

**BUILDING CAPACITY TO COPE WITH  
CLIMATE CHANGE IN NORTHERN CANADA**

**BACKGROUND DOCUMENT FOR  
CLIMATE CHANGE POLICY OPTIONS  
IN NORTHERN CANADA**

**FINAL DRAFT  
VERSION 1.3**

**FOR THE  
NORTHERN CLIMATE EXCHANGE  
YUKON COLLEGE**

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2001 June 7

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# Background Document to Climate Change Policy Options in Northern Canada<sup>1</sup>

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## Abstract

*Climate change is a global issue whose cause, and ultimate resolution rests at the local level. Despite the relatively small contribution to global climate change made by residents of Northern Canada, scientists project changes in average annual temperatures to be among the highest in the world. Northerners must address and understand what may happen and what they can do now, and in the future. A first step in that direction was taken through the formation of the Northern Climate ExChange at Yukon College and in March 2001 when the Circumpolar Climate Change Exposition and Summit was held in Whitehorse, Yukon. To help move forward from this landmark event, this document provides a preliminary overview of documents relevant to climate change in Northern Canada. This document is intended to function as a resource to researchers, policy analysts and government officials developing policy options and implementing programs for Northern Canada. The background document provides an initial overview of relevant materials and attempt to integrate existing documentation from the three territories that comprise Northern Canada, relevant national publications and selected international and circumpolar reports.*

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**Key Words:** climate change, global warming, policy development, Northern Canada.

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## **1. Overview**

The development of policy is a long, and often complex process requiring integration of many conflicting demands/pressures and consultation with a diversity of interest groups, organizations and governments. The process that leads to the development of policy is one of making choices and balancing interests. To support this process decision-makers require a concise synthesis of crucial factors/arguments based on a thorough analysis and synthesis of the relevant information that addresses the issue directly, and from indirect, peripheral perspectives. This document presents an initial compilation of background material in support of the development of climate change options for Northern Canada.

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<sup>1</sup> This document was prepared with support from the Department of Foreign Affairs and International Trade (DFAIT) for the Northern Climate ExChange at Yukon College. It is a research document and does not necessarily reflect the policy point of view of the federal or territorial governments and organizations involved.

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For the purposes of this document “Northern Canada” is defined as the combined jurisdictional boundaries of the Yukon, the Northwest Territories, and Nunavut. It is, however, recognized that other perspectives of “the North” exist based on geophysical, ecological and cultural characteristics. The definition selected here reflects the responsibilities of the Northern Climate ExChange, and while open to healthy debate, is used for convenience and to focus energies. Nonetheless, the similarity between the northern portions of provinces and the three territories is acknowledged.

Evidence from respected scientific sources (IPCC, WMO, IASC, etc.) indicate the global climate has warmed significantly since 1850, and that the rate of warming appears to be increasing. Temperature increase has not been constant, but has consisted of warming and cooling cycles at intervals of several decades. Northern circumpolar regions are predicted to receive the earliest and most extreme impacts as a result of this trend in the global climate. Scenarios of climate change suggest that northern regions could warm up by 5°C, while changes of up to 15°C could occur in the high arctic, by the middle of the 21<sup>st</sup> century. Corresponding with this warming, alpine glaciers have been retreating, permafrost has thawed, sea levels have risen, and climatic zones have been shifting. To varying degrees, a changing climate will affect all aspects of life in the North, including northern economies, wildlife, and traditional cultures.

Canadians living in Canada and the Canadian North contribute only a small fraction of the world’s GHG emissions. The choice facing Canada, and the North especially, is to adapt to the impacts of climate change while working through international negotiations to arrive at agreements to reduce global greenhouse gas emissions. Northern regions will have little choice in the short term – 5 to 20 years – than to respond to the effects of climate change on wildlife, water and land resources. The scope of responses available, and their effectiveness will be influenced by the political, lifestyle and economic choices made by government officials, community residents and industry leaders.

The action plan objectives of the *National Climate Change Business Plan* for their business plan are:

1. Reduce GHG emissions;
2. Understand the impacts of climate change and develop adaptation strategies and actions;
3. Increase understanding of the importance of climate change and encourage individuals and businesses to take action;
4. Position Canada to make decisions at the right time with the right information; and,
5. Increase opportunities through technology.

The impacts, while felt at the local level, are the result of millions of independent decisions made around the globe. Consequently, the issue of climate change requires consideration and understanding at different scales and within different organizational frameworks. For example, Canada has a long-standing tradition of developing foreign policy that promotes international cooperation to develop institutional support and practical approaches to problem solving. This tradition assumes greater importance, especially in northern regions where resources are limited, geographies are diverse, and economies struggle to take shape. Within the circumpolar community of nations, Canada has a strong reputation for thoughtful assessment and action, and as such, is well-positioned to take a lead role in addressing climate change in northern regions, where the impacts are already being felt.

Building on this reputation and the growing importance of the North within Canada an exploration of a northern climate change policy seems warranted and timely. While many northerners and others will readily agree, many others still wonder what policy is, who develops it, and how is it used. The full answers to these and the many related questions that evolve through thinking about policy would, conservatively, form a useful book. Hopefully, a few brief statements here will provide a basic understanding for discussions that readers and others can continue in their own jurisdictions, communities and homes.

In short, policies are qualified statements used to guide decision-making on topics and issues of concern to civil society. Climate change is one such issue. Policies can be specific, as with say the issue of drinking and driving, or general as with the value of biodiversity. The implementation of a policy may require legislation, regulations and/or standards to be prepared and accepted. Enforcement may also form part of ensuring adherence to laws, such as harvesting limits, which implement policies related to maintaining healthy animal populations. Generally one thinks of governments and corporations having policies on how to manage or address this or that situation or event. However, communities, families and individuals can also have policies that outline how they intend to act under certain circumstances. A community may have a “mutual aid policy” that says it will provide assistance to an adjacent community, if it experiences a need beyond its own capabilities. Policies are sometimes created by edict, but more often they evolve through consultations and meetings with interested parties, most often by businesses and governments. Anyone can develop a policy; it is the scope of application that requires acceptance by others.

We don't tend to use policies directly, but rather refer to them for guidance before action (at any level from individual to government). Depending on what we do and where we live some policies will have a greater influence on our lives than others. Policies on fishing directly affect maritime communities, while national transportation policy can affect us all. While we may not realize it, policies affect our daily lives and create the texture and character of the society we live in. The evolution of climate change policy for northern Canada will add to this mix and help engage all residents, communities and corporations in making a contribution. To understand the process of policy formulation, development and implementation in northern jurisdictions, and with particular attention to the climate change issue, will require a process mapping exercise. While some components will be common across all jurisdictions, there will be differences, thus the policy process map developed for one jurisdiction will require modification for other jurisdictions.

This document presents a preliminary overview of the international, national, territorial, and general material that will influence and direct the development of climate change policy options for the North. The emphasis is on strategic and policy documents, and key relevant reference documents rather than specific projects. Following a brief statement on the status of climate change action in each territory, participant groups that can contribute to the policy options development process are discussed. In each territory some initiatives are underway and others are to be implemented in the near future. These initiatives are listed as a reference to the current state of action as of March 2001. Observations are then made on the role and status of legislation related for attaining the national objectives for climate change in Canada. Community tools are

explored and then the largest portion of the Background Document is devoted to an annotated listing of relevant documents.

## **2. Regional Status of Climate Change Action**

Three territories comprise the focus of this document. Each territory is at a different stage in the evolution of their climate change activities, as they each strive towards the concurrent tasks of: (1) developing strategy and action plans, and, (2) initiating the implementation of those plans, or where that is premature, identifying the climate change components of existing programs and initiatives. As well, the various components of each territories' climate change policy varies in focus, and have yet to attain an operational balance between impacts and adaptation initiatives and GHG mitigation actions. This leaning is natural, but must be corrected. The tendency to place emphasis on mitigation activities evolves from the global attention on the reduction of GHG and a history off-oil and energy conservation efforts. By comparison, tangible policy options for adaptation are harder to grasp, seem to address a less immediate need and are less of a focus in national policy. However, at the international scale adaptation is gaining wider support. It is well recognized that many long-standing programs and initiatives, particularly in the areas of energy efficiency and alternate energy, will help northern jurisdictions address their climate change objectives. The challenge here, which has been taken up in collaboration with sectorial and national programs is to integrate the territorial components of these programs into the evolving strategies and action plans. Progress has been made and more will follow in the coming 2001/2002 fiscal year. On the climate change file the three territories are cooperating to deliver their message in Ottawa and international fora.

### **2.1 Northwest Territories**

In March 2001, a draft Greenhouse Gas Strategy was approved by Cabinet to guide mitigation of emissions in the Northwest Territories (NWT), however, a companion adaptation strategy remains to be developed in order to achieve a balanced approach. The strategy included an action plan structured according to the five national theme areas. Initiatives were identified under each theme. Some initiatives have been started while others await implementation in coming years as specific activities are structured, approved and funded. In the NWT there are three primary sources of emissions: electrical generation (diesel), space heating (fuel) and transport. The Arctic Energy Alliance plays a key role in the emissions reduction strategy through education, awareness and community consultations.

To reach their objectives greenhouse gas considerations will need to be integrated into NWT projects in all sectors. The strategy is viewed as a "living document" and will therefore be revised in future years as more information becomes available. Following the schedule of the National Implementation Strategy on Climate Change, the NWT Greenhouse Gas Strategy has three year rolling business plans that will be updated by January 2004. An advisory panel oversees the implementation of the strategy under the direction of the Minister of Resources, Wildlife and Economic Development.

