helps us understand why we're finding it difficult to adapt to change; our supply of social and technical ingenuity falls short of our requirements.



In his presentation, Homer-Dixon addressed the questions, "How does climate change boost our ingenuity requirement? How do we change its supply?" He began by describing climate change as "perhaps the most severe adaptive challenge humankind has ever faced." Some climate change will be non-linear. Over time we have witnessed abrupt rising in the atmosphere's temperature and possible disruption in the themohaline circulation. One result is an increased frequency of extreme events that will exacerbate other stresses, such as existing environmental degradation.

He continued by pointing out that for several reasons, psychological and social phenomena create barriers for adapting to climate change. Humans are in existential denial, believing that climate change is not happening—and we are in consequential denial, thinking that it will not matter very much if it does. Governments, institutions, and/or societies that put industrial economic needs above the environment further hinder effective responses to climate change.



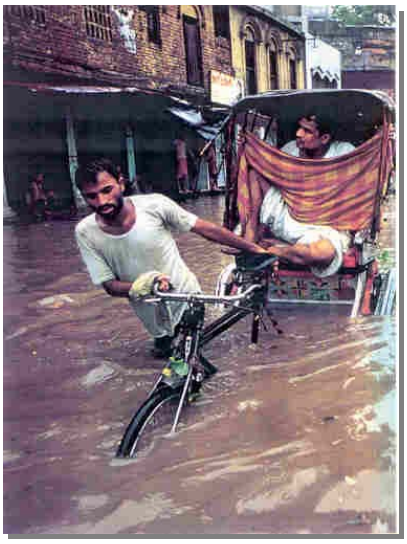
Climate change adaptation needs to happen cooperatively where all players can share costs and responsibility, and collectively take action. Homer-Dixon points out however that current mitigation and adaptation methods present a severe collective action problem. The costs of inaction on climate change are borne more heavily by developing nations, leaving them even more powerless.

How can we supply the ingenuity needed to meet challenges from climate change? The answer, says Homer-Dixon is to focus on **adaptive innovation**. Societies that are highly adaptive contain good cross-disciplinary knowledge and are able to produce and deliver ingenuity, or useful ideas, to meet the demands placed on them by worsening environmental problems. They are able to provide the appropriate kind of ingenuity at the right time and places to prevent severe problems. Adaptive societies have abundant social capital and strong norms of social responsibility reinforced with networks of trust and reciprocity. In some ways, humans have not extended a species-wide sense of identity—and we need to or we will be unable to create institutions with adaptive capacity for dealing with impacts from climate change.

Homer-Dixon offered several points for promoting adaptive innovation. **First,** recognize the complexity of problems and solutions. For instance when dealing with climate change, mitigation, adaptation and resilience methods should all be used in conjunction; never do just one thing. **Second**, decentralize the search for possible solutions. A decentralized response consists of multiple agents with diverse strategies who can learn from failure. **Third,** focus on increasing resilience by: (i) loosening coupling, increasing buffering, and increasing redundancy; and (ii) building societies with stronger connections in a secure network. **Fourth**, front load the ingenuity supply in time so that it may be delivered sooner rather than later.

Where from and where to: climate change impacts and adaptation research and practice

Barry Smit (University of Guelph)



Two broad policy questions serve as the basis for reviewing and critiquing climate change impacts and adaptation research, with a special focus on the connection between research and practice. These questions are:

- How serious is climate change?
- What can be done about it?

The idea of climate change being serious is important because there will be no urgency in the international community to do something about it unless the effects are viewed as dangerous, *i.e.* harmful to ecosystems and human systems. This is the language used in the convention framework.

The standard way to estimate the level of danger is to focus on impacts. And, this has been the established practice in climate change impacts and adaptation research. Using impact-based approaches means analysts select the attributes they think are important and plug them into climate change models to project their likelihood of occurring. Adaptation options to reduce impacts are likewise included, based on the assumptions that these are the changes people will make. For example, in many studies of prairie agriculture under different climate change scenarios, various adaptation options are tried out in models (*e.g.* diversifying crops, using irrigation, moving production to different regions). Calculations for the economic costs and benefits from these altered farm practices provide some indication about the likelihood they will be adopted and estimate the overall effect for the industry.

A vital element missing from such impact-based approaches is consideration of human behaviour. How do people respond when facing the types of risks associated with climate change? Such a question requires going beyond the standard "climate science" analysis that dominates impact assessments and incorporating what people actually do. Recent studies in the Canadian Arctic (including traditional knowledge) reveal a number of factors important to the Inuit facing altered environmental conditions. Among them is wind direction, which may change from prevailing patterns and lead to unexpected problems for Inuit hunters during the ice break-up in spring. Instead of the usual north wind (pushing breaking ice back onto shoreline ice and a route to safety), south winds may send ice floes out into the open ocean where chances of rescue are limited for anyone caught on those floes.

The answer to the second question we are considering: "What do you do about climate change?" has two components, namely mitigate the cause (green house gas emissions) and adapt to the impacts. The UNFCCC deals with both responses, although the latter has received less attention.

Some research pursues the topic of adaptation options themselves. What are they, how effective will they be and so on. Such inquiry leads to the realization that it is, in fact, quite rare for decisions-makers to work through this kind of formal evaluation process. In agriculture we have found that it is unlikely that producers consider climate change at all--they use business management options and other risk management practices--climate is one of the many factors to take into consideration.

Questions of vulnerability inevitably arise. Vulnerability as a concept is related to resilience/sustainability and so on. Two components comprise vulnerability: exposure to a hazard and adaptive capacity (*i.e*. how well can the system deal with the exposure). We need to understand the nature of vulnerability and how climate stress interacts with other stressors to affect the capacity to adapt. For instance, Bangladesh and Florida might have similar exposure levels to sea level rising but they differ in terms of levels of adaptive capacity for dealing with the subsequent impacts from such a feature.

Vulnerability indices can be constructed based on assessments of exposure and adaptive capacity and they may provide direction to decision makers as to where they should direct help. However, if we say we are going to inform decision makers then we are obliged to understand the nature of decision-making in our research, otherwise we will come up with naïve recommendations that will go nowhere. Likewise if we claim our work is applied and policy-relevant then let's be honest and find ways to make it so.

