

ASSESSING THE IMPACTS OF CLIMATE CHANGE ON FOOD SECURITY IN THE CANADIAN ARCTIC

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Frozen turkey in grocery store, Arctic Bay, Nunavut



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Prepared by GRID-Arendal (Stephanie Meakin and Tiina Kurvits) for Indian and Northern Affairs Canada, March 2009

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The right to food, as one specific aspect of a worthy standard of living, is a fundamental human right. To live a healthy and productive life, however, the right to food must include a reliable supply of food. **This concept is known as food security.**

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“All the other impacts of climate change – rising sea levels, bigger hurricanes and storm surges, the migration towards the pole of diseases now confined to the tropics – will arrive on schedule or before, but nothing matters as much to human beings as the food supply.”

Gwynne Dyer, 2008

INTRODUCTION

Canada is internationally recognized as an economically wealthy and progressive country. Hunger is not an image that many associate with a G8 country that so often ranks at the very highest levels of the United Nations Human Development Index. However, hunger continues to be a regular occurrence for many Canadians, especially those who face poverty, and for those who live in very isolated communities where access and the high cost of living is a daily reality.

If there are two global issues that have come into favour in the last decade it would have to be climate change and food security. Food security, like climate change, is a multi-faceted issue. It is affected not only by obvious influences such as climate and weather but also by oil and commodity prices, trade and social policies, global politics, and population growth, to name just a few. Bringing the two together to determine how climate change may impact food security is complex. Sir Nicholas Stern recognized this when he wrote in his 2007 landmark analysis, *The Economics of Climate Change*, “Climate change will have a wide range of effects on the environment, which could have knock-on consequences for food production. The combined effect of several factors could be very damaging.” The impacts of climate change on food security is a vital challenge and a particularly critical one for vulnerable regions such as the Arctic.

The recent food security “crisis” can be attributed to many factors. The last two years, however, have seen the convergence of critical global occurrences that have in essence produced a perfect storm that will ultimately see the Arctic and world food crisis worsen. In light of this it is becoming increasingly difficult to maintain food security in a world beset by a confluence of “peak” phenomena: peak oil prices, peak water scarcity, peak grain prices, and peak fish exploitation. Combined with the global financial crisis, global warming, and an explosion in world

population, humanity may well be on the verge of a great “food security” crisis.

It is generally accepted that the term ‘food security’ means, in simplest terms, “access to nutritious food.” The health and well-being of Northerners, and, especially of Arctic indigenous peoples, are directly linked to food security and in particular, their relationship to customary ‘country food’ which encompasses community sharing, cultural continuity, and intergenerational communication.

The Arctic, being on the frontlines of climate change, will be forced to address food security sooner than other regions of Canada and many other areas of the world. How the Arctic responds to this crisis may well provide valuable directions to others and by participating in programs such as Many Strong Voices, the Arctic can work together with other vulnerable or remote communities to find solutions to the food security challenge.

As politicians begin to recognize the holistic nature of global environmental phenomena and the impacts of policy decisions, the connection between climate change, mitigation and food security has become a priority issue. We see now the debate over the efforts to mitigate CO₂ emissions by converting food crops to biofuels and the effects that might be having on the global food supply. Similarly, more concerns are being expressed over the impacts of the changing climate on the ability to grow food in certain regions of the country or to harvest food from the land.

Food security is a vast and complex topic, standing at the intersection of many disciplines. This paper will briefly touch upon the myriad of influencing factors, examining the impacts of climate change on food security in the Canadian Arctic and how it compares to other global regions, and consider options for maintaining food security.

Box 1. Many Strong Voices – Linking the Arctic and Small Island Developing States

The Arctic and Small Island Developing States (SIDS) share both vulnerability and resilience characteristics that make these disparate regions natural allies in the struggle against climate change. The Many Strong Voices (MSV) Programme, coordinated by UNEP/GRID-Arendal, helps build creative partnerships between communities in the Arctic and SIDS focusing on three inter-connected objectives: research, capacity building, and communication (<http://www.manystrongvoices.org>). It focuses on incorporating climate change adaptation into community planning and decision-making, and attempts to link local knowledge and scientific research to support community adaptation planning. Food security was as an important issue at an MSV workshop held in Washington, D.C. in March 2009.

DEFINING THE SCOPE OF THE STUDY – THE CANADIAN NORTH

Food security is an all too common reality in Canadian northern communities. The challenges of sustaining proper nutrition and of accessing sufficient, healthy food robs northern communities of their potential, impacts their development, and places hardships on the most vulnerable community members.

Understanding and addressing food security is difficult due to its complex and multidimensional nature. Some factors are local, while others are regional, national, and global. Hence, a part of dialoguing issues and solutions requires the involvement of a range of stakeholders who play various roles at different levels in the process of providing food and food information to a community.

Northern communities, however, face more challenges to attaining food security than those faced by more southern and developed communities in Canada. High transportation costs, high food costs, food quality, community remoteness, increasing dependency on southern foods, lack of dietary awareness, lack of economic opportunities and employment, the increasing challenges and costs of wildlife harvesting – these factors and others contribute to increasing concerns over the level of food security in the North.

While food security in the North has been a concern to governments, health agencies, and non-government organizations for the past two decades, there are indications that recent developing trends

in both the North and globally are exacerbating the situation and threaten to hasten the erosion of food security in the near future.

In order to understand and address this challenge, there is a strong need for stakeholders to move forward to build a strategy and establish action plans to effectively monitor food security and to take steps to increase the access of northern families to sufficient amounts of healthy, appropriate, and secure food sources in the North. In context, food sources for northern communities include both store bought foods and harvested country foods.

STUDY OBJECTIVE

The objective of this study is to provide a preliminary assessment of the impacts of climate change on food security in the Canadian Arctic, examining the scope of the issue in this region, comparing it with experiences in other vulnerable regions, and providing a baseline for action. The information gathered in the study will provide the background for a workshop on Arctic food security, tentatively proposed for FY 2009–2010, which will bring together different interests in the field of food security to examine the issue in greater detail with the aim of identifying actions to help communities and governments respond to the effects of climate change on food security.

The paper aims to address the following three questions regarding the current state of food security in the Canadian Arctic. These questions may also provide the basis for an Arctic Food Security Conference.

- Where are the gaps in knowledge and action with respect to the challenge that climate change poses for Arctic food security?
- What needs to be done to ensure a comprehensive, interdisciplinary, and multi-stakeholder approach to achieving food security in the Arctic?
- What modalities are required for a long-term and sustained approach to addressing food security in the Arctic?



Caribou is an essential part of the northern indigenous peoples' diet. Apart from the meat, many other parts are edible, including the stomach contents and even the hooves. Caribou-skin clothing is unsurpassed for lightweight warmth in extreme cold.



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GEOGRAPHIC SCOPE OF STUDY

A common definition of Canada's North used in this paper includes the three territorial administrative regions north of 60° latitude (Yukon, Northwest Territories, and Nunavut) as well as the region of Nunavik, north of 55° in the province of Québec and the Inuit settlement region of Nunatsiavut within Labrador. The latter two regions comprise communities with large Aboriginal populations and share many biogeographic characteristics with the territorial Arctic. Together, this region covers approximately 60% of Canada's landmass.

The vast coastline, islands, and permanent multiyear ice found in Canada's North are rich in geography and biodiversity. The diversity of the regions' ecosystems, climate, and cultures forms a socio-ecologic collage across the top of the country. Communities are spread along Canada's northern coastline and interior, and the land and sea provide northern residents with a primary source of nutrition and form a central part of their livelihoods and cultures (Van Oostdam *et al.* 2005).





Northerners have witnessed profound environmental, social, political, and economic changes in recent decades (Wonders 2003). Research on both contaminants and climate change has uncovered what many northerners have known for some time: the Arctic environment is stressed and irreversible changes are occurring to it. At the same time, many communities are transitioning economically, having become more permanent than they were 40 years ago. Many communities now have a mixed economy of traditional or land-based activities and wage employment, with many of these now associated with large-scale development of non-renewable natural resources (e.g., mining).

Just over half of the approximately 100,000 northern residents are Aboriginal and belong to distinct cultural groups including the Yukon First Nations (Yukon), Dene, Métis and Gwich'in (Northwest Territories), and Inuit (Nunavut, Nunavik, the new Inuit land claim area of Nunatsiavut within the region of Labrador, and the Inuvialuit Settlement Region of the Northwest Territories). Many of the communities are characterized by an increasingly young and rapidly growing population: 54% of the population of Nunavut is less than 15 years of age compared with the national average of 25% (Statistics Canada 2006). The non-aboriginal population is made up of northern born multi-ethnic populations and migration of southern Canadians and others to the north.

Many northern communities still experience lower health status than their southern counterparts. Life expectancy, for example, among Aboriginal people in some regions, such as Nunavik, is as much as 12 years lower than the national average for both sexes (Statistics Canada 2001). In addition, many remote communities are challenged by limited access to health services, lower than average socioeconomic status, crowding and poor-quality housing, and concerns regarding basic services such as drinking water quality (Statistics Canada 2001).

Despite these challenges, all northern cultures retain a close relationship with the environment and a strong knowledge base of their regional surroundings. Even today, the environment and the country foods that come from the land, lakes, rivers, and sea remain central to the way of life, cultural identity, and health of northern Aboriginal people (Van Oostdam *et al.* 2005). More than 70% of northern Aboriginal adults harvest natural resources through hunting and fishing and of those, more than 96% do so for subsistence purposes (Statistics Canada 2006). This strong relationship with their environment plays a critical role in the ability of northern Aboriginal peoples to observe, detect, and anticipate changes in their natural environment and to contribute to their community food security.

FOOD SECURITY AND THE IMPACTS OF CLIMATE CHANGE

FOOD SECURITY / INSECURITY

Food security is defined by the Food and Agriculture Organization of the United Nations as, “when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary and food preferences for an active and healthy life,” (FAO 1996). A household is considered food secure when its occupants do not live in hunger or fear of starvation. The United Nations Food and Agriculture Organization (FAO) defines the four aspects of food security as follows:

- **Food availability** is determined by the physical quantities of food that are produced, stored, processed, distributed, and exchanged.
- **Food accessibility** is the ability to secure the resources (including legal, political, economic, and social) to access food.
- **Food use** refers to how food is used and how people secure essential nutrients from food and includes the nutritional value of the diet, social values of foods, and the quality and safety of the food supply.
- **Food system** stability or sustainability is determined by the temporal availability of, and access to, food (FAO 2008).

Food security in Canada is defined as the requirement of adequate amounts of safe, nutritious, culturally acceptable food, accessible to all in a dignified and affordable manner (Koc & MacRae 2001). For residents of the Canadian Arctic, the ready availability of nutritious foods, and an assured ability to acquire personally acceptable foods, plays an essential role in meeting psycho-social and physiological needs (Campbell 1997).

FOOD INSECURITY

Food insecurity has been described as “a condition in which people lack basic food intake to provide them with the energy and nutrients for fully productive lives,” (Hunger Task Force, 2008). Impacts from food insecurity include a broad range of direct health issues including diabetes, cardio-

vascular problems and generally compromised health for individuals. Social impacts include increased tension in households, increased lethargy, poor school performance, and a range of other social ills. Together, these factors inhibit the development of healthy, active and productive communities and citizens. (ITK, Food Security Workshop, 2007).

The State of Food Insecurity in the World 2008 states that “the poorest, landless, and female-headed households are the hardest hit” by increasing food prices (FAO 2008). It gives two reasons for this:

- women tend to spend proportionally more on food than male-headed households so are hit harder by price increases
- women face a variety of gender-specific obstacles that limit their ability to produce more food and so benefit from higher food prices.

The report was looking at data from Albania, Bangladesh, Ghana, Guatemala Malawi, Nicaragua, Pakistan, Tajikistan, and Viet Nam. In the Arctic 50% of households are headed by women.

Box 2. Food Security Definitions

Two commonly used definitions of food security come from the UN’s Food and Agriculture Organization (FAO) and the United States Department of Agriculture (USDA):

- Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. (FAO)
- Food security for a household means access by all members at all times to enough food for an active, healthy life. Food security includes at a minimum (1) the ready availability of nutritionally adequate and safe foods, and (2) an assured ability to acquire acceptable foods in socially acceptable ways (that is, without resorting to emergency food supplies, scavenging, stealing, or other coping strategies). (USDA)

“Nutrition is an input to and foundation for health and development...better nutrition means stronger immune systems, less illness and better health. Healthy children learn better”
 World Health Organization, 2007

Box 3. World Food Prices

The years 2007–2008 saw dramatic increases in world food prices, creating a global crisis and causing political and economical instability and social unrest in both poor and developed nations. Systemic causes for the worldwide increases in food prices continue to be the subject of debate. Initial causes of the late 2006 price spikes included unseasonable droughts in grain-producing nations and rising oil prices. Oil prices further heightened the costs of fertilizers, food transport, and industrial agriculture. Other causes may be the increasing use of biofuels in developed countries and an increasing demand for a more varied diet across the expanding middle-class populations of Asia. These factors, coupled with falling world-food stockpiles have all contributed to the dramatic worldwide rise in food prices. Long-term causes remain a topic of debate. These may include structural changes in trade and agricultural production, agricultural price supports and subsidies in developed nations, diversions of food commodities to high input foods and fuel, commodity market speculation, and climate change. As of 2009, food prices have fallen significantly from their earlier highs, although some observers believe this decrease may be temporary.

