Food Security of Northern Indigenous Peoples in a Time of Uncertainty

C.D. James Paci[i], C.Dickson[ii], S.Nickels[iii], L.Chan[iv], and C.Furgal[v]

This special position paper for the Northern Research Forum (NRF) raises issues related to the security of traditional/country food; that is the continued and predictable availability and access to food, derived from northern environments through Indigenous cultural practices. Traditional/country food is the general category of foods describing all of the plant and animal nutrients required for the health and sustenance of northern Indigenous Peoples. In this paper we assume that traditional use of natural resources occurred within cultural/social and environmental contexts. We assume that these contexts are being impacted by changes that are both independent and interrelated, focused as they are in our paper on climate change. The vast array of traditional economies reflected through our focus on food security will be simplified for our discussion. However, readers should be forewarned that such simplifications do not include the notion of traditional/country food economies as entirely fixed or unchanging. The relationship between Indigenous harvesters and consumers on the one hand, and a predictable and standard supply of goods (natural resources) on the other, is a reflection of complex ecological systems. The mode of harvesting/gathering as well as consumption patterns followed traditional rhythms, which included a degree of flexibility, innovation and adaptation. The degree of change and adaptation, that is the range of behaviors of hunters and consumers, was to a greater or lesser degree set by a range of environmental factors, including historical patterns of scarcity and abundance, predictable spatial and geographic scales.

How is climate change threatening food security? Indigenous Peoples are suffering the increased risk of uncertainty caused by climate change. The availability and predictability of the range of traditionally harvested and consumed foods, as well as the quality and quantity of these foods being impacted. Changes in climate are causing other changes, creating hazards on the land is discussed elsewhere (Newton *et al.* in press). Climate change is a real and significant threat to the existence of northern Indigenous Peoples.

Our discussion places particular emphasis on several implications for food security under changing climate scenarios for the purposes of our session on northern security. The NRF has identified security as,

possibly transcending all issues in the North is the wide ranging one of concepts security (sic). Security involves all elements of resilience of northern communities. It ranges from notions of military security and the nation state, which many consider to be outdated, to environmental security, and to the most pressing concepts of civil security. Civil Security involves culture, food and freedom of expression; the security afforded by the built environment and community health; the access to the needs of modern societies without the intrusion of aspects of southern society; and security of communications.

Of particular importance to the NRF are: the ability to respond to environmental or human disasters, civil security in a world of media globalization of culture, the meaning of the national borders in a circumpolar world, culturally relevant education, adaptation and vulnerability in the context of global change. Our paper begins with a brief introduction of the topic, followed by a summary of a research project currently underway in northern Canada (Chan and Furgal, A566, 2003), and finally

comments and questions for each of the theme areas identified by the NRF for the session on security.

Introduction

The circumpolar north is home to richly diverse cultures and biological diversity. It is a complex and sensitive region of the world, a region that the Arctic Council has identified as an "indicator" of global processes. What this term suggests is that the circumpolar north is a region where global processes, such as the long-range transport of contaminants (such as persistent organic pollutants) or changes in atmospheric gases, and increases or decreases in global temperature regimes, are registered before and more intensely than in other parts of the world. The physical environment and the peoples of the circumpolar north are vulnerable to global forces of change. By paying attention to northern environments and northern peoples, the global community will watch the effects of global change.

Climate change is amplified by the close relationship between northern Indigenous peoples and their environments. While impacts of change will profoundly effect how people live and organize themselves in the north, perhaps the most important indication of change will be how northern peoples adapt. Research needs to focus on the impacts of change, not only to provide the world an early warning, but too indicate to the people who are causing change: stark necessities they will need to make in the face of change.