In light of energy efficiency activities already underway, the initial thrust of the strategy is to reduce increases in emissions. Progress on climate change in the NWT will be dependant on funding levels and the need to consider the implications of a recent upswing in the oil and gas industry. Moreover, the NWT will need to re-assess subsidies to remote communities, and

provide stronger support for community efforts to reduce greenhouse gas emissions. A complementary approach directed towards assisting residents, businesses, and other organizations adapt to future changes in climate is under consideration. Over the long term an effective strategy for the Northwest Territories must incorporate both approaches. Given the pulse of gases already in the atmosphere from international sources, it is evident that some form of adaptation will be required, no matter what reduction efforts are made in the NWT.

## **2.2 Nunavut**

Since the establishment of Nunavut, strategies and action plans to address climate change implications have been under development. The two-part Nunavut Climate Change Strategy was initiated in 1999. It was developed to reduce increases in emissions, and address adaptation to anticipated impacts, with a business plan to meet the goals and objectives of this strategy, modeled after the national plan. Expanding and updating the database of key information is a crucial task. Nunavut must collect and document information on climate change, and this knowledge must be effectively communicated between science and government. In addition, the government of Nunavut will continue to support its energy management and renewable energy projects.

The challenges faced by Nunavut: climate, size, and population distribution complicates climate change action, as does community dependence on diesel-generated electricity. Equally problematic for Nunavut are the challenges associated with adapting to a changing climate where the options are few and the projected impacts appear to be severe, though not as dramatic as the models project for the Western Arctic. As well, economic activity has increased because of industrial development. The government has approved a climate change strategy for Nunavut, with draft preparation and public consultation to occur in 2001. Nunavut's strategy must also acknowledge the dependence of a significant portion of the population on the natural environment for food and sustenance. The next steps are to complete the consultation process across Nunavut, and raise awareness of climate change and climate change strategies.

## **2.3 Yukon**

The Yukon government has played a major role at national and international meeting on climate change, including the recent Sixth Conference of the Parties to the Kyoto Protocol (COP 6), insisting that Canada highlight Northern concerns at these conferences and in day-to-day negotiations in the future.

In the Yukon, a Climate Change Coordinating Committee is working towards the creation of a climate change action plan for the Yukon. A key element in that plan is the Northern Climate Exchange (NCE) at Yukon College, designed to act as a catalyst for climate change action and as a hub for public education and outreach in the North. One of NCE's initiatives is to increase awareness of climate change issues and responses through community workshops and the compilation and dissemination of research information. Other initiatives in the Yukon include the recent establishment of the Energy Solutions Centre and an inventory of climate change actions. In the Yukon, immediate climate change action will focus on the development of a climate change action plan, reviewing provincial and territorial plans, and refining the greenhouse gas inventory.

### 3. Participants in the Climate Change Process

Everyone has a stake in climate change. Addressing this issue in a successful manner over the long term will require actions by many stakeholders. Recognizing the existence of stakeholder groups is a first step to engaging their involvement. Climate change is an inclusive issue: there are no individuals or groups who do not have a contribution to make. Once stakeholder groups are identified and contacted, awareness and education can lead to active roles and assumption of responsibilities. The following is a partial list of stakeholder groups who influence policy development or have roles and responsibilities for addressing climate change in the North.

#### Figure 3.1 A Sample of Stakeholder Groups and Organizations

United Nations Environment Programme ♦ World Meteorological Organization ♦ International Panel on Climate Change ♦ International Arctic Science Committee ♦ Arctic Council ♦ Arctic Athabaskan Council ♦ Inuit Circumpolar Conference Climate Change Impacts and Adaptation Research Network ♦ Climate Change Public Education and Outreach Hubs ♦ National Roundtable on the Environment and the Economy ♦ Environment Canada ♦ Natural Resources Canada ♦ Health Canada ♦ Indian and Northern Affairs Canada ♦ Transport Canada ♦ Department of Foreign Affairs and International Trade ♦ Canadian Polar Commission ♦ Members of Parliament ♦ Members of the NWT Legislature ♦ Members of the Yukon Legislature ♦ Members of the Nunavut Legislature ♦ NWT Department of Resources, Wildlife and Economic Development ♦ Federation of Canadian Municipalities ♦ Community businesses ♦ Oil and Gas Industry ♦ Tourism Industry and Operators ♦ Sierra Club of Canada ♦ Northern Climate Exchange ♦ Council for Yukon First Nations ♦ Inuit Tapirisat of Canada ♦ Arctic Energy Alliance ♦ Energy Solutions Centre ♦ Residents of First Nation communities ♦ Land claim governance bodies ♦ Co-management Boards ♦ Community Clubs & Organizations ♦ etc...

As strategies and action plans are developed and refined in each of the three territories the list can be segmented, adapted and expanded. More detailed lists at regional and community scales can also be prepared as part of specific action plans. Knowing who is involved, or has a stake in specific climate change initiatives, is a prerequisite to effective action.

### 4. Initiatives to Address Climate Change

Since the landmark conference in Toronto – The Changing Atmosphere: Implications for Global Security – in 1988, Canada has been a leader in the development of strategies to address the rapidly evolving issue of climate change. In the past decade this issue has become more prominent for the three territorial governments, who are at various stages in the development of strategies and action plans. Activities, programs and concepts are actively being developed related to climate change in Northern Canada. Initiatives that address climate change are listed below, as of April 20, 2001, for the Northwest Territories, Nunavut, and the Yukon.

The focus is on activities and programs in Northern Canada, though it is acknowledged that there is much to learn from similar initiatives being undertaken in the rest of Canada and internationally. Indeed, some of the national initiatives (see Section 7.3) have provided valuable frameworks and conceptual guidance for the development of programs and actions suited to northern environments and cultures. For example, the five-theme framework conceived at a national level has been adopted to provide a consistent reporting and tracking structure. When reviewing the initiatives listed below it is important to recognize the difference between activities that have the potential to reduce greenhouse gases, such as training, awareness or provision of information, called ‘soft’ mitigation, and activities that directly reduce emissions, such as improvements in energy efficiency or changes in modes of transportation, called ‘hard’ mitigation. Both types of mitigation are necessary and valuable, in that awareness and knowledge must precede decisions leading to direct action.

#### 4.1 Northwest Territories

Effort in the Northwest Territories to reduce greenhouse gases focuses on measures that are cost-effective and help to develop the momentum needed to implement the wide range of initiatives envisioned in the strategy document (see Figure 4.1). It is anticipated that the full strategy will be implemented incrementally over the next 2-6 years. The initial emphasis of the initiatives implemented is to “mitigate” or reduce greenhouse gas emissions, primarily through energy efficiency and alternative energy options. Following the national lead, climate change initiatives have been grouped under the five main themes noted in Figure 4.1.

#### Figure 4.1 Northwest Territories’ Climate Change Initiatives

Theme #1: Enhance public awareness and understanding

1. Design and develop energy management workshops\*
2. Incorporate climate change information in school curriculum
3. Establish a NWT public education and outreach hub
4. Climate change resources for northern educators (pan-northern in scope, compiled in YK)
5. Promote changes in driver patterns\*

Theme #2: Investing in knowledge/building the foundation

1. Build knowledge of climate change science, northern impacts and adaptation issues\*
2. Sustainability of arctic communities under climate change (pan-northern)
3. Impacts of climate change on migratory caribou
4. Arctic borderlands ecological knowledge co-op (YT, NWT and Alaska)
5. Northern climate change schools program (pan-northern)
6. Database of northern climate change information (pan-northern, developed in YK)
7. Database of northern climate change researchers and practitioners (pan-northern, developed in YK)
8. Climate change impacts and adaptation research network\* (pan-northern)
9. Plantwatch (YT and NWT)
10. International tundra experiment (pan-northern)
11. Monitor NWT GHG emissions\*

Theme #3: Encourage action across and between sectors

1. Adopt energy efficiency codes for new construction\*
2. Move to full-cost pricing and rationalize utility subsidies\*
3. Provide financing for energy efficiency retrofit projects in non-government and private sectors\*
4. Support communities efforts to reduce GHG emissions\*
5. Promote participation in the VCR program
6. Environmental tax shifting\*
7. Integrate GHG emission considerations in the design/implementation of new projects

Theme #4: Promoting technology development and innovation

1. Establish a renewable energy technology conversion assistance program\*
2. Set up a northern research centre to test new technologies\*
3. Develop hydro-electric resources\*
4. Convert Mackenzie Valley communities to natural gas\*

Theme #5: Government leading by example

1. Increase energy efficiency of government operations\*
2. Develop a policy to require purchase of low emission products\*
3. Continue or expand existing energy management initiatives

\* These initiatives are under development and have not yet been implemented

## 4.2 Nunavut

No comprehensive listing of climate change initiatives in Nunavut is currently available, though close cooperation with the NWT climate change program is anticipated to yield a wide range of similar initiatives in the near future. The government is leading by example, with an energy management plan to be implemented in new buildings, projects and industries. Further, it is targeting public education, developing community energy plans, including retrofitting residential heating systems, and promoting new technologies such as passive solar heating and wind turbines.

The initiatives listed in Figure 4.2 have been assembled from the national *Compendium of Climate Change Initiatives* and from presentations at the March 2001 Circumpolar Summit in Whitehorse. The scope of activities identified in Nunavut is likely a reflection of what has been reported or compiled regarding climate change actions there. Many other initiatives are likely underway that are indirectly related to the climate change issue. Of significance to the need to understand and learn from local knowledge, the Government of Nunavut is doing a Traditional Knowledge Documentation Project funded by CCAF.