The vulnerability approach (discussed later in this report) is a step in that direction.

PART II CLIMATE CHANGE AND HEALTH AND WELL-BEING

How Agricultural Policy Changes related to Climate Change may affect Community Health

Terry Rolfe (University of Saskatchewan) *

In keeping with the underlying theme of looking beyond discipline boundaries, Rolfe points out the cross-cutting nature of climate change adaptation policy and actions. Initiatives designed to enhance capacity in some areas may have negative outcomes in others. ***For effective policy that will "do something" about managing climate change risks***, it is necessary to go beyond a short-term, site-specific focus and consider what the unintended consequences could be. The use of Conservation tillage (CT) and No Till (NT) systems in prairie farming is a case in point. Moving from conventional tillage (that leaves soil bare and easily eroded) to conservation tillage systems (where there is little soil disturbance) continues across Canada and has been adopted for primarily economic reasons (cost reductions in energy use; improved yields, etc.). At the same time, there are benefits for climate change impacts as conservation tillage increases soil moisture to withstand prolonged drought and lessens flood damage by having the soil protected.

(Photo Credit: Purdue University: CTIC)

However, these reduced tillage systems are also associated with a sector-wide transformation in the agri-food system where farms are becoming larger and more industrialized. For instance, CT and NT are related to the use of large equipment over uniform land surfaces with more efficient (*i.e*. one-pass) applications of fertilizer, seed (often genetically modified) and increased chemicals. The most profitable crops are sold on contracts where uniformity, including times of maturity is a critical factor.

Diversity is not valued in these systems, not in terms of land, technology, or products. Farming systems themselves lose diversity as more industrialized activity results in a focus on quantity rather than quality to realize economies of scale. The move toward

* Other researchers include Lawrence Martz and Michael Trant (University of Saskatchewan).

greater homogeneity in our farm communities (*i.e*. the dominance of large industrial farms) implies that diversity is good for other life on this planet but not for our own communities.

The need to go beyond borders of discipline thinking and consider interactions with other systems is typical of ecosystem approaches. Such a perspective is summarized as follows:

> *The health of individuals and communities is affected by the complex synergy of nature, society, institutions and economics in the face of accelerated change and uncertainty.*

Instead of limiting diversity (as appears to happen with the drive for industrializing agriculture), ecosystem approaches value diversity because it increases resilience (*i.e*. allows the system to respond to stress). As well, humans are viewed as an integral part of the ecological system. All communities (human and non-human) reflect evolving repertoires for adaptation whether to climate or other external and internal factors.

Within ecosystems, community health is affected by a multitude of social and biophysical factors, which are themselves connected. Activity in agricultural operations will inevitably affect human communities. Therefore, with climate change, it is necessary to consider how impacts on agriculture will affect human health in the community attempting to sustain farming activity. Challenges come from many directions. For instance, climate change may exacerbate problems related to water quality and quantity, most notably from extended droughts and extreme flooding.

(Source: Alberta Irrigators, Waterton Reservoir)

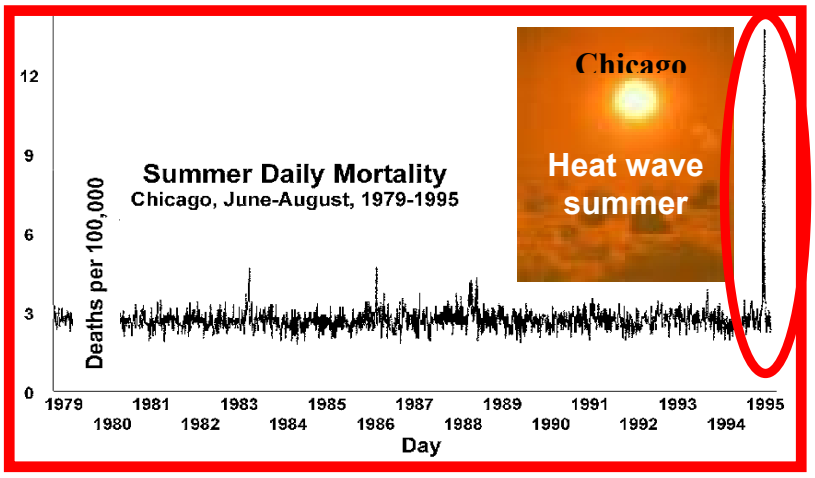
Across the Prairies, in response to overwhelming concerns for adequate water supply, there has been considerable infrastructure development to redistribute water and manage supplies in the form of flood control measures. Residents may no longer think flooding is a serious issue even though from an ecosystem perspective, it remains a natural part of a cycle that has ecological benefits. Under climate change, with potential increases in abrupt intensified water events, it may be that the loss of "natural flooding " in ecosystems will have negative consequences for human health. There may be more accelerated run off where toxins and pollutants are released quickly instead of having them periodically flushed out of the system during a natural flooding cycle.

One way to prepare for the potential climate change impacts on ecosystem and therefore human health will be to follow a layered management approach within an ecosystem framework. This would bring together "expert" opinion and "public" input to develop community-based monitoring and site-specific management. Such initiatives will not succeed without social science insights and methods.

A Canadian case study: the Québec Assessment of Health Impacts related to Climate Change

Pierre Gosselin (Centre de recherche du CHUQ et Institut national de santé publique du Québec)*

Social and health sciences have a well-established relationship as many of the risk factors for disease and illness are directly related to socioeconomic status and other lifestyle features. Thus any attempts to improve health status need to take into account a number of risk factors in an individual's life and his or her wider environment. Impacts from altered climate and weather conditions are new considerations for community health assessments.



[1]

Risk factors for extreme heat

- Aging population
- Health conditions
- Socio-economics
- Type of housing
- Warning systems

Examples of the relationship between climate/weather and health include the devastating heat waves in Chicago (1995) and France (2003) where a number of risk factors led to serious loss of life, especially among the elderly and the poor. Besides such direct impacts, there are indirect considerations related to linkages between disease vectors and climate conditions.

Acknowledging the potential health problems from climate change, researchers in Québec are pursuing several related projects to help with policy and program development that will reduce vulnerability to impacts from climate change. The goals of the research fall under both of the initial questions set out in this report: **How serious is climate change? And what can be done about it?**

Gosselin reported on four separate studies that address climate change and health issues in Québec. The first project follows a traditional approach by combining meteorological data and statistics on mortality and morbidity as input in widely used models. The output will help to assess the seriousness of climate change by determining if there is a correlation between specific weather conditions and levels of sickness and/or death rates.