Food insecurity in Canada is strongly associated, although not exclusively so, with low household income, according to Statistics Canada (2001). One-third of people residing in low-income households reported some form of food insecurity in 1998/99 and almost as many people reported that they felt their diet had been compromised (The Daily 2001). Approximately 58 % of households relying on social assistance reported food insecurity.

The FAO has examined the impact of high food prices on household welfare. The empirical analysis described in this section shows that, in the short term, the vast majority of poor urban and rural households are hit hardest by higher prices. Among the poor, it is the landless and female-headed households that are most vulnerable to sharp rises in basic food prices. The 2000/2001 Canadian Community Health Survey reported the following statistics indicating the percentage of the population food insecure: PEI and Ontario 13%; Quebec 14%; Manitoba 14.7%; New Brunswick

and Newfoundland and Labrador 15%; Alberta, Saskatchewan, Nova Scotia and British Columbia 17%; Yukon 21%; Northwest Territory 28%; Nunavut 56%. The situation is not improving: the 2007 census reported 71% of households in Nunavut as being food insecure.

The cost of a healthy food basket in some Inuit communities is at least two times higher than a comparable basket in southern Canada (Indian and Northern Affairs Canada 2008b) while incomes for Inuit are much lower. In 2005, the median income for the total population of Canada aged 15 and over was \$25,615 compared to \$16,970 for Inuit (Statistics Canada 2006). In addition, the cost of clothing and other products is higher in the Arctic which further contributes to poverty (Bernard 2006).

The average cost of a total food basket¹ in the north is as follows:

Labrador and Nunatsiavut	\$146.00–196.00
Nunavik	\$222.00–244.00
Nunavut	\$275.00–322.00
NWT	\$159.00–343.00
Yukon	\$163.00–388.00
Ottawa	\$166.00

The 2006 Aboriginal Peoples Survey showed that 30% of Inuit children in Canada had experienced hunger at some point because the family had run out of food or money to buy food. In Nunavut, nearly four in 10 (39%) Inuit children aged 6 to 14 had experienced hunger. One-third (33%) of Inuit children in Nunavik and 30% in Nunatsiavut had been hungry because the family had run out of food or money to buy food. Figures were lower in the Inuvialuit Region (12%) and outside Inuit Nunaat (8%). Nationally, among Inuit children who had experienced hunger, this was not a regular

1. Cost is for 2006 unless otherwise indicated. The Northern Food Basket is comprised of 46 items, based on Agriculture Canada’s Thrifty Nutritious Food Basket used to monitor cost of a nutritious diet for a lower-income reference family of four (a girl 7–9 years, a boy 13–15 years, and a man and woman 25–49 years of age). Source: Indian and Northern Affairs Canada (INAC), 2007.

occurrence for one-third (33%). In addition, for 13%, this happened every few months. However, for 24%, it happened regularly at the end of the month while an additional 21% had experienced hunger more than once a month (APS 2006).

Worldwide around 852 million people are chronically hungry due to extreme poverty, while up to 2 billion people lack food security

intermittently due to varying degrees of poverty (FAO, 2003). As of late 2007, increased farming for use in biofuels, world oil prices at more than \$100 a barrel, global population growth, climate change, loss of agricultural land to residential and industrial development, and growing consumer demand in China and India have pushed up the price of grain. 2008 saw unprecedented food riots in many countries across the world.

Box 4. Food for Fuel

Lester Brown, President of the Earth Policy Institute and founder of the Worldwatch Institute think tank, said in 2008: "The competition for grain between the world's 800 million motorists, who want to maintain their mobility, and its 2 billion poorest people, who are simply trying to survive, is emerging as an epic issue." In 2007, US farmers distorted the world market for cereals by growing 14 m tonnes, or 20% of the whole maize crop, for ethanol for vehicles. This took millions of hectares of land out of food production and nearly doubled the price of maize. In 2008, former US President George W. Bush called for steep increases in ethanol production as part of plans to reduce petrol demand by 20% by 2017. Yet Brown (2009) writes that "even if the entire U.S. grain harvest were diverted into making ethanol, it would meet at most 18 percent of U.S. automotive fuel needs. The grain required to fill a 25-gallon SUV tank with ethanol could feed one person for a year."

Maize is a staple food in many countries which import from the US, including Japan, Egypt, and Mexico. US exports are 70% of the world total, and are used widely for animal feed. Shortages in maize have disrupted livestock and poultry industries worldwide. "The use of food as a source of fuel may have serious implications for the demand for food if the expansion of biofuels continues," reports the International Monetary Fund. The outlook is widely expected to worsen as agro-industries prepare to switch to highly profitable biofuels. Research by Grain, a Barcelona-based food resources group, suggests that the Indian government is committed to planting 14 million hectares (35 million acres) of land with jatropha, an exotic bush from which biodiesel can be manufactured. Brazil intends to grow 120m hectares for biofuels, and Africa as much as 400m hectares in the next few years. Much of the growth, the countries say, would be on unproductive land, but many millions of people are expected to be forced off the land. In a similar vein, Oxfam has warned the EU that its policy of substituting 10% of all car fuel with biofuels threatens to displace poor farmers.

CLIMATE AND CLIMATE CHANGE IN THE CANADIAN ARCTIC

The Canadian North warrants particular attention with respect to climate change for a number of reasons. Despite a small and dispersed population, the circumpolar Arctic is recognized as being an increasingly significant region in global environmental, political, and economic systems, much of this driven by the warming climate. The Arctic regions are important for global climate regulation and because they provide extensive areas that remain wild and relatively unaffected by human activities; these regions serve as critical areas for many culturally and otherwise important migratory species that are important components of global biodiversity (Chapin *et al.* 2005). The increasing level of mineral exploration and extraction activities, the significant but as yet unharnessed oil and gas reserves, and the rising importance of northern development sites to global markets has increased

the importance of this region in the global economy. With warming and projected decreases in sea ice cover and extent, and the potential increased access and travel through the Northwest Passage in the future, the Canadian North is projected to garner significant attention, and to undergo potentially significant further and irreversible change.

The breadth of scientific research on the Canadian northern environment has grown significantly in recent decades. Scientific research, monitoring, and observations and the knowledge we have acquired from northerners (indigenous and non-indigenous) and scientists have resulted in an awareness that changes are taking place.

Observed trends vary depending on the region and period analyzed. The western and central Arctic,

Box 5. Assessing climate change in the Arctic

The Arctic Climate Impact Assessment (ACIA) report released in 2005 was the first comprehensive review of climate change science for the Arctic. The key findings of ACIA included:

1. Arctic climate is now warming rapidly and much larger changes are projected.
2. Arctic warming and its consequences have worldwide implications.
3. Arctic vegetation zones are projected to shift, bringing wide-ranging impacts.
4. Animal species' diversity, ranges, and distribution will change.
5. Many coastal communities and facilities face increasing exposure to storms.
6. Reduced sea ice is very likely to increase marine transport and access to resources.
7. Thawing ground will disrupt transportation, buildings, and other infrastructure.
8. Indigenous communities are facing major economic and cultural impacts.
9. Elevated ultraviolet radiation levels will affect people, plants, and animals.
10. Multiple influences interact to cause impacts to people and ecosystems (ACIA 2005).

The more recent 4th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC AR4) concluded that warming of the climate is "unequivocal" and that most of the recent global warming is "very likely" due to anthropogenic greenhouse gas emissions (IPCC 2007).

for example, has experienced a general warming of approximately 2–3°C over the past 30–50 years (Weller *et al.* 2005). This warming is more pronounced in winter months. It was not until the last 15 or so years that this same warming trend, although not to the same extent, has been observed in eastern regions of the Canadian Arctic. Observed impacts associated with these changes include a significant thinning of sea- and freshwater ice, a shortening of the winter ice season, reduction in snow cover, changes in wildlife and plant species' distribution, melting permafrost, and increased coastal erosion of some shorelines (Cohen 1997; Huntington and Fox 2005; Ouranos 2004; Weller *et al.* 2005).

According to the Arctic Climate Impact Assessment (ACIA) designated climate models, the predictions are for increased warming and precipitation throughout the Canadian Arctic (ACIA 2005). Annual mean warming in the west is projected to range between 3 and 4°C and upwards of 7°C in winter months. Winter warming is expected to be greatest in the more centrally located areas of southern Baffin Island and Hudson Bay (3–9°C). A 30% increase in precipitation is

Box 6. Climate change in the Arctic – the view since ACIA

Reports of the size and scope of ACIA and IPCC AR4 can hardly keep up with the science and new findings are continually being released, changing projections for the Arctic. An update of climate impact science since ACIA made three significant observations:

1. Arctic climate change impact trends described in ACIA continue through the Arctic.
2. While the science is improving for many of the systems studied, none of the trends noted in ACIA were found to have reversed.
3. Change is occurring on all Arctic system levels, impacting both physical and biological systems, as well as human societies.

For several key Arctic systems, especially Arctic sea ice and the Greenland Ice Sheet, recently observed changes are happening at rates significantly faster than predicted in previous assessments, including ACIA and IPCC AR4 (WWF 2008).

predicted by the end of the 21st century, with the greatest increases occurring in areas of greatest warming (Weller *et al.* 2005). The predicted impacts on the environment, regional economies, and people are far reaching. Recent research projects have begun to identify specific local vulnerabilities and the risk management measures/adaptation strategies that are already in place or that can be planned (e.g., Berkes and Jolly 2002; Ford *et al.* 2006; Nickels *et al.* 2002); however, very little attention has been given to health impacts and adaptations in this region to date.

There is strong evidence that the Canadian Arctic, like other circumpolar regions, is already experiencing changes in its climate (Huntington *et al.* 2005; McBean *et al.* 2005; Ouranos 2005; Bonsal and Prowse 2006). According to the ACIA, over the past 30 to 50 years the western and central Canadian Arctic have experienced a general warming, most dramatically during winter months, of approximately 2–3°C (Weller *et al.* 2005). Although significant cooling (–1.0 to –1.5°C) was reported for the period of 1950–1998 for the extreme northeast regions, warming is

now reported for recent years (Zhang *et al.*, 2000). As well, community residents, Aboriginal hunters and Elders have reported significant warming throughout the North in recent decades, corroborating the scientific observations and describing the impacts these changes have already had (Huntington *et al.* 2005; Nickels *et al.* 2006). According to both scientific measurements and local knowledge, these climatic changes have led to significant decreases in the extent and thickness of winter sea ice throughout Canadian Arctic waters, melting and destabilization of permafrost, increased coastal erosion of low-lying areas, and shifts in the distribution and migratory behaviour of some Arctic wildlife species. The current and future implications of these changes for human communities in the North are far-reaching. The complex changes in northern climate and environmental systems observed to date require greater understanding and involvement by individuals and institutions to accurately assess the impacts of these changes on the health of some of Canada's most vulnerable populations and to aid in the development of effective adaptation strategies to minimize risks to health in this region (Ford *et al.* 2006; Furgal and Séguin 2006).

The increased pressures that polar regions are experiencing imply that they are approaching critical thresholds (such as thawing of permafrost and

vegetation change), yet the exact timing and nature of these thresholds are not well known. Crossing these thresholds will likely trigger a cascade of effects, with significant impacts (some positive and some negative) on human health and well-being (Chapin *et al.* 2005). Northern communities and the northern public health system may very well be a bellwether for vulnerable populations in other parts of Canada and the world. How communities are adapting to what is already occurring may provide valuable knowledge to support proactive adaptation in other regions.

Finally, there is a sense of environmental injustice in relation to the issue of climate change and northern health. The Arctic regions are reported to be the first to experience climate change and its related impacts, and these regions are where change may be the greatest (Intergovernmental Panel on Climate Change (IPCC) 2001). These regions are also where large groups of Aboriginal people reside; they are still inextricably tied to their local environments through culture and tradition, and are reliant upon the natural environment for many aspects of livelihoods, health, and well-being. Northern residents (and the regions in which they live) are in general among the lowest proportional contributors to greenhouse gas (GHG) emissions in the country yet it is these populations, and particularly Aboriginal residents, who are the most exposed and potentially most vulnerable to climate change health impacts in Canada.

Box 7. Global Climate Change Effects

According to the 2007 IPCC UN climate report, the Himalayan glaciers that are the principal dry-season water sources of Asia's biggest rivers – Ganges, Indus, Brahmaputra, Yangtze, Mekong, Salween, and Yellow – could disappear by 2035 as temperatures rise. Approximately 2.4 billion people live in the drainage basin of the Himalayan rivers. India, China, Pakistan, Afghanistan, Bangladesh, Nepal, and Myanmar could experience floods followed by severe droughts in coming decades. In India alone, the Ganges provides water for drinking and farming for more than 500 million people. The west coast of North America, which gets much of its water from glaciers in mountain ranges such as the Rocky Mountains and Sierra Nevada, also would be affected. In addition to loss of freshwater from melting glaciers, sea level is also reported to rise as climate changes progresses, reducing the amount of land available for agriculture and increasing saltwater intrusion, particular concerns for developing nations.