### Figure 4.2 Nunavut Climate Change Initiatives

Theme #1: Enhance awareness and understanding

1. Public education\*
2. Promotion of solar heating\*
3. Climate change resources for northern educators (pan-northern in scope, compiled in Yukon)
4. Public education and outreach hub\*

**Theme #2: Invest in knowledge**

1. Sustainability of arctic communities under climate change (pan-northern)
2. Northern climate change schools program (pan-northern)
3. Database of northern climate change information (pan-northern, developed in YK)
4. Database of northern climate change researchers and practitioners (pan-northern, developed in YK))
5. Climate change impacts and adaptation research network\*(pan-northern)
6. International tundra experiment (pan-northern)

**Theme #3: Encourage action**

1. Community energy planning (in 9 communities)
2. Retrofitting residential heating systems\*

**Theme #4: Technology development and innovation**

1. Investigation of wind turbine applications\*

**Theme #5: Government lead by example**

1. Energy assessment of major buildings and facilities

\* These initiatives are under development and have not yet been implemented

### 4.3 Yukon

The diversity of initiatives in the Yukon, which are directly or indirectly related to climate change, required the preparation of an inventory (See Section 7.8 below for a brief description). The initiatives in this inventory range from workshops on climate change and financial incentives to improving energy efficiency, to greenhouse gas research and energy management for government buildings. The inventory will be a valuable compilation of climate change efforts in the Yukon, and of assistance to the Yukon Climate Change Coordinating Committee as they, together with other Yukon organizations, work towards the development of a Yukon Climate Change Strategy. The projects and activities listed below reflect diverse interests and stakeholder involvement in the issue from the NGO community, First Nation communities and groups, and all levels of government.

In Figure 4.3 initiatives are listed in a consistent manner with the main themes used at a national level. Such consistency helps with the establishment of national summaries and aids in the communication of key climate change messages to stakeholders at all levels. For more detailed information refer to the publication referenced in Section 7.8. A few of the initiatives listed are marked with an “\*” as they have not yet been initiated.

#### Figure 4.3 Yukon’s Climate Change Initiatives

**Theme #1: Enhance public awareness and understanding**

1. Climate change essay contest
2. Energy awareness month
3. Energy fair
4. Experimental high school program
5. Northern Climate ExChange
6. Climate change resources for northern educators (pan-northern in scope, compiled in YK)

7. Central Yukon climate change workshop
8. Exchanging Ideas on Climate Change in the Yukon
9. Public education and outreach hub
10. Workshop – Taking action on climate change in the Yukon
11. Vehicle emissions testing
12. Public awareness fact sheets

Theme #2: Investing in knowledge/building the foundation

1. Old Crow wetlands assessment
2. Sustainability of arctic communities under climate change (pan-northern)
3. Impacts of climate change on migratory caribou
4. Arctic borderlands ecological knowledge co-op (YT and NWT and Alaska)
5. Northern climate change schools program(pan-northern)
6. Database of northern climate change information(pan-northern, developed locally)
7. Database of northern climate change researchers and practitioners(pan-northern, developed locally)
8. Circumpolar climate change summit
9. Climate change impacts and adaptation research network\*(pan-northern)
10. Plantwatch (YT and NWT)
11. International tundra experiment(pan-northern)
12. Environmental monitoring on Herschel Island
13. Wolf Creek research basin
14. Greenhouse gas inventory for the Yukon
15. Transportation survey
16. Renewable energy resource assessment
17. Consumer training
18. Home shows
19. Energy audits
20. Greenhouse gas inventory for Whitehorse\*
21. Thandlat
22. St. Elias climate change project
23. Wetlands monitoring
24. Kluane alpine ecosystem project
25. Porcupine caribou and climate modeling (YT, NWT and Alaska)
26. Permafrost monitoring
27. Flood mapping and monitoring
28. Coastal erosion monitoring of the Beaufort Sea (YT and NWT)

Theme #3: Encourage action across and between sectors

1. Project Yukon
2. Renewable power sales incentive program
3. Energy infrastructure loans for resource development projects
4. Rural electrification program
5. Domestic hot water timer project
6. Parking lot timer project
7. Community district energy
8. Commercial energy management program

9. House calls program
10. Residential energy management program
11. C2000
12. EnerGuide for houses
13. Green mortgage program
14. Home repair program
15. R2000
16. Trade training
17. Waste watch

Theme #4: Promoting technology development and innovation

1. Wind research and development
2. Green power initiative
3. Yukon energy solutions centre

Theme #5: Government leading by example

1. Energy management program for government buildings
2. Alternative fuel vehicles
3. Mayo-Dawson transmission project\*
4. Anti-idling campaign

\* These initiatives are under development and have not yet been implemented

## 5. Modifications to Legislation

Preliminary investigations and discussions have not identified any specific changes to national or territorial codes and standards due to climate change. Building and construction codes have not yet been modified due to the lack of specific direction emerging from the scientific investigations addressing the potential impacts of climate change. At present, any changes in accepted building practice are on a project-by-project basis. The most prominent example is the new Confederation Bridge to Prince Edward Island that was raised one metre in anticipation of a possible rise in sea level. New standards for bricks and reinforced concrete are also being investigated due to premature deterioration.

However, in order to adapt to climate change it may become necessary to modify building codes, standards for heating, ventilation and air conditioning and other codes and practices. So far the need to do this has not been addressed, partly because the climate change scenarios do not provide information about future climates, which is specific or precise enough, either in terms of localities (i.e. the climate models are on a coarse spatial scale) or the climate variables themselves. At present the variables used in the leading climate models do not necessarily include climate parameters that are specific to, or give guidance about, particular adaptation measures that would provide a sound basis for legislated changes to established codes and practices.

This area requires further investigation and research as the institutionalization of modified codes and practices, will, in the long term, be necessary to reduce damage and losses from an increase in extreme weather events and maintain an acceptable level of safety. Acting in advance of climatic changes would be prudent, but will require strong will from numerous stakeholders to act in the face of uncertainty and increased construction costs.

## **6. Community Tools**

Over the past decade public and governmental attention has been focused on the scientific debate over the nature of climate change and the linking of that change to human influence, and the international response and negotiations for global action. The general furor and uncertainty has deflected attention and effort from the advancement of specific action to reduce emissions, apart from those underway due to other economic and political pressures (e.g. acid rain, fuel efficiency and diversification, air quality). As well, consideration of adaptation strategies is relatively recent, has had to compete with greenhouse gas mitigation proponents for profile and funding, and thus has not moved very far beyond the conceptual stage.

Consequently, the development of specific tools for use by organizations and communities has seemed peripheral to the various debates, educational efforts, and specific demonstration projects, primarily related to energy efficiency and alternative energy options. Nonetheless, the widespread application of climate change actions throughout organizations and communities from Whitehorse to Iqaluit will require easy-to-use practical implementation tools that are applicable to northern communities. The first tools to emerge for local application are likely to be similar to the inventories of climate change actions and opportunities being compiled at a territorial level, address the local capacity to cope with extreme events and provide mechanisms to identify measures that might be taken to reduce damage and losses due to these events. The further development of these tools and their dispersion throughout northern communities will be required prior to the wide-spread implementation of actions to reduce greenhouse gas emissions, and general acceptance of ways to adapt to local climatic changes.

The role of tools is to collect information and provide methods of analysis that will aid in a better understanding of climate change and vulnerability at regional and local scales in Northern Canada, so that appropriate and constructive decisions can be made. The idea is not to “fix a problem” but to institutionalize a slightly different way of thinking about life in the North, which will reduce current levels of emissions and enhance the adaptive capacity of northerners. The objective is long term and strategic, rather than the all too frequent short term tactical focus. This is not to say that tactical actions are not needed, but rather to ensure that such actions are embedded in a way of thinking and a social framework that will thrive and prosper after the action/project has been completed. Too frequently, activity is intense and promising while program funding flows, but seems to evaporate when funding stops or programs are terminated. This “boom and bust” cycle rarely reached the penetration rates envisaged at the outset and requires repeated learning curves by new cohorts of proponents. We have inherited this model and need to seek ways to change and modify it to achieve the safe, sustainable communities all northerners desire.

At present, climate change programs in the North are in their early developmental stage and have not reached the maturity and established foundation of stakeholder support that seem to be a prerequisite for implementation of community level tools. However, some general procedures and templates to perform GHG inventories (an initial step in establishing baseline conditions) have been developed by the Federation of Canadian Municipalities for use in communities throughout Canada. Pilot projects are currently underway, including one in Norma Wells, NWT. Nonetheless, further research, design and development of appropriate tools should proceed now,

to be ready for implementation in the 2-5 year time frame it will take for current strategies and programs to mature.

## **7. Annotated Bibliography**

Material relevant to climate change in Northern Canada has been reviewed and organized from a jurisdictional and geographic perspective. Placement is not exact, but rather indicative, as some materials have multiple jurisdictional objectives and geographic coverage. Entries include reference to organizations, papers, books, workshop and conference proceedings, chapters, pamphlets, and government publications. While the primary focus of the bibliography is Northern Canada and Canadian research on climate change, reference has also been made to key international efforts, of which Canada is a participant, and interesting material from other sources. Documents have been organized, in a general manner, to move from a global scale to a territorial scale. This segmentation uses the following classification:

- International
- Circumpolar
- National
- Government of Canada – General
- Government of Canada – Northern Focus
- Northwest Territories
- Nunavut
- Yukon
- First Nations / Indigenous People’s Initiative
- Other Documents

In view of the diversity of material full citations have not been provided. Information has been limited to document/organization name, publishing organization and date. Annotations are drawn directly from the subject material and composed by the author of this document. Any error or misrepresentation is the responsibility of the author of this document and readers are encouraged to communicate suggested revisions to the scientific authority for this research at the Northern Climate Exchange of Yukon College (please direct to [aogden@yukoncollege.yk.ca](mailto:aogden@yukoncollege.yk.ca)).

