Human Perceptions, Comprehension and Awareness of Contaminants in Sanikiluaq

by

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A Thesis submitted to the Faculty of Graduate Studies of

The University of Manitoba

in partial fulfilment of the requirements of the degree of

MASTER OF ENVIRONMENT

Department of Environment and Geography

University of Manitoba

Winnipeg

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Of

Master of Environment

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Abstract

The management and communication of the risks posed by environmental contaminants in the food chain of northerners comprises a very challenging issue for health and environmental professionals; and unfortunately, risk management and communication strategies have been faced with many challenges. Though a lot of resources have been invested in examining the root of communication problems, limited attention has been given to assessing the perceptions and levels of awareness and comprehension of contaminants issues that currently exist in these communities. To help address some of these issues, this thesis documents community perceptions, and assesses the levels of comprehension and awareness in the northern community of Sanikiluaq.

The methodology used incorporates both quantitative and qualitative methodologies which included direct observation, in-depth interviews, the application of a questionnaire and the analysis of documents and materials. The results from this study indicate that perceptions, levels of awareness and comprehension vary significantly between individuals in the community and that there are several interrelated social, psychological, cultural and economic factors which influence the reception and comprehension of contaminants information.

Acknowledgements

I would like to express my sincere gratitude to the residents of Sanikiluaq, without whom this thesis would not the possible, your wisdom and knowledge is truly inspiring. Thank you to all the staff and students at the Nuiyak School for always making me feel welcome and including me in school activities, I enjoyed every moment of it. To my translator Dinah Kavik for all your hard work and finally to the Rumbolt family, Mina you are truly an angel! I am so grateful for all your advice, your warmth and hospitality, I feel truly blessed to have met you.

The Department of Indian and Northern Development - Northern Contaminants Program; The University of Manitoba Centre for Earth Observation Science; Northern Scientific Training Program and Arcticnet Canadian Centre for Excellence for their financial support.

Finally my advisory committee Jill Oakes, Chris Furgal, Eric Loring and Gary Stern, I feel so honoured to have been able to work with such incredible people, your advice, knowledge, encouragement and support is truly appreciated and I am so grateful for all your time and commitment.

Dedication

I would like to dedicate this thesis to my parents. I am at a loss for words, but all I can say is "thank you". I know that you had to make many sacrifices and work very hard to provide me with opportunities that neither of you had growing up. And I know it wasn't always easy for you. I am truly grateful to you for providing me with this opportunity.

Table of Contents

Title	Page
Chapter 1 - Introduction	10
1.1 – Community Background	10
1.2 - Introduction	14
1.3 - Definitions	16
1.4 – Problem Statement	18
Chapter 2 - Literature Review	19
2.1 Introduction	19
2.2 The importance of traditional foods	20
2.3 Contaminants: Cases in the North	24
2.3.1 PCBs in Broughton Island	24
2.3.2 Elevated levels of mercury in Sugluk	25
2.3.3. Mercury advisory for merganser birds in Sanikiluaq	26
Chapter 3 - Contaminants Background	28
3.1 Persistent Organic Pollutants (POPs) or Organochlorines (OCs)	28
3.2 Metals	30
3.3 New Chemicals	30
3.4 Vulnerable Groups	32
3.4.1 The Physical Environment	32
3.4.2 The Biological Environment	32
3.4.3 Human health	33
3.5 Sources of contaminants in the North	36
3.5.1 External	36
3.5.2 Internal/local	37
Chapter 4 - Methods and Methodology	39
4.1 Research design	39
4.2 Introduction	39
4.3 Project Planning	40
4.3.1 Establishing contacts	40
4.3.2 Determining the interest and needs of the community	40
4.3.3 Relationship-building	41
4.3.4 Securing Approvals	42
4.4 Data Collection	42
4.4.1 Introduction	42
4.4.2 Participant selection	43
4.4.3 Interviews	45
4.4.4 Questionnaire	49
4.5 Data Compilation	47
4.6 Assessment and Analysis	47
4.7 Limitations and Ethical Considerations	49
Chapter 5 - Results	51
5.1 Introduction	51
5.2 Results	52
5.3 Quotes	54
5.3.1 Elders	54
5.3.2 Youth	55

5.3.3 Women of childbearing age	56
Chapter 6 - Discussion	57
6.1 Introduction	57
6.2 Indigenous terminology	59
6.3 Education and Communication of Contaminants at the Community Level	60
8.4 Environmental Health Risk Perception	63
8.5 Mixed Messages	66
8.6 Differences in Knowledge Systems	67
Chapter 7 - Community Priorities	69
7.1 Climate Change	69
7.2 Human Health Issues	70
7.3 Standard of Living	71
Chapter 8 – Risk Benefit Analysis of Traditional Food Consumption	73
8.1 Introduction	73
8.2 Results	73
8.3 Discussion	74
8.3.1 Socio-cultural Considerations	75
8.3.2 Socio-economic Considerations	77
Chapter 9 - Traditional knowledge and scientific knowledge: The value of knowledge integration	79
9.1 Introduction	79
9.2 Results	80
9.3 Visual Traditional Knowledge	80
Chapter 10 - Linkages between Traditional and Scientific knowledge	82
10.1 Community Cases	82
10.1.1 "Blisters and blotches on seal and beluga skin"	82
10.1.2 "Animals are thin"	83
10.1.3 "The livers in some of the animals look different from what we're used to over the years"	83
10.1.4 "Animals are not having as many pups"	84
10.1.5 "A lot of animals seem sick nowadays"	85
10.2 Summary	86
Chapter 11 Conclusion	87
11.1 Community Recommendations	91
11.2 Research Contributions	91
11.3 Future Research	92
Appendices	94
Appendix A Interview / Questionnaire Questions	94
Appendix C Approval Form and Informed Consent Document	95
Bibliography	98

List of Tables

Table	Title	Page
1	Most Commonly Consumed Traditional Foods in Sanikiluaq	21
2	Advantages of Traditional and Store-bought Foods	23
3	Summary of Major POPs and OCs	29
4	Summary of New Chemicals	31
5	Breakdown of Research Participants	44
6	Levels of Comprehension and Awareness	52
7	Representative Groups	53
8	Traditional Food Consumption Choices	73
9	Traditional Knowledge versus Scientific Knowledge	80

List of Figures

Figure	Title	Page
1	Map Showing Sanikiluaq	9
2	A view of Sanikiluaq	11
3	Nuiyak School	13
4	An Elder Preparing Beluga Meat	22
5	Bioaccumulation Pathways of Contaminants in the Arctic Food Web	33
6	PCB Concentration in Inuit versus Caucasian Breast Milk	35
7	Contaminant Source Areas	36
8	The Local Dump	37
9	Two-way communication model	61



Figure 1. Study Location: Sanikiluaq, Nunavut
Located on the north end of Flaherty Island, a large central island in the Belcher Islands in Hudson Bay. Sanikiluaq is 150 km off the Coast of Quebec; it is Nunavut's most southern community.

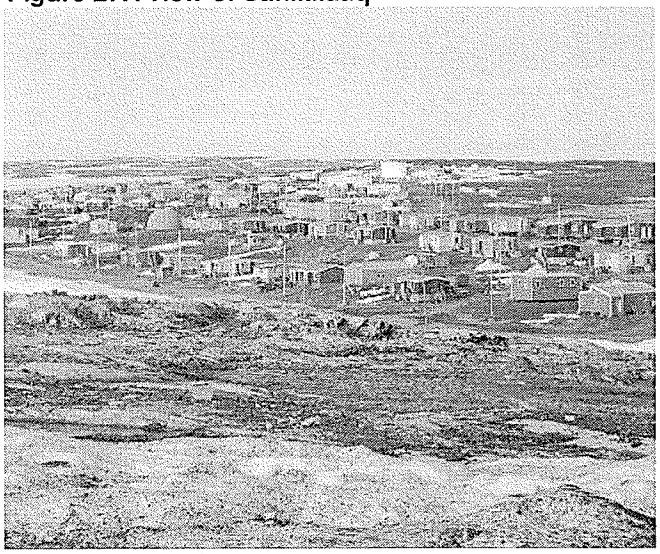
Chapter 1
1.1 Community Background

The perceptions of contaminants voiced in this thesis come from the community of Sanikiluaq, Nunavut located on the Belcher Islands off the coast of Quebec in Hudson's Bay (see Figure 1). The community of Sanikiluaq was chosen for this project for many reasons firstly for logistical reasons; secondly, in some northern communities there has been a significant drift away from traditional foods and practices towards a more western way of life, however the residents of Sanikiluaq have maintained strong Inuit culture and traditions over the years, which was critical for the success of this research project. In addition to this, the residents of Sanikiluaq have a slightly different diet to other Inuit communities for example, caribou is not a major part of their diet and they consume large amounts of invertebrates, which is not the case in other most other Inuit communities. Finally, in the months leading up to the planning and development of this research, hunters from the community noticed an unknown brown substance in the sea ice surrounding the community, which caused some concern regarding contaminants in the community.

In terms of addressing health and environmental issues in the community, the decision-makers in the community include a number of different people. Elders are knowledgeable, well-respected members of the community and play a major role in the decision-making process; additionally the mayor, as well as representatives from the municipal office are also key decision-makers. The communication of health and wildlife issues is primarily done through community meetings and is normally communicated by a representative from the municipal office as well as community experts such as nurses, doctors and wildlife officers working in the community. Some information is also communicated through the community radio.