Circumpolar Indigenous Peoples have already lived through periods of dramatic changes, recorded in geological time. These changes are perhaps imperfectly understood. However, Indigenous cultures have been shaped and have adapted to the slow and sometimes violent changes that have molded the circumpolar world. In the past, anthropology or history was used to document and analyze these cultures for knowledge of the past, with a focus on cultural change. The knowledge, traditional knowledge, of Indigenous Peoples is being made available by these peoples in an effort to educate the world. Ecology, environmental and social history, action anthropology (as well as a host of post-modern methodological approaches) have increased the array of questions and broadened research to focus on Indigenous Peoples knowledge of ecological change, including causes and predicted future directions for adaptations. Geographers and climatologists are studying climate change independent of Indigenous Peoples and the social science. Combined we can map the patterns of past changes and counter assumption, regarding the movements of peoples in adaptation to major climactic events.

Recent scholarship has considered human occupancy and use, traditional knowledge, along with the results of various scientific studies, for greater insight on how peoples were impacted and adapted to change (Berkes 1999, Jolly *et al.* 2002). Interdisciplinary approaches are proving to be an effective means of understanding climate change and the related impacts for Indigenous communities (Krupnik and Jolly 2002). Collectively, a full hearing of the knowledge (data sets and values) from both lived experience (traditional and local knowledge) as well as the analytical power of prediction (scientific models) must be brought together to assist northerners in developing a more complete understanding of where circumpolar ecosystems are heading --what the implications of changing climate mean to both the day to day immediate and long-term survival of northern cultures/ways of living (NTI *et al.* 2001).

Systematic research of climate change is new. By its very complexity, climate change research is an area that requires interdisciplinary approaches (team or individual). As an area of inquiry it is still, relative to other intellectual areas, under-resourced and open to new approaches and theory. More climate change questions are unresolved then those few we now have a firm and conclusive scientific understanding of. Questions remain unresolved for both the methodologies employed and the results endorsed. Climate change research is progressing, as all areas of inquiry do, and the uncertainty that currently exists is nothing new.

There is evidence of significant episodic cycles of warming and freezing, during and between periods of human occupancy in the north. The circumpolar north saw both tropical and frigid periods. In the high arctic there is evidence of huge trees. We have records (oral and written) of glaciations. Why then is the current trend of global warming alarming so many scientists, community members, media, and politicians (on either side of the debate)? The simple reason is that causes for current climate change are attributed to a lifestyle, western

consumption patterns (contingent as they are on fossil fuels) that are increasing the rate of warming, interfering with natural processes, in significant and, while it is debated, predicted ways. The debate is heated, excuse the pun, because most of the consumers are unaware that their behaviour is having detrimental impacts on their local, national and global environments. In other words, the side-effect of how some unaware people are living is changing how global processes behave, the implications of addressing these changes requires that people become aware and cease their consumption patterns. These people (Developed countries, in particular upper middle class) are affluent, there are poor people (Developing countries) who seek to attain the same level of affluence. One can see the serious pressure for an upward spiral of consumption rather than a slowing and reversal of many of the causes of global warming.

Climate change, as it has gained international attention, is the more recent period of warming, precipitated by increased emissions of greenhouse gases, namely carbon dioxide (CO2), resulting from industrial development. During the period of intensive industrial development in the western world, beginning in 1850 to a marked increase in growth and widespread use of automobiles and other fossil fuel consumption periods (1930-2003). Anthropogenic influences have outstripped natural forces in causing global warming. The indicators of global warming, for example the circumpolar region, is a sparsely inhabited region of the world, with sensitive biodiversity, cultures tied for generations to the land, which has been marginal to development, except as a source for natural resources or sink for waste (e.g contaminants).

The impacts and adaptation to climate change for traditional/country food consumers/ producers is very much an unknown. There are a number of stressors that have marginalized and are jeopardizing northern food production systems. The frequency of periods of crisis in food supply due to temporal fluctuations in food resources are expected to become more often, longer and more intense. The reasons for these assumptions come both from what scientists' modeling scenarios suggest; as well as what elders say is foretold in oral history. It is reasonable to suggest that climate change "will increases temporal fluctuations in species distributions, populations abundance, morphology, behaviour and community structure" (Dickson 2003:3). The results of climate change may be most acutely felt in northern Indigenous homes, homes where people have had limited capability to let the rest of the world know what is going on. Households have a relative ability to adapt to impacts. Climate change threatens aspects of their traditional cultures and lifestyles. Adaptation is not necessarily supported by economic access to modern alternatives. The technology trap has changed considerably since the 1970s.