A plethora of research, governmental and NGO information on climate change, and more specifically climate change in northern regions, has been prepared for conferences, major projects, climate change programs, and scholarly research. As the focus of this background document addresses the development of policy for climate change in northern regions, the emphasis in this listing has been to provide reference to documents that inform and guide our understanding and appreciation of climate change and the scope of current activity. In order to be helpful and manageable this preliminary compilation includes documents that “talk” about climate change, discuss options for action and provide an overall context for the issue at various levels from global to local. With only a few exception, the listing does not attempt to list “actions” taken in specific projects, but rather acknowledges the various areas in which project have, and/or could be implemented. The rationale here is that the exploration of information relevant to the development of policy requires material at different scales and levels of detail to provide insight preparatory to structuring appropriate policy guidelines. Projects tend to demonstrate the application of technology or outreach methodologies, which represent an

important application of policy positions, but would overwhelm the policy discussion with detailed findings. Nonetheless, each individual project or activity plays an important, and essential, role in realizing the overall goals of mitigating and adapting to climate change and will likely be thoroughly documented in territorial and national listings of initiatives. For the northern policy discussion, documents that provide context have been selected. Readers are encouraged to seek further information about specific technologies or geographic regions from other sources.

The listing is partial and viewed as an initial compilation of material that can be augmented and improved through future expansion. Where available web sites holding electronic copies (often in pdf format) of material or related information on the agency or organization have been provided after each entry. Readers are encouraged to visit these web sites to obtain more detailed and complete information on the entry. In some instances, for material published in the last 3-5 years hard copies may still be available from the issuing agency or organization, though increasingly on-line pdf files are becoming the economic publication route of choice, by agencies and governments alike.

## **7.1 International**

### ***Third Assessment Report – WG2, Chapter 16 Polar Regions (Arctic and Antarctic)*** (Intergovernmental Panel on Climate Change, 2001)

This chapter provides a current analysis of the impacts, feedback loops and vulnerability of the Polar Regions to climate change. The level of uncertainty of each observation is noted. The authors conclude the Arctic is extremely vulnerable to projected climate change, and the various resultant physical and social impacts. Positive feedback mechanisms active in the Arctic will cause a rapid and amplified response. Of particular concern to the authors are the combined stresses on human communities in the Arctic of globalization and shifts in local environment due to climate change. Extensive references support the chapter. The document is currently under expert review and will be released shortly. Companion documents include: WG I – Atmospheric Science; WG III – Mitigation; and an overall Synthesis Report that is still in preparation.

### ***Come Hell or High Water – Integrating Climate Change Vulnerability and Adaptation into Bank Work*** (World Bank Environment Department, 1999)

This paper examines the vulnerability of World Bank projects to climate change, and the impacts of Bank activities on national vulnerability in client countries. From the analysis of six projects and six countries it is concluded that significant risks exist in the present and in the longer term. Consequently, there is an opportunity for the World Bank to develop a new line of business in helping clients assess and then reduce their vulnerability to climate change and variability through precautionary and co-beneficial adaptation measures, designed as an integral part of economic development work. Downstream implications of this paper could also influence actions in developed nations.

### ***Preliminary Guidelines for Assessing Impacts of Climate Change*** (Intergovernmental Panel on Climate Change – WG II, 1992)

This report provides preliminary guidelines on methods of climate impact assessment. It outlines a basic framework for the study of climate-environment-society interactions, with an emphasis

on assessing the impacts of an enhanced greenhouse effect. Measurement of social and economic impacts is acknowledged as difficult, and thus an area that requires more detailed work. The report does not aim to prescribe a single preferred method, but does provide a seven step analytical outline. Guidance is also offered on the organization of research and the communication of results.

***Two types of global environmental change: Definitional and special-scale issues in their human dimensions*** (Global Environmental Change – Human and Policy Dimensions, 1990)

Clarification of several issues in the human dimensions of global environmental change is essential to the creation of a balanced research agenda. Global environmental change includes both systemic changes that operate globally through major systems of geosphere-biosphere, and cumulative changes that represent the global accumulation of localized changes. An understanding of the human dimensions of change requires attention to both types through research that integrates findings from spatial scales ranging from the global to the local. In conclusion, the authors feel a regional or meso-scale focus represents a particularly promising avenue of approach.

***Assessing the Social Implications of Climate Fluctuations – A Guide to Climate Impact Studies*** (United Nations Environment Programme, 1989)

This book focuses on approaches to empirical and projective studies that can give resource managers, policy makers, and scientific researchers a better idea of climate sensitivities in various regions and different economic sectors. As well, approaches are discussed to improve the quality of impact assessment and prediction, particularly where data sets are scarce and analytical capabilities limited. The document combines conceptual frameworks with practical guidelines as it explores the emerging dynamic linkage between societal actions and climatic changes.

***Conference Proceedings – The Changing Atmosphere: Implications for Global Security*** (World Meteorological Organization, 1989)

Evolving directly from the consultations of the World Commission of Environment and Development with Canadian officials in 1986 this conference was chosen to focus attention on the issue of climate change. This was an event waiting to happen. The conference provided a forum to demonstrate the Canadian conviction that major atmospheric pollution issues, such as acid rain, ozone and global warming were not independent, but inextricably linked and that actions must be more holistic including the human and economic dimensions of such change. A formally issued Conference Statement set the course for climate change initiatives still being pursued today. Understanding ‘roots’ remains crucial to effective action today.

***Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies*** (United Nations Environment Programme, 1998)

This handbook is designed to help those conducting climate change research. Underlying the research are two fundamental questions: "What does climate change mean to us?" and "What might be done about it?" This handbook is designed to provide newcomers to the field of climate impact and adaptation assessment with a guide to available research methods, particularly for answering the first question. The handbook will also serve as a ready reference for many others currently engaged in impacts and adaptation research. This handbook functions essentially as an

introduction to a wide range of methods that can be used to design assessment studies of climate change impacts and related adaptation strategies.

[http://www.vu.nl/english/o\\_o/instituten/IVM/research/climatechange/fb\\_Handbook.htm](http://www.vu.nl/english/o_o/instituten/IVM/research/climatechange/fb_Handbook.htm)

### ***The Greenhouse Gases*** (United Nations Environment Programme, 1987)

Prepared well before widespread action and public awareness of the implications of climate change this publication summarizes the then current knowledge of the subject in a way that is understandable to all. It was designed to spur public interest in the subject and most of the material is still valid today. In addition, the document was intended to encourage those who devise policies to increase their efforts. Indeed, much effort has been spend over the last 14 years, however, an objective observer might well say that the message intended here still, sadly, has currency in 2001.

## **7.2 Circumpolar**

### ***Arctic Climate Impact Assessment*** (Arctic Council, 2004)

The assessment is an international project organized under the auspices of the Arctic Council to evaluate and synthesize knowledge on climate variability, climate change, and increased ultraviolet radiation and their consequences for the arctic region. The aim is to provide useful and reliable information to the governments, organizations and peoples of the Arctic on policy options to meet such changes. The US is the lead country and the secretariat will be located at the University of Alaska in Fairbanks. The multi-year assessment will produce three volumes by 2004: a peer-reviewed scientific volume, a synthesis document summarizing results, and a policy document providing recommendations for coping and adaptation measures.

<http://www.acia.uaf.edu/default.html>

Additional background information on the Arctic Council can be found on the following web site.

<http://www.dfait-maeci.gc.ca/arctic/menu-e.htm>

### ***Circumpolar Climate Change Summit and Exposition – Conference Proceedings*** (Northern Climate ExChange, 2001)

Proceedings for the Circumpolar Climate Change Summit and Exposition will be published in a special edition of *The Northern Review*. The three-day Summit and Sustainable Technologies Exposition was held in Whitehorse, Yukon, March 19th to 21st to present monitoring and research results, identify vulnerable northern ecosystems and industries, and develop strategy recommendations for responses to climate change. The Summit brought together policy-makers, researchers, government officials, community representatives, and related commercial initiatives from across the Circumpolar North to make recommendations about needed steps for the future. Approximately 100 presentations were made to the 275 attending delegates on the primary theme - *Uncertain Future, Deliberate Action*.

<http://www.taiga.net/nce/circumpolar>

Delegates of the Circumpolar Climate Change Summit released the *Whitehorse Declaration on Northern Climate Change*, outlining actions to be taken to address climate change and its impacts in the Circumpolar North.

<http://www.taiga.net/nce/declaration>.

### ***Canada and Polar Science – Conference Proceedings*** (Canadian Polar Commission, 1994)

The conference was intended to review and stimulate thinking about the state of polar science as it was in Canada at the time. The agenda for polar science is strongly international, covering issues such as climate change, ozone levels, air and water borne contamination and their consequences. These issues are of scientific interest and of real concern to the Canadian public in general. Over the last thirty years the approach to polar research has changed significantly, to be more inclusive of northern and aboriginal residents, involve them in research undertakings, investigate issues of concern to them, and communicate research results more effectively. The series of Polaris Papers and subsequent workshops and conferences assist in achieving these objectives.

<http://www.polarcom.gc.ca>

## **7.3 National**

### ***Canada's National Implementation Strategy on Climate Change*** (NCCP, 2000)

The National Implementation Strategy is part of a coordinated national response to climate change. It has been developed jointly by federal, provincial and territorial governments and will be implemented by these jurisdictions through individual and joint actions. The first series of actions are outlined in the First National Business Plan, a three-year plan that will be updated annually based on progress reports from each participating government. The vision of the strategy is for Canadians to take effective action – at home and abroad – to reduce the risks of climate change, to realize opportunities and to protect and improve our quality of life.

<http://nccp.ca/html/index.htm>

### ***Canada's First National Climate Change Business Plan*** (NCCP, 2000)

The national business plan for climate change will evolve annually, look forward on a three-year basis, and focus on four priority theme areas. Note that territorial plans now include a fifth theme – *Encourage Action*. The actions identified in the national plan are intended to begin to reduce Canada's emissions growth now, advance efforts to reduce the cost of future decisions, assess impacts, identify adaptation needs, and prepare for future decisions through analysis and options development. In identifying common themes and objectives the plan highlights the comprehensive response taken, according to both theme and sector. Cross-cutting initiatives (e.g. sinks) are also addressed and are anticipated to be more prominent in future business plans, building on the foundation of climate change response established here.