The community of Sanikiluaq is a relatively small hamlet which has approximately 744 residents, the majority of whom are Inuit (Statistics Canada, 2007).

Figure 2: A view of Sanikiluaq



Source: Researcher, 2007

The community is surrounded by low rolling hills, and is situated on a large naturally occurring harbour on Hudson Bay. The ice provides a relatively smooth and quick means of travel for those community members that partake in hunting on the sea ice. The local river that cuts through the community is fed by a large freshwater lake that provides the Hamlet's water supply. A small pumping station situated on the lake treats the water and pumps it into the local water truck which then delivers to individual holding tanks underneath each home.

The statement that some homes are too 'crowded' was made by many residents. This comment is supported by the constant construction of new housing during the warmer months. An 8.8% increase in population from 2001 to 2006 also indicates that the population is growing quickly (Statistics Canada, 2007). An increasing access to more Southern lifestyles and media accompanies the growing population.

In regards to community infrastructure, Sanikiluaq has its own power generating station which supplies electricity to every home. Large tanker ships fill oil and gasoline reservoirs every summer for use over the year. Heating oil is then trucked as needed to a smaller oil tank outside of every home. Similarly, sewage is moved from holding tanks in each home and disposed outside of the hamlet near the community dump.

Among other facilities, the community has two general stores, locally referred to as 'Co-op' and 'Northern', where general items such as food, clothes and toiletries, as well as larger items such as ammunition and all terrain vehicles can be purchased. New goods, particularly fresh produce, are usually airlifted into the community on a weekly basis depending on weather conditions. Due to the remote location and high cost of airlift and shipping, Sanikiluaq residents have higher living expenses than people in the South.

Sanikiluaq is also home to a small hotel with an attachment restaurant that accommodates visitors, various researchers, and seasonal workers. Also visible in the community are the Hamlet office, the housing office, an RCMP station, an Anglican church, a radio station, a daycare and a school. Of all the buildings within in the community, the school is the largest (See Fig. 3). Nuiyak, the name of the school is an Inuktitut word for a traditional weapon used to catch birds on the Belcher Islands. The school has approximately 300 students enrolled, 23 staff members and 2 co-principals; one from Southern Canada and the other an Inuk from the community. Nuiyak serves the entire community by offering kindergarten to grade twelve, as well as other community-based programs.

Figure 3: Nuiyak School



Source: Researcher 2007

The community also features other community institutions aimed at young people such as an indoor skating rink, and a recreation hall. The school building used by students today was erected in 1986. When the new school building was first named, "pressure by Elders resulted in the name Nuiyak being retained from the old school" as a reminder of this traditional tool's use on the Islands (Sanikiluaq yearbook, 2000, p.85). The making of and use of traditional tools such as the Nuiyak are only a few examples of the knowledge Inuit needed in order to live on the lands now known as Nunavut.

1.2 Introduction

Not so long ago, most Inuit believed that their way of life would never be threatened by problems caused by contaminants in the northern environment or in the wildlife resources they depend on for food. Unfortunately, in the last few decades, scientific disciplines have indicated that the Arctic is no longer that pristine, unpolluted region. During the last few decades, mining, logging, and large-scale hydroelectric projects have been developed and in most cases with little regard for the human ecological impacts (McDonald *et al.*, 1997:49). The occurrence of elevated levels of environmental contaminants in northern communities was at first viewed simply as a public health issue. Efforts were therefore directed towards monitoring the presence of contaminants in the ecosystem, identifying those at risk, and reducing the risk by counselling, avoidance and substitution (Usher *et al.*, 1995). However, it was soon learnt that it was a more complicated issue and that the presence of these contaminants poses a threat to the physical, mental, and cultural health of the Inuit who retain close links to the land and sea, and rely heavily on the "traditional foods" that their environment provides (Elias & O'Neil, 1995; Usher *et al.*, 1995).

The management and communication of the risks posed by environmental contaminants in the food chain of northerners comprises a very challenging issue for health and environmental professionals (Furgal *et al.*, 2003). One of the major reasons for this is that traditional food is the anchor to cultural and personal well-being in the north and is therefore essential to the nutritional and social health of the Inuit (Van Oostdam *et al.*, 2005; Condon *et al.*, 1995). In addition to this, there are several complexities associated with the communication and comprehension of contaminants information including factors such as contrasting information in different regions in the north (specifically differing levels of different contaminants, in different components of

the environment) and this is further compounded by problems with translations into different dialects and the lack of trained translators with adequate scientific background to communicate this information. It is therefore easy to understand why, risk management and communication strategies in the past have resulted in fear and confusion, distrust and anxiety; and in some instances, among community residents they have had significant direct and indirect social, economic, and health impacts (Furgal, 2003).

To date, great effort and significant resources have been invested in communication and education activities on topics related to contaminants (and traditional food) in certain parts of the Canadian North (Furgal, 2003); however, Sanikiluaq has not been one of them. In addition to this, limited attention has been formally given to assessing the reception, comprehension and awareness of this information and the effects that these communication and education have had both positive and negative (Furgal, 2003). It is therefore important to assess the comprehension and awareness of different regions in the North as this information would be invaluable in the development of future communication strategies. With that in mind, this thesis documents residents' perceptions of contaminants in the community of Sanikiluaq, assesses the levels of comprehension and awareness; evaluates how the community weighs the risks and benefits associated with the consumption of traditional foods; as well as examines linkages between traditional and scientific knowledge on the topic of contaminants.

1.3 Definitions

Contaminants

The term "contaminant" is used to identify substances that can be harmful to the physical and biological environment as well as humans. A small number of these non-living substances can occur naturally, but most of these substances are produced as a result of human activity (Coventry & Nixon, 1999).

Traditional foods

Traditional food is food that is acquired through subsistence methods such as hunting and fishing, and is considered to be natural (without the use of chemicals and processing). Traditional food is significant to Aboriginal people far beyond nutritional value. They regard it as an essential element of health and well-being, which cannot be substituted by imported food. Specifically, the harvesting, preparation and consumption of traditional food are defining social and cultural activities, and are key elements of Aboriginal identity (Usher *et al.*, 1995). Furthermore, Aboriginal peoples describe their food quite specifically as Inuit food, or Dene food, as the case may be. The term "traditional food" refers to the mammals, fish, plants, berries, and waterfowl/seabirds harvested from local stocks (Indian and Northern Affairs Canada, 2003).

Traditional knowledge

The term Traditional Knowledge (TK) refers to a knowledge system based on tradition that is created, preserved and dispersed. This information is passed from generation to generation and is determined by land, environment, region, culture and language (Crowshoe, 2005). Traditional knowledge consists of a worldview, organizing principles of life, laws of behaviour, and knowledge of the sciences from archaeology to zoology,

framed and presented in a unique way through the power of the spoken word. The spoken word is the fabric out of which the pattern of the culture is fashioned (Royal Commission on Aboriginal Peoples, 1993). Everyone in a community or culture holds traditional knowledge because it's collective, and is typically rooted in activities such as storytelling, ceremonies, medicines and dances. (Crowshoe, 2005).

At the start and development of this research project, the term Traditional knowledge was the common term used to refer to Inuit knowledge, beliefs and value systems. Currently, the term Traditional knowledge is now referred to as Inuit Qaujimajatuqangit (IQ). IQ is used to describe a body of knowledge and unique cultural insights of Inuit into the workings of nature, humans and animals. Inuit Qaujimajatuqangit, then, has both practical and epistemological aspects that branch out from a fundamental principle that human beings are learning, rational beings with an infinite potential for problem-solving within the dictates of nature and technology (Kruse *et al.*, 2004) However for the purposes of this project, the term Traditonal Knowledge is used for what is now commonly known today as Inuit Qaujimajatuqangit.

Scientific knowledge

Knowledge derived from natural science. It can be articulated through the use of mathematical expressions, formulas, manuals, models and so forth (Yli-Pelkonen & Kohl, 2005).

1.4 Problem Statement

The term 'contaminants' means different things to northerners, however generally speaking a low level of general awareness of contaminant issues exist. It is therefore important to examine potential factors that influence differences in the levels of awareness, comprehension and risk perception among theses populations (Furgal *et al*, 2003). Though a lot of time and resources have been invested on communicating on contaminants in northern communities, there are many challenges and complexities surrounding communication on contaminants such as different dialects in different regions, the shortage of interpreters and translators with adequate scientific background as a result is very easy for confusion to occur and misconceptions to develop. It is extremely difficult for residents to understand such complex and sometimes conflicting information, which is a major part of the problem.

In studies (Furgal *et al*, 2003) conducted in 2 Baffin and 2 Labrador communities, participants responded with a variety of concepts when asked what "contaminants mean to you?" issues such as wildlife abnormalities, spoiled meat, oil drums left on land, food not fit to eat, and smoke were mentioned. Therefore there is a need to understand the nature and levels of comprehension which would aid in future communications as they influence the utility of much of the information delivered from research projects to accurately inform personal decision-making (Furgal *et al*, 2003).

To date no such studies have been done in the area of Sanikiluaq and it is invaluable to gain insight into as many different regions as possible, as different communities have different social, economic and cultural attributes.

