C-CIARN NORTH

Canadian Climate Change Impacts and Adaptation Assessment

Northern Regions Chapter

Northern Consultation Meeting #2
Yellowknife, Northwest Territories

Thursday, March 2, 2006

Participants

Chief Karen Felker – West Point First Nation
Richard Zieba – Industry, Tourism and Investment, GNWT
Jim Sparling – Environment and Natural Resources, GNWT
Aleta Fowler - DIAND
Bob Bromley – Ecology North
Mary Tapsell - MVEIRB
Tanuja Kulkarni - NRCan
Chris Furgal – Laval University
Michael Westlake – C-CIARN Yukon
Yanic Chauret - DIAND
Pauline Deehan – Arctic Energy Alliance
Doug Ritchie – Ecology North
Rebecca Chouinard - DIAND
Savanna Hayes – Environment Canada
Steve Matthews – Environment and Natural Resources, GNWT
Mike Nitsiza – Wha Ti
Lorne Napier – Dene Nation
Shirley Cook – Dene Nation

Notes:

Claire Singer – Ecology North
Rosella Stoesz

Plenary Session

Overview: Canadian Climate Change Impacts and Adaptation Assessment

Presented by Tanuja Kulkarni, National Assessment Coordinator, Natural Resources Canada

The Climate Change Impacts and Adaptation Assessment is a scientifically objective assessment of existing knowledge of the risks and opportunities that climate change presents to Canadians. The assessment will cover what we already know as well as identifying knowledge gaps. Important goals are to understand Canada's ability to adapt and the limits to adaptation, and to understand the significance of the rate of change. This national assessment will complement and contribute to the global perspective of the 4th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), which is currently under development.

The Impacts and Adaptation Assessment differs from previous national studies in that climate science is not the subject of the assessment but one of the contributing sources of information, along with such things as information about biophysical and socioeconomic impacts. The goal of the assessment is to provide and integrate information that will assist Canadians in developing policy related to adaptation.

The assessment will draw on a variety of knowledge sources, including peer-reviewed scientific publications, grey literature such as government reports, traditional knowledge, local knowledge, and the expertise of people working in affected fields and locations. Among the cross-cutting themes that will be addressed are public safety and security, economic sustainability and development, human health, cultural impacts, security and sovereignty, and ecosystem and species sustainability.

The primary focus is on the regions of Canada, although international and transboundary issues will also be addressed. Taking a regional approach will raise the profile of the issue within political jurisdictions, highlight relationships among sectors, and emphasize collaboration within and between jurisdictions. Case studies will provide examples of local approaches. Ultimately, the assessment should tell us what climate change means for Canada.

A number of different products will be developed, aimed at several different audiences. These include a synthesis report, a full scientific report, regional impacts and adaptation posters, and highlights documents. Other potential products have not yet been determined. Target date for release of the assessment is the spring of 2007.

The Northern Regions chapter should make a strong contribution to the assessment. It has the advantage of building on the information gathered for the Arctic Climate Impact Assessment and our knowledge of existing climate change impacts. Now we want to concentrate on the human dimension of climate change – an important contribution the North can make to the national picture.

Overview: Northern Regions Chapter

Presented by Chris Furgal, co-lead author

Lead authors for the Northern Regions Chapter are Christopher Furgal, Université Laval, and Terry Prowse, Environment Canada, University of Victoria. Contributing authors are B. Bonsal, C.

Dickson, H. Melling, D. Milburn, R. Chouinard, F. Jackson, S. Nickels, M. Nuttall, A. Ogden, J. Reist, W. Savigny, N. Snow, and T. Edwards. The contributing authors will be calling on others to assist in developing their chapters. All contributions are welcome and all will be acknowledged.

The chapter is divided into six principal sections: introduction; current and future conditions; implications of climate change for the Arctic environment; implications and adaptation for key areas and issues; regional centres and small communities; and conclusions. The various contributing authors are working on specific sections, with the lead authors pulling the sections together into a coherent whole. For purposes of the report, the northern region is considered to be the area encompassed by the Yukon, the Northwest Territories, and Nunavut.

The introduction will provide a brief overview of the region, its population, and current climatic, demographic, and socioeconomic conditions. The second section will survey past climate in the region through the instrumental records and reconstructions of climate before such records, current climate conditions, and projections for the region's future climate. It will also summarize current and future socioeconomic and demographic conditions and trends.

The third section of the chapter will examine the implications of climate change for the arctic environment: how key components of the natural environment have changed in the recent past and are forecast to change, and the importance of those changes for other parts of the physical system, people and ecosystems. Section three provides important background information for understanding the changes in various sectors discussed in the next section.

The fourth section, the largest part of the chapter, discusses vulnerabilities, projected changes, and adaptation within key areas of northern experience. Currently, ten subject areas are proposed: hydroelectric development, oil and gas, mining, linear infrastructure, shipping and transport, forestry, fisheries, wildlife, aesthetic and recreation aspects of northern environments, and human health. In each of these sectors, discussion will address: current status and key vulnerabilities; projected changes and changes in relation to climate; and sensitivity, adaptive capacity, and options for adaptation.

The fifth section of the chapter will look at the different perspectives, vulnerabilities, and potentials for adaptation in several groupings of northern communities: regional centres, small communities, and indigenous peoples. Finally, the chapter conclusion will offer a brief summary for the region of key vulnerabilities, implications for northern adaptive capacity, and the key gaps and needs for further research and action.