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* Other researchers include D.Bélanger, B.Doyon, M.Giguère (Centre de recherche du CHUQ et Institut national de santé publique du Québec)

[1] Graphs and text box from C-CIARN Quebec, http://www.ouranos.ca/c-ciarn/

Such information will help authorities estimate the impact of future climate conditions. If excessive heat is correlated to increased health problems, then plans can be made for dealing with extended periods of high temperatures (as projected in climate change scenarios), thereby preventing unnecessary hardship among the population.

The second study is an in-depth examination of perceptions, vulnerabilities and adaptation strategies in the general population. Through polls and surveys, researchers are gathering vital information about socio-demographic variables (including work), health status (including chronic problems, autonomy, perception), housing (insulation, air cooling), other solutions proposed, and behaviour during heat wave/cold spells. In preparation for administering the questionnaires, researchers followed established social science methods for validating their questions. In preliminary interviews, the common understanding of expressions (*e.g*. chronic diseases) was checked; the best scales for the poll were decided; and questions that presented problems (sensitive topics such as income level or the floor you live on in an apartment building) were modified. Researchers also included some open-ended questions to ensure individuals could express themselves fully and provide the type of detailed information that social science is uniquely equipped to gather.

A third study has similar goals to the second but the target population is managers of municipalities and the health sector. The interview guide focuses on community level impacts and adaptation. Social science methods are employed throughout, including informal text analysis though transcriptions and *NVivo* coding. The sample includes 90 managers in counties and cities from 15 regions (land use, emergency response, agriculture, etc.) and 60 managers in regional health agencies, including MOH, plus EH, OH and Infectious Diseases coordinators.

There are specific themes that analysts are looking for in both the second and third projects. These include:

- Perception of climate change impacts on health and welfare;
- Comparison of individual/family outlook with the managerial one on socio-economic, environmental and health vulnerabilities;
- Contrast perceptions on CC (is it real for you?) with other known risks in the region of residence (maritime, forest, urban, rural); and
- Level of prioritization of CC within the pre-existing vulnerabilities on health and the environment

Related questions that the studies will address concern the need for interventions – What are the time lines? Over 10, 20 years? Local or regional? – and finding out the key factors behind the answer (job, training, experience, region, team, past events, perception of reality of CC, leadership).

Gosselin also reported on a fourth study that will result in a compendium of existing and currently developed adaptations for heat waves/urban heat island; air quality; food management; emergency preparedness; zoonotic diseases; waste management. Such information will be useful for future programs and policies designed to improve the adaptive capacity of Quebec residents for dealing with health risks form a changing climate.

A Framework for Vulnerability Assessment in Rural and Resource-based Communities

John Parkins (Canadian Forest Service)*

Reporting on research undertaken with colleague Norah MacKendrick for the Canadian Forest Service, Parkins presented a framework for assessing vulnerability in rural communities (see Table 3). This framework offers a direct response to Smit's fundamental question, **"what can be done about climate change?".** Parkins responded by providing a concise and highly informative vulnerability assessment tool so that policy makers and residents have some basis for measuring the community situation.