Chapter 2
Literature Review

2.1 Introduction

In the late 1970's, southern scientists ventured north to measure contaminant levels. Their assumption was that the Arctic was pristine or "clean" and that the measurements they would make could be used as the benchmark for measuring contamination in the south, especially for work that was then being undertaken in the Great Lakes Region (Department of Indian and Northern Affairs Canada, 1997). Much to the surprise of the researchers, they found that the Arctic environment was contaminated with pollutants and chemicals from areas in the south. Pesticides from South-East Asia, PCB's from Eastern Europe, and mercury from the United States were ending up in the fat of ringed seals and other arctic animals as well as in the Inuit who rely on these animals for food. Over the last two decades, scientific studies, mostly funded by the Department of Indian and Northern Development (DIAND) - Northern Contaminants Program (NCP) have documented alarming levels of persistent organic pollutants and heavy metals in the snow, ice, soil, animals and even people of the Arctic (ITK, 2006).

The relationship between the Inuit and the land is a fundamental part of Inuit identity; in fact the environment affects every aspect of Inuit life. Traditionally, Inuit survival depends on the land. It provides their traditional foods as well as the materials for shelter and tools. Although a more southern style of life has been adopted, in many northern communities, the majority of inhabitants in Sanikiluaq still try to maintain their traditional lifestyle, so it is obvious that the presence of environmental contaminants will pose a great threat to the community. The strong connection between Inuit and the land means that changes in the environment will impact Inuit greatly, and in fact, in a recent study on environmental change and its impacts on Inuit, elders spoke of the changes

they have witnessed on the land and how these changes impact their culture, health, and well-being (Adger *et al.*, 2001).

As a result of this, it has become increasingly important to determine the direct social, psychological and health effects of contaminants, and the effects of the response of various agencies external to them, which have sometimes compounded the problem. Scientific uncertainty, difficulties of communication across cultural and linguistic boundaries, and divided bureaucratic mandates, have all contributed to confusion and inconsistency in identifying, monitoring and remedying the problem, as well as anxiety, apprehension and suspicion among those affected (Usher *et al.*, 1995).

2.2 The Importance of Traditional Foods

Food is not only the elementary source of warmth, energy and nutrients, but unfortunately is also the primary route of exposure for contaminants for people in the North (D'browski *et al.*, 2005). Despite this, the known nutritional, economic, social and cultural benefits of consuming traditional foods are believed to outweigh the currently known risks and further studies are being undertaken to develop a better understanding and clarification of these risks (Braune *et al.*, 2005). The Inuit diet consists of traditional foods such as Arctic char, seal, and beluga and the Inuit in Nunavut eat a wide selection and a great amount of traditional food. Due to the fact that they eat more sea mammals than other Inuit regions, they have higher levels of exposure to contaminants though food intake. Table 1 below lists the most commonly consumed traditional foods in the community of Sanikiluaq.

Table 1: Most Commonly Consumed Traditional Foods in Sanikiluaq

Wildlife / Marine Mammals
Polar bears
Reindeer
Walrus
Beluga
Ringed Seal
Bearded Seal
Birds
Eider ducks
Canada Geese
Mergansers
Surf Scoter
Black Scoter
Long tailed ducks
Fish
Arctic char
Cod

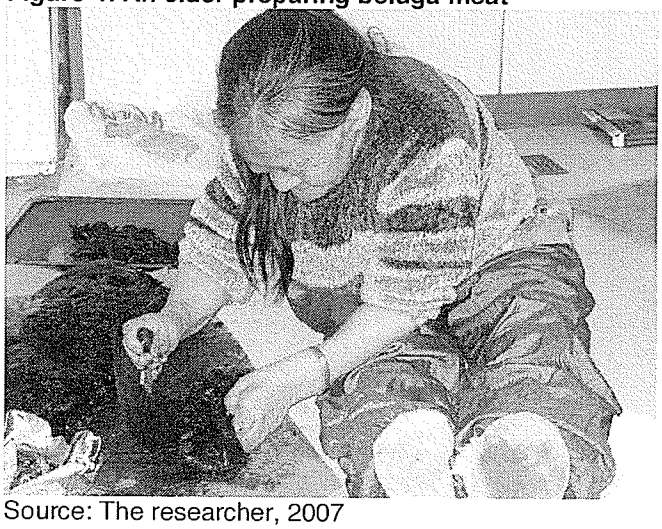
Source: Paul Prefontaine, Conservation Officer (Sanikiluaq), Personal Communication, May 31, 2007.

On the days when people eat traditional food, the diet generally contains less sugar, more of the healthy types of fat, more vitamin E, more iron and more zinc. Overall, a traditional food diet is healthier than a typical northern market food diet. More traditional food is eaten in remote communities such as Sanikiluaq than in urban areas (Condon *et al.*, 1995). People over 40 years old tend to eat more traditional foods than younger people, and men consume more than women. Many traditional foods help people fight illness, injury and disease better than the popular market foods and provide the necessary dietary intake of most vitamins, essential elements and minerals. Harvesting traditional food is physically demanding and helps people stay fit. There are also clear economic reasons which support continued and extensive use of traditional foods, as it is almost always cheaper than market food and is therefore an economic necessity for many northerners (Braune *et al.*, 2005).

Traditional/country foods are an integral part of being healthy for many northerners, Inuit people in particular. A substantial part of the diet of many Inuit consists

of traditional/country foods. Traditional/country food is extremely healthy as it contains all the necessary vitamins and minerals for a healthy diet (Usher *et al.*, 1995; Condon *et al.*,1995). A large proportion of daily nutrient requirements can be found in traditional/country foods such as fish and caribou. Traditional meats such as ringed seal, caribou and bear contain much greater amounts of iron than do market meats such as pork, wieners or chicken. For example, one serving of caribou provides a person with as much iron as six servings of lean pork, and as much zinc as three servings of lean pork. Good sources of vitamin A are caribou, seal liver, marine mammal blubber and fresh willow leaves, while fresh berries, shellfish and fish eggs are good sources of vitamin C. Many traditional foods are high in proteins that are needed to build skin, muscle and blood. Fish and marine mammals contain a special type of fat, not found in store-bought food, identified as omega-3 fatty acid, that is thought to prevent heart disease (Centre for Indigenous Peoples Nutrition and Environment (CINE), 1997).

Figure 4: An elder preparing beluga meat



Source: The researcher, 2007

A recent survey of the socio-economic effects of mercury-contaminated fisheries on remote northern communities (Usher *et al.,* 1995) identified four distinctive elements

of the problem. First is the invisibility of the contaminants, which results in community residents having only the word of outside experts that their daily food is hazardous, and how they should respond to that hazard (Usher et al., 1995; Mercredi *et al*, 1996). The second is the central role of country food in diet, activity, social organization, and culture. The third problem is that in Inuit communities, avoidance is not limited to only food consumption for the reasons noted above. And finally the fourth problem is the context in which contaminant information is received.

The consumption of country food by northern residents represents both significant social, cultural and nutritional benefits, but on the other hand there is also the risks related to the exposure of organic contaminants and heavy metals. However, a study (Furgal *et al*, 2003) conducted on the Inuit of Nunavik, shows that more than 60% had a favourable perception of country food safety and reported knowledge of contaminants while 21% of participants had reported modifying their food related habits. This report concluded that perception and/or knowledge of contaminants and country food were not associated with levels of country food consumption or contaminant intake; knowledge of contaminants and country foods vary with some socio-demographic characteristics; knowledge of contaminants did not vary with food safety and finally, no association existed between the study variables and indicators of social or psychological health.

Table 2: Advantages of traditional and store-bought foods

Advantages of traditional foods	Advantages of store-bought foods
Healthy and nutritious	Convenience and ease of preparation
Low cost	Always available
Clean, free of chemicals	Accessible
Tasty	Fresh produce and staples
Natural	

Source: CINE, Newsletter, 3, 1, 1997, p. 6.

The healthiest diet is still one that includes traditional food. A dietary evaluation study of food nutrients and contaminants conducted by the Centre for Indigenous

Peoples Nutrition and Environment (CINE) among the Inuit in the Keewatin and Baffin regions, concluded that the known benefits of traditional foods and breast-feeding when weighed against the potential biological and social hazards of a rapid shift to market foods as they are currently available and being used, outweigh the known adverse consequences of contaminant intake associated with the traditional diet. A similar study with the Dene and the Métis at Colville Lake advised that the key to a healthy diet is continuing to eat a diversity of wild foods, avoiding excessive consumption of country food containing Toxaphene and PCBs, and choosing market foods for their nutritional quality. Similar studies that are being conducted under the Northern Contaminants Programs have reached similar conclusions. (CINE, 1997; Health Canada, 1995)

2.3 Contaminants: Cases in the North

The issue of contaminants is certainly not a new problem in the North. For instance, radionuclide uptake in lichen and caribou, and the potential danger to the Inuit and Dene in the Arctic was known to health authorities in the early 1960s (Thomas *et al.*, 1992:137), although not publicized. There was also the discovery of methylmercury contamination of freshwater fisheries, and the threat to Anishinabe and Cree health in northern Ontario and Quebec in the early 1970s, which on the other hand was widely publicized and highly politicized. Though the direct clinical effects of exposure were remained unclear, the adverse economic and social consequences were much more evident. The following are examples of the impacts of contaminants in northern communities.