The first draft of the northern chapter is due at the end of March 2006. It will be reviewed over the summer and the authors will respond to the comments in the fall. The final version is due in December, with release of the full report scheduled for spring, 2007.

Questions and Concerns

- Is this assessment just going sit on a shelf somewhere? How will it be used?
- (Furgal) Is our chapter sufficient to address the concerns of northerners and impacts that are already occurring? We need to scale information to ensure readability. We are using information that has already been gathered, rather than raw data.
- Concern: increased emphasis on future modeling decreases the awareness of short-term, immediate climate issues that need to be addressed now.
- We need reliable impact projections.
- Use the assessment to provide information about impacts; move towards adaptation initiatives; provide practical information for industry

Current Relevant Northern Initiatives

- NWT greenhouse gas strategy – touches on increasing importance of impacts and adaptation, information for sectors, coordination of information. A redraft is in the process.
- Northern Ecosystem Initiative.
- Arctic Climate Impact Assessment.
- Many initiatives are currently under way or have been developed in the past.

Pre-breakout Questions

- What is the overall layout of the assessment? Will there be a true reflection of NWT concerns? Will there be sufficient division of territorial concerns – Yukon vs. NWT vs. Nunavut?
- Identify new topic areas if necessary; eliminate others. There is a standard template for the full chapter, but regional specificity is possible.
- What is the justification for the split of oil & gas from other forms of linear infrastructure?
    - Linear infrastructure is a general description that can address any related infrastructure.
- Are feedback loops going to be addressed as they were in the ACIA?
    - Included in section 2 (Climate System). Feedbacks related to the global system have not been addressed, since they were already addressed in ACIA.
- Contaminated site clean-up – what is the treatment in the assessment regarding climate change linkages?
    - Clean-ups would be addressed in the mining section.
- Community construction falls under which section?
    - Housing can be considered under health issues. Infrastructure most like belongs under Regional Centres and Small Communities (Section 5). It will include basic public health infrastructure.
- Planning issues – How can future climate projections be used for construction and be integrated into existing codes?
    - Identify key people at the territorial level that would be worth talking to for the assessment. Possibly Public Works & Services, Transportation; the Minister of Transportation for impacts to the Mackenzie Valley from pipeline activity.

Overall Questions to be Answered

- What information would you expect in the sections?
- What are your information needs?
- Do you have suggestions for case studies?
- Do you have suggestions for communication pathways and strategies?

Breakout Groups

Group A

Facilitator: Michael Westlake

Comments are grouped according to the sections in the draft outline of the Northern Regions chapter. Unless attributed to one of the resource people, the comments and suggestions came from participants in the breakout group.

General Remarks and Suggestions

- The Arctic is experiencing climate change more strongly that the rest of Canada.
- Information is needed about cumulative and direct effects of industrial development in the Arctic.
- More difficult to predict seasonal patterns and local weather phenomena.
- Awareness / knowledge gap between elders and youth. Language barriers between elders / youth increase communication problems.
- Northern communities lack access to research scientists.
- Southern susceptibility to climate change is at least equal to that of the north. This is not a northern problem, but a global problem.

1.0 Introduction

- Large variability between territories – can we expand the assessment to include geographical and physical variabilities between territories and within the NWT?
    - Possibility of vegetation zone maps, topography, ecosystems map.
- What is the intended connotation of the term socio-economy in the assessment?
    - Should include information regarding population, employment, GDP, etc.
- Reports exist regarding industry employment.
- Socio-economic workshop March 15 – MVEIRB: forum for socio-economic discussion, information housing, expertise location / access (a report will be published).
- RCMP environmental scan – summary of socio-economics for the NWT.
- Population, GDP forecasts are available.
- Does this information incorporate First Nations lifestyles and subsistence economies?
    - GDP does not include values of subsistence market.
    - No reliable information regarding impacts of climate change on subsistence harvests. (There is continuing disagreement regarding the effects of climate change on harvests vs. natural cycles in population dynamics).

- Richard Zieba can be contacted for additional information regarding socio-economic reports.
- Impacts of climate change on northern culture:
    - Large amounts of snow impede land access, etc.
    - Impact on culture is an important northern issue that needs to be addressed in the assessment.
    - Mixed ethnic backgrounds can make delineation of cultural beliefs and practices difficult.
    - Changing lifestyle and economic base: subsistence lifestyle is virtually impossible except as a hobby. This is not necessarily attributable to climate change. It is difficult to maintain duality between western education and continued interest in subsistence activities.
    - Isolation of impacts from other stressors is nearly impossible
    - Environmental changes and degradation cause disruption, such as changes to migration routes and disruption of fisheries due to differential ice freezes and thaws.
- Information can be difficult to access in northern communities. Good approaches to delivering information include: plain language, pictures, visible data, and story telling to increase interest. Scientific data and documents are not accessible to the general population. Regional pictures should be used to represent regional environments – tundra is not representative of boreal forest.
    - (Tanuja Kulkarni) A poster series will also be available.
- It is important to recognize the variability between cultures and ethnic groups in the North. Western knowledge tends to group First Nations together, assigning them common values and practices. The assessment needs to present a fair representation of all ethnic groups.