Since the 1970s, circumpolar Indigenous Peoples have been politicized, actively organizing themselves and communicating their collectivist views, based heavily in a rights discourse (Aboriginal rights and title), domestically and to the world. Examples from northern Canada include rejection of the 1969 White Paper (Asch 1997, Erasmus *et al.* in press), development of a pipeline down the Mackenzie Valley (Watkins 1977, Berger 1977), and responding to long-range contamination of traditional/country foods (Jensen *et al.* 1997, Watt-Cloutier 2003). The creation of Nunavut parallels in some ways the political organization of the Sami; both are demonstrating institutional responses to state governments. The Sami Parliament and Sami University are two examples of innovative institution building. Similarly, the inclusion of Permanent Participants, six northern Indigenous Peoples organizations, to the Arctic Council has grown out of the Council's objective of protecting the arctic environment, an environment that includes a rich plurality. The demonstration by northern Indigenous Peoples of local, regional, national, and international environmental and social concerns has occurred within, and triggered, larger social movements for the recognition and retention of rights (Aboriginal and minority). The audience for these arguments has been both national governments (states) and the international community of states (United Nations, Arctic Council).

Summary of the Canadian Research Project

What does food security and climate change share in common? At the grandest level of analysis both are interdependent. What we mean by this is that as the climate changes so to will food security. If it warms or cools there will be impacts on the relative abundance and scarcity of some foodstuffs. Individual food items, such as cranberries, and whole food systems (diet in a household, community or region) will respond differently to changes.

Whether we are discussing individual foods or whole systems, impacts from climate change on food security may include the introduction of new foods, etc. New foods can be invasive species moving into a region, such is the case with the northward moving tree line into what was tundra, the movement of deer north of 60º, and so on, or the introduction of store bought foods. How each society, sub-group, or household within a society, adapts to changes will have impacts on the overall system. There are global implications for the kinds of food systems we have in place.

Northern traditional food systems are local. Trade was regional and small scale, in particular in the circumpolar north, a significant feature of traditional food systems that is no longer. The production and consumption of traditional/country foods is relatively small in scale. Traditional food systems continue to rely on primarily local sources of foods. The means (labour and technology) whereby foods are gathered and processed remains at the level of the household. The opportunities for community hunts persist; however, levels of sharing may be lessening. The amount of food required by most families in any given Indigenous northern community, may be met by local sources. However, research is required to substantiate this observation.

Overtime, northern Indigenous food systems adapted to include modern foodstuffs (metal hunting and cooking implements, flour and sugar). "Modern foods" were acculturated and assimilated into northern Indigenous lives, at various speeds and intensities. Almost always something new was created, regardless of the adaptation the old and new was remade and reformed to northern Indigenous lives (and environments). Whenever new foods did not fit northern realities, whether due to storage, cost or some other reason, they did not last. As food systems change, northern communities are being exposed to a wider variety of foods. It has been debated elsewhere that forced or unintentional, the introduction of "modern" to Indigenous lives, food or anything else, has caused a range of problems that ultimate undermine Indigenous cultures (Greenblatt 1991, Tough 1996, Krech 1999, Minnis and Elisens 2000).

Traditional/country food systems continue to be characterized by strong inter-relations between culture and land. Traditional food is intertwined and embedded within cultural practices --cultural practices nested within traditional/country food systems. The relative health of Indigenous cultures continues to be a reflection of the relative health of their lands. Spirituality, language, economy, are manifestations of what the land has to offer and what is predicted to be available in the future. The degree of flexibility and adaptation within traditional food systems depends on the land and the people, on the types of changes and the reasons for them. For example, overtime rifles replaced spears, just as snowmobiles replaced dog sleds. Each transformation has held a host of ecological and cultural ramifications.