2.3.1 PCBs in Broughton Island

In 1985 trace findings of PCBs in various species of land and sea mammals across the Canadian Arctic prompted scientists from Health Canada and McGill

University to undertake a study of the extent and implication of PCB exposure among Northern residents dependent upon a subsistence diet. In this case levels of PCBs which exceeded guidelines set by Health Canada were found in the blood of residents and resulted in mixed messages and rumours (Kinloch et al., 1992). Recommendations at that time advised residents not to modify their diet, since health risks from food bome PCBs did not warrant altering traditional food consumption patterns (Kinloch et al., 1992).

The researchers involved in the pilot project informed residents of the purpose of their investigation and the procedures involved in carrying out their work. Though there was no organized communication plan, researchers used the community radio to keep people informed about the research activities (Usher et al., 1995). Yet the Broughton Island pilot project left the community uncertain about what had been discovered. While researchers recommended that residents not change their diet until more studies had been completed to quantify the risks and benefits of country food, front-page stories in the Globe and Mail heightened the fears of the Broughton Island community (Kinloch et al., 1992; Usher et al., 1995). Further contributing to fears and anxieties, Department of Indian Affairs and Northern Development (DIAND) meetings regarding Broughton Island excluded Aboriginal leaders and media, a policy that proved disastrous from the perspective of public relations, and thus risk communication (Kinloch et al., 1992; Usher et al., 1995).

2.3.2 Elevated levels of mercury in Sugluk

In the late 1970's elevated mercury levels in residents of Sugluk (Salluit), Nunavik, due to consumption of fish high in mercury concentrations, raised concern for potential human health effects. The Medical Services Branch of Health Canada, finding high levels of mercury in Inuit and also elevated levels in sea mammals, advised

residents to decrease consumption of certain species to limit their exposure (Wheatley, 1997). The release of this health advisory resulted in a certain amount of social, psychological, economic, and lifestyle disruption during the time immediately following the event (Wheatley, 1997).

A number of lifestyle changes for Sugluk residents resulted from the health advisories and alarming media reports. According to Wheatley (1997) "as a consequence of this scare, a number of residents of the community stopped eating country food and switched to store bought food." The problem was further intensified by the isolation of the community and the limited wage employment available. Many community members could not afford to buy market foods equal in quantity and nutritional value to their usual country food. "The psychological effect of the apparently sudden presence of an invisible danger in the traditional food supply, coupled with rumours of crippling deformities and death due to Minamata disease, caused great concern for individuals who had high blood Hg levels and for community leaders who didn't know which information to believe." Furthermore, the study reported, "the few hunters who continued to harvest and eat country food no longer shared with other family members" (Wheatley, 1997). Such impacts included shifts away from country food consumption, an increase in economic hardship associated with reduced hunting and fishing activity and greater need to purchase market foods, and increase in stress and anxiety among individuals in the community (Usher et al., 1995; Powell and Leiss, 1997, Furgal et al., 2005).

2.3.3. Mercury advisory for merganser birds in the Sanikiluaq region

Common mergansers are often the first waterfowl to return north in the spring and the last to move south in the fall. They usually migrate along major rivers, lake chains, and coastlines during day and overland by night. Because of the merganser's

fish diet and migration route, it is an important indicator of contamination pathways and health of aquatic ecosystems. Elevated levels of various contaminants, including PCB, DDE, dieldrin, dioxins, furans, and mercury have been found in merganser tissues in the Great Lakes and other sites. In some instances, levels of mercury in mergansers were a possible risk for human consumption and for reproduction of the birds (Mallory & Metz, 2004). In the community of Sanikiluaq, mergansers birds are one of the most consumed animals in the community and in 2007 researchers working in the southeast Hudson bay region found high kevels of mercury in the merganser bird and issued an advisory through the municipal office warning residents not to eat merganser birds due to the threat of high levels of mercury (Johnassie Ipaak, Personal Communication, May 30, 2007). Information regarding the advisory got to residents by "word of mouth", there was no formal communication of the advisory for concern of the possible effects on the community.

Chapter 3
Contaminants Background

Before going any further, it is important to examine the nature and extent of contaminants that exist in the north. The following highlights the major contaminants in the north, some of the vulnerable groups in the area, as well as some possible sources of contamination in the Sanikiluaq area. Two major groups of contaminants in the Arctic are Persistent Organic Pollutants (POPs), and heavy metals.

3.1 Persistent Organic Pollutants (POPs) or Organochlorines (OCs)

POPs are chemicals that are produced by humans. They include some of the most poisonous (toxic) substances ever produced. Most POPs come to the Arctic via global transport. Although some POPs in the Arctic do come from local sources such as old DEW Line sites and burning garbage, the majority of POPs measured in the Arctic come from industrial areas around the world. Typically, POPs accumulate in fat and biomagnify up the food chain (Macdonald, 2000; Bidleman *et al.*, 2003; Herricks, 1986). POPs share several general characteristics:

1. They originate from human activities
2. They are very persistent
3. They bioaccumulate
4. They are toxic at relatively low concentrations

Table 3: Summary of major POPs / OCs

Compound	Source	Species with highest levels	Target site in the animal
HCB (hexachloro-benzene)	industrial by-product	polar bear, beluga	fat
HCH (hexachloro-cyclohexane)	insecticide (still used in Asia)	polar bear, beluga	fat
DDT	insecticide in Asia and Central America	polar bear, beluga, walrus	fat
PCB's (polychloro-biphenyls)	discontinued industrial product	polar bear, beluga, walrus	fat
Chlordane	discontinued insecticide	polar bear, beluga	fat
Toxaphene (Chloro-bornanes)	discontinued insecticide	beluga, walrus, freshwater fish	fat
Dioxins/furans	industrial by-product	marine species	fat
Dieldrin	discontinued insecticide	polar bear, beluga	fat

Source: Macdonald, 2000

3.2 Metals

Heavy metals were formed by geological processes thousands of years ago. Heavy metals, like cadmium, lead and mercury, are present naturally in rocks and soils. Certain metals are known to have adverse effects and interfere with the normal functioning of biological systems. Mercury contamination in particular remains one of the top priorities in the Arctic, however, it is still too early to tell whether mercury levels are increasing or decreasing. Other metals are usually a lesser concern but should be monitored for new developments (Macdonald, 2000; Bidleman *et al.*, 2003).

Characteristics of heavy metals are that they:

1. Do not break down over time.
2. Can be absorbed into plants, wildlife and people
3. May cause health problems

Mercury, cadmium and lead are three major metals studied in the Arctic. Although these metals occur naturally, it is the burning of fossil fuels and industrial uses of these metals that can be dangerous to wildlife and humans. Most heavy metals come to the Arctic via global transport on wind and water currents (Wagemann et al., 1998).

3.3 New Chemicals

The presence of new chemicals is also an issue. A new generation of POPs have been measured in air, seawater and freshwater sediments and are outlined in Table 4 below.

Table 4: Summary of new chemicals

New Chemicals
Brominated fire retardants (BFRs)
Polybrominated diphenyl ethers (PBDEs)
Short chain chlorinated paraffins (SCCPs)
Polychlorinated naphthalenes (PCNs)
Octachlorostyrene (OCS)
Pentachlorophenol (PCP)
Trifluralin
Mirex
Methoxychlor

Source: Northern Contaminants Program, 2003

3.4 Vulnerable Groups

The major groups affected by contaminants in the North are components of the physical and biological environments as well as human health.

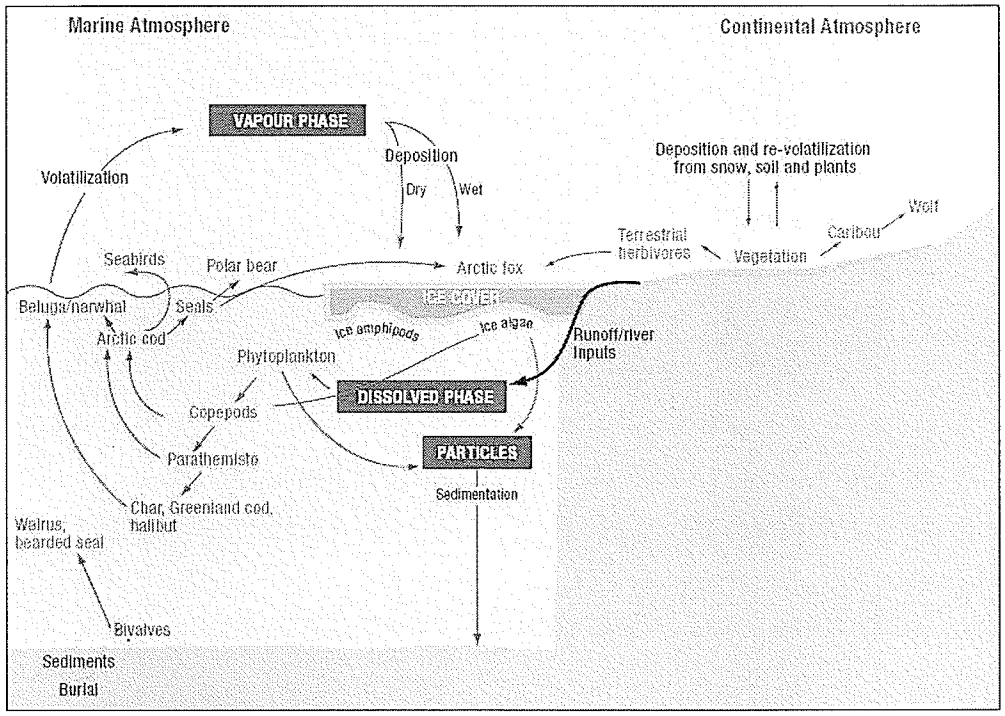
3.4.1 The Physical Environment

Contaminants are found in northern waters, soils, sediments, snow, rain, ice and in the air. The main reason for studying contaminants in the physical environment is to determine their sources, main transport mechanisms and pathways into the biological environment. Levels are quite low, but these contaminants can bioaccumulate and biomagnify in the food web, eventually to reach levels of concern in people (Bidleman et al., 2003; Renzoni, 1994).