2.0 Current and Future Conditions

- Need to recognize that Global Circulation Models (GCMs) are broad in scope and don't necessarily speak on a regional basis. The uncertainty associated with GCMs increases with lengthened time periods for projections (20 vs. 100 years).
- The NWT is along a north / south gradient. This is reflected in variations in regional warming trends and variations in regional species migration. The huge gradient differences need to be addressed.
- Average projections are extremely unreliable when considering all the different regions in the territory and the many different responses to climate change.
- Consider shifts in seasons.
- Wildlife and human populations will be addressed in later sections. This section is for a general, quick overview.
- Cold is the definition of the North. It maintains and holds systems together – common throughout all territories. See Sheila Watt-Cloutier's speech at COP11, "The Right to be Cold" – also published as an opinion piece in Orion magazine at www.oriononline.org/pages/om/05-4om/Watt-Cloutier.html

3.0 Implications of climate change for the Arctic environment

- ACIA provided information about a lot of the impacts.

- Additional factors or implications that need to be included in this section
  - Migration of animals, changing species boundaries, biome shifts.
  - Precipitation, water levels, forest fires – mention specifically in text rather than simply in GCMs.
  - Wind variations should also be covered: increasing strong winds, blizzards, wind as a potential alternative energy source.
  - Impacts of climate change on peat lands.
  - Variations in solar intensity, and increases in UV exposure.
  - Cloud cover increases / decreases: effects on aurora tourism and diamond mine shift changes.
  - Periglacial formations and seismic variations due to climate – LAND: description of potential hazards regarding land variations should be included. For further clarification regarding this comment, please contact Rebecca Chouinard.
  - Water warming will have a huge impact (Great Slave / Great Bear) and should be addressed. Address variations in fresh water as well as marine environment.
  - Parasite load in fish is affected by temperature.
  - Water tables fluctuations in Great Slave Lake – should be included in this section, and then elaborated on in the shipping and transport section. Most of the information associated with water level changes is tied only to the Mackenzie River and Delta and coastlines. Information for freshwater systems and major lakes should also be included.
  - There has been flooding on the Slave River and Fort Good Hope from ice jamming. Emergency plans are a method of adaptation.

4.0 Implications and Adaptations for Key Areas / Issues

4.1 Hydroelectric Development

- Whitehorse consultation suggestion: include hydro in a broader category of renewable energy.
- Hydro power deserves a section in and of itself. It's a major issue, with pro and con aspects and ties to the hydrological cycle.
- 75 percent of power in NWT comes from hydro sources. Talston River hydro ready to apply for approval but has not started operations yet. Transmission lines will run primarily to mines or tar sands for possible export (contact Mary Tapsell for more information).
- Lutselk'e and Wha Ti hydro proposals are in the works.
- Are adaptation and impacts taken into account in hydro construction? No.
- We need more information regarding the potential impacts of precipitation, hydrological regimes, and atmospheric humidity (frost damage).
- Power lines affected by frost damage are also included in linear infrastructure.
- Changing climate includes changing wind regimes, creating a possible wind power source.
- Possible new sources of ground-source heat (geothermal) can be used for primary heating.

- Where would you include sewage lagoons?
- Build on knowledge of alternative energy and permafrost in Alaska (wind turbines adapted for northern conditions).

Permafrost (may be beneficial to add this as a separate section)

- There are many overarching issues related to permafrost that might need to be addressed separately, possibly as infrastructure impacted by permafrost.
- Major difference from Yukon – permafrost in the NWT is primarily centred in peat bogs, which will result in huge amounts of water drainage if melt occurs.
- Mackenzie Gas Pipeline will bury their lines. Will flexibility be retained with permafrost melt, or will the lines break?
- Melting permafrost could lead to disruption of animal migration routes.
- How much impact do engineering practices have on permafrost melt in relation to climate change effects on undeveloped areas? i.e., Are there differential melt rates between developed regions and undeveloped regions?

4.1 Oil and Gas

- Reliability of ice roads is an issue.
- Chilling gas and oil to prevent permafrost melt is the current practice. What adaptation is possible if permafrost begins to melt regardless of these efforts?
- Case Study: IPL pipeline studies in permafrost melting.
- Case study: Drilling to prevent sumps (Mary Tapsell).
- Ground frost is needed for winter operations. What if ground frost doesn't come?
- Construction and implementation of the pipeline will trigger expansion of exploration activities, which will cause higher levels of disruption.

4.3 Mining

- Stability of permafrost-encased tailings ponds.
- Reliability of ice roads.
- Rebecca Chouinard's report on regulations and adaptations to allow for future climate changes, should be consulted in the writing of this section. The report is in regards to new regulations that mining operations are going to have to implement in order to accommodate any climate changes safely.
- Changes in future commodity prices – will this result in changing emphasis on metal mining and related activities?
- Uranium extraction for nuclear power is a future possibility.
- How will climate change affect current practices – e.g., the ability to refill lakes that were drained for industrial purposes if the hydrological cycle changes?
- Colomac: the tailings ponds were sized for dry conditions, but high precipitation caused quick filling of the tailings ponds – hydrological regimes affect sizing of ponds. We need reliable hydrological predictions on a local basis for situations such as this.