In other parts of the world a big effect will be low yields of grain according to the World Food Trade Model, specifically in the low latitude regions where much of the developing world is located (FAO, 2006). As a result, the price of grain will rise, along with the developing nations trying to grow the grain. For every 2–2.5% price increase, the number of hungry people will increase by 1%. In addition to low crop yields, the timing and length of the growing seasons is also expected to change dramatically due to unknown changes in soil temperature and moisture conditions (USDA, 2006)

CLIMATE CHANGE AND FOOD SECURITY IN THE CANADIAN ARCTIC

Climate change poses a threat to country food security in northern regions because it influences animal availability, human ability to access wildlife, and the safety and quality of wildlife for consumption. Decreased access to winter forage (lichen and other vegetation) as a result of harsh winter weather – including heavy snow events and increased icing associated with temperature variability, and winter occurrence of freezing rain – is reported to be associated with significant animal die-offs and a steep decline in the populations of some central and western Arctic caribou herds (Miller and Gunn 2003; Harding 2004; Gunn *et al.* 2006; Tesar 2007). Declines have been so severe in recent years that managers are contemplating limiting the non-resident and non-Aboriginal harvest to protect herds and support recoveries (Tesar 2007).

Residents from both the Yukon (Beaver Creek) and the NWT (Deh Gah Got'ie First Nation, Fort Providence) communities are witnessing changes in climate that are affecting the availability of species and residents' ability to access and harvest them, and hence likely their nutrient intake from these traditional foods (Guyot *et al.* 2006). In some cases, residents are already having to shift or adapt harvesting activities and reduce their consumption of some species, and in other cases, they are able to increase their take of other animals that are moving into their region and becoming more common. Work conducted by Riedlinger (1999), Furgal *et al.* (2002), Ford *et al.* (2006), Nickels *et al.* (2006), and others, with Inuit residents throughout the North, report similar results.

Lower water levels in rivers and ponds in Labrador were reported to negatively impact access to and health of fish species (Furgal *et al.* 2002; Communities of Labrador *et al.* 2005). Higher winds around Nunavut and Nunavik communities were reported to make travel and hunting more difficult and dangerous by boat in the summer; therefore, opportunities for hunting seals and whales in open water were limited (Ford *et al.* 2006; Nickels *et al.*, 2006). In the Inuvialuit Settlement Region, Nunavut, and Nunavik, the increased length of the ice-free season and decreased ice thickness resulting from warming winter temperatures was reported to reduce, and make more dangerous, access to ice-dependent

wildlife species (e.g., ringed seal and polar bear) and other species commonly hunted from the ice (e.g., narwhal) (Ford *et al.* 2006; Nickels *et al.* 2006).

What these and other climate-related impacts to food availability and accessibility mean in terms of shifts in per capita consumption of wildlife species nutrient intake throughout Arctic communities is currently a topic of significant study. In addition to providing significant health benefits, country food species are the most significant source of exposure to environmental contaminants, such as polychlorinated biphenyls, mercury, and lead, for northern residents (Van Oostdam *et al.* 2005). The uptake, transport and deposition of many of these contaminants are influenced by temperature. Therefore, climate warming is likely to indirectly influence human exposure to these contaminants which, among other effects, are known to adversely affect immune and neuromotor functioning in children (AMAP 2003; Després *et al.* 2005; Kraemer *et al.* 2005).

Further, Booth and Zeller (2005) reported that projected climate warming in the North Atlantic (0.4–1.0°C) over the current century will increase rates of mercury methylation and hence concentrations in marine species between 1.7% and 4.4%. These increases could have implications for human exposure via consumption of some fish and marine mammals in these regions. Developing fetuses and young mothers are those most vulnerable to contaminant exposure (Van Oostdam *et al.* 2005). Currently, levels of exposure to mercury and other contaminants among some segments of the population in Nunavik and Nunavut exceed Canadian and international safety guidelines; advisories or consumption advice attempt to limit exposure (Van Oostdam *et al.* 2005).

COUNTRY/TRADITIONAL FOODS

Aboriginal residents maintain a strong and vital connection to the Arctic environment through traditional and subsistence activities of hunting, fishing and gathering a variety of animal and plant species. Many Northerners regularly harvest country foods, i.e., 68% Inuit report harvesting country foods. But for those families who cannot participate in harvesting activities, overpriced, store-bought food is the alternative. The use of non-traditional



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foods is causing financial and nutritional problems for families. Some families cannot afford to eat; the Government of Canada has reported that 30% of Inuit children go hungry (ITK 2008).

The traditional and cultural importance of hunting, fishing, and gathering activities distinguishes them from other northern residents. Country food-related activities have crucial economic and dietary importance; they are also important in maintaining social relationships and cultural identity (Nuttall *et al.* 2005). Food items collected from the land, sea, lakes, and rivers, continue to contribute significant amounts of protein to the total diet, and help individuals to meet or exceed daily requirements for several vitamins and essential nutrients. In some instances, they protect individuals from some types of cardiovascular disease and contaminant toxicity (Blanchet *et al.* 2000; Kuhnlein *et al.* 2000; Van Oostdam *et al.* 2005).

Country food still makes up a large percentage of the fish and meat eaten by many northern families. In 2006, 65% of Inuit in Inuit Nunaat lived in homes where at least half of the meat and fish consumed was country food. This was more common in Nunatsiavut (79%) than in the other regions: 66% in Nunavut and the Inuvialuit Region and 59% in Nunavik. The lower figure for Nunavik could be affected by a large percentage of people who responded “don’t know” or who did not provide a response (16%).

Dietary survey work conducted throughout the North with Yukon First Nations, Dene, Métis, and Inuit communities shows the extent of use of these foods on a regular basis. In the Yukon, country food consumption contributed 50% or more of important nutrients such as protein, iron, zinc, and vitamin B12 to First Nations residents’ diets (Receveur *et al.* 1997). Recently, the Regional Health Survey (CYFN 2006) reported similar results with most respondents (81% of adults, 72% of youth and 65% of children). Similar results were obtained in Dene and Métis communities in the NWT where country food consumption was found to contribute 144g/day to the total diet among women and 235g/day among men (Kuhnlein and Receveur 2001). As well, on days that country foods were consumed, individuals’ diets were healthier in terms of saturated fat, sugar, and carbohydrate intake. Among Inuit residents in the NWT, Nunavut, and Nunatsiavut, similar levels of intake and contribution to nutrient and energy intake were reported. The contribution of these foods to total energy intake ranges from 6% in communities close to regional centres, up to 40% in more remote communities (Kuhnlein and Receveur, 2001).

Despite their significance, northern populations are shifting away from country foods and increasing the amount of store-bought foods in their diet, as is being experienced in many other Aboriginal populations (Kuhnlein 1992; Wein and Freeman 1992). This is

especially the case for younger people and in those communities with greater access to store-bought foods (Receveur *et al.* 1997). This shift is resulting in an increased intake of carbohydrates and saturated fats, and is projected to change the incidence of western-type diseases among this population in the future (e.g., increased incidence of obesity, diabetes and heart disease). Similar trends are being observed in many of the Small Island Developing States.

Market foods

The consumption of market foods varies among and within regions, communities, and households. For example, in Nunavik, the NWT, and the Yukon, market foods contribute a lower proportion of the total diet among Aboriginal residents, older age groups, and those residents living further from a regional centre (e.g., Yellowknife, Whitehorse, or Kuujuaq) (Blanchet *et al.* 2000; Kuhnlein *et al.* 2000; Van Oostdam *et al.* 2005).

Currently, the consumption of recommended levels of market items such as fruit and vegetables is considerably lower among northern residents than the national average, and is lowest among residents of Nunavut (Statistics Canada 2005). In the NWT, males and older individuals were less likely to “eat well,” as defined by *Canada’s Food Guide to Healthy Eating*, than others (GNWT 2005). However, a significant portion of total daily energy intake still comes from market food items in both Aboriginal and non-Aboriginal diets across the North, and access to safe, healthy and nutritious market foods are important for growth and development.

Changes in critical transportation infrastructure throughout the North may influence the transportation of market food, and thus affect its access and affordability in small, remote communities where many items are already prohibitively expensive. Climate warming and warming of permafrost have negative implications for ice roads, all-season roads, and airstrip security and accessibility. Regional representatives to a Transport Canada (2003) workshop on climate change and transportation reported that some significant impacts to transportation infrastructure were already present.

Work by Allard *et al.* (2002) in Nunavik, which has no road network, reports the instability of airstrips as a result of current permafrost warming. Conversely, a longer open-water season with decreasing sea ice coverage and extent will provide greater boat access to coastal communities throughout the year, and make ship and barge transportation more viable.

Additionally, warming temperatures may increase opportunities for local food production in some regions, alleviating the potential stress of relying on

transportation networks with the south. Increased summer temperatures and growing periods in regions such as the western Arctic may enhance opportunities for small-scale northern agriculture; these may provide an additional and potentially more cost-efficient local source of foods than other sources that are often expensive and difficult to access in these northern regions. Mills (cited in IPCC, 2001), for example, identified significant areas (39–57 million hectares) of potentially viable land for northern agriculture in the western Arctic under future climate scenarios.

As a result of the complexities in understanding trends and potential climate influences on changes in total diet (both traditional and market foods), the combined effects of climate change on food security and health are difficult to predict. They are influenced by local availability and access factors, including economic, technological, and political forces. They also presuppose a strong understanding of what the local environment can provide and sustain in the way of wildlife and other food resources.

Migratory patterns of animals

Climate change has been influencing the migratory patterns of Arctic marine and land mammals in recent decades. Inuit hunters have been adapting, but this adaptation has costs: more time and money is required to cover the distances needed to find the resources, and there are increases in personal risk as the sea ice hunters travel on becomes more fragile and unpredictable.

Box 8. Protecting food sources through ecosystem-based management – Alaska’s Arctic Fishery Management Plan

In February 2009, the North Pacific Fishery Management Council adopted the new Arctic Fishery Management Plan (FMP), closing all federal waters – over 500,000 square kilometres – of the U.S. Arctic Exclusive Economic Zone to commercial fishing for any species of finfish, molluscs, crustaceans, and all other forms of marine animal and plant life (Hurst 2009, US Delegation to FAO Committee on Fisheries 2009). This action was taken in direct response to the changes occurring as a result of a warming climate, including declining sea ice, warming ocean temperature, and the long term effects of these changes may have on Arctic marine ecosystems. There are indications that some commercial fish stocks could extend their range northwards as a result of a warming climate but there is a lack of scientific knowledge about Arctic fish stocks and how they could be affected by commercial fisheries. The Arctic FMP does contain provisions for the creation of a commercial fishery in the future, once sufficient information is available on fish stocks and ecological relationships to properly manage a fishery in the future. Taking a broader ecosystem view and prohibiting commercial fisheries in the near term is intended to help protect this valuable food source for the future.

“Many indigenous peoples depend on hunting polar bear, walrus, seals, and caribou, herding, fishing and gathering, not only for food and to support the local economy but also as the basis for cultural and social identity.”

ACIA, p.93

“Changes in the species’ ranges and availability, access to these, a perceived reduction in weather predictability, and travel safety in changing ice and weather conditions present serious challenges to human health and food security, and possibly even the survival of some cultures.”

ACIA, p.61

Links to cultural security

Food security for Inuit is not simply reliable access to nutritious food. It is also strongly linked to cultural security.

Food security goes beyond the mere satisfaction of physical needs – it integrates the social and cultural symbolism of food, which determines what food is and which foods are appropriate for human consumption. Inuit still partly derive their self-worth, individually and collectively, from traditions associated with hunting, fishing, and gathering. More than a mere means of obtaining the foodstuffs required for physical survival, these practices represent an important aspect of community integration. Activities related to subsistence represent an important foundation for the social and economic organization of Inuit communities. (Thériault et al, 2007)

In Chukotka the deteriorating health of the reindeer herds is already affecting the value of reindeer products from the region. Historically, reindeer and products from Chukotka were prized for quality and strength, and people were willing to trade their most valuable items for a good, pregnant, female reindeer (*vazhenka*) or a sire. Now, there are insufficient numbers of herdsman and veterinary surgeons to attend to the growing number of sickly and injured reindeer, and there are no trained or qualified firefighters in the region, despite the rising number of tundra fires from increased thunderstorms which is destroying the limited and marginal pastures. Further, there are not enough modern factories for processing the products of reindeer breeding, which only adds to the challenge of competing in a contemporary market. With the challenges these pose, Chukotkans are finding it hard to provide enough food from the land and without the cash economy, they cannot buy what they need.

Links to external factors

Local food security across the Arctic is affected by a range of external factors.

Economic factors

- High cost of food because of remoteness of communities.
- High costs of fuel and equipment to practice subsistence economies, due to remote location and high fuel prices in general
- Low incomes and limited job opportunities result in insufficient resources to purchase store-bought food or fuel to travel for hunting.
- Climate change exacerbates economic problems because in many cases it has become necessary to travel further in order to obtain sufficient food.

Political factors

- USFWS listing of the polar bear as threatened throughout its range. This was brought on by international concerns over climate change, but runs roughshod over local Inuit needs.
- EU seal ban. Though not aimed directly at Inuit, the ban in the 1980s had disastrous effects on Inuit communities and resulted in a surging suicide rate among young Inuit men whose hope for the future plummeted.



HEALTH EFFECTS ASSOCIATED WITH FOOD SECURITY ISSUES

Food security is not only an issue of insufficient amounts of food but also access to enough safe and nutritious foods. It is an important determinant of health, cultural and social well-being, justice, and dignity (McIntyre et al, 2003).