In contrast to traditional food systems, modern food systems tend to be based on large-scale import/export of foods grown for mass consumption. There are small-scale or local organic systems, but these do not form the bulk of producers within commercially available foods. Agricultural practices have lead to the dominion of modern industrial food systems. These later systems benefit from expansion and investments in scale, growing practices (use of herbicides and pesticides, antibiotics and growth hormones) mechanization, transportation, preservatives, and other anthropogenic inputs. They rely on markets of consumers who are not able to provide their nutritional needs for themselves through gardening, fishing and hunting. The overall orientation to speed up production and lower costs (to boost profits) has lead to innovation. It has also lead some critics (Hawaleshka 2004), in particular those who support organic farming, to ask: "is there anything that's really safe to eat?"

Commercial farming has little opportunity in the north, with some exceptions (geographically speaking). The northern environment posses some challenges including: soil quality, average precipitation and temperatures, light levels (durations), and the occurrence of discontinuous and continuous permafrost. Greenhouses and hydroponic grow operations are largely at this time uneconomical (in comparison to the costs of transportation of readily available and relatively inexpensive southern produced foods). The northern rural and remote communities require inputs, such as transportation and packaging, create wastes that are unplanned, causing problems that are not known and are unsustainable.

If traditional food, such as caribou, becomes scarce in a traditional territory, people have several options. If they perceive the change to

be temporary or determine a local cause for the population loss, they may go further a field to find caribou. If hunters do not have the ability to follow caribou or if there are no more caribou (extirpation) they may switch to lesser sources of food. By lesser we mean that the effort expanded to secure food is greater than the return, or the return is less then what would have been received, nutritionally speaking, for one food compared with another.

There is a feed back loop in the relationship of climate change and food security: as the climate changes so to will the security of foods and food systems. Furthermore, both are reflected, and therefore their presence can be discerned, at various ecological levels --from landscape to population. We intuitively know that as the climate changes, so to do "community patterns of traditional food use", changes that are collectively an ecosystem (Kuhnlein *et al.* 2003).

An ecosystem can be thought of as the term we give to the relationships of living and non-living organisms. That is the net pattern of relationships of growth and decline with qualities such as robustness, flips, chaos, cooperation, changes and constancy, etc. Ecosystems are composed of energy patterns, cycles and a host of organisms. All these ecosystem components and characteristics are inter-related and depend on constants, such as soil chemistry, moisture and temperature, balance between predator and prey populations, etc. Food security depends on a balance between supply and demand.

For a traditional/country food system to be secure there must be a patterned and predictable supply and reserve of a range of foods (Kuhnlein *et al.* 2003). These foods can either be seasonal or available all year; however, the sum total of traditional/country food must meet the peoples dietary requirements, a balanced diet of vitamins and nutrients that contribute to a relative state of health. Climate that is predictable and consistent, patterned and seasonal, has a profound influence on the ecosystem, with a range of human social organization(s) integral to the functioning of such systems. It is important to understand the security of what has been, is now, and is predicted to be on the land. The basis of Indigenous cultures, Dickson (2003:3) notes:

the Canadian north is vast, rich in natural resources and includes the boreal forest, taiga and Arctic ecosystems. Indigenous peoples top the food chain in all three ecosystems. Athabaskan peoples in northern Canada eat large quantities of traditional foods obtained through hunting, fishing, trapping and gathering. Since market foods are much more expensive in many northern communities than in the south, traditional food provides many components of a quality diet at relatively low cost.

Besides its nutritional values, the traditional diet is also a source of cultural strength and is critical for the social, mental and spiritual well-being of individuals and communities.

As the climate changes, either warming or cooling, can we predict the changes in precipitation, vegetation, species, etc.? Because we can assume the conditions that maintain the present system, even if we can not know for certain the conditions that created it, can we predict what the impacts will be if we warm or cool the average mean temperature over time and space? Can we begin predicting the possible future scenarios of food availability, based on what is now being used? Can we project population growth, under different climate change scenarios, with predicted traditional food consumption patterns, so we can begin to chart future demand and what this will mean to us? The impacts on the "social, mental and spiritual well-being" for northern Indigenous Peoples is not easily measured and factored.