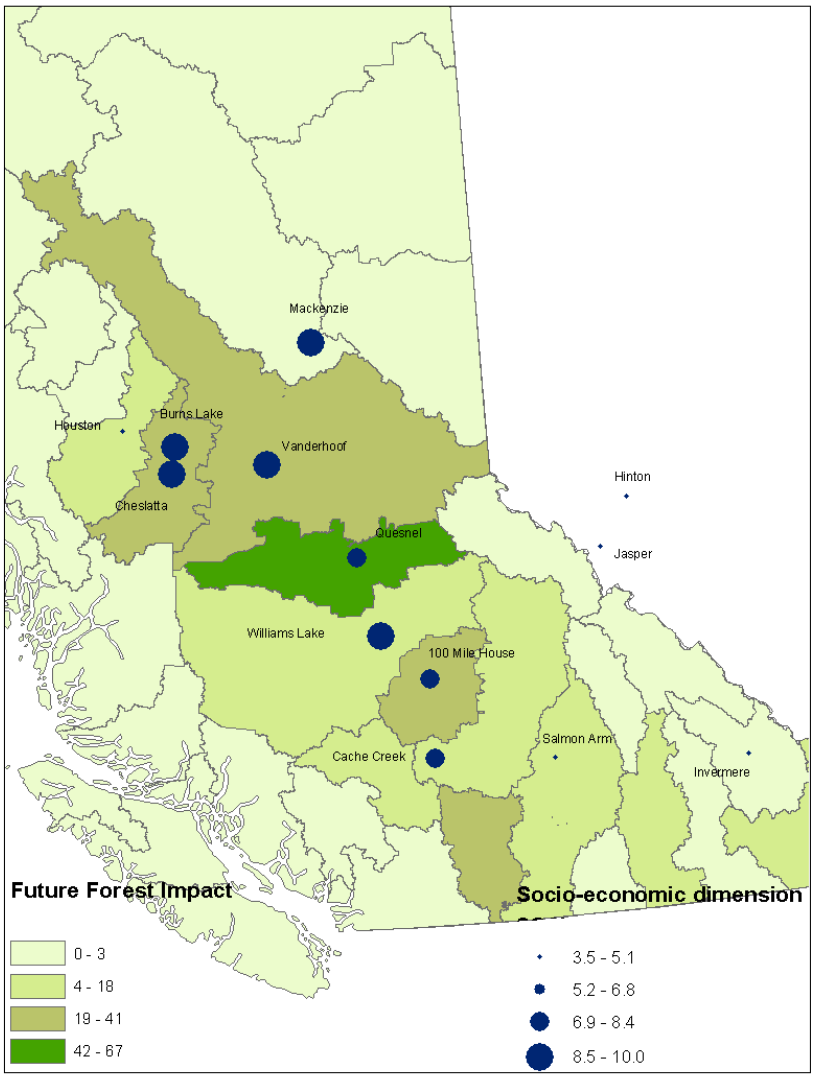
Table 3. Vulnerability index

Index Dimension	Indicator	Variables	Data Source
Physical	Current forest susceptibility	• Susceptibility of pine (m^3/ha) by Timber Supply Area (2003)	BC Ministry of Forests, Research Branch (Special data request)
	Future forest impact	• Projected cumulative volume of pine killed (m^3/ha) by Timber Supply Area by 2010	BC Ministry of Forests, Research Branch (Special data request)
	Perceived impact	• Perceived degree of impact on community from beetle activity • Nature of perceived impact on community (positive vs. negative)	Household Survey
Political	Community risk awareness	• Personal importance of beetle activity	Household Survey
		• Perceived risk to community from beetle activity	
		• Basic knowledge and awareness of mountain pine beetle	
	Evaluation of community leadership	• Trust in government institutions to manage impacts and risk from beetle	Household Survey
		• Evaluation of community efforts to respond to beetle presence	
		• Satisfaction with local beetle management efforts	
Economic	Economic diversity	• Economic diversity index	2001 Census data
	Forest Dependence	• Percent labour force income from all forest activities	2001 Census data
	Long term forest resources available to community	• Percent pine by area for Timber Harvesting Land Base	BC Ministry of Forests, Forest Analysis Branch (Timber Supply Analysis Reports)
	Community assessment of local economic resilience	• Perceived local economic resilience	Household Survey
Socio-economic	Human economic hardship, crime, health, education, children & youth at risk	• Socio-economic index rating	BC Stats (2004)

After discussing the details from this framework, Parkins presented results from communities in British Columbia devastated by the current mountain pine beetle

* other researchers include Norah MacKendrick (Canadian Forestry Service)

outbreak. Social science techniques form the basis for these studies and include having community members determine the key factors associated with vulnerability. Scores for socioeconomic capacity and future forest impact are combined for specific rural communities. The larger the circle the more vulnerable the socioeconomic conditions in the community. At the same time, the darker the area the more severe potential climate impacts may be. Government programs and policies related to climate change adaptation and impacts are especially needed in communities facing increasing stress from socioeconomic conditions and potentially harmful impacts from climate change (such as increased pest infestations).



The framework and its results confirm that it is possible and highly informative to combine data from both physical and social systems; neither is adequate on its own for addressing questions regarding climate change adaptation. As well, using public knowledge and existing data as a foundation yields practical research results for strategic policy and program applications.

PART III CLIMATE CHANGE AND RESOURCE MANAGEMENT

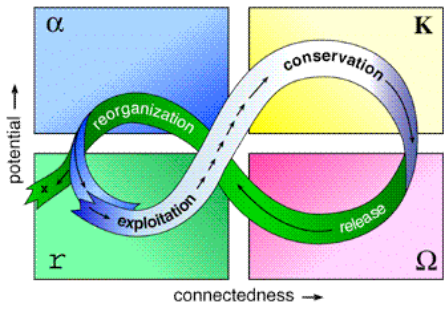
Slowing the Flow: Community-based Watershed Management as Adaptation to Climatic Extremes on the Canadian Prairies

Cynthia Neudoerffer (University of Guelph) *

Starting off the session on resource management and climate change, Neudoerffer presented an outline of her research on water issues in rural Manitoba and some preliminary findings. The focus of her study implicitly offers an answer to the question: **What can be done about climate change?** One approach is to understand how people have handled similar stresses in the past and get a sense of their resilience or adaptive capacity for dealing with future stress. A set of three questions guided this aspect of the Manitoba research:

- How are rural communities on the Canadian Prairies currently organizing to adapt to soil and water problems caused by too much (spring flooding / summer storms) or too little (drought) precipitation?
- What conservation actions are farmers taking?
- How are they organizing to address local concerns?

The research uses two main theoretical concepts: vulnerability and resilience. **Vulnerability** is defined as a function of both exposure to a climate stimulus - in Neudoerffer's case an extreme precipitation event – and the adaptive capacity to manage or reduce the impact of that event. Vulnerability is a location-specific measure that is not static, rather it changes over time, sometimes increasing, sometimes decreasing, depending on the interaction of its two constituent parts. **Resilience** is defined as a function of the ability of a system to absorb change, the ability of that system to self-organize in response to change, and adaptive capacity. The idea of resilience is captured in Holling's "Adaptive Cycle or Figure 8" diagram - which emphases its cyclical nature over time through the four phases of exploitation, conservation, release and reorganization.



Given that building social and ecological resilience is one way to reduce vulnerability and increase adaptive capacity in the face of climate change, there is merit in carefully examining resilience and seeing how it develops in communities. In short, understanding the past can help preparations for future adaptation to climate change.

These ideas formed the basis for a case study of an organization called Deerwood Soil and Water Management Association (DSWMA) as it undertook work within a Manitoba watershed from 1985 to present. Based on extensive qualitative research (*i.e.* through in-depth interviews, reviewing historical records, and participant observation) it is evident that the DSWMA is a unique example of community-based management on the Prairies.

* Other researchers include David Waltner-Toews (University of Guelph)

Farmer-led since its inception and supported by all farmers in the watershed, DSWMA formed to address local concerns with soil erosion and flooding during extreme precipitation events, particularly the spring runoff and summer storms. Working in the South Tobacco Creek (STC)[1] watershed, the farmers began designing and building a network of 26 small check dams in the upper reaches of the watershed. Past research has demonstrated that the dams reduce peak flow runoff by as much as 90%. Equally important is the network of partnerships that DSWMA has formed with over twenty other groups including provincial and federal agencies and other local NGOs.

The Deerwood experience provides lessons for future community-based adaptation to climate change in agriculture in rural Canada - at least in this context on the Manitoba Prairies. It also points out how adaptation to climate change is very often a response to some other related stress (such as impacts from excess moisture, soil erosion, or income loss due to low yields).

Future impacts from climate change may be reduced if residents can form groups like DSWMA and receive institutional support to sustain them. However, when asked about future prospects for forming a community group like Deerwood most of the farmers responded in the negative. They feel that Deerwood's future is aligned with what they see as farming's declining future in general. Included in their concerns are demographic shifts in farm population; the consolidation of farms into larger enterprises whose owners may not have strong interests in environmental sustainability; a loss of sense of community as people have less time for volunteering and supporting community groups; and a lack of funding and interest from governments for this type of community-based work in the province.