4.5 Shipping and Transport

- The sector has a history of reactive adaptations.
- Case Study: Mackenzie River crossing at Fort Providence.
- Case Study: Extension of winter road at Wrigley; joint government and industry response .
- Exits and entrances onto ice crossings succumb quickest to climate change.
- First phase of climate change and transportation report from Richard Zieba available in one month. Richard suggests that authors consult with him for this report's findings.
- The Mackenzie River is extremely important. It seems to be missed in the assessment outline and needs to be addressed.
- Water level increases or decreases, or major fluctuations need to be included
- Servicing of northern communities: elimination of ice roads would have a huge impact on the cost of living.
- Fort Chipewyan: a change in the ice road season has prevented Christmas shopping as well as resupplies.
- Aircraft movements are affected by icing events and cloud cover.
- Landing strips are affected by permafrost
    - Department of Transport: effects of permafrost melt on roads (Consult Richard Zieba)
    - EC, Transport Canada, GNWT report: impacts on transport in general, costs, etc. (Consult Richard Zieba)
- Projections of operation and maintenance costs are needed.
- We need to know the range of probability of climate change for construction activities (low vs. high probability of occurring).
- Case study: Inuvik school roof collapse due to heavy snow load (upgrades need an upper limit of climate change damage to accommodate).
- Case study: Bathurst Inlet Deep Sea Port and rail line (all-weather road to Contwoyto Lake) or North Slave all-weather road.
- Access to the Northwest Passage should be discussed.
- Time is needed to adapt to these changes, as well as time to implement the adaptation. This is related to perceived and actual forecasting accuracy.
- Construction of all-weather roads could open the North up to further exploration, an example of cumulative impacts.

4.6 Implications and Adaptation for the Northern Forestry Sector

- Too much Yukon emphasis in the outline. There is virtually no existing forestry industry in the NWT.
- What will the impacts be on fuel wood access.
- What is the role of NWT forests under the Kyoto protocol – source or sink?
- Methane in peat bogs might be released with warming.

- Parasites and insect invasions may impact the potential value of the forest resource – e.g., spruce budworm, leaf miner.
- Potential increase or decrease in forest fires could have an effect on tourism.
- The correlation between fires and recorded lightning strikes might be interesting.
- GNWT forestry sector contacts – Rick Lanneville / Tom Lekusta.

4.7 Fisheries

- Whitefish are no longer as tasty.
- The mixing of lakes and eutrophication are issues.
- Impacts on the quality of main catch.
- Parasitic invasion – there is a higher chance with lowering of the water table and higher water temperatures.
- Winter kill.
- Hydrological cycles.
- Species invasions – salmon (arriving in larger numbers rather than new appearance). Potential results include competition for other species and indirect effects like introduction of parasites.
- Subsistence fisheries are being impacted. Instead of being able to dry fish, increased humidity is causing rotting. Storage has become problematic with warmer temperatures and increased humidity.
- Department of Fisheries and Oceans contacts: Ron Allan, David Tyson (both should be consulted in the writing of this section).
- The impact on fisheries is a more prominent problem in coastal communities.
- Climate change might increase the season for recreational fishing.
- The location of fish is becoming unpredictable.
- Winter fishery is affected by safety issues, including more overflow, less ice, and thinner ice.

4.8 Wildlife

- Low biodiversity in the North.
- Impacts felt more strongly and faster in the North – high sensitivity.
- Wildlife lose sense of seasonality with disruption of climate, leading to changes in the timing of reproduction and migration.
- The subsistence harvest represents a significant northern economy that could be adversely affected by caribou decline and cuts to the aboriginal harvest.
- Increased snow causes transportation difficulties for both humans and animals.
- Warmer temperatures may cause icing of snow cover, which could cause food scarcity for herbivores.
- There is high uncertainty related to wildlife. Many different cycles in population dynamics are apparent and many different factors influence the health of animals. It is difficult to isolate the impacts of a single stressor.

- Rapid climate change may cause difficulties for animal adaptation.
- Consult the Bathurst Caribou Management Plan Final Report – Yellowknife for an additional source of information.
- Contacts: Ray Case and Arthur Boutillier of DIAND
- Introduction of new species and changes to animal distribution and behaviour: e.g., white-tailed deer with brain worm (Can it cross over to other species?); grizzly bear appearances; wolves attacking people. Some are corridor species and cannot necessarily be attributed to climate change.
- Corridors are increasing through industry expansion, and warmer winters facilitate survival.
- Climate change increases uncertainty, with implications for planning.
- We need more information on the impacts on the subsistence economy related to the effect of stressors on critical habitats and species, policies / plans etc. to expand industry, helicopter traffic, and the effects of additional development on species disruption.

4.9 Aesthetic and Recreational Aspects of Northern Environments

- Contact Protected Areas Strategy secretariat.
- Major attraction is the pristine nature of the North.
- Changes to river travel and species are a potential deterrent to tourism.
- Effects of climate change on the polar bear hunt and polar bear viewing.
- Construction of all-weather road may increase access to the land.
- Will there be a fundamental change in the perception and draw of the northern environment?
- Suzanne Carrière: Biodiversity Action Plan
- Promotion of cross-country skiing, and the NWT as training grounds for cross-country ski teams, as areas in the South get reduced snow seasons and loads because of a changing climate.
- We are seeing a reduction in hunting opportunities because caribou are further away. Is there a climate change link?
- Snowmobile accessibility is decreasing.
- Increased opportunity for paddlers with higher water levels – an ecotourism opportunity.
- Recreation is being affected: natural ice rinks are in danger; dog teams are used less; hunting and trapping are less prevalent; overflow is increasing.
- Unpredictability of weather can cause safety issues.
- Possibility of developing new sports.
- Climate change complicates management strategies. Land use planning is based on past and current conditions, not future possibilities.