<http://www.nccp.ca/>

### ***Taking Action on Climate Change – A Compendium of Canadian Initiatives*** (NCCP, 2000)

This compendium showcases Canadian climate change initiatives by all levels of government across Canada as of mid-2000. Initiatives are grouped by the five theme areas catalogued for each

of the territories in Section 4 of this Background Document. The compendium is not a complete listing of all climate change initiatives in Canada, as many actions are taken at the community level, by businesses and through non-governmental organizations. Financial support for many of the initiatives listed has come, in whole or in part, from the Climate Change Action Fund.

<http://www.nccp.ca/>

#### **7.4 Government of Canada – General**

The Government of Canada Climate Change web site provides links to what federal departments, provincial governments, other agencies, and the international community are doing on climate change.

<http://climatechange.gc.ca/>

#### ***Government of Canada Action Plan 2000 on Climate Change*** (Government of Canada, 2000)

The comprehensive package in information contained in this document reflects the Government of Canada's contribution to the *First National Climate Change Business Plan* for the country (see above). The action plan targets key sectors (e.g. transportation, energy, industry, buildings, agriculture, and forestry) and, if fully implemented as proposed, will take Canada a third of the way to achieving the targets established for Canada under the Kyoto Protocol. The initiatives outlined are contingent on coordinated, sustained and informed action by governments, industry, interest groups and individual Canadians. Current action and future adaptation strategies are considered. A supplemental insert addresses impacts and actions to be pursued in Canada's North.

#### ***Climate Change Communication: Proceedings of an International Conference*** (Environment Canada, 2000)

Without effective, appropriate communication, between organizations, with the public and other stakeholders capability to improve our understanding of climate change and respond to potential impacts will be limited. In recognition of this need, the communications of climate change messages was explored in a three day conference at the University of Waterloo attended by 250 delegates from four continents. Communication was seen as an essential part of the science-policy process to identify problems, encourage participation, invite innovation, and promote mitigation and adaptation. Furthermore, communicating the climate change issue requires imparting information to fulfill three expectations: (1) to raise awareness; (2) to confer understanding; and (3) to motivate action. Theoretical and practical papers explored effective communications and how best to apply these concepts and techniques to climate change messages, outreach activities and behavioural change.

<http://www1.tor.ec.gc.ca/airg> or <http://www.fes.uwaterloo.ca/research/publications>

#### ***Climate Change and Canada's National Park System*** (Environment Canada, 2000)

In collaboration with Parks Canada, a screening level assessment of the impacts of climate change in Canada's system of national parks and reserves was completed. Implications for abiotic features, ecosystems, individual species, and visitor use of each park were examined using park resource inventories and existing climatologically and climate change studies. A broad range of inter-regional disturbance patterns and shifts were identified as significant for

national parks, particularly those in the Arctic region. Arctic national parks were addressed in a separate section. The authors note, with some concern, that the need for concerted action identified a decade ago remains as relevant today.

<http://www1.tor.ec.gc/airg>

***Canada's Perspective on Climate Change – Taking on the Challenge*** (Government of Canada, 1999)

This booklet explains Canada's initial response to the Kyoto Protocol, in accessible text and with supporting examples. The objective of the document is to give Canadians from all walks of life the opportunity to become more informed and provide input to the national climate change strategy. Information is provided on relevant programs, initiatives and actions to mitigate GHG emissions in Canada and internationally. A listing of governmental web sites compliments the text.

<http://www.climatechange.gc.ca>

***Canada's Perspective on Climate Change – Science, Impacts and Adaptation*** (Government of Canada, 1999)

Climate science is a complex and rapidly evolving field of investigations. This document provides Canadians with an overview of the basic science of climate change through examples, charts and graphic features. The material is accessible and focused. The concept of adaptation is explained and explored across the range of Canadian sectors from fisheries to agriculture and wildlife. Specific reference is made to the projected impact on Canada's North.

<http://www.climatechange.gc.ca>

***Report from the Adaptation Learning Experiment*** (Emergency Preparedness Canada and Environment Canada, 1999)

This report documents a workshop designed to address two issues that have emerged onto the policy agenda in the past decade: (1) climate change; and, (2) natural disasters. In view of the challenge to stabilize and reduce greenhouse gas concentrations in the atmosphere, the concept of adaptation has gained greater prominence in scientific and policy research communities. Adaptation, or confusingly 'mitigation' in the natural disaster community has gained higher profile due to a dramatic national and international increase in losses during the 1990s. In light of these converging agendas, this project explored research in each area and sought to identify linkages and collaborative research efforts of mutual interest.

***Decoding Canada's Environmental Past: Climate Variations and Biodiversity Change during the last Millennium*** (Environment Canada, 1998)

This booklet documents a workshop designed to explore past climatic conditions in Canada, and in so doing increase our knowledge and understanding about past climate and biodiversity changes. "Paleo" information is essential in extending and verify our historical records. Papers explore proxy climate information from a variety of sources, acknowledge the maturity of this science, and emphasize the need to decode this information within a framework of environmental prediction and early-warning of future climatic changes. Recommendations addressed the need for continued scientific collaboration, science and extreme event assessments, regional studies, and proxy biodiversity research.

***Canada's Energy Outlook 1996-2020*** (Natural Resources Canada, 1997)

This report provides detailed charts on energy generations and the conversion into greenhouse gas emissions. As well, emission conversion factors are determined for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, however, there is some dispute between the conversion factors used in this report and those used by Environment Canada. This can be attributed to the fact that emission conversion factors are changing over time as they become better refined. The Environment Canada factors are more reliable. This document does not distinguish Yukon from NWT.

***Trends in Canada's Greenhouse Gas Emissions 1990-1995*** (Environment Canada, 1997)

It is general protocol in Canada to use this publication as a standard for information on greenhouse gas emissions. Complete inventories of greenhouse gas emissions, sources, analysis and estimates of emissions for Canada are described. Information provided in this report was used for *The Yukon State of Environment Interim Report 1997*. Relevancy to the Yukon is uncertain as the sources of information have not been confirmed. It does provide global warming potential (GWP) values which can be used in conversion of CH<sub>4</sub> and N<sub>2</sub>O to CO<sub>2</sub>.

**7.5 Government of Canada – Northern Focus*****Agenda 2003 – A Sustainable Development Strategy for the Department of Foreign Affairs and International Trade*** (Department of Foreign Affairs and International Trade, 2001)

Through experience it has become evident that sustainable development is a long-term process of continuous learning, in which gains are made slowly through an increased appreciation and understanding of interrelationships and dependencies. Working in partnership with a diversity of Canadians, including northerners and Aboriginal peoples is a hallmark of the process leading to this, the second strategy. Linkages to the North are seen in Goal 4, in which the integrative nature of sustainable development to basic human security and rights is addressed, and Goals 5 that reinforces the need to implement the Northern Dimension of Canada's Foreign Policy. Documents such as Agenda 2003 provide a policy foundation on which to build climate change initiatives through the Arctic Council and the circumpolar community.

<http://www.dfait-maeci.gc.ca/sustain/menu-e.asp>

***The Northern Dimension of Canada's Foreign Policy*** (Department of Foreign Affairs and International Trade, 2000)

The Northern Dimension of Canada's Foreign Policy was formulated through a multi-party consultative process. A framework was established to promote the interests and values of northern Canadians and address issues, such as climate change, that are common to all circumpolar countries. The resultant policy objectives are fourfold: (1) to enhance the security and prosperity of Canadians, especially northerners and Aboriginal peoples; (2) to assert and ensure the preservation of Canada's sovereignty in the North; (3) to establish the Circumpolar region as a vibrant geopolitical entity integrated into a rules-based international system; and, (4) to promote the human security of northerners and the sustainable development of the Arctic. To be effective the policy must be an integral part of Canada's broader foreign policy, and must also be reinforced by domestic policies. Climate change clearly falls in this realm.

<http://www.dfait-maeci.gc.ca/arctic/menu-e.htm>

An interesting response to the June 8<sup>th</sup> release of “Northern Dimension of Canada’s Foreign Policy” can be found on the ACUNS website

[http://www.uottawa.ca/associations/aucen-acuns/en/n\\_resndcfp.htm](http://www.uottawa.ca/associations/aucen-acuns/en/n_resndcfp.htm)

***Towards a Northern Foreign Policy for Canada – Canadian Centre for Policy Development Consultation Paper*** (Department of Foreign Affairs and International Trade, 1998)

This consultation paper places, for the first time, the essential elements of Canadian policy for the domestic and circumpolar north within a comprehensive, flexible foreign policy framework. This consultation paper sets out 33 core objectives arranged under seven major themes: sustainable development; environmental protection; social and cultural renewal; regional good governance and democratic development; northern sovereignty and security; bilateral relations with northern neighbours; and the consultative process and national unity. Taken together, these provide a coherent policy framework to help guide Canada in choosing the specific goals and action plans it will adopt for the circumpolar Arctic.

<http://www.cfp-pec.gc.ca/NationalForum/nfp-e.htm>

***Northern Science and Technology Federal Framework and Research Plan*** (Indian Affairs and Northern Development 2000)

This document has been compiled to ensure that federally funded science and technology continues to improve the quality of life and the environment, social and economic well-being, and the advancement of knowledge in Northern Canada. As one of seven key areas of focus, research on climate change is seen as a major federal policy initiative for the North. Moreover, research in many of the other key areas has both direct and indirect affects on our understanding climate change in the North and its potential impacts on the lives of residents and wildlife. In fact, the report acknowledges that climate change is the single research issue that cuts across all scientific disciplines and federal mandates. Climate change research two-year and long term objectives in the North are outlined in a specific section, as are linkages to other related programs.