There has been relatively few research studies to date that contribute to our understanding of future conditions under present climate change patterns. Predicting what will come to pass must be taken with a grain of salt as the systems we are talking about are profoundly complex. Cause and effect relationships are not so easy to discern, subtle changes can escape manipulation, furthermore households and communities often find innovation in adaptation to changes that are unconventional. Research studies need to focus on indicators of change and adaptation. Researchers must begin to ask how future warming trends will be managed by both modern and traditional solutions. Rather than painting an alarming picture of significant change in global systems, we need to focus on how local northern communities adapt to changes in the hydrological cycle and other ecological functions (can we assume new and radically altered functions?). Northern ecosystems are particularly vulnerable to change, mostly because change will be so dramatic (ACIA in press, Newton *et al*. in press). Research must

focus on climate change impacts in the north, including scarcity and uncertainty in traditional foods and harvesting areas (methods).

Once such research study is beginning in northern Canada (Chan, Furgal, Nickels, Dickson, Paci). The interdisciplinary team brings together the collective wisdom of McGill University and the University of Laval, with Inuit Tapiriit Kanatami, Council of Yukon First Nations, and Dene Nation. These researchers are working with three northern Indigenous communities: Deh Gah Got'ie First Nation (Fort Providence, Northwest Territories), Whitewater First Nation (Beaver Creek, Yukon) and the Inuit community of Kangiqsujuaq in Nunavik (northern Quebec). The research is a three-year project. Each of the three northern Indigenous communities is collaborating with researchers as part of a project to examine the "impacts of climate change on food security in three northern Aboriginal Communities-Plans for adaptation." The research is being funded by Natural Resources Canada, Impacts and Adaptations program, under the climate change and human health funding call.

Dr Chan, CINE at McGill University, will lead the Denendeh and Yukon investigations, while Dr Furgal, Nasivvik Centre for Inuit Health and Changing Environments at Laval University, is leading the Eastern part of this project. Both eastern and western Arctic communities will act as case studies representing different food supplies –with the main objective to understand the relative importance of food security under changing climatic scenarios. These communities are working with researchers to investigate food security issues for terrestrial freshwater systems as well as coastal systems. Northern communities differ in that they rely heavily on terrestrial, freshwater and marine resources, depending on proximity and traditional/historic patterns.

An objective of the Canadian research project is to understand the potential health impacts of climate change on an important aspect of the lives of northern Indigenous Peoples. Deh Gah Got'ie First Nation, Whitewater First Nation and Kangiqsujuaq will serve as case studies, both representing different ecological systems as well as different traditional food economies. Inuit, First Nations in the Yukon and Dene communities, like other northern communities, have strong ties to the land, in particular hunting, whaling and sealing, trapping, berry picking, and fishing. The research aims develop a framework in which to understand adaptive strategies to climate change and to identify potential impacts on food security. Research may lead to an analytical understanding of Indigenous decision-making. Applying this framework to climate change scenarios, researchers will attempt to understand the effectiveness of traditional knowledge and decision-making under chaning conditions.

There are limits to what researchers can determine. We hope to find if research can answer questions related to adaptation. While we appreciate that traditional knowledge cannot be captured in a scientific model, we know that we can record low-grade representations of traditional knowledge, as it is currently known. While traditional knowledge changes with time, is responsive and reflexive, there is a fundamental continuity and connection with the past. Researchers hope to discern the variation and thus the optimal conditions under which traditional decision-making works best. To some degree researchers hope to determine the robust nature of traditional Indigenous decision-making processes. Researchers are gathering both documentary and oral evidence of Athabaskan and Inuit traditional knowledge related to climate and climate change and its potential impacts on food security. During the first year of research a workshop is being held in each community to gather and document traditional knowledge from key community members (experienced hunters/gatherers and elders), using established research methods (Kuhnlein *et al.* 2003), adapted in collaboration with each of the research communities (in consultation with their national and regional organizations).