People who are “food insecure” (not achieving a status of “food security”) are at increased risk of being overweight, and having chronic health conditions, mental health challenges, and a lower learning capacity (McIntyre et al. 2003). In Canada, younger generations, women and Aboriginal people are most likely to report experiencing food insecurity (McIntyre et al. 2003; Ledrou and Gervais 2005). Residents in the North are the most likely to report food insecurity at the household level, with the rate in Nunavut being four times higher than the national average (Statistics Canada 2005)

In northern communities, the diet of many residents is a combination of imported foods from outside of the region and local foods harvested from the environment. Items from outside of the region are transported by air, by truck on seasonal or all-weather roads, by boat, or by a combination of these. Thus, the food security of northern residents may be influenced by climate change through impacts to the access, availability, or quality of locally harvested wildlife, or through impacts to transportation networks linking northern communities with southern sources of market foods.

CONTAMINANTS AND FOOD SECURITY

While it is important to promote traditional food, the quality or safety of this food is another concern. Environmental contaminants such as organochlorines and heavy metals are found in the Arctic environment as a result of long-range atmospheric and oceanic transport and local mining activities. Potential health effects on indigenous peoples are a concern because humans are at the top of the food chain.

Some of these pollutants are known to bioaccumulate, and animals at high trophic levels, such as fish and marine mammals, are important components of the traditional diet in the Arctic. Both dietary exposure assessment and biomonitoring studies have shown that Inuit exposure to these pollutants is higher than the Canadian average. Initial results from an ongoing cohort study among the Inuit population of Nunavik have shown a decrease in birth size possibly related to increasing PCB concentrations. Ongoing studies related to this birth cohort study have also found a possible link between contaminants and immune deficits in Inuit infants.

With the implementation of the Stockholm Convention on Organic Pollutants and the active research and communication activities conducted under the federal Northern Contaminants Program, there is an increasing awareness of contaminant issues in the Canadian Arctic. Key among them is the balance of risks and benefits associated with

eating traditional food. Over the last 15 years a great deal of research has been supported through the Northern Contaminants Program (NCP) on contaminants in country food. Of interest here is the effect contaminants have had on the community confidence and perception of country food safety. This perception of “risk” has led to the perceived decrease in consumption of country food and this in turn can be linked to an increase in the consumption of market foods and the subsequent health issues. The current consensus appears to recognize the importance of maintaining or even promoting more use of traditional foods while actively improving the characterization of the health risk associated with contaminant exposure, through research.

Climate change exacerbates the effect of contaminants on human health in the following ways:

- By imposing added stresses on human health that may interact with contaminant stress to worsen health problems (stresses include new diseases arising from warmer climate (bacteria outbreaks, new viruses or other pathogens, etc.)
- By increasing contaminant transport and cycling leading to higher contaminant levels in the atmosphere, in freshwater and oceanic food webs, and in top predators.
- By enhancing toxicity of contaminants. Warmer temperatures, sunlight interactions, microbial activities, and other factors may transform contaminants and enhance their toxicity. Examples of this include the transformation of the less toxic inorganic mercury to its most toxic form, methyl mercury, and an increase in the photo-enhanced (up to 1000 times greater) toxicity of spilled oil as a result of higher UV radiation.

Climate change also increases the input of contaminants into the environment through the following climate-change-related occurrences:

- Increased occurrence of forest fires, causing contaminant emissions produced by combustion (such as polyaromatic hydrocarbons, PAHs);
- Higher precipitation, which will ‘wash out’ contaminants from air and deposit it into oceans, lakes, and soils;

- Melting permafrost and glaciers, which release stored (‘locked-up’) contaminants into the environment;
- Increasing traffic and anthropogenic activities in the Arctic due to higher accessibility. This may include mining and drilling activities, transport/traffic, tourism and general population increases, all of which would lead to locally increased contaminant releases;
- Spread of insect pests which may lead to an increase in pesticide use
- The potential expansion of agriculture to more northern areas which would also increase fertilizer and pesticide use.

Predicting how climate change will alter contaminant transport to the Canadian North in the global environment remains a challenge. It requires detailed knowledge of the physical and chemical properties of contaminants as well as understanding of environmental pathways and how they might respond to changes caused, for example, by altered atmospheric greenhouse gas composition. We presently lack this depth of understanding. It is well-established, however, that dietary composition (e.g., marine vs. terrestrial, fat vs. protein, old fish vs. young fish) can determine the amounts and kinds of contaminants ingested. Dietary changes can occur because of fluctuations in the populations of target species (e.g., beluga, bowhead whales, walrus, seals, bears, birds, fish, caribou, muskox) or by changes in access to the species. Shifting from lake trout to whitefish, for example, will decrease the intake of mercury whereas eating more marine mammals than land mammals will increase the intake of mercury and organochlorines.

The research activities in this area require strong community support as well as collaboration with researchers from diverse disciplines. New paradigms are often required to integrate the newly generated information as well as translate them into policy. It is hoped that the information collected and the research results will help the communities increase their capability to develop adaptation plans and health promotion programs.

GLOBAL FOOD SCARCITY

“Coping with the short-run challenge of food price volatility is daunting. But the longer-term challenge of avoiding a perpetual food crisis under conditions of global warming is far more serious. History shows that extreme seasonal heat can be detrimental to regional agricultural productivity and human welfare and to international agricultural markets when policy-makers intervene to secure domestic food needs.”

D.S. Batistti and R.L. Naylor, 2009

The global nature of climate change means that Arctic food security cannot be considered in isolation of the issue elsewhere in the world. Much of the literature on food security focuses on local food production, whether locally grown or harvested, yet for many vulnerable communities imported foods already are a significant part of their diet and likely to become even more so in the future. As climate change impacts agriculture around the world, these communities become even more vulnerable. As example, we can consider world grain reserves, where ten years ago, there was a 150 day reserve of grain in the world (Dyer 2008). By 2007, this has been reduced to less than 57 days (Dyer 2008; Lane 2008) and forecasts for the future show that we are heading for further declines (FAO 2008c). Grain production stalled in the 1990s but the world population continued to grow and as a result, we have literally been eating into the reserves. As world temperatures continue to increase, world grain production will decrease. With an increase of 2°C in temperature, there will be little or no international grain market left; most of the major grain exporters will not have enough grain to export (Dyer 2008). The world had a foretaste of this scenario in 2008 when many rice producing countries severely restricted rice exports to deal with shortages domestically with the end result of spiralling costs and food riots in many countries.

This leads to the fact that food security cannot be considered in isolation of other global issues. The year 2008 saw the convergence of three global crises: food, fuel, and financial. While these are not a direct impact of climate change, they will affect the ability of individuals, communities, and nations

to respond to food security issues that are brought about by climate change.

Food: Starting in 2006 and peaking in 2008, food prices around the world soared forcing people in many countries into hunger and causing riots in 30 countries around the globe. While many factors contributed to the crisis, the most significant were extreme weather events in major cereal producing countries and the resulting decline in yields and stocks; speculation in food markets; growth in non-food crops, especially biofuels; and high oil prices (Nellemann *et al.* 2009). After a century of relatively steady decline, there was a 50–200% increase in selected commodity prices in 2008. Even though world oil prices have since declined sharply, food prices remain higher than where they were at the start of the crisis. It remains to be seen whether 2008 was a momentary crisis or the start of a new trend in food prices although it is widely believed that the era of stable food prices has come to an end.

Fuel: Coinciding with and contributing to the food crisis of 2008, was a surge in the cost of fuel. The price of crude oil peaked at US\$147 per barrel in July 2008 after which it declined to US\$43 in December 2008 (Nellemann *et al.* 2009). The price of fuel affects fertilizer use, food production, distribution, and transportation, and ultimately, the price of food. It is unreasonable to believe that prices for this non-renewable resource will remain low and indeed many believe that we are entering or have entered into the period of “peak oil”, i.e., a global peak in oil production after which the rate of production enters into a terminal decline. Already subject to higher food and transportation costs than the rest of Canada, the impact of higher fuel costs on isolated northern communities can be expected to be severe.

Financial: Since mid-2008, the world has been experiencing an ever-expanding financial crisis of a scale and magnitude not witnessed in generations. The implications of this crisis are not yet fully realized but one of most profound effects on the Canadian economy to date has been on the value of the Canadian dollar. The dollar, driven by high oil prices, reached a modern-day high of US\$1.09 November 2007 and remained over or near par with the US dollar until starting a rapid decline in fall 2008. It reached a low of US\$0.77 in December 2008 and

as of late March 2009, the Canadian dollar is trading around US\$0.80. The effects on food security have been immediate, with the cost of food rising across the country. The Consumer Price Index in Canada rose 1.4% in the 12 months to February 2009, driven largely by increasing food and shelter costs (Statistics Canada 2009). In the 12-month period to February 2009, food prices, the largest factor driving up the CPI, rose 7.4% (Statistics Canada 2009).

The FAO has stated that to evaluate the impacts of climate change on food security, “it is not enough to assess the impacts on domestic production in food-insecure countries. One also needs to:

1. assess climate change impacts on foreign exchange earnings;
2. determine the ability of food-surplus countries to increase their commercial exports of food aid; and,
3. analyse how the incomes of the poor will be affected by climate change,” (FAO 2003).

The impacts of climate change on the global food system will be varied and complex. The FAO has identified a number of potential impacts, all of which need to be taken into consideration when developing adaptation strategies for the Canadian Arctic (Table 1).

Table 1. Potential impacts of climate change on food systems and food security (from FAO 2008b)

	Food availability	Food accessibility	Food use	Food system stability
CO₂ fertilization effects	Increased food production in major exporting countries would contribute to global food supply but this could be negated by diverting land from food to more valuable cash crops.	Increase in food production would limit price increase on world markets but diversion of productive assets to other cash crops could cause food prices to rise.		
Increase in global mean temperatures	Reduced production of food crops and livestock products in affected areas. Reduction in global supplies likely to cause market prices to rise.	Impacts on incomes, prices, and affordability uncertain. Changes in preference uncertain.	Risk of ill health from eating food that is spoiled.	Higher cost for storing grain and perishable products.
Gradual changes in precipitation (increase in the frequency, duration, and intensity of dry spells)	Declines in production. Pressure on grain reserves. Decrease in food exports/increase in food imports. Increased need for food aid.	Preferred food not available or too costly.	Dietary adjustments with different nutritional content.	Greater instability of food supply, food prices, and agriculturally-based incomes.
Gradual changes in precipitation (changes in timing, location, and amounts of rain and snowfall)	Likely impact on global supplies, trade, and world market prices is not known.	Full-cost pricing for water may cause food prices to rise.	Food safety is compromised by water pollution and damage to stored food.	Greater instability of food supply and food prices.
Impacts of increase in the frequency and intensity of extreme weather events	Possible decrease in surplus production in flooded agricultural areas. Increased need for emergency distribution of food rations.	Possible increase in food prices.	Ability of body to process food reduced due to diseases.	

RESPONSES TO FOOD SECURITY ISSUES

PROTECTING CANADIAN ARCTIC FOOD SECURITY THROUGH ADAPTATION TO CLIMATE CHANGE

Understanding, adapting, and responding to Arctic climate change and the threat to food security is a challenge that requires the combined efforts of the scientific community, civil society, governments, national, and even international organizations. Over the past decades, much scientific work has been dedicated to data collection and analysis in order to understand the origins and processes of climate change and to establish food security baselines.

The Arctic represents a crucial region of environmental and social transformation due to climate change. These transformations will impact the entire planet, as ramifications of change in the far north spread through the global networks of environmental, biological, cultural, economic, and political interconnections. The changes currently

seen in the Arctic also serve as a forewarning of what may occur in other global regions as climate change advances. Lessons learnt now in the Arctic, about how to collaborate in monitoring, mobilising, and responding to climate change, may therefore be of crucial importance for other world regions.

Health data series and regional scale assessments in the Canadian North are limited. However, recent qualitative studies examining the potential health impacts of environmental change provide new insights with which to focus research and proactively develop response strategies. They show the need for community participation in filling information gaps and increasing our understanding of factors that enhance or inhibit adaptive capabilities (Furgal *et al.* 2002; Nickels *et al.* 2002).

RESILIENCE TO CLIMATE CHANGE AND FOOD SECURITY ISSUES

Adaptation strategies require a broad interdisciplinary response. They must be rooted firmly in the knowledge-base of scientific monitoring and assessment, which provides data on changes in climate and their direct impacts on the physical environment and the social and cultural environment. Also it is essential to understand how these changes will impact on the network of Arctic biological systems that sustain the vibrant country food harvest. Adaptation to climate change adds a social, economic, and cultural aspects as it encompasses the ability of different societies to respond to the challenges put before them by climate change.

Examples of adaptive strategies from northern communities has shown the inherently adaptive nature of northern society and northern Aboriginal cultures in general (Adger *et al.* 2003; Nickels *et al.* 2002; Reidlinger and Berkes 2001). However, the ability to respond varies among communities and regions and is influenced by some common critical factors.

To maintain an adequate supply of traditional food, community members have had to alter their harvest mechanisms. It is clear that a commitment to programs that will protect traditional food systems is necessary.

UNDERSTANDING THE CAPACITY OF CANADA'S NORTH

A number of examples of adaptive strategies regarding food security in place today indicate the inherently adaptive nature of northern communities and northern Aboriginal cultures in general (Adger *et al.* 2003; Nickels *et al.* 2002; Reidlinger and Berkes 2001). However, the ability to respond varies among communities and regions and is influenced by some common critical factors.