3.4.2. The Biological Environment

In terms of contaminants in the biological environment, emphasis is placed on marine mammals, fish and wildlife, which become exposed to contaminants through their interaction with the physical environment (Herricks, 1986; Fisk *et al.*, 2003). The processes that deliver contaminants to marine, freshwater and terrestrial environments where they become available for uptake by biota are shown in Figure 5 (Fisk *et al*, 2003). These bioaccumulation pathways shown in Figure 5 influence the different levels of contaminants typically found in certain species.

Figure 5: Bioaccumulation pathways of contaminants in Arctic food webs.



Source: Fisk et al., 2003

3.4.3 Human Health

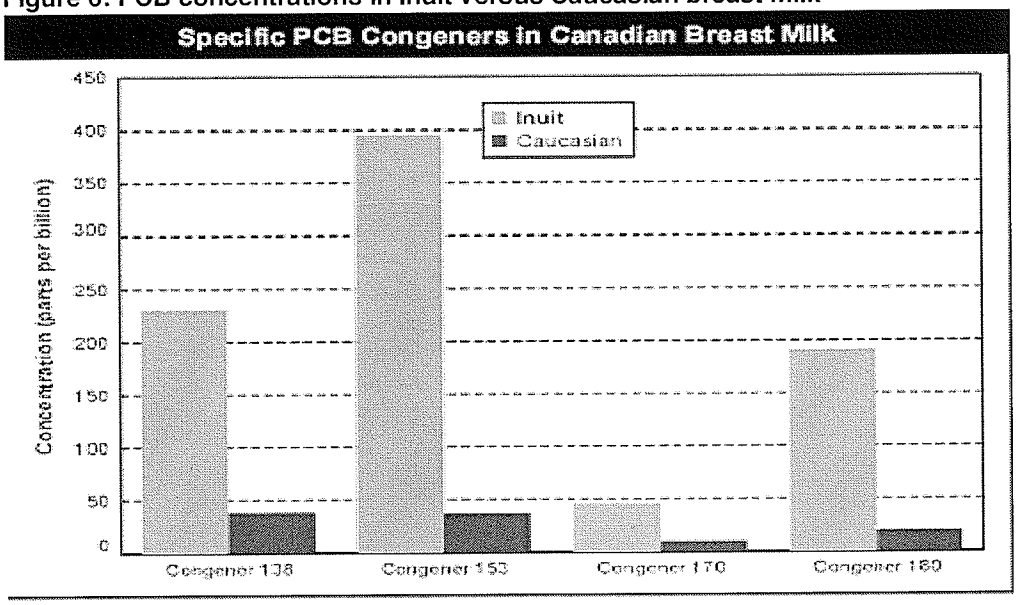
Human health is undoubtedly one of the major concerns associated with contaminants in northern communities. Unfortunately, traditional foods such as fish and land and marine mammals are considered the primary environmental pathway of contaminants for people living in the Arctic (Jardine *et al.*, 2003). In Inuit communities, traditional foods are directly associated with physical and spiritual health and well-being. In Sanikiluaq, people regard these foods as being able to generate bodily warmth and strength in a way that imported foods cannot (Usher et al., 1995).

As mentioned earlier, persistent environmental contaminants such as PCBs, toxaphene, DDT and mercury biomagnify and bioaccumulate in the food chain, which

can make human exposure very high (D'Itri & Karmin, 1983). Levels of organochlorine contaminants in human tissue in the Arctic are considerably higher than those in southern Canadians, reflecting the greater consumption of food species at the top of long food chains. PCBs are certainly a concern for some residents as they are environmentally hazardous and are known to pose numerous adverse health effects. One issue in Inuit women is the effect of PCBs in breast-milk on their unborn child; high levels of exposure can cause significant effects on infants ranging from low birth weight to more critical problems such as brain defects. (Natural Resources Defense Council, 1997). Inuit women have shown significantly higher breast milk levels than other populations (See Figure 5), and this is primarily attributable to their higher fish consumption. PCBs are also known to cause other significant health effects such as cancer.

In terms of metals, mercury levels in country foods is another major problem in many Inuit communities as long-term exposure to mercury can cause permanent damage to the brain, kidneys and developing fetus (Macdonald, 2000). Recent research has revealed significantly higher levels of mercury in the maternal blood of Inuit women when compared to Caucasian, Dene and Métis (Van Oostdam *et al*, 2003). High concentrations of selenium are generally found in the traditional food diet of the Inuit, particularly marine mammals. Lead levels are also elevated among some Inuit groups but it is not known for certain if the Sanikiluaq Inuit is one of them. Research on lead isotopes has indicated that these elevations of blood lead levels are likely due to the use of lead shot in the hunting of traditional food and thus its presence in the wild game consumed (Usher *et al.*, 1995).

Figure 6: PCB concentrations in Inuit versus Caucasian breast milk



Source: CINE, 1997

The Inuit also have the highest mean level of cadmium in maternal blood. These values are roughly 1.5-5 times higher than other groups and is likely due to the high rate of smoking among Inuit mothers and the high cadmium content in Canadian tobacco (Macdonald, 2000). It may also result from the consumption of marine and terrestrial mammal liver and kidney.

In terms of radionuclides, research conducted through the NCP identified the lichen → caribou → human food chain as the most significant radiation exposure pathway for Arctic residents. These animals graze over wide areas on slowly growing lichen, which can accumulate deposited radionuclides over decades. Most of the radiation exposure received through the food chain resulted from anthropogenic radiocesium isotopes from the naturally occurring lead-210 → polonium-210 decay chain (Van Oostdam *et al*, 2003). Despite these factors, research relating to contaminants and human health has resulted in the message to northerners that the known nutritional,

economic, social and cultural benefits of consuming traditional foods are believed to outweigh the currently known risks. Further studies are being undertaken to develop a better understanding and clarification of these risks.

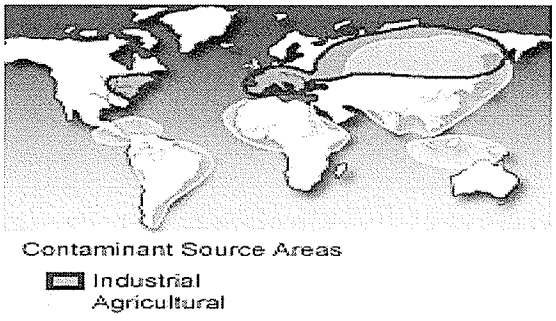
3.5 Sources of contaminants in the North

Contaminants are known to have natural and human-made sources; however human activities are responsible for most of the contaminants found in Northern Canada (Bidleman et al., 2003). Though for the most part, contaminants in northern communities are primarily external, there are some internal sources as well.

3.5.1 External

Most contaminants in the north arrive directly from other countries through the atmosphere, for example, heavy metals such as lead and mercury are emitted by many industrial processes, and Europe and Asia are thought to release many of the heavy metals that are transported in the air and winds to the Canadian north (Bidleman et al, 2003; Stonehouse, 1985).

Figure 7: Contaminant Source Areas



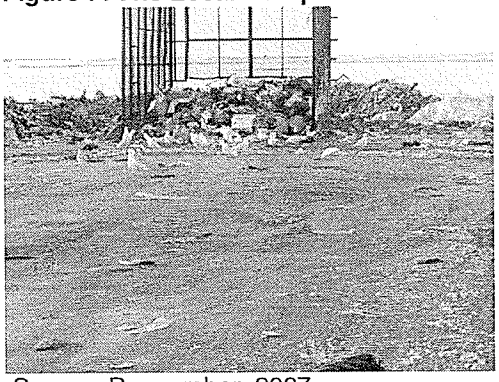
Source: Inuit Tapiriit Kanatami, 2006

Some may also arrive by a mechanism known as the "grasshopper effect" and oceans can also transport contaminants but it can take years for contaminants to reach the north by these routes. Once contaminants have arrived in the north, sea ice is important for moving them into the marine environment, and bioaccumulation and biomagnification in the food web worsens this problem (Indian and Northern Affairs Canada, 2003; Stern, 2006).

3.5.2 Internal/Local

Most contaminants in the Arctic come from activities such as agriculture, mining, and forestry. In the case of Sanikiluaq, the major sources of contaminants include the local dump (Fig. 7), which involves burning as well as the disposal of garbage such as oil drums, plastic, motor oil, gasoline and sewage. There is also the exhaust from the all terrain vehicles and snowmobiles.