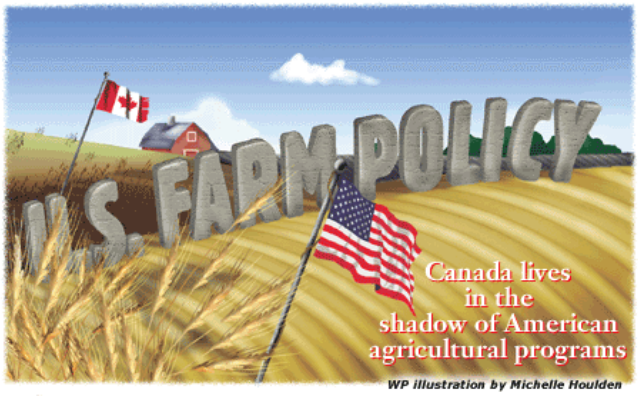
[1] The STC watershed, although small, incorporates three distinct Prairie physiographic units (Uplands, Escarpment and Lowlands), allowing the study of adaptive strategies appropriate to much of the Prairie landscape. It is a 75 km^2 watershed bounded on the west by the Manitoba Escarpment and to the east by the Red River Basin with a 183 m (600 ft) elevation drop from west to east in just 11.3 km (7 miles).

Climate change impacts and adaptation in a wider context: an agricultural example

Ben Bradshaw (University of Guelph)

Social science responds to the challenge of understanding society and the individuals within it. How humans behave and relate to the natural world are daunting phenomena to explain; yet such knowledge is essential for long-term sustainability. It is widely accepted that all behaviour is fundamentally structured by the interaction of a number of social forces such as culture, politics, and economics (to name some); their study constitutes social science. As a social scientist, Bradshaw finds agriculture of particular interest because it is directly connected to the state of the environment. The actions and attitudes of farmers/producers need to be understood before effective policies and programs can be developed and implemented to improve environmental conditions.

Bradshaw's presentation addressed fundamental questions about **what can be done in response to climate change** by focusing attention on the array of factors influencing adaptive behaviour. In the case of agricultural producers, climate represents only one of many sources of risk (or opportunity) to which they are exposed. Events such as commodity market downturns, changes to government support programs, fluctuations in currency and interest rates, or the loss of export markets due to consumer health concerns, may present significant risks to producers at certain times.[1] Adapting to these and other factors has always been a feature of Canadian agriculture.



As noted in the Neudoerffer presentation, current trends in the agricultural sector may be limiting producers' ability to adapt. Bradshaw noted that agricultural commodity prices typically depreciate over time in inflation-adjusted terms and offered the example of wheat prices declining in the past 50 years despite increases in production costs. Adaptive responses to a drop in price might mean taking more off farm work, intensifying production, or diversifying farm enterprises. Climate

[1] Obvious examples of late in Canada include the loss of the US export market for live cattle owing to the discovery of BSE on a few Alberta farms, and the associated decimation of prices for feed crops like corn and soybeans.

change may not be all that important compared to these other forces and in fact the response from farmers confirms this attitude does exist.

Based on research on apple and grape production in the Okanagan region of British Columbia, Bradshaw and colleagues found that climate and market factors inevitably intersect and affect producers' vulnerability.

Prior to the Free Trade Agreement, grape producers grew French hybrid grape varieties, which are winter hardy, but produce a low quality wine. The provincial government sponsored a "pullout" program in 1988, in which the French hybrid vines were replaced with the tender *Vitis vinifera* varieties (*e.g*. Chardonnay, Merlot and Cabernet Sauvignon). This change enhanced the wine industry's international competitiveness, but simultaneously increased its susceptibility to winter injury. Similarly, the government sponsored a replant program in the apple industry, which prompted growers to replant old orchards with new, higher paying, high-density varieties on dwarfed rootstock. Having dwarfed rootstock means the roots are closer to the surface, and are therefore more susceptible to frost and winter damage. The fruit is also more susceptible to sun scald, because the high density varieties are less leafy, increasing the fruit's exposure to direct sunlight. Thus in both cases, markets have been a fundamental driver of adaptation, which in turn has increased vulnerability to certain climatic stresses.

These details about climate change risk and adaptation from grape and apple production in B.C. provide lessons for understanding what happens in other types of agricultural production across Canada. Bradshaw concluded with these basic points:

- Adaptation decisions are made in a multi-risk context and within systems that are dynamic
- Climatic risks are often expressed through, or at least relate to, market risks
- Vulnerability to climate and other risks varies by farm and by sector

Climate change adaptation policy in agriculture will be limited unless contextual features such as these three are recognized and taken into account. The same is true for other industrial sectors and regions throughout Canada. Social sciences provide the perspectives and tools for ensuring that context is acknowledged, leading to a more substantial answer to the important question: **what can be done about climate change**?

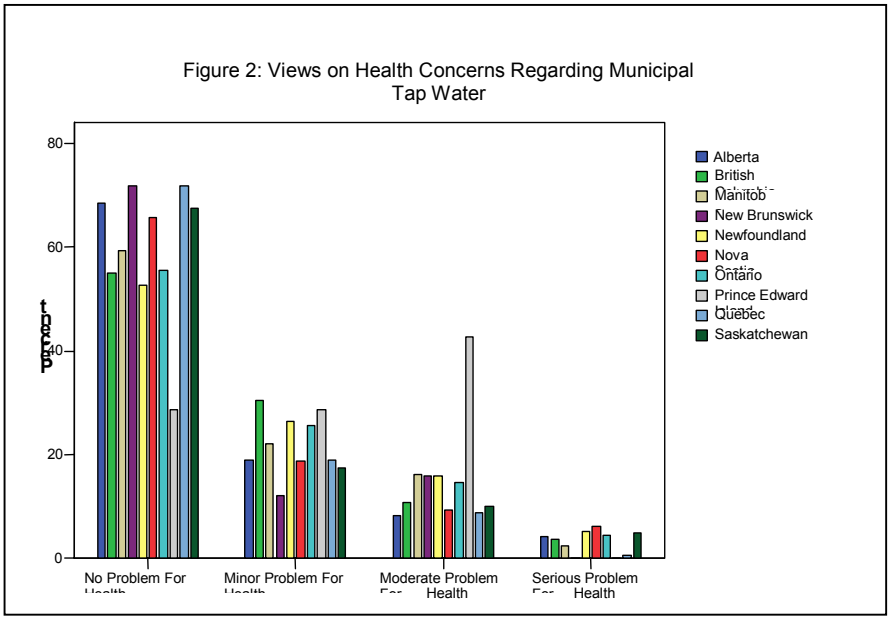
Water Quality and Climate Change: What are consumers willing to pay to reduce health risks?

