

Integration and Synthesis: Assessing Climate Change Impacts in Northern Canada



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Understanding the impacts of climate change on a region is very difficult. Impacts and the responses to those impacts on one system or region affect the nature and degree of impacts and responses in another. A number of synthesis reports exist that attempt to compile the results from a number of unlinked parallel studies of impacts on particular places and/or systems. However, these reports typically look at impacts in isolation changes in other systems and places. Integrated assessments (IAs) provide a method of understanding the impacts of climate change within the context of other changes. This paper will discuss the relative merits of IA and synthesis reports for understanding climate change using case studies from northern Canada. The paper concludes with a discussion on the future of research into climate change impacts in northern Canada.

Integration and Synthesis Defined

Integrated assessments attempt to include the diversity of impacts of climate change, and to place these impacts within the context of other changes (Cohen et al., 1998). Integrated Regional Impact Studies (IRIS) are a type of IA that seeks to integrate knowledge from various disciplines for a particular region or place. The ultimate objective of many IRIS is to inform policy makers and decision makers. Therefore, IRISs are best conducted at a scale that is appropriate to the users of the information, particularly those who develop policies to address the consequences of change. The assessment framework for most IRISs is generally based on a set of concerns shared by researchers and stakeholders, and many IRISs engage stakeholders in developing research questions and producing new research and information (Cohen, 1997).

Synthesis reports are essentially literature reviews that are designed to achieve a broad level of understanding, or to describe the state of knowledge. These reports compile the results of a number of stand-alone studies. Gap Analyses are a type of synthesis report that seek to identify what is known about a particular topic, and to highlight where there are gaps in the information base. Synthesis reports can be useful to demonstrate the level of understanding

* The Northern Climate ExChange website address is www.taiga.net/nce

** Opinions expressed herein are those of the authors and not necessarily those of Environment Canada.



of what information currently exists, and to identify areas where further work is required (NCE, 2002).

INTEGRATION: The Mackenzie Basin Impact Study

The Mackenzie Basin in northwestern Canada was the subject of a major climate change study between 1990-1996, the Mackenzie Basin Impact Study (MBIS). At 1800 km in length, the Mackenzie River is the longest in Canada and the basin drains approximately 20% of the country. MBIS sought to understand the potential impacts of global warming on regions and inhabitants within the basin. This six-year cooperative study applied a scientist-stakeholder approach to IA and was one of the first attempts at an integrated regional assessment of climate change (Cohen 1997a,b).

The Mackenzie Basin is home to a large number of aboriginal people who rely heavily on traditional resource use, contains sensitive ecosystems, and has experienced warming of up to 1.5 °C over the past century. MBIS sought to answer questions of how a region, with both wage and non-wage economies, will cope with an additional warming of 4 to 5 °C before 2050 as projected in GCM model scenarios.

Integration was achieved in MBIS through models, stakeholder consultation, and in the selection of research themes. To focus research, a series of questions was developed to focus integration efforts. Scientists examined “what if” scenarios of climate change and stakeholders answered “so what” discussions on responses to the issue. Both groups collaborated on suggestions on “what should be done”.

The assessment framework recognized that stakeholder involvement is essential to define the objectives of the study and to identify priority areas for research to target limited financial and human resources. Stakeholders made invaluable contributions to the MBIS study team, especially in regard to providing local information and identifying priority issues.

MBIS concluded that IA research should be undertaken on a common platform. All aspects of the assessment should be based on common goals and objectives, temporal and spatial scales, methodologies and scenarios. A common platform will enable a better understanding of the interactions between systems in response to change. MBIS also concluded that a well-defined process, which encourages mutual learning and sharing of information, along with joint ownership of research questions, methodologies, results and communications, is essential to providing information that is of greatest benefit to the end-user.

MBIS demonstrated that IA is both a research and a learning process. Particularly when applying a scientist-stakeholder collaborative approach, integration is an iterative process, requiring numerous phases of consultation to ensure that local priorities are addressed, and to foster the process of mutual learning within and among members of the study team and the stakeholder community.



SYNTHESIS: The Northern Climate ExChange Gap Analysis Project

Beginning in 1999, the Northern Climate ExChange (NCE) coordinated a major project aimed at assessing the current state of knowledge about climate change and its impacts on northern Canada. The project had four major goals: to determine what is currently known about climate change and its impacts in northern Canada, and incorporate this information into a database; to identify trends or patterns in the available information; to make use of this information to help identify research, monitoring, technology, and policy priorities; and to improve collaboration and coordination among and between researchers, communities, governments, non-government organizations, and residents of northern Canada.

The project resulted in a graphical interface called the *NCE Matrix Maker*, a tool used to evaluate the state of knowledge about climate change in northern Canada, two databases --- the *Database of Climate Change Information Sources for Northern Canada* and the *Directory of Contacts for Climate Change in the Canadian North*, four technical reports, a summary report. All of the products from the project are displayed on the NCE Knowledge web site (<http://yukon.taiga.net/knowledge/index.html>).

In general, the NCE Gap Analysis Project revealed inequalities in the amount of information that exists on climate change impacts across systems in northern Canada. In addition to sectoral differences, strong regional trends for compiled information exist --- some regions in northern Canada are well studied and others barely touched. While a tremendous amount of local and traditional knowledge exists, relatively little of it is available in published reports and documents. There is more information available about climate change impacts on biological systems with economic implications than those without obvious financial consequences, and greater knowledge and confidence concerning the impacts on systems from predicted temperature changes than from other climate components.

The NCE Gap Analysis Project produced a synthesis of information that can be used as a baseline and a tool in determining future directions. However, any determination of priorities for research and monitoring, technology development, and policy is best made through a broad public process since climate change is an issue of considerable public concern in Canada's North.