[http://www.ainc-inac.gc.ca/nstp/nst\\_e.html](http://www.ainc-inac.gc.ca/nstp/nst_e.html)

***From Crisis to Opportunity: Rebuilding Canada’s Role in Northern Research*** (NSERC/SSHRC Task Force, 2000)

In this report the NSERC/SSHRC Task Force urges Canada to rebuild its university-based northern research capacity in order to help Northerners cope with the unprecedented social, physical and environmental challenges currently facing the region, including the pressing need to focus on a coherent strategy for climate change. The report calls for new partnerships between universities and northern communities and the direct involvement of Northerners in research and training. The report acknowledges that Canada’s newest governments face significant challenges, such as: climate change, rapid population growth, sustainable development, pollution, and a myriad of social, health and educational issues. These all require the understanding and effective action that can only be founded on solid research.

<http://www.nserc.ca/news/2000/p000921.htm>

***Mackenzie Basin Impact Study, Final Report*** (Environment Canada, 1997)

This report on the Mackenzie Basin region is a study on the impact resulting from climate change and not on greenhouse gases themselves. Yet it is an important paper in that it deals primarily with the effects of climate change on northern regions. It provides an interesting approach and discussion on climate change and its relevance to traditional lifestyles, land, vegetation, wildlife and water. The executive summary provides a list of agencies and specialists who deal with climate change and its effects in different areas. This report discusses concerns specific to the northern environment. Since many other reports do not have northern content, this study is important material for an analysis of climate change in the Northwest Territories and the Yukon. <http://www.msc-smc.ec.gc.ca/airg/pubs/mbisfinal.htm>

***Proceedings – Impact of Climate Change on the Canadian Arctic*** (Environment Canada, 1986)

This volume seeks to understand the nature and possible impact of future global climate change on the Canadian Arctic region. Following an examination of possible scenarios and general circulation models, physical, biophysical and socio-economic impacts are explored from a primarily scientific perspective, though human implications are also addressed. A separate summary document includes specific recommendations. This early work contributed to the foundation of literature upon which subsequent climate change research in Northern Canada built.

**7.6 Northwest Territories*****Northwest Territories Greenhouse Gas Strategy*** (Resources, Wildlife and Economic Development, 2001)

Thirteen departments and agencies directed development of a strategy to control increases in greenhouse gas emissions. This effort also provided a mechanism for northerners to contribute to Canada's national strategy. The strategy process was inclusive, involving sub-groups consisting of representatives from 37 government, First Nation, non-profit and industry organizations who jointly developed and evaluated a range of options for reducing GHG emissions in all sectors of the economy. The strategy states broad and focused objectives, basic principles, action plans for each of the five primary themes identified in the national strategy, and recognition of the challenges faced to implement these actions in the NWT. Adaptation is acknowledged as a complementary approach to coping with climate change, but has not been developed as an integral part of this strategy.

***Sila Alangotok – Inuit Observations of Climate Change*** (International Institute for Sustainable Development, 2000)

This 42 minute video documents the changes in local conditions and patterns witnessed by the Inuvialuit of Sachs Harbour, located on Banks Island in the High Arctic. As the hunters and trappers of Sachs Harbour travel over the tundra, ice packs, and open water in the summer they observe their surroundings with a keen eye, as their safety and hunting success depends on an intimate knowledge of the natural environment. Recently they have noticed changes in the environment that they relate and describe in the video.

***Greenhouse Gas Emission Forecast for the Northwest Territories*** (Ferguson Simek Clark, 1998)

Much of the report is focused on long range forecasting, business as usual scenario, rapid growth scenario and enhanced measure scenario which is not relevant for this project, as the focus here is looking at three specific years. The information collected in this report and how it is organized are of particular interest due to the northern content. The potential impact analysis table is also applicable to the Yukon. The breakdown of emissions will also be useful in analysis of emissions in the Yukon.

***Responding to Global Climate Change in Canada's Arctic – Volume II of the Canada Country Study: Climate Impacts and Adaptation*** (Environment Canada, 1997)

This volume describes our current understanding of the impacts that climate change and variability will have on all aspects of the Arctic's physical and biological environments and its socio-economic activities, with specific focus on the Northwest Territories. Existing and potential adaptation options are explored. While recognizing the complexity of linkages, each aspect and activity is dealt with separately.

<http://www.ec.gc.ca/climate/ccs/volume2.htm>

***Climate Change and Transportation in Northern Canada: An Integrated Impact Assessment*** (Environment Canada, 1988)

This report presents the results of a two-year study that assessed the physical, economic and social impacts of climate change on the transportation system in the Mackenzie River region of the Northwest Territories. The implications of physical impacts due to climate change for the transportation infrastructure are explored, as are the impacts on regional economies and individual communities. The central focus of the study is the river and overland transport system in the Mackenzie River valley between Great Slave Lake and Norman Wells. Case studies were conducted in Norman Wells and Hay River. This research was preparatory to the Mackenzie Basin Impact Study.

***An Exploration and Assessment of the Implications of Climate Change for the Boreal Forest and Forestry Economics of the Prairie Provinces and Northwest Territories – Phase 1*** (Saskatchewan Research Council, 1987)

This report is Phase 1 of an exploratory study to assess the implications of climate change on the boreal forests in the Prairie Provinces and Northwest Territories. From a policy perspective likely impacts on forestry include changes in forest productivity, species composition, forest fires, insect and disease infestations, timber harvesting and restocking, forest zonation, and water supplies. The authors conclude better linkages are needed and that a systems analysis approach has many merits for use in interdisciplinary studies.

***A Climatic Classification of the Northwest Territories for Recreation and Tourism*** (Environment Canada, 1976)

This document is a condensed version of an earlier climatic classification report investigating the recreation-tourism potential of the Northwest Territories. Linking this work, and similar

subsequent studies, to the climate change literature can help guide informed decision-making in an increasingly important economic sector for the NWT. In this document the climate is outlined, limiting factors as related to safety and comfort are emphasized, climatic controls are described, and factors affecting recreation in the Arctic are addressed. In conclusion the authors explore linkages between climate and recreation/tourism.

***Climate Change Impacts and Adaptation Strategies for Canada's Northern Territories: Final Workshop Report*** (GeoNorth Ltd. 2000)

This 3-day workshop took place in Yellowknife, NWT in February 2000. The overall goal of the workshop was to gain an understanding of the data and research required for developing appropriate adaptations to climate change. Participants came from all groups and jurisdictions involved with climate change in Northern Canada. Presentations address current results of climate change science, impacts studies, experiential observations, and what can be done to develop and support adaptation strategies. Aboriginal participants note their greatest concern is for those living a subsistence lifestyle and those who want this lifestyle option preserved for future generations. The workshop participants came to a number of observations, including a sense of urgency, need for stronger linkages among stakeholders, need for continuity of effort and long term commitment were among the observations. The value of a northern network on climate change was also raised by participants.

## **7.7 Nunavut**

***Traditional Ecological Knowledge of Environmental Changes in Hudson and James Bays: Part II*** (Manitoba Keewatinowi Okimakanak, Inc. 1995)

This report is the early stages of what became the book, "Voices from the Bay", by the same authors. The report outlines the research process and schedule for the project. It also provides some initial conclusions regarding seasonal characteristics in Hudson Bay, environmental indicators used by local people, local knowledge of currents, descriptions of rivers and settlements, local knowledge of sea ice dynamics and typology, summaries of local knowledge of Snow, Canada, Brant and Blue geese, and summaries of local knowledge of regional changes in Hudson and James Bay.

## **7.8 Yukon**

***Taking Action on Climate Change – Working Towards a Yukon Climate Change Action Plan – Preliminary Draft*** (Yukon Climate Change Coordinating Committee, 2001)

This document acknowledges the benefit for the Yukon Government of learning from other jurisdictions, and thus includes a comparative analysis of the development process and content of existing federal, provincial and territorial action plans. These plans were reviewed to reveal best practices for developing action plans – such as creating interdepartmental committees to coordinate the action plan development and providing opportunities for stakeholders and the public to participate. The most comprehensive action plans include data on GHG emission levels and future

projections, set clear objectives and recommend actions for all sectors that contribute to climate change. The contents of the action plans reviewed are summarized in the Appendix. The key findings of the comparative analysis will aid in the development of a Yukon climate change action plan.

***An Inventory of Yukon Climate Change Initiatives*** (Yukon Climate Change Coordinating Committee 2001)

As it has become increasingly difficult to keep track of all of the climate change initiatives in the Yukon an inventory was produced following the five theme areas. Together the initiatives outlined in this document focus on the range of actions needed to begin to address climate change in the Yukon. The inventory functions as a resource and integrating framework for organizations working on climate change and those developing a Yukon Climate Change Strategy. The inventory was first intended to be used by the Minister of Renewable Resources at the 6<sup>th</sup> Conference of the Parties in The Hague in November 2000. It will continue to be used as a resource for the Yukon Climate Change Coordinating Committee and other organizations.

***Calculating Greenhouse Gas Emissions for the Yukon – An Inventory of Methodologies – Preliminary Draft*** (Yukon Climate Change Coordinating Committee, 2001)

The Yukon Climate Change Coordinating Committee is working towards a climate change strategy for the Yukon. Calculating the greenhouse gas (GHG) emissions for the Yukon is one of most challenging and critical steps in the development of the strategy. Accurate data is needed to identify baseline emission levels, establish GHG reduction targets and monitor progress in meeting those targets. Recent analysis has shown that the emission levels reported in the Yukon Inventory are inconsistent with studies at the national level. As such, the Yukon Government determined it would be appropriate to examine how other jurisdictions have conducted inventories.

This document contains a review of inventory methodologies that have been followed by the International Panel on Climate Change (IPCC) and other jurisdictions across Canada for conducting inventories of GHG emissions. A comparative analysis has been done to identify the strengths, weaknesses and opportunities for improving the 1999 Yukon Inventory (see below).