Diane Dupont (Brock University)*

Moving from the general issues of multiple risks in agricultural resource management, Diane Dupont presented on very specific problems related to deteriorating water quality. Her research addresses both questions: **how serious is climate change? And what can be done about it?**

Water utilities in Canada are charged with the important task of ensuring that consumers are supplied with good quality water. Yet over the last decade, this job has become increasingly more difficult as agricultural and industrial pollution continues to deteriorate source water quality. Models of climate change predict weather conditions that may further erode water quality. One solution, chlorine, has been identified as potentially carcinogenic. Thus solutions to current and potential water quality problems require extensive study and wise policy and programs if they are going to be effective under changing climate conditions.

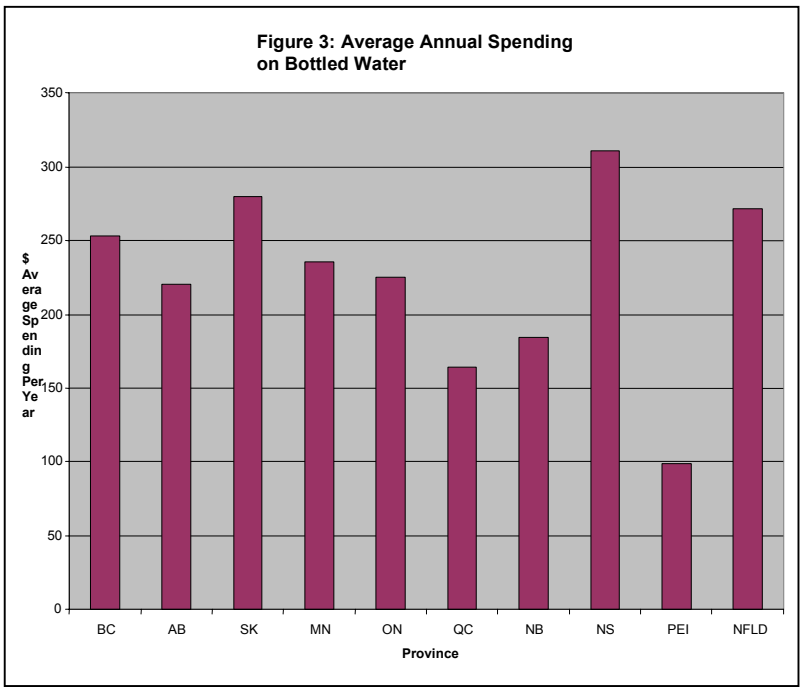
Dupont reported on results from research addressing questions about Canadians' attitudes toward health risks of tap water and just how much they are willing to pay to see these risks reduced. Their study used the choice experiment method (CE) from economics where respondents are presented with *status quo* (SQ) alternatives that differ in levels of attributes (microbe risk, cancer risk, cost to household). Respondents then choose from the options based on those that provide the highest level of utility.



* Co researchers include: Vic Adamowicz, University of Alberta; Alan Krupnick, Resources for the Future; Lorie Srivastava, University of Alberta

Using the internet as the medium for the survey and the services of *Ipsos-Reid*, researchers developed questions based on extensive focus group testing and a pilot survey in December 2002. Respondents came from a sample of over 100,000 people, representing "Internet-enabled" Canadians. Results indicate that Canadians generally feel their tap water is safe but there is some cause for concern (Figure 2).

Using monetary values, Dupont and colleagues estimate that Canadians would be willing to pay an additional $88-$142 to have water that caused 10 fewer deaths from cancer and 50 fewer cancer cases. That figure increases to $143-$217 if the changes were 10 fewer deaths from microbial illness and 15,500 fewer microbial cases. These results reflect what people say they "would" be willing to pay and are preliminary results since they are calculated from specific models. Continued examination of other models is on-going.



However, what people say they do and what they actually do may sometimes differ. Therefore, Dupont and colleagues examined spending behaviour among Canadians for purchasing bottled water. In this way they could determine how much people actually pay for water rather than rely on their estimation of a willingness to pay. Results are in Figure 3 and indicate that across the provinces, with exception of PEI, families spend between $150-$250/year on bottled water.

One conclusion from this study is that Canadians are already concerned about municipal water quality enough to spend a substantial amount on purchasing an alternative. Because they apparently have sufficient financial resources to do this, their adaptive capacity for dealing with perceived water quality risks is currently quite high. What will this mean for future adaptive capacity in this regard? If climate change conditions do lead to degraded municipal water will there be adequate alternative supplies of high quality to meet an increased demand? Will Canadians continue to have the financial resources to purchase that water?

Addressing questions such as these is an important element of preparing for climate change adaptation. It is also a step that demands social science perspectives and methods.

PART IV METHODOLOGICAL APPROACHES TO CLIMATE CHANGE RESEARCH

Understanding the Complex of Health, Economic and Social Climate Impacts for Policy Making Purposes

Douglas Macdonald (University of Toronto)

Climate change adaptation takes place within social and ecological systems. Thus, Macdonald notes that developing effective policy and programs for climate change adaptation rests upon a basic understanding of how such systems function and the ways in which governments can best assist in strengthening their adaptive capacity for climate change impacts. This theme is related for the second question that underlies this report, namely, **what can be done about climate change**? by exploring the basic challenge facing governments as they develop policy related to climate change adaptation.

All policy making is essentially an attempt to change the behaviour of state or societal actors by using instruments such as law, spending on program delivery, positive or negative financial incentives or exhortation to voluntary action, all of which place before such actors new incentives of reward or punishment. With a few exceptions however, such as fiscal and monetary policy intended to improve the performance of the economy as a whole, governments rarely try to influence the behaviour of systems as a whole. Instead, they use such instruments as the Criminal Code to change the behaviour of individual citizens or environmental regulation to change the behaviour of individual firms. Although such policy is applied to a large number of actors, governments usually take as the object of their policy-making groups of individual entities, not systems.