The ability to overcome changes in access to or availability of country food resources, which are important for nutritional and sociocultural well-being, is significantly influenced by an individual's access to economic resources and technology. The ability to invest more in the required tools and equipment for hunting and traveling, or the access to other forms of transportation (e.g., snow machine, four-wheel all terrain vehicle, flat bottom or larger boat) allows individuals to adapt more easily to changing environmental conditions (Duhaime *et al.* 2002; Ford *et al.* 2006).

Similarly, the generation and sharing of local or traditional knowledge of regional environments and the relationship between the environment and humans further support this ability to adapt while on the land and safely navigate increasingly dangerous and uncharacteristic conditions. The ability to shift species, alter hunting behaviors, and read environmental cues (e.g., weather prediction, ice safety) all increase hunting and travel safety and success. The importance of this knowledge is gaining recognition among scientific and policy communities (e.g., Huntington and Fox 2005); however, its generation is being challenged locally with shifts toward a more "western lifestyle" involving more time spent in communities engaged in indoor wage-based economic activities and less time on the land (Chapin *et al.* 2005).

The support provided through institutional or formal arrangements for aspects of traditional lifestyles and health may become increasingly important with climate change in Arctic regions. As many communities begin to represent more pluralistic societies in terms of livelihoods and lifestyles, establishing country food collection, storage, and distribution programs, and economic support for the

pursuit of traditional activities become important in reducing the vulnerability to and enhancing adaptive capabilities for climate-related changes. Also important is the formalization of traditional knowledge documentation and sharing mechanisms through the establishment of such things as community-based ice monitoring programs (Lafortune *et al.* 2004).

Box 9. Nasivvik as a Partner

"Nasivvik is an Inuktitut word that means vantage point. It can be a height of land, a hummock of ice, or any place of elevation that affords an observer a clear view of their surroundings to make good observations."

Zebedee Nungak

Through a 1.475 million dollar grant from the Canadian Institutes of Health Research Institute of Aboriginal Peoples' Health (CIHRIAPH), a Centre is being established for education, training and research on Inuit Health and Changing Environments based at the Public Health Research Unit, CHUL-CHUQ, Laval University (Quebec). This Centre is one of many being established in a network across the country by IAPH (ACADRE Program: Aboriginal Capacity and Developmental Research Environments) to address Aboriginal health training and research needs.

Environmental changes influence Inuit health in the Canadian Arctic

Significant changes in the global environment have been experienced in the past decades as a result, in large part, of human activities. The contribution of environmental factors to disease among the most vulnerable populations in the world has been roughly estimated by the World Health Organization (WHO) to be between 25% and 33% of the global burden of disease. Inuit in the Canadian and circumpolar Arctic face health issues related to a variety of factors including the presence of contaminants in the environment and wildlife and the direct and indirect effects of climate and environmental change. Additionally, social, political, and economic factors related to Inuit health are rapidly evolving and a number of complex issues face an increasingly young population. Meanwhile, Inuit communities and regions strive for self-determination and self-reliance to direct and address the issues that affect them. In looking towards the future in Inuit communities, there is a need for capacity development and enhancement. To move from health research for Inuit, to research with Inuit, and ultimately to research by Inuit, significant efforts in the areas of training, education and research are needed to address the very important environmental health issues facing Arctic populations today and in the future.

Warming temperatures and the potential for the introduction of new water and food-borne agents and permafrost melting, threatens built structures in coastal communities, and basic public health infrastructures (e.g., water treatment and distribution, emergency transportation).

The security of basic public health infrastructure in small remote Arctic communities that are already challenged regarding provision of some basic services is a significant determinant of adaptive ability in the Arctic. Further, existing health status issues in northern populations (e.g., nutritional deficiencies, increasing rates of diabetes and some cancers associated with shifts toward a more “western diet” and sedentary lifestyle, and rates of respiratory illness) appear to be further exacerbated by changes in local climate.

The combination of environmental change, basic health needs, limited economic choices, and shifts

in northern society and lifestyle appears to increase vulnerability and limit the ability of some Arctic communities to respond. When many of these factors overlap and the population is already facing some critical health and food security issues, the impact of climate change is greater because of the population’s vulnerability (e.g., small remote communities, with a limited natural and economic resource base).

Aboriginal groups are uniquely adapted to its geography and local ecology, it is reasonable to speculate that each group’s socio-ecologic resilience and adaptive capacity for health issues is similarly unique. Observed climate changes, impacts, and response abilities of Yukon First Nations living in the interior of the western Arctic likely are very different from those of the Inuit communities.

As in other regions of the world, enhancing adaptive capacity can be regarded as a “no regrets” option in the North, as it not only reduces vulnerability but also improves immediate resilience to current day stresses (Yohe and Tol 2002). Strengthening access and availability to country foods throughout the year for communities or increasing public health education associated with environmental causes of nutrition and disease are such examples.

Establishing community freezer and distribution plans will help in addressing current nutritional and other food issues as well as increase the capability of an individual to access safe and healthy foods in the face of environmental changes. Increased knowledge and awareness of environmental causes of disease will address perceived risks and provide valuable information to empower individuals to continue to make healthy decisions.

This level of engagement and contribution is a significant advance in environmental health impact and vulnerability research. Despite these advances, research on climate, food security, and health in the north is sparse (Berner and Furgal 2005), and the identification of the impacts on local populations and community adaptations is still in its infancy thresholds and limits to adaptation (Berkes and Jolly 2002).

Box 10. Adapting subsistence-based livelihoods to climate change

One of the services now available to communities to help adapt their traditional lifestyles to the changing climate comes from the Polar View program (http://www.grida.no/_res/site/file/publications/PolarView-booklet_scr.pdf). Polar View is an international consortium of government agencies, research institutes and service providers across Europe and Canada that offers integrated monitoring and forecasting services in polar and mid-latitude regions affected by ice and snow. Three pilot services in particular are benefiting indigenous people and may be part incorporated in a food security strategy:

1. Floe Edge Monitoring Service – satellite images which show ice edge and zones of moving ice and land-fast ice enable Inuit residents to plan their travel safely across frozen sea.
2. Reindeer Pastures Monitoring Service – maps of snow extent and snow water equivalent in northern Eurasia are used to help reindeer herders adapt their seasonal activities and migration patterns.
3. Lake Ice Monitoring Service – satellite-based monitoring of lake ice distribution in Nunavik is being integrated with traditional ecological knowledge to improve the understanding of the impacts of climate change on critical fish habitat and assist with sustainable management of the fisheries.

STRENGTHENING RESILIENCE AND MANAGING CHANGE

In the Canadian Arctic, the debate is no longer solely about identifying and predicting effects of climatic change but rather about what can and should be done to adapt, as some communities are already reporting impacts. This research focuses on improving the understanding of the magnitude and timing of the impacts of climate change, how individuals and communities cope with current and predicted changes, and what public institutions should do to actively support adaptation.

There is currently sparse information on the effectiveness of any current strategies for dealing with climate-related or environmental risks to health and food security in the Arctic and in other areas of the country. Many Small Island Developing States, on the other hand, have started undertaking comprehensive assessments of the impacts of climate change on food security in their countries. The recently released *Climate Change and Food Security in Pacific Island Countries* presents case studies for three countries and makes recommendations for national strategies to mitigate, adapt, and respond to climate change on agriculture and food security (FAO 2008d). Similar assessments

are underway in several other SIDS countries. Perhaps these countries are ahead of Canada with respect to assessments because their need has greater with respect to food security. Regardless, the lack of information for Canada is an important gap in our understanding and ability to assess who, where, and when Canadians may be vulnerable to the effects of climate change and food security.

A significant component is the lack of an assessment of the Canadian health sector's ability at various levels and in various locations to cope with and plan for the impacts of climate change. The cooperative planning, development, and conduct of projects in Inuit communities bringing together scientists, northern environment, and health professionals, and community residents and experts, as presented here, has been essential to the success of the projects described in this article. The community-based, dialogue focused approach has proven valuable in engaging communities and establishing a local baseline for understanding the changes, impacts, vulnerabilities, and the ability to respond at the local scale. Such an approach may very well prove useful in establishing this baseline in other regions.

Box 11. Food Mail

The Food Mail program of the Northern Air Stage Program has been administered by Indian and Northern Affairs Canada (INAC) for many years now, in order to make healthy foods more available and affordable, improve nutrition and health, and supplement traditional foods (INAC 2001; INAC 2004). In 2000/01, INAC spent \$22.5 million for Food Mail service – approximately 61% was used to service Nunavut communities (INAC 2001; INAC 2004). As a result, the perishable part of the northern food basket cost less in 2002 than in 1991. All northern communities which lack year-round surface transportation access (except during brief freeze-up or break-up periods) are included in the program, and it can be used either by stores or by individuals, though most subsidized shipments go to stores. Through the Program, reduced postage rates are available for nutritious perishable foods such as fresh and frozen meat, vegetables, fruit, dairy products, eggs and some prepared foods containing such ingredients.

Currently, this rate is \$0.80 per kilogram for perishable foods, and \$2.15/kg for non-perishable and nonfood items (INAC, n.d., Food Mail Brochure), with an additional charge of \$0.75 per parcel. This also covers non-perishable foods such as canned food, cereal and pasta, and essential non-food items like clothing and cleaning supplies. Foods of little nutritional value (pop, potato chips, candy), some convenience foods like fried chicken and prepared sandwiches, and tobacco and alcohol are not eligible. This rate is not available to northern country food producers, sending food to other northern communities, except now, as part of a new pilot project being tested in a few communities. One country food entrepreneur in Iqaluit noted that he pays more for freight than he does for the actual fish he buys from other communities' fisheries. In reality, this means that communities further from Iqaluit than Pangnirtung are out of the running for marketing their fish catches. Current practices have the airlines giving lower freight rates from the Baffin communities to Ottawa than to Iqaluit, and even backhaul rates from the communities to Iqaluit are higher than for the northward transport. Northern enterprises have an extra burden keeping them from "taking off."

THE WAY FORWARD

Studies on populations in Canada's North and a review of other recent research in the Arctic (e.g., ACIA 2005; Ford *et al.* 2006; Health Canada 2003) identify data gaps that need to be filled and methods that need to be used to increase our understanding of climate and health assessment, vulnerability, and the capacity to adapt in northern Aboriginal communities. They include the following:

Multiple-scale research and data.

Community-based assessments and systematic research must be conducted on the issues of climate change impacts on food security in the North and elsewhere in Canada. Local, regional, and national levels are interconnected in supporting and facilitating action on climate change, food security and health; thus data at multiple levels and research that link scales to understand these relationships are needed. Fine-scale meteorologic data is required in many northern regions and must be collected in a way that allows the data to be linked to existing and future health data sets. Models of change and impact must be linked with currently used global change scenarios.

Quality, comparable, standardized data.

Innovative approaches to health, food security and climate assessments are needed and should consider the role of sociocultural diversity present among Arctic communities. This requires both qualitative and quantitative data and the collection of long-term data sets on standard health outcomes at comparable temporal and spatial levels. These data must include local observations and knowledge collected using reliable and standardized methods.

Integrated, interdisciplinary approaches to assessment.

Assessments that take a multidisciplinary approach bringing together health scientists, nutritionists, climatologists, biologists, ecologists, social and behavioral scientists, and policy researchers and include demographic, socioeconomic, and health and environmental data are required to develop an adequate understanding of impacts, vulnerabilities, and capabilities in Arctic communities.

Increased analysis of historical data.

Historical data (climate, health, social, economic) from appropriate locations with climate systems similar to those projected for Canadian northern regions must be used for integrated and geographic analyses of the spread of disease relative to climate variables. These analyses would make efficient use of existing information and increase our understanding of these issues and their interconnected nature.

Improvement of scenarios and models for health assessment.

Developing and improving regional scenarios is needed for areas projected to experience significant impacts, such as the western Arctic. Socioeconomic scenarios to model and project impacts and changes within northern indigenous populations are needed. Such scenarios are currently sparse, poorly developed, and inadequate.

Conceptual and analytical understanding of vulnerability and capacity.

Work is needed at both the conceptual and analytical levels to define and increase our understanding of vulnerability and community health, how best to measure these concepts, and the use of these concepts in making decisions about the health of the community and in risk management. This work should include local knowledge and informal institutions (e.g., cultural sharing networks) to best understand these concepts in Aboriginal communities.

Enhancement of local capacities to identify, conduct, and analyze data related to climate change and the impacts on health.

To ensure success and sustainability of adaptation strategies, development of local and regional monitoring, analytical and decision making capabilities are needed to support cooperative and empowering approaches to research and action.

A GLOBAL PERSPECTIVE

In April 2009, over 300 indigenous representatives from 7 regions of the world came together in Anchorage Alaska to discuss among other climate change issues food security (see Appendix 1 for the Anchorage Declaration). Two recommendations in particular were agreed upon by delegates to the Summit regarding Food Security:

13. In order to provide the resources necessary for our collective survival in response to the climate crisis, we declare our communities, waters, air, forests, oceans, sea ice, traditional lands and territories to be “Food Sovereignty Areas,” defined and directed by Indigenous Peoples according to customary laws, free from extractive industries, deforestation and chemical-based industrial food production systems (i.e. contaminants, agro-fuels, genetically modified organisms).

14. We encourage our communities to exchange information while ensuring the protection and recognition of and respect for the intellectual property rights of Indigenous Peoples at the local, national and international levels pertaining to our Traditional Knowledge, innovations, and practices. These include knowledge and use of land, water and sea ice, traditional agriculture, forest management, ancestral seeds, pastoralism, food plants, animals and medicines and are essential in developing climate change adaptation and mitigation strategies, restoring our food sovereignty and food independence, and strengthening our Indigenous families and nations.