4.10 Human Health

- Climate change is changing the ability to the predict weather – disruption of patterns – faster changes between patterns.
- Safety issues: overflow, thin ice, unpredictability.

- Adaptation: respect for the environment and awareness of surroundings are necessary for survival.
- Reduced access to subsistence harvesting results in changes in diet.
- Consult with the Northern Contaminants Program in Yellowknife and Fort Resolution for further human health information.
- Increased duration of respiratory illnesses (colds and flu).
- Section should address the increasing quantity and severity of dust observed on the roads, affecting health, and the possibility for increases with a changing climate.
- Particulates and airborne contaminants, both organic and inorganic, are increasing.
- Contacts: Lorne Napier for information on elders' health conference next week; Chris Paci for a study on food security; Duane Fleming, Senior Environmental Health Officer, Stanton Regional Health Authority in Yellowknife; Dr. Laurie Chan at McGill University for contamination of food sources.
- Comfort and health are related to temperature stability.
- Increased mortality from accidents related to climate change (thin ice, etc.)

5.0 Regional Centers and Small Communities

- More systems are in place in larger municipalities.
- (Westlake) People just think these systems are in place. For example, power outages may cause pipes to freeze as happened recently in Whitehorse.
- Hydro generators: Frost buildup on power lines can interrupt power distribution.
- Yellowknife as a larger municipal center is just as vulnerable as smaller communities.
- Magnitude of impacts is greater in larger centres due to population density.
- In smaller, less developed communities, it may be easier to implement up-to-date technologies and build infrastructure to accommodate future conditions.
    - Introduction of renewable energy hybrid systems utilizing the diesel infrastructure which already serves the energy needs of communities (Contact NT Power Corp – Myra Berrub, in Hay River, for more information)
    - Regional / geographic situation also plays an important role
- Note: Yellowknife is not a big city in the global context. It can still be considered a relatively small community.
- Industrial development will be the biggest factor in determining future energy development and needs.
- Need to differentiate between northern and southern large centres and small communities.
- Small communities are usually off-grid and often off-road. Road access (permanent, ice road, no road) is a very important distinction to make in the North.
- There are significant distinctions among the territories with regard to the nature of communities and the percentage of aboriginal population.
- Subsistence harvesting subsidizes the high cost of living in the territory.

- Impacts that the construction industry must accommodate include: permafrost melt, road unreliability, less material because mines siphon it off, increased snow load, high cost of fossil fuels (potential incentive to increase energy efficiency), and foundation shifts.
- Impacts on piped water systems include breaks because of ground shifts and sewage lagoon failures.
- Emergency preparedness plans are necessary.
- Erosion issues related to permafrost degradation in both coastal and riparian systems.
- Adaptation examples, local and from other places:
    - Shishmaref in Alaska: houses on skis / relocation.
    - Russia: buildings on pilings.
    - Japan: airport built for subsidence. This airport was built on ground that was already sinking, so it was designed to accommodate subsistence. Related to NWT with respect to permafrost subsistence in ice-rich regions.
    - Old Town (Yellowknife): houses on pads allow shifting due to frost heave.

Communications Products and Approaches

- Products already proposed include a final report, a summary document aimed at decision-makers, and a pamphlet aimed at the general public.
- A small publication which highlights the regional findings rather than the national (communication product in addition to the highlights, summary and scientific report).
- Products or information that would be useful for the Dene Nation: terminology and climate change; how to interpret the information that affects people in communities; standard set of vocabulary for information dissemination. A Dene translation workshop is to take place next month. and the results should be included in the Northern Chapter of the National Assessment.
- Other potential tools for disseminating information about the assessment might include: a PowerPoint presentation; clear, simple website; CDs; C-CIARN North website.
- Radio and television presentations and news reports. Method of delivery is important in the North, and radio and TV are best. Computers and the Internet are unreliable.

Group B

Facilitator: Chris Furgal

Comments are grouped according to the sections in the draft outline of the Northern Regions chapter. Unless attributed to one of the resource people, the comments and suggestions came from participants in the breakout group.

General Remarks and Suggestions

- (Furgal) We want to hear about content, what are critical points to go into the sections, and needs, what you need for decision making, adaptation, etc. Today doesn't end process; you can contact people to add to the report for the next month or so.

1.0 Introduction

- Methane gas is very rarely discussed. Why not? It's particularly important for the North.
- (Furgal) It's something to include, related to uncertainty around information we have. It's challenging to put in at the local scale.
- For northern communities dependent on air access and barge resupply, costs are high relative to other places.
- (Furgal) We can talk about networks that exist in and beyond communities, size, physical location, issues related to costs, and the importance of those things for making people more vulnerable. We need to do some of these assessments, and we're looking for help in this. Even at the global scale, there's not much research focusing on socioeconomic changes.
- UV – didn't see the word in here anywhere. Northerners will receive 30 per cent more, so it is an issue.
- (Furgal) There isn't as much focus on UV in this assessment as in the ACIA. It will be included in the health section. However, we're still looking at the impacts. Do we have an increase in the number of skin cancers being reported? There are problems with data, small populations, etc. We do have survey data about skin rashes and sunburns.
- When you leave out scary parts like methane and UV, it makes people less likely to be precautionary and more likely to think we can manage this. We shouldn't underplay these real issues.