Figure 7: The Local Dump



Source: Researcher, 2007

In addition to this, Abandoned Direct Early Warning (DEW) Line sites are another local source of contaminants. The DEW Line sites were built in the 1950's as part of the North American defense against surprise air or missile attacks from the former USSR. These radar sites were utilized for almost 30 years, and their operation required

electronic equipment and support installations that contained, on a local scale, sizable amounts of PCBs. These sites contribute only 1% of the total PCBs found in the north. These sites are now being cleaned up under a separate program from the NCP (ITK, 2006). Elders have stated that there are such sites near to the community as well as a few mining sites.

Chapter 4
Methods and Methodology

4.1 Research Design

For the purpose of this thesis and its objectives, it was determined that it would be beneficial to incorporate both quantitative and qualitative methods but focuses primarily on the latter. Qualitative research in environmental studies is currently used to address a whole range of issues and events, and these studies utilise a variety of methods (Devereux & Hoddinott, 1992). Qualitative researchers typically rely on four methods for gathering information: (1) participation in the setting, (2) direct observation, (3) in depth interviews, and (4) analysis of documents and materials (Limb & Dwyer, 2001). This research, to some extent incorporates all 4 methods; however in depth interviews was the most extensively used form of data collection. In this case, talking directly with residents was the most effective method of getting accurate and appropriate information (Brenner *et al*, 1985).

4.2 Introduction

The first phase of this project involved collecting data to establish the parameters of the study and to establish key contacts in the community. After reviewing the collected information, a set of questions were developed to cover the scope of potential research that would need to be conducted. This phase of the research also involved the collection and review of indicator data from NCP and other reports to establish a baseline of indicators.

The second phase involved interviews with residents based on an established set of questions, as well as the development and application of a questionnaire. The reason for combining qualitative and quantitative data is that it enables the researcher to answer confirmatory and exploratory questions at the same time. In addition to this,

because all methods of data have limitations, the use of multiple methods can neutralize the disadvantages of certain methods. This method of triangulation has many benefits including the "convergence of results" allowing the researcher to gain a more balanced and fuller perspective (Babbie, 1986).

4.3 Project Planning

The first phase of this project involves taking the appropriate steps for conducting research in northern communities, this involves, collecting data to establish the parameters of the study and to establish key contacts in the community and external organizations. In addition to this, there were some important steps which had to be taken prior to going out into the community and conducting fieldwork.

4.3.1 Establishing contacts

Establishing contacts is extremely resourceful when conducting research in the North. For this project, some contacts included John Jamieson (School principal); Lucassie Arrangutainaq (Municipality of Sanikiluaq); Lisi Kavik (School principal); and Mina Rumbolt (teacher). Through these contacts the researcher was able to determine effective and appropriate research methodologies specific to the community. These contacts also provided referrals for research assistants, translators and interviewees.

4.3.2. Determining the interest and needs of the community

In many northern communities residents feel that research occurs with very little or no consideration of the needs or interest of the community and is therefore of very little benefit to them. Therefore it was important for the researcher to ensure that the research being conducted matches the interest and needs of the community and its residents. Prior to planning this project the researcher consulted Nunavut Tunngavik Inc.

(Phillip Lavallee), the Inuit Research Advisor for Nunavut (Jenny Ipirq) and The Municipality of Sanikiluaq (Lucassie Arrgutainaq) to ensure that the community was interested in the project and that the right steps were being taken to conduct research in the community.

4.3.3 Relationship-building

The issue of relationships and its central importance in successful research is often overlooked (Dey, 1993); however, relationship building is an extremely important component of social sciences research. In the past, the opinions and concerns of the local people in northern communities have either been overlooked or misused (Egan, 1999) and this has resulted in a lot of mistrust and scepticism in many residents. It is therefore beneficial to build relationships of trust, which would allow people to feel comfortable and encourage them to be open-minded about the research as well as the researcher working in the community.

Relationship building is an aspect of successful research that is often overlooked. For this project relationship building occurred during different stages of the project including communicating with the community on the goals and objectives of the project prior to entering the community and keeping them updated in any progress and changes in the project. Once in the community the researcher spent time in the schools working and interacting with students. Time was also spent attending community meetings, gatherings and activities. Relationship building was extremely beneficial in the research process because it allowed participants to be more open and honest during interviews once that trust was established. In addition to this, it provided the researcher with useful insight when analyzing data including information such as the importance of traditional knowledge, the role of the environment and the knowledge of and value of elders.

4.3.4. Securing Approvals

For this project, there were 2 approvals required: the Social Science Research Licence from the Nunavut Research Institute and Ethics approval from the University of Manitoba Research Ethics Board. Once these approvals were approved and the community granted their approval, the fieldwork component began.

4.4 Data Collection

4.4.1 Introduction

The researcher spent 3 weeks in the community which allowed participation in the setting, direct observation and in depth interviews to take place. By using direct observation as a method of data collection, the researcher was able to gain invaluable information and insight to the issues applicable to the goals and objectives of the project. Specifically, the levels of traditional activities taking place in the community and the recognition of the important role of the preparation and consumption of traditional foods in the community. As well, the general social, economic and cultural factors in the community which influence the reception and comprehension of contaminants issues.

As mentioned earlier, the main form of data collection were interviews; interviewing residents allowed the researcher to produce a rich and varied data set in a less formal setting (Hoggart *et al*, 2001; Kitchin & Tate, 2000). The second method of data collection would be the development and application of a questionnaire. The purpose of this method was to capture the same data as the interview, but to generate quantitative data from which statistical data can be calculated (Kitchin & Tate, 2000).

4.4.2. Participant Selection

One of the most important decisions any project is determining how to select participants, how many participants to select and who to select; this is known as the *representative sample* (Kitchin & Tate, 2000). In terms of the number of participants to select, qualitative research does not focus on numbers but rather on 'an analysis of meanings in specific contexts' (Kitchin & Tate, 2000; Robinson, 1998). Michael Paton's work (2002) on *purposeful sampling* refers to various forms of sampling. The major strategies employed included:

1. *Snowball or chain* sampling was the most frequently used method. It identifies cases of interest from people who know other people with relevant information. For this project, Dinah Kavik (translator), Mina Rumbolt (teacher) and Lucassie Arrgutainaq (Municipality of Sanikiluaq) referred appropriate people to be interviewed.
2. *Opportunistic* sampling allows the researcher to flexibly follow new leads during fieldwork and takes advantage of the unexpected. (Harvey & Jessup, 2003; Patton, 2002) for example while interacting with students at the Nuiyak School an elder approached the researcher about being interviewed as she wanted the opportunity to express her opinions.
3. *Convenience* sampling involves selecting participants on the basis of access. Even though this strategy saves time and money it often provides the lowest dependability and can potentially yield information-poor cases, and as a result was not widely used.

Through the use of these sampling methods, a total of 40 participants were selected from the community to take part in this project. The table below outlines the profile of the residents interviewed.

Table 5: Breakdown of Research Participants

	Total	Age Range	Mean Age	Male	Female
Elders	15	52-74	63	9	6
Youth	20	15-19	16	7	13
Women	5	24-29	26	0	5
Community	40	15-87	37	16	24

1. *Elders*

A total of 15 Elders from the community were interviewed, and it should be noted that all the elders interviewed were hunters and trappers. Elders are respected and cherished individuals who have amassed a great deal of knowledge, wisdom and experience over the period of numerous years and are very in tune with the environment (Royal Commission on Aboriginal Peoples, 2007; Dumont-Smith, 2002).

2. *Women of Childbearing age*

A total of 5 women were interviewed from this group and included women between the ages of 20 and 30. Women of childbearing age are some of the major at risk groups for contaminants, due to its effects on the reproductive system and the unborn child. A convenience sampling method was used mainly with the women of childbearing age as this was a difficult group to recruit and therefore mainly females who worked at the schools were interviewed.

3. *Youth*

Youth often tend to be overlooked at times and to date they have not been included in similar studies on the perception of contaminants, so it is important to gain insight into their perceptions as well. For this thesis youth primarily between the ages of 15-18 were interviewed. Based on the recommendation of the teachers and principals at the Nuiyak School data collection was in the form of questionnaires and a class discussion.

4.4.3. Interviews

One of the major advantages of this form of data collection is that it is sensitive and people oriented, allowing interviewees to provide details in their own words. This conversation provided an opportunity for the researcher and the interviewee to develop into a wide-ranging discussion. In the course of the interview, the researcher had the opportunity to go over the same topic asking the same questions in different ways in order to explore issues thoroughly; participants were allowed to explain the complexities and contradictions of their experiences and describe issues in detail. Another benefit of this approach is that it allowed respondents to raise issues that the researcher did not anticipate. The material generated in this way is rich, detailed and multi-layered, producing a "deeper picture".

Once the participants were selected, the next step was coordinating the interviews. For the elders, this process was done with the assistance of the translator who scheduled the time and location of the interviews. For the women of childbearing age, the researcher was stationed at the Nuiyak School where interested participants were interviewed. The interview process for both groups was semi-structured, the questions asked in the interview were content focused and dealt with general contaminant issues (See Appendix A for interview questions). This form of interviewing

was organized around ordered but flexible questioning, which allowed the conversation to flow as 'natural' as possible. With minimal direction from the interviewer, the respondents were encouraged to relate their experiences, describe events that are significant to them, and reveal their opinions concerning contaminants as they saw fit (Hay, 2000; Kitchin & Tate, 2000).