Macdonald explores the issues facing adaptation policy, given this challenge: how can policy makers identify the boundaries of the human system or systems they hope to influence within those boundaries? how can they identify the points of intervention which will maximize feedback effects moving the system toward increased resiliency? which instruments will influence system behaviour? Is it realistic for policy makers to even think about increasing adaptive capacity of entire systems, above and beyond that of the individual actors within them?

Systems-based adaptation policy needs to concern itself with three types of systems:

(1) the physical and natural system in a given geographic area being affected by climate change;
(2) the human system in that area comprised of health, economic and societal aspects; and,
(3) the relevant federal, provincial and local government policy systems.

Those working in the area of resource management have had to consider the value of social and health sciences given that in many instances, policy based on traditional

science was unable to achieve its objective of conservation of the resource. It is necessary to explore both the workings of complex physical and natural systems and the ways in which they interacted with human systems, referring to this combined subject as "social-ecological systems". Scholars point to a number of relevant areas of study, including:

- environmental ethics;
- political ecology;
- environmental history;
- ecological economics;
- study of common property institutions; and
- traditional ecological knowledge.

The field of adaptive management for climate change is an attempt to develop new ways of using this research into social-ecological systems to better inform resource policy.

However, a given adaptation policy unit working to increase climate adaptability within its territorial limits, and starting from the basis of at least some knowledge of existing and potential impacts and vulnerabilities, faces many challenges as it works to influence systems, rather than individual actors: These include identifying the most significant of the health-economic-social systems and subsystems it wishes to move to a new equilibrium of increased resilience; having at least some understanding of the boundaries of those systems; selecting the policy instrument or instruments most effective for influencing systems; and, applying those instruments at the point which will maximize positive feedback effects.

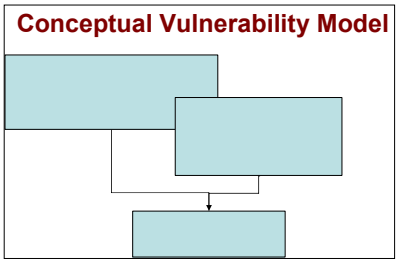
It is unrealistic, given available resources, to expect that governments can develop anything close to full understanding of the social-ecological systems they wish to influence. That said, policy makers are more likely to increase resiliency within their jurisdiction if they spend at least some time considering systems, boundaries, system-influencing instruments and points of application. To do so will mean adopting some of the perspectives and insights from health and social sciences.

Vulnerability approach to climate change research

Johanna Wandel (University of Guelph)

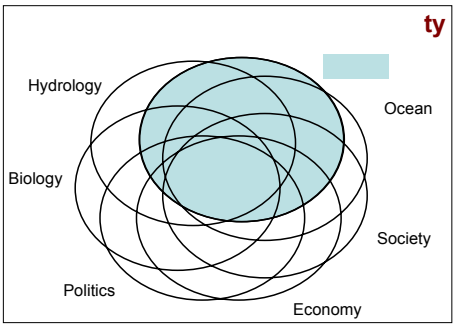
In Smit's introductory presentation for the Symposium the value of the vulnerability approach was outlined. Wandel elaborated these points, showing how the approach effectively answers the question **what can be done about climate change**. Material from research conducted in the Canadian North, supported her claims. As context, Wandel provided a summary of different and often complementary research approaches for investigating climate change adaptation issues:

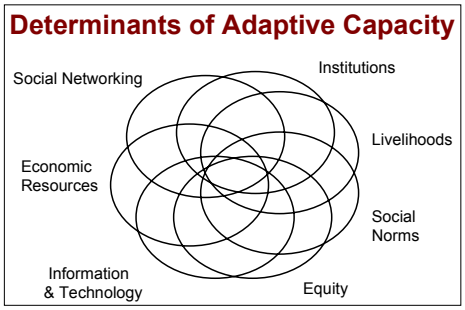
- Impact Assessment, addressing what will the climate change impacts be.
- Adaptation Options: addressing what will be done about impacts?
- Vulnerability Indices: addressing who or what will be impacted the most?
- Adaptation Processes: addressing who adapts, to what, and how?



The vulnerability approach fits into the adaptation process line of inquiry. Neudoerffer, in her presentation supplied the standard definition of vulnerability that forms the basis for the model showing how it is directly related to the level of exposure to a hazard and the adaptive capacity of the system for dealing with that exposure.

When exposure and adaptive capacity are explored in detail it is clear that there are many factors to take into consideration. Social science allows researchers to deal with these multiple conditions.





Guiding questions for the vulnerability approach follow a logical progression and once again underline the value of social science theory and methods for addressing those questions.

They include:
•What conditions have posed problems in the past/what are the relevant conditions?
•How have people coped with conditions in the past? How are they coping now? What role do institutions play?
•What change is expected in relevant conditions in the future (climate and other)? What capacity exists/is likely to exist in the future?

These questions can only be applied to a specific, distinct system (such as a human community or a farming system). The data and information required come from a variety

of sources. For instance, there are primary data related to a researcher's basic observations (including "participatory"), key informant interviews and input from community members through surveys and interviews. As well, secondary sources such as historical records and popular and scholarly literature provide valuable information for understanding the system and its capacity.However, as Wandel noted, researchers have to go into the communities and work with the residents there in order to get that kind of information. Without their cooperation, answers to the key questions are not available.

Insights from research investigating climate change adaptation issues for Arctic Bay, Nunavut, were then presented. The research team continues to work with Inuit organizations and Northern research organizations as it reviews government documents and informal records. In-community fieldwork continues and is starting to yield valuable insights about vulnerability for future climate change.

Arctic Bay has about 700 people, many of whom rely on traditional food sources such a narwhal. Changes in technology (*i.e*. snowmobiles that allow for further travel and GPS for monitoring where people are) are combining with changes in climate and weather conditions that affect wind direction, ice floes, and snow quality. One result is that hunters face increased hazards during the season. The adaptive capacity to deal with those risks may be hampered by a loss of traditional knowledge to overcome difficulties and the rise of socioeconomic disparities among community members. With increased climate change, these factors may limit the community's ability to adapt effectively. Social sciences are vital to finding solutions and implementing effective responses.