2.0 Current and Future Conditions

- Arctic Energy Alliance (AEA) has a mandate to work with all 33 communities and government to assist them to reduce the costs of energy and energy related impacts.
- Tuktoyaktuk is a prime candidate for being studied. Their shoreline is gone; there's your adaptation. Their weather went from extreme warm to a huge storm, which they welcomed because it's what they're used to.
- Workshops have been conducted in Inuit communities, including Tuk. We heard those sorts of concerns and issues, and the workshop report is available. In the context of future climate and what models can tell us, we need more information about variability, rate of change, and the scale issue as well.

- (Furgal) Right now we get temperature and precipitation from modeling community, but the models now aren't able to start talking about coupled outputs as far precipitation out of the norm. Is that something that's really important, trends in temperature and precipitation, are there other needs for modeling, i.e. Seasonal trends.
- There's a trend to import basic needs into our community. That's the fundamental reason why we're where we are. It has policy implications, speaks to vulnerability, and so on.
- We're importing water, but making sure we have good healthy water gets less focus. We're moving towards more mega-development and away from self-sufficiency. That increases vulnerability.
- Regarding things that would characterize community health, community liability, some social indicators have been developed in relation to diamond mining.
- The NWT Dept of Health would have that sort of information.
- Because there are socioeconomic agreements related to the diamond mines, there is probably a range of indicators being used to track how well communities are participating, health and wellness. Some of that should be public information.
- Resiliency is an area where we'd like to see some focus.

3.0 Implications of climate change for the Arctic environment

- Is there any research being done about how to stop it now, deal with it now, because ten years from now it's going to be worse that what the public knows?
- A fundamental point that I hoped is not lost, is that the best long-term adaptation is mitigation. In the North, we're having challenges, we think we can adapt – it's difficult to explain to communities that the changes coming are even bigger.
- (Furgal) We're getting some of the information about the challenges communities are facing on a season by season basis, but we may not be able to include it all. The thing to keep in mind is that the diversity of communities is just as important as the diversity of the environment.
- One issue is caribou, bison, moving closer to towns, but I didn't see one mentioned. The changes are so drastic.
- Difficulties in translation for the communities, changes for the trappers, shorter length of time to trap, and changes in the quality of fur as well.
- In Wha Ti we are thinking of using the river for hydro. In the project itself we are having trouble dealing with the Department of Fisheries and Oceans guidelines that we have to follow.
- (Furgal) One of the things that will enable or hinder communities in making changes is the flexibility of guidelines.
- Not too long ago Wha Ti almost ran out of fuel. You need to reduce your vulnerabilities.
- (Furgal) That came up in Yukon too. We need to be able to put in these safety nets, alternative options to be more resilient and adaptive.
- AEA is trying to get more capacity into the communities, but it's difficult, because there's too much on their plates. AEA goes to the communities talks to them, goes over everything, and then it's left there. They need help getting to the action stage.

4.0 Implications and Adaptations for Key Areas / Issues

4.1 Hydroelectric Development

- (Furgal) One discussion that we had is on talking about all the energy items together – hydroelectric development, alternative energy, oil and gas development.
- Keep them together.
- For us the key is alternative energy.
- Wha Ti is doing a mini-hydro project.
- Communities have received money to do community energy plans.
- There are significant regional issues with hydro that warrant separating them out.
- In Whitehorse, with only one more mine they will have to reactivate their diesel plant; therefore it is important to know the trends. What is the capacity of the system to cope with growth?
- (Furgal) One good news story is that I'm convinced that there's going to be lots of water in the Slave River system. People like Chris Burns and Chris Spence explained to me that if you have moisture in fall, then in spring the water goes into the river systems and not into the ground.
- (Furgal) I heard that folks had started to do a listing of pilot-project case studies going on in communities to use new technologies.
- That's going to be available from AEA. The person doing the listing is completing the tour in the next week, and will be putting together a report. He gave me some background on the visits: people are saying that they want to keep their traditional values.
- Large hydro has costs. Regional self-sufficiency is fundamental. We should develop things in the North in a way that we can afford and that meets our needs. Wha Ti and Great Bear River is an example of this type of project, with Wha Ti being an example of sustainable development and the Bear River project as an unsustainable example of development.
- One issue that we see a lot of, is meeting short-term needs with long-term impacts.
- If you really get into the alternative model, it feeds the local system. People can get local jobs and stay at home more, which leads to healthier communities because they're not spending half their time in the camps.
- Related to scale and self-sufficiency, has there been discussion of thresholds and adaptation? Do we have concerns about where those thresholds are? Do we know where the limits are? Are there alternative models?
- The closest thing is DIAND's cumulative effects and management framework (CEAMF).
- The "working landscapes project" is in progress (Environment Canada), with work being done across Canada. Leslie Wilson is project officer working on that team.

4.2 Oil and Gas

- The big concern is that it just adds one more stressor to a system. That factor, plus the pipeline itself, just puts increased pressure on wildlife. You have all those factors, stresses out there. We have to exercise precautionary principles.
- (Furgal) The issue of cumulative impacts is critical in this context.