***Taking Action on Climate Change in the Yukon Workshop Proceedings*** (Northern Climate ExChange, 2000)

On May 15-17, 2000, the Northern Climate ExChange hosted a workshop and public information session called "Taking Action on Climate Change in the Yukon". Over 70 people attended the workshop including community, industry, researchers, educators. The purpose of the workshop was to explore options to address climate change issues in the Yukon. Participants were asked to identify needs and develop options, and to assess priorities for action. The main objective of the workshop was to define the role of the Northern Climate ExChange, and other agencies/organizations, in developing and carrying out an action plan on climate change.

***Climate Change in the Central Yukon*** (Carleton University, 2001)

The work presented in this report is an investigation of changes in the environment of central Yukon, based on readings from the historical record.

***Northern Climate Change Impacts - State of Knowledge Assessment*** (Northern Climate ExChange, 2001)

This project involved a broad analysis of our current state of knowledge (scientific and traditional) of the impacts of climate change in Canada's north. Through the development of a number of matrices (or tables) that outline the cross-relationships between predicted environmental changes (i.e. warmer summer temperatures) with the many elements of natural and human-oriented systems (i.e. boreal forest ecosystems and transportation), this exercise is designed to provide an assessment on what is known about climate change and its effects on northern Canada. The assessment will facilitate the establishment of priorities for climate change research, monitoring, technological development, policy development, etc. in Canada's north.

***ExChanging Ideas on Climate Change in the Yukon*** (Northern Climate ExChange, 2001)

The Northern Climate ExChange hosted a community tour in the summer and fall of 2000 to:

- Improve understanding of climate change issues in Yukon communities,
- Document local concerns and observations related to climate change,
- Encourage partnership-building within and among Yukon communities.

The communities visited were Watson Lake, Teslin, Faro, Dawson, Mayo, Haines Junction, Beaver Creek, and Burwash Landing. During a session of the North Slope conference devoted to this project, we met with residents of that region. Everyone benefits when we share observations about changes in the weather and the land. We need information from the real climate change experts – the people who are close to the land – as even the most sophisticated computer models still lack good climate information. Climate change research will be more effective if it is guided by local observations and concerns

***Energy Management in the Yukon: Implementing the Yukon Government's Energy Strategy*** (Government of Yukon 2000).

The Yukon Government established the Cabinet Commission on Energy in 1996 to explore energy issues – from the cost of power to reducing greenhouse gas emissions – at length. The Commission came up with 56 short, medium and long term recommendations and in November 1998 the Yukon Government responded to these recommendations by committing to an *Implementation Plan for the Final Report on the Cabinet Commission on Energy*. This report reviews the progress on the Implementation Plan and builds upon it by providing a more comprehensive look at the approaches the government has taken, as well as ones it will be taking, to turn the Commission's recommendations into a coordinated approach to addressing the Yukon's energy issues.

***Economic Development from Renewable Energy: Yukon Opportunities*** (Pembina Institute, 1999)

This discussion paper is one of several documents prepared in support of the Yukon Economic Forums. It outlines aspects of introducing renewable energy technologies into the mainstream Yukon economy. It discusses technologies and their resource potential in the Yukon and describes some of the economic, social and environmental benefits of using renewable energy. The paper features case studies of renewable energy use that point to potential applications in the Yukon and offers a selection of key actions for implementing renewable energy, focusing on overcoming typical energy market barriers.

***Greenhouse Gas Inventory for the Yukon*** (Yukon Conservation Society, 1999)

In the 1990s, the Yukon government made a commitment to reducing greenhouse gas emissions within the Yukon. To address this objective, an appreciation and understanding of the current situation within the territory was required through conducting an inventory of GHG emissions in the Yukon. The inventory took a sectorial approach, investigating transportation, energy, waste, industry, agriculture, mining, and forestry. For each sector both general emissions and specific contributors (generally large power/industrial operations) were addressed. The inventory is analytical and includes information on conversion factors. The authors also deserve credit for rating the data quality and relevance of references. An inventory of Yukon-generated emissions provides an important first step towards the development of a greenhouse gas reduction strategy. This report provides an outline of sources and sinks of emissions appropriate for a more comprehensive inventory of greenhouse gases in the Yukon. The most detailed and accurate analysis in this greenhouse gas inventory for the Yukon focuses primarily on sources from energy and transportation.

While the Inventory was extensive, a number of data gaps and uncertainties surfaced. Recent analysis has shown that the emission levels reported in the Yukon Inventory are inconsistent with studies at the national level. As such, the Yukon Government determined it would be appropriate to examine how other jurisdictions have conducted inventories (see above).

***Yukon State of the Environment Interim Report 1997, A Focus on Air Quality and Climate Change*** (Marshall & McIntyre, 1998)

This document provides a good analysis of air quality and emission factors in the Yukon. In addition, it includes background information on greenhouse gas emissions and an understanding of where related information is located.

***Responding to Global Climate Change in British Columbia and Yukon – Volume I of the Canada Country Study: Climate Impacts and Adaptation*** (Environment Canada, 1997)

This document explores the effects of climate change on fish, forests, coastal environments, agriculture, and notes likely human responses. In British Columbia and the Yukon, warmer temperatures are expected to result in milder winters and warmer summers. However, winter storms may be wetter and windier. Summer rainfall may be heavier and thunderstorms may be more intense, increasing the hazards of lightning, wind and hail. Detailed and plain language summary versions of this report exist to reach both scientific and lay communities.

[http://www.ec.gc.ca/climate/ccs/ccs\\_e.htm](http://www.ec.gc.ca/climate/ccs/ccs_e.htm)

### ***Climate of Yukon (Environment Canada, 1987)***

This study presents a broad overview of Yukon climate, which is classified as sub-arctic continental. Climatic regions are defined although data are too sparse from the high country to allow for rigorous specification of regional differences. Traditional climatological analyses are presented for elements of temperature, wind, precipitation, humidity, cloud, thunderstorms, visibility and obstructions to vision. Normal circulation patterns are depicted and four common synoptic-weather patterns are defined. Analysis includes probability estimates of extremes and duration statistics for maximum and minimum temperatures, daily precipitation and wind speed. The subjects of air pollution potential, wind energy and climatic change are discussed in summary rather than in depth.

## **7.9 First Nation / Indigenous Peoples Initiatives**

### ***Arctic Athabaskan Council***

The Arctic Athabaskan Council (AAC) is an international treaty organization established to represent the interests of United States and Canadian Athabaskan member First Nation governments in Arctic Council I, and to foster a greater understanding of the common heritage of all Athabaskan peoples of Arctic North America. Information is not currently available on their climate change strategy, which is under development.

<http://www.arcticathabaskancouncil.com/>

### ***Inuit Circumpolar Conference***

The Inuit Circumpolar Conference (ICC) is an international non-governmental organization representing the Inuit of Greenland, Canada, Alaska, and Chukotka (Russia). ICC holds Consultative Status II at the United Nations, and has the following goals: (1) to strengthen unity among Inuit of the circumpolar region; (2) to promote Inuit rights and interests on an international level; (3) to develop and encourage long-term policies which safeguard the Arctic environment; and, (4) to seek full and active partnership in the political, economic, and social development of circumpolar regions. Climate change information related to ICC activities will be available shortly. Monitor 'climate change' under activities on the following web site

<http://www.inusiaat.com/>

### ***Inuit Tapirisat of Canada***

Since its establishment in 1971, the Inuit Tapirisat of Canada (ITC) as the national voice for the Inuit of Canada has broadened its aims and objectives in response to the changing social, economic and political challenges facing Inuit. It has done so in a manner that reflects the emerging relationship between Inuit and the rest of Canada and between ITC and the four Inuit regional organizations. With the exception of Labrador and the off shore of Nunavik, the four regions have now signed final land claim agreements. ITC's activities are governed by the Board of Directors comprised of the presidents from the four regional organizations and from the Canada Office of the Inuit Circumpolar Conference. In 1997, ITC and the Canadian office of the Inuit

Circumpolar Conference (ICC) were formally linked together. Climate change in Northern Canada is one among many issues of concern and interest to ITC as the impacts are beginning to be felt by Inuit residents.

### ***Council of Yukon First Nations***

There are 14 First Nations in the Yukon. Eleven of the 14 signed a constitution of a General Assembly in July 1995 and together form the Council of Yukon First Nations (CYFN). Climate change in the Yukon is an issue of concern and interest to CYFN, as the impacts will be felt by members of these communities, and in some cases are already being experienced.

## **7.10 Other Documents**

### ***Storm Warning – Gambling with the Climate of Our Plant*** (Doubleday Canada, 2000)

In a thoroughly researched effort Dotto captures the global significance of climate change from the Canadian perspective. Nowhere in the current literature is there such a comprehensive review of the progress and pitfalls of the climate change file in Canada. Weaving the story from the science to recent extreme events gives the reader context, data and an appreciation of the complexity and difficult challenges faced to move forward at the international, national and local levels. Dotto is a science writer who provides extensive supportive data, drawn from research documents and practitioners. References to the North are few and thus in the context of this Background Document the value is mainly in the comprehensiveness of the historical overview.

### ***Canadian Municipal Response to Climate Change: A Framework for Analyzing Barriers*** (Pamela J. Robinson, 2000)

Recently completed as a doctoral dissertation at the University of Toronto Department of Geography, this research investigates the level and type of responses being undertaken, as well as the barriers that inhibit action by municipalities with populations greater than 10,000. North of 60 only Whitehorse and Yellowknife qualified for inclusion. Both communities responded to the 17-page survey that was distributed with the assistance of the Federation of Canadian Municipalities. However, the compilation of the data from 236 municipal respondents makes any observations about communities north of 60 problematic. For northern communities, the results at best, would be indicative of potential trends and tendencies with respect to local responses to climate change. Nonetheless, the methodology provides a reference model for similar undertakings in northern communities, though extensive modifications would be required to reflect the cultural context.