COMMENTARY

Social Science Research Opportunities in Climate Change Research

Pamela Kertland (Natural Resources Canada)

The nine presentations in the C-CIARN symposium were followed by a commentary from Pamela Kertland who is a research program manager with the Climate Change Impacts and Adaptation Program. Noting how instructive the presentations were for her work, Kertland emphasized the need to have social, economic, political, psychological, and cultural analysis for developing effective adaptive responses to climate change. She recognizes that social science has already explored many of the topics that policy makers need to understand and incorporate. Some social science pursuits are of particular importance. For instance, providing a global context to understand national and even local issues is useful for anticipating responses to different policies and programs. It is important to know what external factors might create barriers for end users' weather and climate risk management strategies. Additional insights from social science come from exploring drivers for decision-making, barriers to adoption, economic analysis and role of technology. None of these important topics is accessible without social science input.

There is much untapped information out there that policy makers need to do a better job of drawing out. It is not always a case of completing new research, but of thoroughly exploring the existing knowledge base and applying it to a potentially new topic, namely climate change adaptation. There remain many more questions that need to be answered.

To bring the discussion back to the current situation, Kertland noted that government funding programs for climate change adaptation research are finishing one cycle and developing plans for a future phase. Part of that planning includes evaluating the current program. What worked and what did not? Attempts to draw in more social science were not always successful. If the past research calls for proposals were not appealing to social scientists, that needs to be known. What can be done to ensure more participation of social scientists in adaptation studies? Any and all views on this are welcome. One way to express your opinions is through C-CIARN. The network is designed to monitor and assess research gaps and needs.

Appendix A

Climate Change and Canadian Society: Social Science Research Issues and Opportunities

Congress of the Humanities and Social Sciences,
University of Western Ontario
London Ontario
June 2, 2005

Session 1 Room 2050 SS	**INTRODUCTION TO CLIMATE CHANGE IMPACTS AND ADAPTATION**
8:30 - 8:45	Carrie Spencer (C-CIARN) Introduction to the Day and Keynote Speakers
8:45 - 9:15	Thomas Homer-Dixon (University of Toronto) ***Adaptive Capacity and Resilience: How to Meet the Challenges from Climate Change***
9:15 - 9:30	Questions
9:30 - 9:50	Barry Smit (University of Guelph) ***Where from and where to: climate change impacts and adaptation research and practice***
9:50 - 10:00	Questions/Discussion
10:00 - 10:30	Break

Session 2 Room 2050	**CLIMATE CHANGE AND HEALTH AND WELL-BEING**
10:30-10:50	Terry Rolfe (University of Saskatchewan) ***How Agricultural Policy Changes related to Climate Change may affect Community Health***
10:50-11:10	Pierre Gosselin (Laval Unversity) ***A Canadian Case Study – the Quebec Assessment***
11:10-11:30	John Parkins (Natural Resources Canada) ***A Framework for Vulnerability Assessment in Rural and Resource-based Communities***
11:30-noon	Discussion
Noon-13:00	Lunch

Continued on next page

Session 3
Room 2050
SS

CLIMATE CHANGE AND RESOURCE MANAGEMENT

13:00 – 13:20 Cynthia Neudoerffer (University of Guelph) ***Slowing the Flow: Community-based Watershed Management as Adaptation to Climatic Extremes on the Canadian Prairies***

13: 20- 13:40 Ben Bradshaw (University of Guelph) ***Climate change impacts and adaptation in a wider context: an agricultural example***

13:40-14:00 Diane Dupont (Brock University) ***Water Quality and Climate Change: What are consumers willing to pay to reduce health risks?***

14:00-14:15 Discussion

14:15 - 14:45 Break

Session 4
14:45-16:15
Room 2050

METHODOLOGICAL APPROACHES TO CLIMATE CHANGE RESEARCH

14:45-15:05 Doug Macdonald (University of Toronto) ***Understanding the system of health, economic and social climate impacts***

15:05-15:25 Johanna Wandel (University of Guelph) ***Vulnerability approach to climate change research***

15:25-15:45 Frank Duerden (Ryerson) ***Working with First Nations Communities***

15:45-16:00 Discussion

16:00-16:15 Pamela Kertland (Natural Resources Canada)
Social Science Research Opportunities in Climate Change Research

Carrie Spencer (C-CIARN)
Closing Remarks

Appendix B

STRATEGIES TO ENHANCE INTERDISCIPLINARY RESEARCH (AND INTEGRATIVE POLICY-MAKING)

BASIS FOR INTEGRATION	DETAILS
Research Orientation	▪ Not only project design but researchers themselves should be interdisciplinary as much as possible; ▪ Researchers should be flexible and willing to learn; ▪ Recognize that approaches are not static but need to be refined according the groups involved; ▪ Re-think meaning of expertise (*e.g.* treat stakeholders as experts in their own rights).
Focus	▪ The more specific the research project's goals and objectives the better; ▪ Limit opportunities for going off on tangents; ▪ Organize results based on the focus; ▪ Limit project to specific locality (*e.g.* Watershed) but do not ignore the broader political economic structure
Research Problem	▪ Be as specific as possible; ▪ Root the research in real concerns from a specific community and/or region; ▪ Acknowledge relationships between/among different scales and their implications; ▪ Formulate the problem as concretely as possible and aid communication by using appropriate tools (*e.g.* maps, satellite imagery).
Research Topics	▪ Some topics are more integrative by nature than others (*e.g.* health, water); ▪ Stress and risk are both integrated phenomena; they cannot be understood fully without incorporating multiple perspectives; ▪ Link research to work on issues with obvious connections to the topic of interest (*e.g.* Climate change adaptation is closely related to: resilience; sustainability; risk management, etc.).
Research Framework	▪ Research components should follow similar steps; ▪ Some methods are more conducive to interdisciplinary work (*e.g.* Case Studies); ▪ Stakeholders need to be included in defining the problem, gathering the data, and interpreting the results.
Language	▪ Agree on precise definition of terms; ▪ Avoid language that could be offensive (*e.g.* vulnerability) and/or convey homogeneous responses (*e.g.* community)
Institutional support	▪ Remove barriers to Interdisciplinary work.