- I know nothing about caribou, but the scientists are working on the climate change impacts on them. If you add the oil and gas development, it could be too much.
- (Furgal) Looking at migration routes, vegetation, calving grounds, overlapping vulnerabilities coming together in one place, you can't talk about any one of those stresses on their own.
- Elders are very concerned about all the species that live among us. Climate change has affected them, their survival is in question. Changes in snow – lots of it, then melting, and then freezing –affect the vegetation. The positive thing to do is to make sure they have food on the ground, so that they don't migrate.
- What Wha Ti is doing is, instead of using all the heating fuel, they're using about 2000 litres every year, but they cut down by using firewood. A lot of homes are going back to firewood.
- What happens if the pipeline goes through even if people object to it. When will the effects be seen – two years, five years, ten years?

4.3 Mining

- Diamond mines – that's huge. Transportation is energy-intensive; there's so much linkage between development and energy sectors.
- Will Ekati finish sooner than expected now that production is doubled?
- They could finish earlier than 25 years, but they'll continue to explore and try to find more kimberlite pipes.
- What about the cleanup process after the mine?
- It's expensive, but they're sort of doing it as they go. Some of it cannot be cleaned up or returned to its original state.

4.5 Shipping and Transport

- (Furgal) What would be critical components of the transportation network for the NWT?
- Maintenance problems.
- Water levels, like for the Mackenzie River.
- All-season roads.
- On the way to Wrigley, historically the ice bridge was used at Mackenzie. Putting in a new bridge will eliminate that, if it actually goes in. There is some indication that it may be on hold because costs are escalating.
- (Furgal) In the Yukon there is discussion of rail lines to support transportation. Is the NWT looking at expanding transportation networks?
- The Department of Transport has produced a transportation strategy.

4.6 Implications and Adaptation for the Northern Forestry Sector

- Pest management is starting to look like it could be a big issue. The pine beetle, for example. When we don't get the deep low temperatures, that allows it to survive.
- (Furgal) The author of this section is based in Whitehorse, and there are challenges in getting recent information from the NWT.

- As mentioned, wood burning has the potential to be important to communities again. Also there's non-traditional harvesting, "wild crafting", mushrooms, and, for example, Aroma Borealis in Yukon, which produces tinctures.
- Carbon management is a huge issue.
- The way I understand it is that the boreal forest is a sink, but it's not a management tool to store carbon.

4.7 Fisheries

- Somewhere I've read there could be a 50-percent loss of species, and food fish may be the most vulnerable.
- At the West Point workshop we heard that there are decreased productivity issues. It might be change in effort, but there's some evidence that something's not right – more disease, more anomalies, fish don't last as long.
- For char there's some commercial aspects, as well as sport fishing.
- The fish plant went to East Arm to get a big haul, spent a lot of money to get there, and didn't get as much as they'd hoped. The quality of fish is changing.
- Some years with plenty of heat, the fish in shallow water die off because of the heat.
- Sometimes decisions have been made not to have a commercial fishery, so as not to interfere with domestic fishing.
- Are contaminants addressed in the assessment?
- (Furgal) They'll be dealt with in the human health section. There's not a lot of work being done in this area, and there are lots of gaps to fill.
- One of the considerations in doing a run-of-the-river project rather than a dam is that if you flood a river, it brings new toxic elements into the system.

4.8 Wildlife

- There's the whole issue of multiple stresses, different types and levels of parasites, quality of animals – very similar to fisheries issues.
- They say caribou are moving closer to town.
- The biodiversity issue – there are so many unknowns.
- The trapping perspective is important – good linkages, transportation impacts, etc.
- The footprint of oil and gas development, more roads, more access, garbage, etc. – it goes on and on. It will also be more difficult to pursue traditional lifestyles.
- (Furgal) Is there a sense that communities welcome economic pursuits to support their traditional lifestyles? In Nunavik, for example, one person is a wage earner, one a hunter, and they're the most productive families.
- Sometimes it leads to dependency on government, and that doesn't seem to be the answer. One thing that you have to understand is that adaptation is expensive. One of the answers is more government assistance. If it's structured in a way that promotes the right values, and there are jobs associated with it, it could be in form of subsidies for changing reliance on fuel sources to other fuel sources.

- When you talk about economic pursuits, it's not oil and gas. What we need to do is get local resources developed in local communities. There's no creative thought. All the focus of governments seems to be on mega developments, which does not work in the long term.
- (Furgal) It would be good to look at this in the community section, look not just at building adaptive capacity, but HOW we develop that capacity, realizing that some short-term gains have long-term negative impacts.
- One theme in Wha Ti was old values, new ways.
- Like the Tlicho government – now they can think of the options like hydroelectric that they weren't able to consider before.
- (Furgal) It sounds like there are some really important lessons to be learned from the cases you're bringing up. If we were looking for a case study related to adaptation or community sustainability, would Wha Ti make an interesting case community?
- Wha Ti would be good for energy. There are many negative examples – for example, in Colville Lake, everybody became so involved in gas exploration, nobody had time to go out and hunt caribou, and someone came in and sold the community a lot of lobster, etc.

4.9 Aesthetic and Recreational Aspects of Northern Environments

- (Furgal) There isn't much on tourism related to climate change out there.
- Protected areas are becoming more critical to help species affected by change.
- There's been some discussion about not having permanent protected areas. There are significant implications for wildlife and other features, and implications for tourism as well.
- Regarding Nahanni: when it was set up, not all the watershed was put into the park. Aboriginal people want it included.
- Not sure where it fits, but traditional knowledge is suffering. It's not as applicable as it used to be.
- (Furgal) Some of these issues will come out when I sit down with Dene Nation: challenges that environmental change poses to TK, changing context of TK with younger generations.