### ***Disaster Mitigation and Preparedness in a Changing Climate*** (Emergency Preparedness Canada., 2000)

Undertaken by knowledgeable researchers in the field this document begins to strengthen the link between climate change and our capacity to cope with emergencies, specifically the extreme events predicted to increase in the near term. Given the natural causation of the extreme events discussed the emphasis of the linkage is on adaptive measures. The paper provides an extensive bibliography in two areas: (1) climate change science; and, (2) prevention, mitigation (referring to the reduction of impacts of natural disasters) and preparedness. Produced under the research

directorates of what was Emergency Preparedness Canada, the linkage between climate change, natural disasters and coping mechanisms is likely to receive further attention.

***Uncertainties in Greenhouse Gas Induced Changing Climate*** (Alberta Environment, 2000)

This study reviews recent scientific literature with particular emphasis on the latest developments in several key areas of climatic science uncertainties, specifically observational evidence, data analysis and climate models. The author observes that there is still uncertainty about temperature trends at the earth's surface versus temperature trends in the troposphere, and that available climate data does not show any increasing trend in extreme weather events. With respect to climate models the report notes considerable uncertainty in the simulation of mesoscale atmospheric and oceanic features and their impacts on future climate, as well as the inadequate simulation of the El Niño southern oscillation.

***An Anatomy of Adaptation to Climate Change and Variability*** (Kluwer Academic Publishers, 2000)

In this paper the authors propose an “anatomy of adaptation” to systematically specify and differentiate adaptations, based on three questions: (i) adapt to what? (ii) who or what adapts? and (iii) how does adaptation occur? The authors observe that adaptation depends fundamentally on the characteristics of the system of interest, including its sensitivities and vulnerabilities. The nature of adaptation processes and forms can be distinguished by numerous attributes including timing, purposefulness and effect. The paper notes the contribution of conceptual and numerical models and empirical studies to the understanding of adaptation.

***Municipal Risk Assessment: Investigation of the Potential Municipal Impacts and Adaptation Measures Envisioned as a Result of Climate Change*** (Federation of Canadian Municipalities, 2000)

The objective of this document is to provide estimates and projections of specific climate change impacts and potential adaptation measures affecting communities across every region of Canada. As the protection of life and property is important to all citizens, the report concludes that adaptation to climate change is in the interest of municipal governments. Nonetheless, only a small portion of municipalities are seen to possess the knowledge and capacity to respond effectively to likely climate change challenges. A review of the history and factors influencing climate change action are covered, as is the link to natural disasters (e.g. extreme events). The second part of the document focuses on municipal adaptation measures.

***The Science of Adaptation, A Framework for Assessment*** (Kluwer Academic Publishers, 1999)

This paper outlines what is meant by “adaptation” to climate change, and how it might be addressed in the IPCC Assessments. Two roles of adaptation in the climate change field are identified: adaptation as part of impact assessment (i.e. what adaptations are likely?) and adaptation as part of policy response (i.e. what adaptations are recommended?). The paper demonstrates that, for adaptation purposes, climate extremes and variability are integral parts of climate change, along with shifts in mean conditions.

***The Relative Magnitude of the Impacts and Effects of GHG-Related Emission Reductions***  
(Pollution Probe and Rainmakers Environmental Group, 1999)

This scoping paper provides a preliminary assessment of our current state-of-knowledge regarding the co-benefits associated with climate change mitigation. The research provides a “reference library” on co-benefits of value to the national Issue Tables and other investigative and policy development groups. In pursuing the knowledge gaps identified there is a need to recognize the importance of scale in shaping co-benefits. The authors conclude that an integrated-qualitative approach that draws upon expert judgment to assess co-benefits may be the most practical and productive method to overcome uncertainties and knowledge gaps.

***Indicators of Climate Change in the UK*** (Natural Environmental Research Council, 1999)

A set of 34 indicators of climate change and its impacts has been identified for the UK. The indicators, which cover climatic, socio-economic and environmental factors, are those known to be sensitive to year-to-year variations in climate from long-term records. Constraints and criteria were used in the selection of the indicators from a larger data set. The authors consider the indicators to be a preliminary set, presented for consultation and subject to revision – on the web site – in response to comments and new information. Nonetheless, the indicators provide a comprehensive point of departure for standardized monitoring and reporting of climate change across jurisdictions.

<http://www.nbu.ac.uk/iccuk/>

***Adapting to Climate Change in the Context of National Economic Planning and Development***  
(World Resources Institute, 1998)

Through placing adaptation to climate change in the context of national economic planning and development this paper underscores the presence of a two-way integration process. This investigation addresses the potential for a more comprehensive adaptation response process, including measures to be evaluated and adopted at tactical and strategic levels and in policies for sustainable development. The author notes that significant incremental and additional benefits may be obtained if future projects take climate change and variability into account in such a way as to reduce future vulnerability to extreme events. A pioneering example in Uganda demonstrates this approach.

***Vulnerability & Adaptive Response in the Context of Climate & Climate Change*** (Kluwer Academic Publishers, 1997)

This paper explores the distinction between climate and climate change, and proposes that adaptation to current climate variability is an additional approach to our preparation for coping with long-term climate change. The author suggests that it may be prudent to focus on adaptation to extreme events, even though, at present, there is no scientific consensus that extreme events have increased in frequency on a worldwide basis. Nonetheless, some regional shifts have been observed, and it is therefore proposed by the author that the research communities studying adaptation to extreme events and adaptation to climate change work more closely.

***The Impacts of Global Climate Change in the Bering Sea Region*** (BESIS Project Office, 1997)

The Bering Sea is an integrated environmental system that needs to be studied as a whole, not its individual components. This approach applies equally to numerous other regional arctic systems, thus this report is of interest here. It is the importance of addressing societal responses to regional climate change that underlies the value of regional impact assessments, and the fundamental concern of the authors about global change. Impact assessments provide an excellent means of interdisciplinary analysis and synthesis of change. In this document, key questions are asked and succinct responses documented, together with concise explanatory text, tables and graphics. Problems with the assessment are raised and qualified responses and recommendations for improved impacts assessments provided.

***Taking Charge: Personal Initiatives*** (David Suzuki Foundation, 1997)

This paper is a discussion on different levels of the role of government participating in lowering greenhouse gases. Appendices in this document provide emission factors. Electricity CO<sub>2</sub> conversion factors are given for the Yukon, however their accuracy is questionable. The series of publications by the David Suzuki Foundation on *Climate for Change* provide discussions on greenhouse gases that are beyond the scope of this paper. They are policy oriented and provide some considerations on action-oriented approaches to realize reductions in greenhouse gases.

***The Growth of Adaptation Capacity: Practice and Policy*** (Springer-Verlag, 1996)

In this paper six reasons are provided for developing and adopting adaptation strategies. The author concludes that adaptation to extreme events (natural hazards) can reduce long term vulnerability to climate change. To support this view a framework for identifying and classifying adaptations is presented and applied to the adaptation options described by the IPCC. The paper concludes that some major categories of adaptation, such as insurance, disaster assistance, and changes in land use and location, receive minimal or no attention in the literature. Of relevance to the Northern Canada is the observation that emissions reductions are shared globally, while adaptive actions are location specific.

***Preparing for an Uncertain Future: Impacts of Short- and Long-term Climate Change on Alaska – Proceedings of a Workshop*** (The Center for Global Change and Arctic System Research, 1995)

An excellent overview of the issue of climate change in Alaska presented in an accessible and well-organized document. In lieu of an Executive Summary, the authors provide a brief Policymakers' Summary in which various commonly held myths about climate change are concisely and effectively dispelled. Much of the content of the document is equally applicable to Canadian arctic jurisdictions, from physical and terrestrial impacts to economic concerns and policy implications. In view of society's reluctance or inability to face potential long term problems the authors have considered it more useful to address climate change impacts in the near-term (a few decades) and long-term (a century). Recommendations map out a strategy to prepare for an uncertain future.

***The Carbon Bomb – Climate Change and the Fate of the Northern Boreal Forests*** (Greenpeace International, 1994)

In this book Greenpeace provides an interesting analysis of approaches to reducing greenhouse gas emissions, and contextualizes information in terms of the boreal forest and carbon balances.

Much of the information is still of interest, though subsequent publications have dealt with the subject in greater depth. The document is well researched, though some of the content belies an objective position on the subject.

***The Dynamics of Social Dilemmas*** (Scientific American, 1994)

Individuals in groups must often choose between acting selfishly or cooperating for the common good. Social models explain how group cooperation arises, and why that behaviour can suddenly change. An appreciation of such models is useful when exploring the potential mechanisms to encourage social changes in behaviour that result in reduced emissions or increased adaptive capabilities. The authors argue that in social dilemmas requiring negotiation long periods of stasis can be punctuated by unexpected outbreaks of cooperation.

***Canada's Missing Dimension: Science and history in the Canadian Arctic islands – Volume I and II*** (Canadian Museum of Nature, 1990)

All Canadians would benefit from not only seeing, but experiencing life in the Arctic Islands. The two volumes of this publication are a good substitute. These volumes provide coverage of current knowledge about the region's natural heritage, place that knowledge in historical context with a view to the future, detect important gaps in our understanding of natural processes, and suggest ways of filling such gaps. The publication is intended for those who are deeply interested in the nature and history of the Canadian Arctic.

***Perceiving and Managing the Complexity of Ecological Systems*** (The United Nations University, 1984)

C. S. Holling is renowned for his research into the functioning and response of systems. This article in an excellent book on the issue of complexity investigates ecological systems and the endless variables, connected in a web of interrelationships that are fundamentally non-linear. The concepts that Holling explores are worthy of attention, as they relate to climate change and the human desire to influence the rate and direction of that change.