The project may lead to the development of protocols for strategic development, for adaptations to minimize the impacts on the communities involved; as well as to serve as a suggested framework of development for other northern communities. The integration of traditional knowledge, cultural practices, with biological information about wildlife, vegetation, toxicology, and diet (food composition, nutritients, food availability) is particular to each community. However, the methodology, if it proves effectiveness, efficacy a measure of its ability to predict food security under environmental change, it can be useful for robust decision-making, can serve as a methodology for other northern communities.

Eventually other jurisdictions, domestically, should replicate and improve the research

study. An international comparative research project should follow the Canadian studies. The Canadian research highlighted here is a step in understanding how traditional systems will cope with climate change. Ultimately more research would be needed to ensure the methods and conclusions are robust. With this said the precautionary principle urges us to also act now to prevent biological loss. The last section of the discussion paper poses questions for Northern Research Forum participants to think about under the rubric of Security and the "Resilient North", human responses to global change.

The Ability to Respond to Environmental or Human Disasters

Sir John Houghton (2003), co-chair of the Scientific Assessment Working Group of the Intergovernmental Panel on Climate Change argued global warming was a "weapon of mass-destruction… our long-term security is threatened by a problem at least as dangerous as chemical, nuclear, or biological weapons, or indeed international terrorism: human induced climate change." Climate change can trigger or exacerbate further a number of problems, such as long-range contaminants in the north. Dickson argues,

potential health effects of fluctuations of natural food resources on indigenous peoples may be indirect… environmental contaminants, long-range transport, accumulation and biomagnification in the Arctic environment will be affected by climate change. Predicting how climate change will alter contaminant mechanisms in the Canadian north in a global environmental context remains a challenge (2003:3).

Researchers from University of Laval investigating climate and health in Nunavik and Labrador are demonstrating that environmental causes for Inuit can have both direct and indirect impacts for these communities (Furgal *et al.* 2002). In many cases there are far more indirect impacts that may be much more difficult to detect, but these are just as important if not more so, in terms of the importance to the community, than many of the direct impacts. For example, hydro demands in large north American urban centers will continue to have profound effects on communities that are directly and indirectly impacted by hydro-electric developments, including increased releases of greenhouse gases and mercury (Hg).

Newton (*et al.* in press) note "with projections of more extreme natural events occurring in northern Canada research is crucial to shape climate change policies respectful of local Indigenous wisdom and the aspirations of residents to share more fully in the growth and development of northern Canada. It is by no means an easy balance to achieve, but it must be done thoughtfully, guided by integrated hazards and climate research with a strong social dimension." Climate change research has important implications for food security, more circumpolar and comparative studies are required before cause and effect relationships will be known. Implications of food security has relevance to a number of areas including: implications for civil security in a world of globalization (including media and other cultural practices), education (culturally relevant), adaptations and vulnerabilities.

Civil Security in a World of Media Globalization of Culture

There can be no civil security in a world where food safety, supply and quality, is uncertain. Uncertainty to civil security is experienced in one part of the world, because of the development patterns of industrial development and growth, followed by developed countries and exacerbated by developing countries. What role will global media play? The globalization of culture, including the hegemony of western culture, is a significant concern for researchers and policy makers. The multicultural reality of the circumpolar world, begs the question of who is being served by climate change media representations, programs and policies, research, and education?

Environmental "injustice" is at the heart of food security. Development of modern industrial food systems and consumption patterns in the developed world is a significant driver in climate change. Among those that have the choice to do so, those urban and first world economies, shelter consumers from the uncertainty of supply by developing extensive commercial centers that attract the wealth and bounty of food production systems. Developed countries are first among those that eat well (perhaps too well?), but developing countries and fourth world economies do not have a range of choices having instead shortages and narrow or lesser nutritional choices available.

Global processes are having a large impact on those that have little choice --in the northern regions of the world. There is an inequitable distribution of risk for food gathering activities, with relatively few (globally speaking) benefiting (from consumption of fuels etc.).

Media and other cultural presentations of food security issues are aimed as telling the story of industrial food systems, with little understanding of traditional food systems. There are some ethical issues here. Unfortunately, it is a combination (like in the contaminants case) of global physical processes coalescing (atmospheric currents, or UV and Arctic atmosphere): inequitable distribution of resources (money, cash economy, infrastructure), social change (modernity; lifestyle putting people at risk, but also changing health status by region), and cultural loss (culture shock, health and morbidity).