The following is a summary of those discussions which provide some insight to the global nature of the food security issue.

GENERAL STATEMENTS:

- Delegates supported the Declaration of Atitlan (Appendix 2), particularly the definition of and need for Food Sovereignty as being “the right of Peoples to define their own policies and strategies for the sustainable production, distribution and consumption of food, with respect to their own cultures and their own systems of managing natural resources and rural areas, and is considered to be a precondition for Food Security”.
- Food affects our cultural and spiritual health, ceremonies, clan relationships, etc. If we are

denied our traditional foods, we suffer diabetes and other illnesses.

- Food security simply provides access to the market. Sovereignty is essential because it is about who produces the food – food subsidies may be available, but they are for foods that are unknown to our peoples.
- Indigenous Peoples have more awareness of climate change issues than other people.
- Food = medicine = food
- In some cultures, foods are sacred, since they are spirits of our ancestors. Genetic modification of these foods is therefore equivalent to genetic testing on our ancestors.
- We need to “treat, teach and develop.” Educating our people is paramount – it is cheaper to prevent disease with traditional knowledge than it is to treat the problems when they arise.
- For the World Health Organization, each government prepares an annual report. We ask that indigenous issues be included in that report. We need monitoring of the impacts of climate change on the health of Indigenous Peoples, and ways to help them look for solutions when they suffer these devastating catastrophes.
- We have proved that our foods are good foods, and are more health for our people. Our Elders used to die from being old. Now they die from being unhealthy.
- Indigenous Peoples have the right to medical assistance: prevention and treatment of malaria, typhoid, diabetes, etc. Medical help and training of our own peoples is needed.

Arctic

- In the Bering Sea in the Arctic, climate change brings storms and erosion. We harvest “stinky” whales that are counted in our quota, but we can’t eat because they have been poisoned. The thawing of the permafrost destroys the freezers we used to preserve our food. There are

“Climate change impacts tied into persistent organic pollutants (POPs) and other toxic contaminants, being released as the earth warms and the permafrost melts. In Alaska, the Eklutna tribe are seeing increased disease in animals – cancer and tumours. We are not sure what to do with these new sicknesses. Water clans do not know how to host ceremonies when the water is contaminated with pharmaceutical chemicals.”

Delegate to the International Indigenous peoples Climate Change Summit, 2009

contaminants in the breast milk of our mothers, and toxins in the bellies of our salmon. If you are what you eat, we are becoming toxic ourselves. As the ice melts, the walrus stay on the coast and destroy the food along the coast. The rains come at the wrong time, so they turn the ground to ice. Our reindeer crush their hooves to the bone, but they still cannot break through the ice and they starve. We find dirt and stones in their stomachs.

- The Saami live in symbiosis with nature, and our reindeer decide our lives. Climate change has caused our wetlands to melt and the tracks of our reindeer change. The forest grows higher and our reindeer lose their pasture. Plants and berries have disappeared and new insects have arrived. Glaciers are melting, creeks have run dry, the water is too warm and the fish have died. We have Western sicknesses – diabetes and heart disease. We suffer from technological disasters – after Chernobyl disaster, the reindeer were born with no legs, or two heads. We have a deep respect for nature and are working to preserve everyday wisdom for the future world.
- Studies at the University of Alaska have shown that the willow boughs on which young moose survive used to be highly nutritious, but 200 miles away their nutritive value has dropped so much that although their bellies are full, technically they are starving.
- In the Yukon River, where king salmon are the staple food for Indigenous Peoples, there are no more big fish. We depend on berries for vitamins for our immune system, but when there is no rain, there are no berries. It is not just the health of the people we must watch, but also the health of the plants and animals is needed for survival.
- For the Dene, the life of our hunters and gatherers is changing. We rely on caribou living in the barren lands. But our caribou have suffered a major decline in the last 5–10 years. Our weather is unpredictable – the rains come at the wrong time, they freeze on the land surface, our animals cannot get food over winter months, and their calves starve. Their migration patterns have changed, because the ice forms later and melts earlier. The calving grounds are temperature

dependent, so they have also changed. We have reduced our own hunting, and cut non-resident or sport hunting to manage our herds.

- In St Lawrence Island in the Bering Sea, we no longer eat polar bear, we must depend on walrus. Food sustains our bodies and also becomes part of our social and mental wellbeing. Through our hunting and gathering and whaling, what we pass to our children is rapidly changing. We used female walrus hides as sails when we go whaling. Now, to keep walrus populations stable we don't use the hides, our children now use aluminum boats and high powered motors, which contribute to greenhouse gases through increased dependence on motorized vehicles. We have to go further and further to find greens, but now they don't even exist anymore.
- In Greenland, the status of hunters has changed in the communities – they are no longer able to hunt seals or bring home enough income. Pollution and contamination is changing our food security – we need to eat European products (chicken, beef). The Arctic council's research has found pollution in the Arctic caused by industrial centres in North America and even India and China.

Caribbean:

- In St Vincent, our foods are affected by insects – the pink mealy bug, the mango seed weevil. Our Indigenous Peoples depend on agriculture and fishing – a recent \$32 million project to open a fishing complex in an indigenous community has greatly improved their food security.

Latin and South America:

- Many of our creation stories tell that food is part of us. For example, Mayan people are corn people, they are made of corn. There are caribou people, salmon people, etc. There are fundamental relationships between food and wellbeing
- The New Mexico Acequia Association has developed the *Declaration of Seed Sovereignty: A Living Document for New Mexico* in 2006, which resolved, for example, to create zones that will be free of genetically engineered and transgenic organisms.

- In Chile, the Mapuche are suffering from the effects of climate change on water resources. Loss of territory and contamination of natural resources is changing our culture and way of life. We are losing our medicines to the water shortage, and our healers can no longer make the remedies to our problems, which means we are also losing knowledge. We also have a high rate of diseases that are new to our people, like diabetes.
- In Mexico, agrofuels are taking the place of our food crops. Our forests are replaced with monocrops. We have less rain, fewer fish and there is nothing left for food. We need a working group of Indigenous Peoples in the FAO to pressure governments to develop food production programs that fit with our own worldview.
- The Miskito from Nicaragua and Honduras are enduring many hardships from climate change. Our laws and standards are good, but they are never complied with. Our young people learn new attitudes at school, and they are not humanitarian principles of serving. Our children need education, but education that is consistent with the principles of our culture.
- In Peru, the mitigation policies for climate change (like biofuels), but this goes against the protection of food for human consumption for Indigenous Peoples who don't have ability to buy food on the market. Many are implementing food aid programmes – but they bring foods from other zones to our indigenous zones where we become simple recipients of that programme. This completely changes our culture and ways of using land, and creates dependency on other foods we can't use in the long run. We need to promote an exchange and use of products that are healthy and contaminant free – food produced by our own communities to be used for food assistance programmes.
- Mount Huascarán in Peru no longer has its “eternal ice” – it has lost 40% of its ice in the last 30 years. The freshwater algae that used to be available as a protein source for the Indigenous Peoples have also gone.
- populations, which leads to more malaria, and increasing resistance to quinine medication. Flies are also proliferating, including tsetse flies which bring sleeping sickness to people and animals – a particularly lethal element for Indigenous pastoralists.
- In Tanzania and Kenya, greenhouse gasses are increasing but governments continue to invite investors in polluting industries to continue. They take the forests from the Indigenous Peoples living there. The March rains did not come this year and our livestock died.
- In Tanzania, the pastoralists depend on their livestock. Challenges from climate change include a lack of water resources, and depletion of the forests. We used to use the forests only during the dry season, not the wet season, but now we can only find fresh grass in the forests. Our governments say that pastoralism has failed to feed our families and pressure us to move to another system that does not meet the needs of our families and our culture.
- In Uganda, the Batwa pygmies were evicted from their forests in 1991, had no alternative places to go. They had to work for food, not money, and many died. NGOs have bought land, but it is in the wrong places. Ground is sloped, or infertile, and cannot sustain the people.
- In Ethiopia, we have new diseases increasing. An Elder observed that in his lifetime he has seen both HIV and typhoid fever introduced into his communities. There are also new diseases for the cattle. People used to be able to feed themselves with traditional seeds, but they no longer appear on the land. Alien seeds given by the Government may grow the first time, but their yields drop each year until they are sterile. Our land races have disappeared. Our bodies are getting weaker as the temperature changes.
- In Tanzania, there are policies for eliminating “primitive” pastoral lifestyles. The Government is invading our families and taking our livestock, leaving our communities without food. We need to solve other problems before we can solve climate change.

Africa:

- In Africa, climate changes have included increases in rain, which have led to floods and endanger vital lands for Indigenous Peoples. They are forced to move to big cities, where they change their way of life and eating, which has led to an increase in diabetes.
- Changes in the water table affect the wetlands, which can increase the Anopheles mosquito

Pacific:

- On small islands, water contamination is a big issue, as contamination of sweet waters and salt waters leads to a loss of traditional foods such as fish.

- In Papua New Guinea, mountain communities in the highlands are facing cases of hunger because food crops are not yielding. This is badly affecting our youth – the money we saved for school fees must be used for food. Our children will have no education and no future. We need subsidized food and free education.

North America:

- In the Pacific Northwest, when Indigenous Peoples manage their forests, fire is a life-giver – it renews the forest and germinates the medicine plants. But Indigenous peoples have been blocked from managing their own natural resources, so exotic grasses have been introduced, which are more flammable, and now enormous fires are ripping through the forests. Then beetles come because the trees are not strong, and destroy them. We need to reinforce the rights we have already fought for through existing treaties to resume care of the land.
- The Swinomish in Washington are fishing peoples and are experiencing climate change impacts on water resources. The farmers of the sea have lost 95% of their chinook salmon since 1995. In 2006, we discovered the largest dead zone in the history of Hood Canal. The Duwamish River people have no land base on which to hold their ceremonies. All our food sources are impacted. Our elders and spiritual leaders have been alarmed to find 12 whales that died along the coast. Our Community Alliance and Peach-Making Project is trying to find a pathway for young people to connect their realities so they can protect their homelands. We are trying to use the media, and have a Native Lands project where our youth are working with a film crew. We need to connect the local frontline grassroots communities.
- In Athabasca, the snow and water levels are changing drastically from year to year. We have been able to reach our traditional hunting grounds for moose for the past 3 years.
- The Second National People of Color Environmental Leadership Summit or Summit II was held in Washington, DC on October 23–26, 2002. It produced Principles of Working Together to guide us in building our strength together.
- The Native Earth Bio Culture Council in conjunction with the Institute of American Indian Arts and Pueblo of Tesuque farm program is hosting the fourth annual Symposium For Food and Seed Sovereignty on 25–26 September 2009. The Symposium will include internationally renowned speakers as well as local and regional

experts in the areas of food security and sustainable ecology and a heritage seed exchange

- The National Congress of American Indians has passed resolution SAC-06-091 on Genetically Engineered Foods. Seeds, foods and other products containing genetically modified material must be labelled.
- Radiation exposure from uranium mining on the Spokane Indian Reservation in Washington still affects the population. Governments supply food “hand outs” at the forts we call “mystery meat” since we don’t know what it is. Food contamination has caused us to lose our elders, which has interrupted and lost the transmission of our culture. Ensure even more representation of youth because they inherit these problems and lessons. Water rights are hand in hand with food security. We should not hide the unspoken losses, the still births of our children. Who can be held accountable? We need to identify the violator and hold them accountable under international law.

Asia:

- In Tajikistan, Central Asia is facing a similar situation. We do not want to take the position of a beggar, but want to speak as equals. We must take care of our own peoples.
- In North-East India, and the rest of the world, we are finding that there is a huge unseen movement of communities going back to traditional systems. Food sovereignty is so important to Indigenous Peoples. Climate change leads to changes that causes us to lose our seeds, like moving to higher ground in the mountains. We need the right to get back our lost seeds from the international seed banks that have kept them. We need co-ownership of international agricultural research.
- In the Philippines, logging and destruction of our land and resources is violating our human rights. The death of our traditional lands is the death of us as Indigenous Peoples. We are not against “development”, but we ask the questions “development for whom”?
- In Nepal, temperature changes are impacting agriculture. Farmers have drought in the mountains. Indigenous Peoples pray before harvesting for favourable weather conditions, but they can’t understand what they have done wrong to nature to suffer so – they do not realize they are suffering from someone else’s greedy mistake. We have the highest mortality rate for children and women in the world. We have malaria in the mountains where people are not used to these types of insects and the people have no resistance.

STRENGTHENING RESILIENCE AND MANAGING CHANGE

Socio-economic and environmental factors have influenced food security in the Arctic, resulting in the need for coherent policy attention. Factors such as employment, contaminants, and community lifestyles have fostered changes in food consumption patterns in Arctic communities.