The interview process was open, the following questions outline the general questions asked during the interviews however due to the open-eded nature of the questions in many cases responses from one question led to the devleopment of other questions, interview questions can be found in Appendix A.

A combination of audio-tape recording and note-taking were the main techniques of recording the interviews. Audio-recorders compile the fullest and most accurate recording while allowing the researcher to concentrate on the conversation; on the other hand note-taking will capture the gist of what is said and can provide a rich description of the interview (Hay, 2000; Kitchin & Tate, 2000).

4.4.4. Questionnaire

The second method of data collection was the development and application of a questionnaire. As stated earlier, the purpose of this method is also to capture the same data as the interview but produces more quantitative. This method was only used for youth at Nuiyak School (based on the recommendation of school administration) because of time constraints to conduct interviews with individual students during school hours.

The benefit of this is that it allowed youth (who are not comfortable speaking) to be more open. On the other hand, this method may have resulted in a lack of appropriate responses, therefore to deal with this issue a class discussion was also held with students which allowed them to openly discuss contaminants issues. The

discussion was also recorded and similar to the interview, the discussion was open allowing students to voice their opinions.

4.5 Data Compilation

After the data collection process was complete, data was complied and organized for the final stages of analysis. The first part of this is the mechanical phase, which involved recording transcription and field note assembly (Hay, 2000; Flowerdew & Martin, 1997). The first step of the mechanical phase involved transcribing data, which produced a written 'reproduction of the formal interview', in this process the notes and interviews were transcribed into coherent transcripts. Upon completion of transcription, the interview data was analyzed in order to seek meaning and extract important content from the data.

4.6 Assessment and Analysis

There are different ways to approach the analysis of data produced. These include an *interpretative approach* (Patton, 2002) which emphasizes the role of patterns, categories and basic descriptive units; *grounded theory approach* (Strauss and Corbin, 1990) which emphasizes different strategies of coding data; and the *quasi-statistical approach* (Miles and Huberman, 1992) which seeks to minimize interpretive analysis and introduce an objective, prescriptive approach to analysis. These approaches are often utilized in analyzing different sorts of data (Kitchin, 2000). In this project an interpretative approach was mainly used as it will allowed patterns in awareness or lack of it, to be determined, and basic descriptive units such as "very aware" versus "unaware" to be established amongst categories of people in the community.

The classification of data goes beyond data description to interpretation and making sense of the data. By undertaking interpretative analysis the data generated is understood more fully and is made more meaningful to others. Relationship building was extremely beneficial in collecting and analyzing data because it allowed participants to be more open and honest during interviews once that trust was established. In addition to this, it provided the researcher with useful insight when analyzing data including information such as the importance of Traditional knowledge, the role of the environment and the knowledge of and value of elders.

This was done by categorizing the data into similar parts and placing them in similar categories or classes. In this process the most important factors were identified, in order to draw out commonalities and divergences (Kitchin & Tate, 2000).

Qualitative research involves and in-depth understanding of human behaviour and the reasons that govern that human behaviour (Marshall et al., 1998). With that in mind, this thesis specifically examines why the levels of comprehension and awareness are what they are, why people weigh the risks and benefits associated with contaminants the way they do, and why people choose certain knowledge forms for contaminants information. This was done by the examination and interpretation of current literature as well as an in-depth analysis of responses during interviews as well as notes from direct observation.

Once this is complete, the corroboration of conclusions is vital, particularly in qualitative data analysis. Corroboration is aimed at avoiding some of these criticisms by strengthening the claims made from qualitative data; it is concerned with integrity and validity (Dey, 1993; Kitchin & Tate, 2000). In this thesis, some aspects of the qualitative data were analysed using quantitative data. In addition to this, given the range of qualitative data sets, it was essential to the data was triangulated to address completeness, convergence, and dissonance of key themes (Eyles *et al*, 2006).

4.7. Limitations and Ethical Considerations

Due to the fact that qualitative data is interpretative and relies on the researcher's ability to make informed and impartial judgments (Kitchin & Tate, 2000), the limitations of this research relate to the way in which this research information is interpreted. There are a number of dangers in conducting this type of research. Firstly, the researcher may only pay attention to information that supports the thesis, or a lack of awareness may undermine the ability of the researcher to identify hidden messages. In other situations the researcher may overly identify with the subjects and bias the research and interpretation by applying their own thoughts and feelings to the findings. However, all these limitations are negated by the unbiased approach, insightfulness, of the researcher as well as by the objectives and nature of the project. However, one major limitation in this thesis includes the translation of the word "contaminants" into Inuktitut, which can affect the proper interpretation and understanding of interview questions. In addition to this, the number of participants from the group women of childbearing age was considerably less that other groups and therefore may not be fairly represented.

Another limitation of this project invloved the use of a transaltor during the interviews. This can cause information to be lost in translation between the interviewer and the interviewee. In order to reduce the possible effects on information integrity and accuracy, the transaltor used for this project had years of experience as a translator doing work for the Department of Fisheries and Oceans and Department of Indian and Northern Development. In addition to this, prior to the interviews, the research spent time with the translator going over the goals of the project and was advised to translate what participants were saying word for word, she was informed not to put in her interpretation of what is being said.

Another limitation of this type of research is the fact that climate change is now a major issue and threat to many northern communities, these are visible changes with

noticeable indicators, many northerners are directly experiencing the impacts of climate change and therefore there is increased awareness and understanding of climate change issues in the community. However, contaminants are invisible and many people in the community have not had any experiences or seen any indications of contaminants in the community, whereas approximately 10 years ago some northern communities has direct experiences with contaminants and therefore at that time there would have been increased awareness and comprehension of contaminants issues as opposed to current times where many northerners are focused of climate change and its effects.

Chapter 5
Results

5.1 Introduction

Perceptions, understanding and concerns regarding contaminants in northern communities are quite complex (Jardine & Furgal, 2007). Even within a small community such as Sanikiluaq, consensus does not exist with regard to contaminants and its effects on the environment, wildlife and human health. The following results show the varied ways that Inuit think about, comprehend and react to contaminants. It can be seen that the levels of awareness and comprehension varies and demonstrates the heterogeneity that exists in the community. The often complex and interwoven perceptions, concerns and understanding of the issue as well as the confusion that sometimes exist will also be explored.

The word "contaminants" has several different interpretations for people in the North. Generally speaking, there is a low level awareness and comprehension of contaminants issues in the community. From current literature and discussions during interviews it is clear that there are several interrelated factors which influence how the community perceive contaminants, some of these factors include: problems with translation of contaminants terminology into Inuktitut, lack of education and communication at the community level, differences in knowledge systems (traditional knowledge versus scientific knowledge), mixed messages and environmental health risk perception. In addition to this, one consistent point throughout the interviews is that residents were generally unconcerned about contaminants because of more pressing challenges facing the community such as health problems, poverty and climate change, which they perceive to have more significant direct impacts on the health and well-being of the community.

Another objective of this research is to identify how the community weighs the risks and benefits associated with the consumption of traditional foods when posed with the threat of contaminants. Again, responses varied throughout different demographics in the community, however there are several psychological, social, cultural and economic factors that influence people's choices. The following results show the different levels of comprehension and awareness in the community as well as how the community weighs the risks and benefits associated with the consumption of traditional food.

5.2 Results

The following results show the levels of awareness and comprehension for the community. Due to the significant differences in the levels of comprehension and awareness between community elders, youth and women of childbearing age, results for each individual group is also shown.

Table 6: Levels of Comprehension and Awareness

	Awareness			Comprehension		
	Low	**Moderate**	**High**	**Low**	**Moderate**	**High**
Elders	20%	47%	33%	60%	27%	13%
Youth	80%	20%	0%	80%	20%	0%
Women	100%	0%	0%	100%	0%	0%
Community	67%	22%	11%	80%	16%	4%

Representation of Each Group in Different Levels of Awareness and Comprehension

The following table shows how the different groups interviewed (Elders, youth and women of childbearing age) are represented in the different levels of comprehension and awareness. From the results presented it can be seen that the levels of awareness and comprehension varies significantly between different groups.

Table 7: Representative Groups

	Awareness			Comprehension		
	Low	Moderate	High	Low	Moderate	High
Elders	10%	70%	100%	25%	52%	100%
Youth	40%	30%	0%	32%	48%	0%
Women	50%	0%	0%	43%	0%	0%

Community elders had the highest level of comprehension and awareness on the topic compared to the other groups interviewed, with women of childbearing age having the least. There seems to be a correlation between the level of comprehension and awareness to time spent on the land and taking part in traditional activities such as hunting, fishing and the preparation of traditional food (the residents that frequently take part in these activities were most aware and knowledgeable on the topic). All the elders interviewed in this study indicated that they were very active in these areas. Community youth and women of childbearing age do not spend as much time (as elders) on the land, taking part in traditional activities, and this was mainly attributed to the introduction of technologies such as computers and cable.