The Meaning of the National Borders in a Circumpolar World

Climate change, like environmental contaminants, show how the world, Gia, is a self-regulating and incredibly complex and resilient system of relationships. Within this complex global system of air and water currents, ecosystems and bioregions, there are extremely fragile edges and regions that can are severly impacted by domestic national patterns of consumption and waste. Nations, states, territorial and municipal governments can cause, prevent, regulate actions/contexts, to enable industrial developments. These developments may abate, contribute or fail to account for environmental costs and services. Without adequate environmental standards in any of these jurisdictions, the circumpolar world pays the price. The cumulative effects of uncoordinated and unplanned development will impact food security, as it is being demonstrated today.

In Canada, the Northern Contaminants Program (NCP) has fed into the Arctic Monitoring and Assessment Programme (AMAP). Investments to manage research, communicate results, and feed research into international instruments to reduce contaminants has been a hurclean effort by a relative few (Jensen *et al.* 1997, CACAR 2 2003, Downie and Fenge 2003). Such an effort has not yet been made with regards to climate change, rather, the efforts are uncoordinated and under funded, for example in the Canadian example there is no northern climate change program feeding into a circumpolar process (not like there was on the contaminants issue).

What is sovereignty in the face of climate change? Global processes do not recognize the efforts of one state over the other. Preferential tax systems, exchange rates, languages, political structures, border guards, these mean nothing to moving tree lines, degredation of permafrost, or an ice-free polar ice cap. Climate change, in particular warming, will continue to be an issue that draws together all eight nations, either within the Arctic Council (as is the case with the Arctic Climate Impact Assessment Report to be released in the fall of 2004), or other international fora (Nordic Ministers, Baltic States, European Union, United Nations, NATO, etc.)

Culturally Relevant Education

How do we now talk about climate change and food security? The environment, communities, and the world is always in a state of change, chaotic but ultimately predictable and constant birth and death. The right context needs to be brought to this discussion. As we have said elsewhere in this paper, various forms of knowledge and understanding different aspects of the issues, and all knowledge ought to be utilized and respected.

All to often we find southern education, western systems of knowledge, dominating the education of northern peoples, in particular northern Indigenous Peoples. The systems of education that were in effect prior to contact and colonization are complex systems. Today's education has been steeped in a rather short colonial history across the circumpolar north (Paci 2002, Bravo and Sorlin 2002). University of the Arctic, as well as curriculum from circumpolar universities, and those with a research/teaching focus on northern issues, are improving on past efforts. For example, Indigenous language teaching is addressing the hegemony and loss of small language families.

Food security is intimately linked to education. Students and teachers will value (and eat) foods that are advanced by their institutions and curriculum. The development of culturally relevant education must permeate all aspects of northern Indigenous peoples lives, as well as reflecting their values. The double bind most jurisdictions find themselves in, simply, is the trap of national standards and educational

structures that erase local/regional interests. The many conflicts between "a national culture" and the plurality of Indigenous cultures goes beyond standards, to include assumptions about the viability of multiple cultures. If education is to support food security, it must advance traditions and plurality, while serving the larger interests of improving how we relate to each other and ensure the environment for future generations. Culturally relevant education must marry western science with traditional knowledge, both in delivery (pedagogy) as well as in research used to support our lessons.

Adaptation and Vulnerability in the Context of Global Change

The literature on climate change often speaks about the adaptation and vulnerabilities of northern communities. It is true that rural, remote and resource-based economies are sensitive to global changes, economic as well as environmental. Housing, education and health care infrastructure (facilities and human resources) and services are examples of areas where rural and remote communities lack adequate coverage. Sensitivity comes from population shifts and dependence for services on a local tax base. Perhaps northern communities are even more sensitive due to lack of access to services and markets that are external to the local community. We are seeing the urbanization of some northern cities, which were at one time villages, cities that are not sustainable, except for the cash economies created by natural resource booms.