Food insecurity is an increasing concern for households in Arctic communities. While 8 % of Canadians reportedly were forced to compromise the quality or quantity of their diet, a substantially higher number of households in Arctic communities have had similar experiences (Lawn and Harvey 2001). Addressing the four needs of food security as defined above, leads us to conclude that the ability of households in the Arctic to satisfy all the criteria

Box 12. UNESCO's Mandate

As a UN specialised agency, UNESCO is unique in that it brings together the domains of natural sciences, social sciences, including environmental ethics, culture, education and communication. Given this broad cross-cutting mandate, UNESCO is uniquely placed in the UN system to foster integrated approaches to global challenges such as those posed today by climate change and the need for a broad knowledge base for monitoring and adaptation. Indeed, the UNESCO Strategy for Action on Climate Change outlines a strategic vision that emphasizes intersectorality and adaptation to climate change as key to the organization's response to climate change. The establishment within the Organization of a dedicated institution-wide platform on climate change ensures that intersectoral and interdisciplinary efforts are a mainstay of UNESCO's work in this area. UNESCO, together with the World Meteorological Organization, has also been charged with the role of convenor for United Nations agencies in the cross-cutting area science, assessment, monitoring and early warning.

of availability, accessibility, use, and stability of food is complicated by changing circumstances in arctic communities. However, it is also apparent that some socioeconomic and cultural practices persist, which contribute to food production and sharing, and thereby to a degree of food security.

Addressing food insecurity will require a variety of levels of institutional engagement including:

- Community Approaches (Community, Territorial)
- National Approaches (DIAND, Health Canada, Agriculture and Agri-Foods)
- The Intergovernmental Panel on Climate Change
- The United Nations Framework Convention on Climate Change, its Conference of the Parties, the Kyoto Protocol and the Nairobi Work Programme
- Agenda 21 and sustainable agriculture and rural development
- Integrating adaptation and mitigation

In March 2009, UNESCO hosted a meeting in Monaco, entitled Climate Change and Arctic Sustainable Development: scientific, social, cultural, and educational challenges. One recommendation emanating from this meeting was the need for an Arctic meeting on food security to be hosted in the circumpolar world. One of the recommendations from the meeting was:

The United Nations Environment Programme (UNEP) and UNESCO should organise a 'food security' conference focusing on the Arctic, in collaboration with the Arctic Council.

(UNESCO Draft Report from Monaco, 2009).

Canada as a leader in food security research would be ideally placed to host in partnership with UNESCO an Arctic Food Security Conference in 2009/2010.

WORKSHOP OUTLINE

POSSIBLE QUESTIONS TO BE ADDRESSED

These questions may also provide the basis for an Arctic Food Security Conference or workshop.

- Where are the gaps in knowledge and action with respect to the challenge that climate change poses for Arctic food security?
- What needs to be done to ensure a comprehensive, interdisciplinary and multi-stakeholder approach to achieving food security in the Arctic?
- What modalities are required for a long-term and sustained approach to addressing food security in the Arctic?
- What are the elements of a community adaptation strategy to the impacts of climate change on food security?

PROPOSED FORMAT

UNEP/GRID-Arendal has assessed the need for a three day “Arctic Peoples Food Security Workshop” to be held in the Canadian Arctic in the winter of 2009 or the spring of 2010. This concept was supported at a March 2009 UNESCO meeting on climate change in the Arctic hosted by the Prince of Monaco (Draft UNESCO Meeting Report, 2009).

It is suggested that this workshop be small (~50 people) and strategic with clear objectives on determining the elements for adaptation strategies and developing recommendations to ensure Arctic Peoples Food Security.

Potential Partners:

International: UNEP/GRID-Arendal; Arctic Council, Sustainable Development Working Group (SDWG); World Health Organization (WHO); Food and Agriculture Organization (FAO); UNESCO; United Nations Environment Program (UNEP); ICC international offices (Greenland, Alaska, Russia); Saami Council, Gwich'in Council International (GCI); Arctic Athabaskan Council (AAC), Aleut International Association (AIA), RAIPON, Many Strong Voices (MSV)

National: The Department of Indian and Northern Affairs; Health Canada; Agriculture Canada; US Department of Health; representatives from Denmark, Sweden, Norway, Finland, Denmark, Russia

Provincial and Territorial (Department of Health and Social Services): Yukon Government; Northwest Territory; Nunavut, Quebec, NFLD and Labrador

NGO: Community representatives, Nasivvik, Inuit Tapiriit Kanatami (ITK); Inuit Circumpolar Council – Canada (ICC); Council of Yukon First Nations (CYFN); Dene Nation.

Workshop Outline:

A combination of discussions at the plenary and working group level will be developed to ensure an interdisciplinary outcome for the workshop.

A series of plenary **keynote talks** on the first morning and afternoon will outline the current state of knowledge, recent developments, and predictions for future trends with respect to the meeting's themes. These keynote addresses will set the stage for deliberations in parallel working groups over the following days.

Working groups will be established to address major themes such as:

1. Climate Change and Food Security: Critical issues of change
2. Arctic Community Food Security Responses: Adaptive Capacity and Resiliency
3. Food Security Knowledge gaps and Institutional needs
4. Learning from others: Global food security perspectives

Four cross-cutting themes will also be explored in these same working groups

1. Environmental, Social, Cultural ethics
2. Education for sustainable development
3. Monitoring and observing systems
4. Global connections and change in the Arctic

The Workshop would produce a report and a set of recommendations that would be delivered to a various levels of governments, identify the key elements necessary for community adaptation strategies in the Arctic, and identify a potential pilot study.

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APPENDICES

THE ANCHORAGE DECLARATION

DECLARATION OF ATITLÁN

APPENDIX 1.

THE ANCHORAGE DECLARATION

24 APRIL 2009

From 20–24 April, 2009, Indigenous representatives from the Arctic, North America, Asia, Pacific, Latin America, Africa, Caribbean and Russia met in Anchorage, Alaska for the Indigenous Peoples' Global Summit on Climate Change. We thank the Ahtna and the Dena'ina Athabascan Peoples in whose lands we gathered.

We express our solidarity as Indigenous Peoples living in areas that are the most vulnerable to the impacts and root causes of climate change. We reaffirm the unbreakable and sacred connection between land, air, water, oceans, forests, sea ice, plants, animals and our human communities as the material and spiritual basis for our existence.

We are deeply alarmed by the accelerating climate devastation brought about by unsustainable development. We are experiencing profound and disproportionate adverse impacts on our cultures, human and environmental health, human rights, well-being, traditional livelihoods, food systems and food sovereignty, local infrastructure, economic viability, and our very survival as Indigenous Peoples.

Mother Earth is no longer in a period of climate change, but in climate crisis. We therefore insist on an immediate end to the destruction and desecration of the elements of life. Through our knowledge, spirituality, sciences, practices, experiences and relationships with our traditional lands, territories, waters, air, forests, oceans, sea ice, other natural resources and all life, Indigenous Peoples have a vital role in defending and healing Mother Earth. The future of Indigenous Peoples lies in the wisdom of our elders, the restoration of the sacred position of women, the youth of today and in the generations of tomorrow.

We uphold that the inherent and fundamental human rights and status of Indigenous Peoples, affirmed in the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), must be fully recognized and respected in all decision-making processes and activities related to climate change. This includes our rights to our lands, territories, environment and natural resources as contained in Articles 25–30 of the UNDRIP. When specific programs and projects affect our lands, territories, environment and natural resources, the right of Self Determination of Indigenous Peoples must be recognized and respected, emphasizing our right to Free, Prior and Informed Consent, including the right to say “no”. The United Nations Framework Convention on Climate Change (UNFCCC) agreements and principles must reflect the spirit and the minimum standards contained in UNDRIP.

Calls for Action

1. In order to achieve the fundamental objective of the United Nations Framework Convention on Climate Change (UNFCCC), we call upon the fifteenth meeting of the Conference of the Parties to the UNFCCC to support a binding emissions reduction target for developed countries (Annex 1) of at least 45% below 1990 levels by 2020 and at least 95% by 2050. In recognizing the root causes of climate change, participants call upon States to work towards decreasing dependency on fossil fuels. We further call for a just transition to decentralized renewable energy economies, sources and systems owned and controlled by our local communities to achieve energy security and sovereignty.

In addition, the Summit participants agreed to present two options for action which were each supported by one or more of the participating regional caucuses. These were as follows:

A. We call for the phase out of fossil fuel development and a moratorium on new fossil fuel developments on or near Indigenous lands and territories.

B. We call for a process that works towards the eventual phase out of fossil fuels, without infringing on the right to development of Indigenous nations.

2. We call upon the Parties to the UNFCCC to recognize the importance of our Traditional Knowledge and practices shared by Indigenous Peoples in developing strategies to address climate change. To address climate change we also call on the UNFCCC to recognize the historical and ecological debt of the Annex 1 countries in contributing to greenhouse gas emissions. We call on these countries to pay this historical debt.

3. We call on the Intergovernmental Panel on Climate Change (IPCC), the Millennium Ecosystem Assessment, and other relevant institutions to support Indigenous Peoples in carrying out Indigenous Peoples' climate change assessments.

4. We call upon the UNFCCC's decision-making bodies to establish formal structures and mechanisms for and with the full and effective participation of Indigenous Peoples.

Specifically we recommend that the UNFCCC:

- a. Organize regular Technical Briefings by Indigenous Peoples on Traditional Knowledge and climate change;
- b. Recognize and engage the International Indigenous Peoples' Forum on Climate Change and its regional focal points in an advisory role;

c. Immediately establish an Indigenous focal point in the secretariat of the UNFCCC;
d. Appoint Indigenous Peoples' representatives in UNFCCC funding mechanisms in consultation with Indigenous Peoples;
e. Take the necessary measures to ensure the full and effective participation of Indigenous and local communities in formulating, implementing, and monitoring activities, mitigation, and adaptation relating to impacts of climate change.

5. All initiatives under Reducing Emissions from Deforestation and Degradation (REDD) must secure the recognition and implementation of the human rights of Indigenous Peoples, including security of land tenure, ownership, recognition of land title according to traditional ways, uses and customary laws and the multiple benefits of forests for climate, ecosystems, and Peoples before taking any action.

6. We challenge States to abandon false solutions to climate change that negatively impact Indigenous Peoples' rights, lands, air, oceans, forests, territories and waters. These include nuclear energy, large-scale dams, geo-engineering techniques, "clean coal", agro-fuels, plantations, and market based mechanisms such as carbon trading, the Clean Development Mechanism, and forest offsets. The human rights of Indigenous Peoples to protect our forests and forest livelihoods must be recognized, respected and ensured.

7. We call for adequate and direct funding in developed and developing States and for a fund to be created to enable Indigenous Peoples' full and effective participation in all climate processes, including adaptation, mitigation, monitoring and transfer of appropriate technologies in order to foster our empowerment, capacity-building, and education. We strongly urge relevant United Nations bodies to facilitate and fund the participation, education, and capacity building of Indigenous youth and women to ensure engagement in all international and national processes related to climate change.

8. We call on financial institutions to provide risk insurance for Indigenous Peoples to allow them to recover from extreme weather events.

9. We call upon all United Nations agencies to address climate change impacts in their strategies and action plans, in particular their impacts on Indigenous Peoples, including the World Health Organization (WHO), United Nations Educational, Scientific and Cultural Organization (UNESCO) and United Nations Permanent Forum on Indigenous Issues (UNPFII). In particular, we call upon all the United Nations Food and Agriculture Organization (FAO) and other relevant United Nations bodies to establish an Indigenous Peoples' working group to address the impacts of climate change on food security and food sovereignty for Indigenous Peoples.

10. We call on United Nations Environment Programme (UNEP) to conduct a fast track assessment of short-term drivers of climate change, specifically black carbon, with a view to initiating negotiation of an international agreement to reduce emission of black carbon.

11. We call on States to recognize, respect and implement the fundamental human rights of Indigenous Peoples, including the collective rights to traditional ownership, use, access, occupancy and title to traditional lands, air, forests, waters, oceans, sea ice and sacred sites as well as to ensure that the rights affirmed in Treaties are upheld and recognized in land use planning and climate change mitigation strategies. In particular, States must ensure that Indigenous Peoples have the right to mobility and are not forcibly removed or settled away from their traditional lands and territories, and that the rights of Peoples in voluntary isolation are upheld. In the case of climate change migrants, appropriate programs and measures must address their rights, status, conditions, and vulnerabilities.

12. We call upon states to return and restore lands, territories, waters, forests, oceans, sea ice and sacred sites that have been taken from Indigenous Peoples, limiting our access to our traditional ways of living, thereby causing us to misuse and expose our lands to activities and conditions that contribute to climate change.

13. In order to provide the resources necessary for our collective survival in response to the climate crisis, we declare our communities, waters, air, forests, oceans, sea ice, traditional lands and territories to be "Food Sovereignty Areas," defined and directed by Indigenous Peoples according to customary laws, free from extractive industries, deforestation and chemical-based industrial food production systems (i.e. contaminants, agro-fuels, genetically modified organisms).

14. We encourage our communities to exchange information while ensuring the protection and recognition of and respect for the intellectual property rights of Indigenous Peoples at the local, national and international levels pertaining to our Traditional Knowledge, innovations, and practices. These include knowledge and use of land, water and sea ice, traditional agriculture, forest management, ancestral seeds, pastoralism, food plants, animals and medicines and are essential in developing climate change adaptation and mitigation strategies, restoring our food sovereignty and food independence, and strengthening our Indigenous families and nations.

We offer to share with humanity our Traditional Knowledge, innovations, and practices relevant to climate change, provided our fundamental rights as intergenerational guardians of this knowledge are fully recognized and respected. We reiterate the urgent need for collective action.

Agreed by consensus of the participants in the Indigenous Peoples' Global Climate Change Summit, Anchorage 2009

APPENDIX 2.