The NCE Gap Analysis Project contributed to improving cooperation and collaboration among the many groups, agencies, and individuals concerned about climate change in northern Canada. The project pulled together a number of researchers and agencies within and beyond the North. Workshops and community meetings broadened the range of people involved in the discussion, although limited resources restricted these more public occasions to the Yukon.

The NCE Gap Analysis Project must be considered a work in progress. Although the project itself is over, the information it identified and the products it yielded are part of a continuing process. Some, like the databases and the matrices, will grow and change as our knowledge of the issues related to climate change increases.



Integration vs. Synthesis

Both projects described above, one of an integrated assessment (MBIS) and the second of a synthesis report (NCE Gap Analysis Project), contributed to advancing the dialogue on climate change impacts in northern Canada. They both focused discussion and debate around critical issues that affect the sustainability of northern ecosystems and communities. However, there are key differences between these two approaches that are worth examining to assist those who are deciding on an approach to examine the impacts of climate change within a region.

IAs tend to have a higher level of stakeholder involvement than a synthesis report, and as a result, require more human and financial resources. The greater the degree of stakeholder embeddedness in a process to understand climate change impacts, the greater the need to manage for conflict through balancing conflicting demands and pressures (Cohen, 1997b,c). However, involving stakeholders throughout a process, in defining research goals and objectives and in the generation of new information, targets the results of a project to addressing stakeholder issues and needs. Therefore, the higher the degree of stakeholder embeddedness, the greater the chance of success in identifying priority issues to inform policy development and decision making within the stakeholder community.

In contrast, synthesis reports tend to have a lower level of stakeholder involvement than an IA and as a result, less human and financial resources are required and less conflict. However, the uptake and ownership of information is likely to be less than in an IA. This level of integration is much more difficult to achieve after the fact when compiling the results of several independent studies.

It should be noted that a continuum of study options exists between integrated assessments and synthesis reports, and that a wider array of options for assessment of climate change impacts exists than the examples presented above.

The Future of IA in Northern Canada

Long-term, regionally focused studies of climate change and its impacts on northern systems are scarce. IA provides a framework for conducting multidisciplinary, long-term research. The Mackenzie Basin Impact Study shows the value of regional studies that use various sources of knowledge and integrate systems. This one study added greatly to the understanding of climate change and its impacts in northern Canada. This type of work would be valuable for other regions in northern Canada as it emphasizes building partnerships, and includes social, political and economic perspectives. Hik (2002) called for the establishment of a network of IRIS programs in northern Canada to ensure that many of knowledge gaps identified in the NCE Gap Analysis project are addressed in a systematic manner.

Funding cutbacks and government downsizing over the past decade have resulted in a decline in research activity and training on northern issues at Canadian universities. The situation became so serious that in 1998, the Arctic science community was called upon by a

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group of alarmed researchers to alert the Canadian government to take action to secure the future of Arctic science before Canada's capacity to perform Arctic research collapses (England et al., 1998). This situation effectively hinders the ability of those interested in pursuing large-scale research efforts, such as MBIS, that are essential to help Northerners cope with the unprecedented social, physical and environmental challenges currently facing the region.

In September 2000, a task force established by the Natural Sciences and Engineering Research Council (NSERC) and the Social Sciences and Humanities Research Council (SSHRC), two of the primary funders of university-based research in Canada, released a report that described the current situation as a crisis, and urged Canada to rebuild its university-based northern research capacity. The Task Force developed a number of program and policy recommendations designed to address these issues. The report called for new partnerships between universities and northern communities and the direct involvement of Northerners in research and training.

In addition to NSERC/SSHRC, funding for climate change research in northern Canada is available from the Government of Canada's Climate Change Action Fund and Northern Ecosystems Initiative. CCAF is a national program that tends to fund single-issue studies, with a disproportionately small number of studies funded in the North, given that half of Canada's coastline and a third of Canada's land mass is in the three northern Territories. The NEI program, has climate change as one of four funding priorities, and tends to provide limited funding for short term, single-issue projects.

Another round of cutbacks to Environment Canada's climate monitoring network was recently announced. Cutbacks to the climate and hydrology monitoring network took place in the late 1990s, and additional cutbacks are likely to seriously affect the amount and quality of research in the North directed at understanding the impacts of climate change.

Clearly, challenges lie ahead for integrated assessment studies in northern Canada. The crisis in northern research in Canada will not be resolved simply or quickly. It requires a long-term commitment to capacity-building and new flexible funding initiatives. In the interim, integrated assessments of climate change impacts will likely need to proceed with efforts to synthesize and integrate information that arise from a variety of sources.

Recently, the Northern Climate ExChange has taken further steps to improve collaboration by hosting the northern region of the Canadian Climate Impacts and Adaptation Research Network (C-CIARN North), in partnership with the Aurora Research Institute in the Northwest Territories and the Nunavut Research Institute in Nunavut. C-CIARN North is a growing network of researchers and stakeholders spanning the North and linked with a national network. Its goal is to facilitate collaboration, reduce duplication in research, and help focus the efforts of researchers where they are needed most. The NCE Gap Analysis project will be an important tool in determining where those efforts are needed. More information about C-CIARN North is available at <http://www.taiga.net/c-ciarn-north/>.

Building capacity for research also needs to take place within a larger context of a broad policy development process. Newton and Burton (2001) presented a possible framework for

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developing integrated climate change policy options and implementing measures for northern Canada that include targeted research. The authors suggest that what first needs to be developed is a “Northern Vision” - a collaboratively developed vision of the future that northerners aspire to for themselves, their families and communities, that will assist in charting a broad course of action.

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