What is often undervalued in the discussions about impacts and adaptations is a complete understanding of traditional economies, which are closed systems dependent on local resources. Traditional economies in a modern context are not entirely closed systems. There exists a balance between import/export of goods and services (movement of people). The replacement of local capacity to adapt and address vulnerabilities that may be exposed by global change is a paradox. For example, the services supplied by traditional economies, the value of traditional/country foods go beyond food, "Traditional foods can also provide protection against many diseases, which are more prevalent among southern populations. Environmental influences on the availability of and access to these important sources of food, present the risk of losing these beneficial factors as well" (Dickson 2003:3). If we replace local food with imported food, the imported foods are often the lowest quality: highest in saturated fats, preservative, processed, etc. Van Oostdam (*et al.* 2003:i) note "traditional/country food are an integral component of good health among Aboriginal peoples. The social, cultural, spiritual, nutritional and economic benefits of these foods must be considered in concert with the risks of exposure to environmental contaminants through their consumption of traditional/country foods."

Conclusions

In the preface to the Arctic Monitoring Assessment Programme (2002:v), the Indigenous Peoples Secretariat (of the Arctic Council), included a statement prepared for the Permanent Participants, who called on "the nations of the world to increase efforts to develop international instruments to deal with the effects of mercury and other heavy metals that threaten the human and environmental health of the Arctic and the world."
Dickson (2003:3) notes "the effects of climate change in the north on indigenous peoples' ability to locate and procure these physically, social, culturally, mentally and economically important food sources are not simply predictions for the future, they are a reality in many communities today. However, the extent of these impacts and their implications for the nutritional well-being of individuals and communities is not yet well understood." More research is needed on food security, on climate change, research that engages Indigenous communities in coordination with regional/national and international processes. The engagement must meet the tests of respectful and responsible research, beyond the ethical reviews of universities and colleges far removed from the peoples and lands under scrutiny. The Northern Research Forum provides us an opportunity to build research partnerships and alliances. Ultimately our success in understanding the resilient north will depend on how well we integrate traditional knowledge and western science.

Changes related to climate variables and the impacts these changes have on communities are being reported and documented in some northern regions (for example ACIA). The Dene and other Athabaskans, Inuit, Metis, Sami, Aluetians, Russian Indigenous Peoples, are contributing case studies from domestic processes. For example the Dene have the Denendeh Environmental Working Group, funded by Environment Canada under the

Northern Ecosystem Initiative. Climate change observations and views in the north are being included in the Arctic Climate Impact Assessment Report. Moreover, climate change is being lived in the circumpolar north and Indigenous Peoples are talking about the changes they are seeing in the land. They are again turning to scientists, the south and the international world to halt what is fast becoming a losing war. The challenge for southern and northern peoples will be to ascertain the relationship between these changes, experienced as they are as pressures on local food security, and to work collectively to develop appropriate adaptation responses and strategies. Ultimately we have all got to work to minimizing risks and to take advantage of any opportunities these changes create for the future.

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[i] Dr Paci is the Manager of lands and environment, Dene Nation. He is an advisor to the Arctic Athabaskan Council (AAC)-Canada. AAC is one of six Permanent Participants to the Arctic Council.

[ii] Mrs Dickson is the Executive Director, AAC, and works for the Council of Yukon First Nations (CYFN). She is a member of the Vuntut Gwich'in Old Crow.

[iii] Dr Nickels is the Director of environment, Inuit Tapiriit Kanatami (ITK).

[iv] Dr Chan is an National Science and Engineering Research Council (NSERC) Northern Research Chair and a faculty member of Center for Indigenous Nutrition and Environment (CINE), McGill University. He is co- principle investigator on the Climate Change Impacts Adaptations Directorate (Natural Resources Canada -NRCan), Earth Science Secretariat research on climate change and human health, under the Impacts and Adaptation Program.

[v] Dr Furgal is a faculty member of Center for Health University of Laval (CHUL) and a co-lead of the Arctic Climate Impact Assessment Report (ACIA) Health Chapter. He is also co- principle investigator on the NRCan funded project.