4.10 Human Health

- (Furgal) One thing brought up earlier was UV, so I've noted that here.
- (Furgal) 4.10.6 in particular speaks to combined impacts – and we know that's extremely important here in the NWT with development, etc.
- If we lose our caribou, it will have a huge impact on us.
- (Furgal) We have looked at the issue of food security, highlighting issues of transport, accessibility, and challenges to traditional food sources.
- In terms of water and waste water systems, next week we'll take a look at this, and see if there are some huge issues that we need to look at regarding our water supply.
- (Furgal) I like what I've been hearing about community context, resiliency, etc., and I can see us using that as a way to address the community section. How is climate change currently being handled in communities? Is it on the radar, and how is it happening?
- Community emergency planning is a huge issue – floods, fires, etc.
- (Furgal) What about search and rescue capacity being stressed?

- We raised this issue in Aklavik, and there people seemed to say that they know how to stay out of trouble on the land.
- I've heard of more rescues happening. There's loss of elders who go where they always went before, people getting trapped in overflow, etc.
- In Wha Ti, Canadian Rangers do local rescue.
- Last year in Fort Smith it got so bad that people couldn't even go out and trap, fish, hunt, etc.
- (Furgal) We're hearing the weather is so unpredictable that we're not going hunting nearly as frequently as we would. What does that mean for transferring knowledge, among many other things?

5.0 Regional Centers and Small Communities

- 5.6 (perspectives from Dene and Métis communities): (Furgal) Do you know of anyone that I should get in touch with to get more information?
    - Someone at the Heritage Centre?
    - The Gwich'in might have something to offer.
    - Violet Camsell-Blondin might be good to talk to; she's with Tlicho.

Ideas for Case Studies of Relevance to NWT

- Tuktoyaktuk is having a lot of direct impacts; they're seeing some major things happen.
- The increasing freeze-thaw events are creating conditions that rot wood pylons. That's more thematic than geographic-based.
- We (Inuvik) had a roof collapse in the school – luckily there were no kids there. They identified other areas that could be vulnerable to higher snow loads, and some progressive work done there. Was it a lack of engineering standards, lack of maintenance, or was snowload truly the factor? It does mean that we have to change engineering methods, if you want to build a 100-year building.
- An anecdote about Colville Lake was reported in News/North. There may be some more recent stuff for Colville Lake.
- Wha Ti is good for energy and the processes.
- Shipping water around to different places is a phenomenal issue.
- We have plenty of solutions already that we need to start implementing now.
- (Furgal) Do you have recommendations to facilitate local actions, and how to start the process to try to instill some sense of urgency so that we can start doing something?
- Put the subsidies where they'll do some good.
- We have to adopt behaviours that we want others to adopt. Globally we need 6 million Wha Tis – the power of the good example.
- The community energy planning approach that was used here might be a good case study.
- Norman Wells – their energy plan.
- Community gardens – there's a lot of potential, and a lot of history there too.
- Lutselk'e did a feasibility for a hydro project. The power corporation has shown interest there.

- Deline has done lots of work with local scientists on the uranium table. A good contact there is Karen Hamre, Avens Associates. She's on the Gwich'in Land Use Board.

- Yellowknife is calling for proposals for the Con Mine shafts to provide heat and power for new development. Ecology North is working with the City on mass transit. We're looking at sustainable neighborhoods, similar to Iqaluit, and would like to promote some concepts to the public.

Communications Products and Approaches

- (Furgal) We've heard that you have to start figuring out who to partner with now, not wait till it's finished. We're open to recommendations.

- Go to communities and do workshops.

- Using video and local languages would be very helpful.

- What's hard for people to grasp is how big it really is – not just warming, but massive global change – and the enemy is the North American lifestyle.

- Make it part of school curriculum.

- We have to get something to decision makers right now.

- Scientists are not generalists, so they're not comfortable talking about the bigger picture.

- We have to address the "why bother" issue, make people realize that everything we do today will make some difference in what happens.

- One common point, is eco-literacy, not connecting the dots. Eco-literacy needs to become a required component in schools, for leaders, political leaders, etc.

- Part of it is presence – we can't expect to deal with politicians by sending them a letter. We have to be equipped to get this issue to attention of politicians. For example, AEA is government-funded so it can't advocate. So Ecology North has very few resources to be able to go to politicians.

- (Furgal) One way might be to use the networks of local people already advocating, providing resources in the form of dollars or tools and support to those who are already working in the field.

- The North is pretty much federal; the NWT just doesn't have jurisdiction.

- That might be something of an excuse in some areas.

- Most of leaders are aboriginal, and they still give great credence to the elders. They would know what you're talking about. But the elders don't have the economic responsibilities. Develop allies and relationships with elders.

- Elders' workshops would be good.

- Public service announcements (PSAs) work well for immediate self-interest, but the climate change message is more about short-term sacrifice for long-term gain, and it's more difficult to convey this message.

- (Furgal) Promote co-benefits of behaviours, positive behaviours.

- Would like to see something for top leaders, premiers, ministers, MLAs.

- (Furgal) Thematic briefing notes have been done before.

- Other sources of information: The greenhouse gas discussion paper revisions will be ready this summer, and Tait Communications has been doing focus groups on environment.