DECLARATION OF ATITLÁN, GUATEMALA

INDIGENOUS PEOPLES' CONSULTATION ON THE RIGHT TO FOOD: A GLOBAL CONSULTATION ATITLÁN, SOLOLÁ, GUATEMALA, APRIL 17–19, 2002

We, representatives and traditional authorities of Indigenous Peoples, Nations, and organizations from 28 countries, gathered from all regions of the world, including farmers, hunters, gatherers, fishers, herders, and pastoralists, met in Panajachel, Sololá, at Lake Atitlán, Guatemala, on April 17–19, 2002, with the following objectives:

1. To learn about the hardships faced by Indigenous Peoples in food-related matters.
2. To define common elements among Indigenous Peoples:
 - To propose them to the States so that the States will implement the Right to Food in accordance with the aspirations of Indigenous Peoples; and,
 - To strengthen ties of cooperation among Indigenous Peoples.
3. To formulate a strategy based on the vision of Indigenous Peoples, with the objective of making proposals to the States and to the international community in order to overcome hardships in matters of Food Security and Food Sovereignty.

We extend our deep appreciation to the Indigenous Peoples of Guatemala, particularly the Maya Kaqchikel People for their hospitality and generosity in hosting the various delegations attending this consultation.

We are aware that in Guatemala, a situation exists of misery, extreme poverty, and death by starvation, day by day, of men, women, and children. This is reflected in the report from the First Indigenous Peoples' National Conference on the Right to Food, held on April 5, 2002, in Guatemala City, which includes the following facts: that in a period of 2 weeks 41 persons died of starvation; that in 44% of Guatemala's territory, people are living in extreme poverty and at high risk of death from starvation; the following Departments of Guatemala are listed in order of their degree of extreme poverty: San Marcos 86.66%, Totonicapán 85.62%, Quiché 86.66%, Huehuetenango 77.85%, Alta Verapaz 76.40%, Sololá 76.36%, Jalapa 72.59%, Jutiapa 63.88%; Santa Rosa 62.07%, and Quetzaltenango 60.67%.

We find the above-described situation to be troubling and, indeed, deplorable as it reflects the reality of many

Indigenous Peoples worldwide, and a risk exists that many others could face the same problem.

We recognize that as Indigenous Peoples, we face a higher risk of suffering the consequences of Food Insecurity. We underscore, for example, that the World Bank in its study on "Indigenous Peoples and Poverty," identifies our Peoples as the poorest of the poor.

The diverse Indigenous Peoples participating in this International Consultation have exchanged points of view, experiences and realities, and are alarmed by the growing food insecurity, starvation and malnutrition, which is a collective reality faced by our Peoples.

DECLARATION:

IN AGREEMENT that the content of the Right to Food of Indigenous Peoples is a collective right based on our special spiritual relationship with Mother Earth, our lands and territories, environment, and natural resources that provide our traditional nutrition; underscoring that the means of subsistence of Indigenous Peoples nourishes our cultures, languages, social life, worldview, and especially our relationship with Mother Earth; emphasizing that the denial of the Right to Food for Indigenous Peoples not only denies us our physical survival, but also denies us our social organization, our cultures, traditions, languages, spirituality, sovereignty, and total identity; it is a denial of our collective indigenous existence,

TAKING INTO ACCOUNT that the right to development is a collective right of Peoples as well as of individuals, and that the Right to Food forms a part of the development process, creating conditions for the enjoyment of all human rights, fundamental freedoms and well-being,

REMINDED that the Plan of Action and the Declaration of the World Food Summit (1996) stated that Food Security means "the access of all people to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life,"

REMINDED that Food Sovereignty is the right of Peoples to define their own policies and strategies for the sustainable production, distribution, and consumption of

food, with respect for their own cultures and their own systems of managing natural resources and rural areas, and is considered to be a precondition for Food Security,

CONSIDERING that Article 5 of the Declaration on the Right to Development (1986) states that “the refusal to recognize the fundamental right of Peoples to self-determination,” as a fundamental injustice against which the States should take resolute steps,

KEEPING IN MIND that Article 1 in Common of the International Covenant on Civil and Political Rights, as well as the International Covenant on Economic, Social, and Cultural Rights recognizes that all peoples, by virtue of the right to Self-Determination, may establish and implement their own economic, social, and cultural development, and their own development strategies, based on their own vision, and that “in no case may a people be deprived of its own means of subsistence,”

RECOGNIZING that for Indigenous Peoples, the rights to land, water, and territory, as well as the right to self-determination, are essential for the full realization of our Food Security and Food Sovereignty,

NOTING that the States parties to the First World Food Summit, in its Declaration and Plan of Action, Commitment I, Objective 1.1 (d) made a commitment to recognize and support Indigenous Peoples and their communities in their pursuit of economic and social development, with full respect for their identity, traditions, forms of social organization and cultural values; also noting that the States parties made a commitment to reduce by one half the total number of human beings suffering from hunger and malnutrition by the year 2015, we regret that for Indigenous Peoples hunger and malnutrition have not been sufficiently reduced, and that suffering from starvation and malnutrition is increasing,

Having consulted and analyzed the situation faced by Indigenous Peoples from various parts of the world with respect to Food Security, Food Sovereignty and other aspects related to the life and the development of Indigenous Peoples, we identified the following obstacles to our Food Security and Food Sovereignty:

OBSTACLES TO OUR FOOD SECURITY AND FOOD SOVEREIGNTY:

1. The implementation and domination of globalization and free trade, which act without limits nor morality in the theft of our lands, territories, and other resources necessary for our Food Security and Food Sovereignty;
2. The imposition of industrial models by the governments, particularly in the form of industrialized mono-agriculture, that causes an erosion of genetic diversity and the resulting loss of our seeds, species and breeds of animals. This only impoverishes our lands, generating a growing emigration of members of our communities to urban areas in search of employment that does not exist. In addition, the adoption

of alien market systems imposes foods on us that do not nourish, but instead cause diseases and problems of all sorts for our health and problems in the physical development of our children;

3. The extension of intellectual property rights in favor of multinational corporations that has increased bio-piracy and the illicit appropriation of our biological diversity and traditional knowledge; and the introduction of genetically altered food, which is causing the loss of our traditional foods, of our health, of our relationship with Mother Earth, of our traditional plants and medicines, and of our very cultures;

4. The growing imposition of the use of pesticides and chemical fertilizers that poison Mother Earth, the communities that work The Earth, and the food resources on which Indigenous Peoples depend worldwide, affecting food production and hence nutrition and health, and increasing morbidity and mortality rates, in particular for our women and children;

5. The imposition of unsustainable projects by governments and private companies in our territories without consultation or prior informed consent, and without taking into account the rights and values of the Indigenous Peoples affected;

6. The policies and demands of international financial institutions such as the International Monetary Fund (IMF), the World Bank, the Inter-American Development Bank (IDB), and their structural adjustment programs;

7. Militarization and repression in Indigenous territories, in particular Plan Colombia and the fumigation of indigenous crops that is now expanding as policy into other countries of the region;

8. National policies that impose inadequate and exclusionary models and practices, which in turn result in the loss of our lands, territories and collective indigenous identity, generating increased food insecurity;

WE THEREFORE RESOLVE:

On the international level:

1. TO CALL for the immediate adoption of the original text of the Draft Declaration on the Rights of Indigenous Peoples, currently being discussed at the United Nations.
2. TO CALL on all States to ratify the Convention on the Elimination of Persistent Organic Pollutants and the Kyoto Protocol on Climate Change.
3. TO CALL upon States to ratify and implement ILO Convention 169, despite its limitations, as a step towards the full recognition of the rights of Indigenous Peoples.
4. TO RECOMMEND to the World Food Summit: five years later, to the World Summit on Sustainable Development, to

the Pan-American Seed Seminar, and to other upcoming conferences on genetically modified organisms, that full recognition must be given to the rights of Indigenous Peoples to Food Security and Food Sovereignty, and that the obstacles limiting access to the necessary resources for our existence as Peoples must be eliminated.

5. TO RECOMMEND that the World Food Summit: 5 Years Later, the World Summit on Sustainable Development, and the States parties insist that international trade and financing entities recognize, respect, and observe human, economic, social, and cultural rights, particularly the rights of Indigenous Peoples.

6. TO RECOMMEND that the World Summit on Sustainable Development and the States parties prioritize as fundamental the Rights to Food, Health, and Education, from the perspective of the values and worldviews of the Indigenous Peoples, in the development process.

7. TO RECOMMEND that the United Nations Commission on Sustainable Development and the Food and Agriculture Organization (FAO):

a. Support the campaigns carried out by Indigenous Peoples to inform our communities regarding our Right to Food, our Right to Development, and our Social, Cultural, Economic, and Political Rights;

b. Support our own systems and networks designed to improve the dissemination of the results of our research and existing information on the impacts of toxics, chemicals, genetic engineering, etc.;

c. Regularly inform Indigenous Peoples' organizations and traditional authorities involved in the issue of food in all countries, utilizing the media that are most accessible to all the communities in appropriate languages.

8. TO RECOMMEND that the FAO establish an open-ended working group so that Indigenous Peoples may consult in the development and implementation of policies that affect Food Security and Food Sovereignty of Indigenous Peoples.

9. TO DEMAND the elimination of development policies imposed by States that run counter to the life and to the philosophy, worldviews, principles, and inherent rights of the collectivities of Indigenous Peoples in the different regions of the world.

10. TO DEMAND that water not be privatized, as it is a sacred element for Indigenous Peoples, essential to our agriculture and to the maintenance of our Food Security and Food Sovereignty.

11. TO DEMAND an end to the policies of theft and usurpation of our lands, territories and natural resources, which are necessary for the enjoyment of our right to adequate nutrition. We also demand an end to the accelerated destruction of the environment.

12. TO DEMAND an end to the appropriation of Indigenous Peoples' knowledge, practices, and innovations as well as the appropriation of our genetic resources. We demand furthermore, a prohibition against the patenting of all forms of life and a prohibition against perverse technologies such as "Terminator" technology.

13. TO DEMAND that governments and multinational corporations inform Indigenous Peoples, in a full, truthful and comprehensible manner, and in the appropriate languages, regarding the production, use, transport, and exportation of pollutants that affect the food systems, environment and health of Indigenous Peoples.

14. TO DEMAND that the governments prohibit the production and application of pesticides, chemical fertilizers, and other substances considered dangerous for human health, particularly those that are already banned in other countries.

15. TO DEMAND the full participation of Indigenous Peoples in the development of mechanisms for equitable land distribution, land tenure, and control over the natural resources necessary for our Food Security and Food Sovereignty, without putting at risk the ownership of land and other resources held by Indigenous Peoples.

16. TO DEMAND that the laws, institutions and public policies of the States recognize and support Indigenous Peoples' systems in agricultural production, fishing, hunting, gathering, herding, pastoral practices (herders), as well as our own economic and political practices.

17. TO DEMAND that the protection of traditional knowledge be carried out in accordance with the worldviews, values, needs and traditional legal systems of Indigenous Peoples.

18. TO DEMAND respect for the spirituality and traditional religions of Indigenous Peoples as an essential part of the development and exercise of our rights, particularly the ceremonial practices related to our knowledge regarding crops, production, Food Security and Food Sovereignty.

WE COMMIT:

On a local/community level:

1. To revitalize the Worldviews of Indigenous Peoples.

2. To initiate a process of de-colonization within our communities, which includes culturally relevant education.

3. To strengthen our traditional food production systems, and family and community economies.

4. To provide families and communities with information regarding the benefits of consuming traditional foods.

5. To provide information regarding the health risks associated with consuming alien or non-traditional foods, including foods produced with chemicals and genetically modified food products.

On a National and Regional Level:

1. To create networks for communication, information, capacity building, and coordination among Indigenous Peoples regarding Food Security and Food Sovereignty.

2. To strengthen cooperation and solidarity on national and regional levels to fortify political, cultural, social, and economic ties and unity among Indigenous Peoples and Nations.

3. To create networks of solidarity among producers and consumers of traditional products.

4. To pursue constructive ties with Civil Society.

5. To create our own development programs in order to achieve Self Determination for our peoples and avoid the dependencies imposed by international financial institutions such as the IDB, the US Agency for International Development (USAID), and the World Bank, among others.

6. To promote autonomous Indigenous processes directed toward the development of systems for the protection of the practice of our knowledge and innovations that reflect our values, priorities, needs, and worldviews.

7. To make the issues of Food Security and Food Sovereignty known at national and international levels through nationally and regionally organized and representative processes, so as to address these issues based on Indigenous Peoples own forms of thinking, feeling, and acting.

8. To disseminate the results of this consultation and the Declaration of Atitlán at the World Summits, and to other international, national and regional agencies and mechanisms, as well as to our own communities, organizations, Indigenous Peoples and to Civil Society.

9. To develop an Indigenous Peoples' Comprehensive Plan of Action regarding Food Security and Food Sovereignty.

CONCLUSION:

The participants in this Consultation REQUEST that the International Indian Treaty Council, IITC, establish and coordinate a mechanism for the dissemination of information and other aspects of follow-up for the recommendations and decisions of this Consultation.

WE REQUEST THAT the Permanent Forum on Indigenous Issues accept this Declaration and propose to the World Summits and agencies of the United Nations System that they incorporate it into their respective plans of action and policies.

Iximulew, job' Imox, Oxi' Kej[1]
Panajachel, Sololá, Guatemala, April 19, 2002.

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