5.3 Quotes

The following depicts the perceptions of participants when asked to describe contaminants in their own words:

5.3.1. Elders

"I think of exhaust, metals, lead, mercury, and PCBs. It is mainly through CBC that we hear about these things, not at the community level." – Joe Kavik.

"Contaminants are affecting the food chain, when one animal eats another animal, the pollutants are passed on. It starts from the earth and then goes into the smaller animals and then the larger animals, which eventually end up in humans." – Annie Tookalook.

"I think it's from the mining and exhaust fumes because there is a film of dust on snow when you melt it now." – Lucassie Takatak.

"It's difficult for me to understand what they mean when they talk about contaminants because how do you see contaminants? How do you see the effects? Because our lands and waters have not been affected as yet. However this winter was the first time I was aware that polar bears aren't as fat as they would normally be during wintertime and I don't know why that is, but it is probably due to a lack of availability of food or it could be contaminants." – Davidee Eyaituk.

"The only thing is when people tranquilize and tag animals, and then they become contaminated and are not safe." – Johnny Tookalook.

"I think about animals and the only way animals would get contaminated is from what it eats and those contaminants come from manmade pollutants. So the manmade pollutants get into the animals and man eats the animals." – George Emikotailuk.

"I understand it as "dirt" coming in and I'm a bit concerned because it's coming from the different rivers along the Hudson's Bay. I also think of exhaust fumes from the big cities, the exhaust goes up into the air and then it turns into clouds." – Shoapik Oqaituk.

"Hydro projects and oil spills. We know the hydro projects are affecting the environment because there are generators and other power equipment, they say they are not affecting the environment but it is. Zooplankton, fish and cod may have been exposed to contamination from hydro projects and they are eventually eaten by bigger animals, which end up in humans. Eider ducks dying off on the Davis Strait and I think it's because of the hydro projects. The water quality is affecting the eating habits (availability to zooplankton). Before the hydro projects, animals only got sick from old age." – Sampson Meeko.

"We hear about ships sinking and oil spills spreading into the ocean. Pollutants from oil spills, shipwrecks and exhaust all have an effect on the system." – Paulossie Eqilak.

"When I hear people talking about contamination, it makes me wonder whether our waters are contaminated or not. But yet you can't see any hard evidence. However in the older days you didn't hear people talking about animals dying off but now there might be a few animals found here that are dying, as well a few years ago the sea cucumbers turned white and that might be due to contaminants." – Emily Takatak.

"I think of pollutants such as lead, mercury and PCBs some of which have been measured in high levels in some of the animals over the years. My major concern is PCBs because I've heard a lot about them on the TV and I know the effect it can have on my health because they just accumulate and they don't breakdown." – Anonymous.

"When I hear about contaminants, I think about our food. I will not eat food if it is contaminated and I can tell if food is contaminated from looking at it. I think it's from the hot weather." – Louisa Ipaak.

"It's scary because we can't see it, we don't know if the food is contaminated or not. I know that it if I have too much contaminants in me that it could affect my health." – Annie Amittook.

5.3.2. Youth

"Contaminants affect our land and our animals and can even affect our health"

"Contaminants pollute the environment"

"Contaminants are things that make our environment dirty"

"Contaminants are chemicals like lead and mercury that are made by big industries, these chemicals get into our water and then ends up in some of the animals we eat so it is passed on to us"

"Contaminants are unhealthy problems with the community or the land that are affecting the plants, food and animals"

"Something that hurts the environment"

"People doing things bad that are not good for the animals"

"I have never heard that word before so I don't know what it is"

"Oil and gas"

"Garbage is everywhere in this town"

"Smoggier weather, PCBs, acid rain, garbage in the lakes and oil spills"

"Contaminants are things that don't break down easily, that are really affecting our environment, mostly our wildlife and marine mammals"

"Contaminants are things that make our environment dirty"

"Garbage and oil"

5.3.3. Women of childbearing age

"Something dangerous" – Louisa Oqaituq

"We know there are contaminants when we smell it or when you see dead animals lying around" – Annie Iqaluk

"How would you know when and where you have contaminants" – Caroline Novalinga

"Contaminants are when oil spills occur" – Annie Kattuk

"Something dangerous" – Annie Oqaituk

Chapter 6
Discussion

6.1 Introduction

From the previous information, it is evident that different levels of comprehension and awareness exist between elders, youth and women of childbearing age. 80% of elders were considered to have either moderate or high levels of awareness. It should be noted that community elders considered to have a high level of awareness learned about it primarily from documentaries on CBC, and stated that very little or no information was communicated at the community level. Though the levels of comprehension were fairly low, community elders also had the greatest understanding of the topic compared to other groups interviewed.

Generally most elders were able to provide general information on the topic, such as identifying food as their major source of exposure, as well as discussing and identifying the possible sources of contaminants such as industrial and agricultural waste from the south. 13% of the elders had a high level of comprehension of contaminants, which meant that they understood the chemical nature of contaminants (including contaminants such as lead, mercury, and PCBs), routes of exposure, sources as well as were able to discuss (in their own words) concepts such as bio-accumulation and bio-magnification. Again the participants in this case gained their information from watching documentaries on CBC. The remaining 87% of elders made generalized statements such as mining and exhaust fumes; oil spills; poison; tagging animals; hydro projects; and "dirt" coming into the community.

Contrary to that of the elders, community youth, maintained a relatively low level of awareness; in fact many youth stated that they had never heard the word "contaminants" before. The youth considered to have moderate awareness of the topic learned about contaminants from attending a science class where they were taught a chapter on the

environment and discussed topics such as the effects of oil spills and exhaust. It should be mentioned that despite the lack of knowledge on contaminants issues, all of the youth discussed and expressed concern about the issue of climate change.

Needless to say, there is also a low level of comprehension, however part of this may be attributed to problems with translation of the word "contaminants", which will be discussed in more detail in the next section. The students considered to have a moderate level of comprehension were the same students that attended the science class discussing the environment. The majority of students made generalized discussions such as "dirt" and "poison".

The participants in the women of childbearing age category had both low levels of awareness and comprehension on the topic and had the lowest levels of awareness compared to the other participants in the other groups. Similarly to the community youth, these participants stated that they were not sure what contaminants were, but they knew they were considered to be "bad". This group also had the lowest level of comprehension amongst all the groups interviewed, with none of the participants having an understanding of the issue of contaminants or what they are.

From the quotes in section 5.3 it can be seen that the word contaminants means a variety of different things to different individuals. There are several factors that influence these perceptions, which are often unique to different personal, social and cultural backgrounds. As mentioned earlier, these factors include Indigenous terminology related to contaminants, education and communication, differing knowledge systems, mixed messages and risk perception; each one is important in understanding the different perceptions that exist and will now be explored in more detail.

6.2 Indigenous Terminology

Despite the fact that there are several factors that influence the reception and comprehension of contaminants communication, it is evident that one of the most significant obstacles in the proper comprehension and perception of contaminants in Indigenous communities is the translation of the word "contaminants" and related information into Indigenous languages. As a result of this, there is a lot of opportunity for misconceptions and misinterpretation to occur.

Language differences exist in a number of forms. In addition to the language barrier between English and Indigenous languages, there are also different levels of language facility within the community; and some individuals are not as fluent as others in their Traditional language or some people may not speak their traditional language at all. This diversity in languages in the same region has been a general problem in cross-cultural communication related to a range of environmental issues (Furgal *et al.*, 2005). Another factor to consider is that many Indigenous languages, including Inuktitut, do not have equivalent terminology for English words referring to scientific concepts and such things as chemical contaminants (Furgal *et al.*, 2005).

The lack of scientific terminology is problematic for health professionals trying to communicate specific information on the relationship between toxicant levels (or intakes) and negative health effects. This obstacle in communication is not only a problem for communicators but for northern residents as well. In fact, Omura (2002) points out that systematic generalizations regarding contaminants and environmental health issues are regarded negatively by Indigenous groups. Such statements are thought to be over simplistic and generalizations of complex phenomena. Such considerations put the translation and communication problem in a different light. The inadequacy of terminology is compounded by definite differences in the concepts of Indigenous and non-indigenous groups, as well as in their respective outlooks on areas such as food,

health, and relationships with animals and the land (Myers *et al.*, 2005). Needless to say that the problem of inadequate terminology can have catastrophic effects on contaminants communication efforts, as it increases the chances for misinterpretation. It is therefore beneficial to work with communities to develop more adequate and accurate terminology, which would undoubtedly foster better risk communication.

6.3 Education and Communication of Contaminants at the Community Level.

Education and communication on contaminants at the community level is one of the most important topics to address in terms of improving community comprehension and awareness. Communicating about the risk of contaminants to northern communities such as Sanikiluaq is not an easy task. Even in southern communities it is often a problem for the general public to grasp general concepts, but in northern communities such information is being layered onto a different worldview and mode of understanding (Furgal et al., 2005). Many residents of Sanikiluaq stated that there have been little or no attempts by the government to educate or inform residents of contaminant issues in the North. Past communication on contaminants in other northern communities have had significant direct and indirect, intentional and unintentional impacts. Lessons from cases such as Sugluk in section 2.3.2 of the literature review show the importance of incorporating appropriate and effective communication strategies. This can be accomplished by applying the basic components of communication as outlined by classic communication models and adapted into a two-way communication model proposed by Powell and Leiss (1997).

Figure 9: Two-way communication model

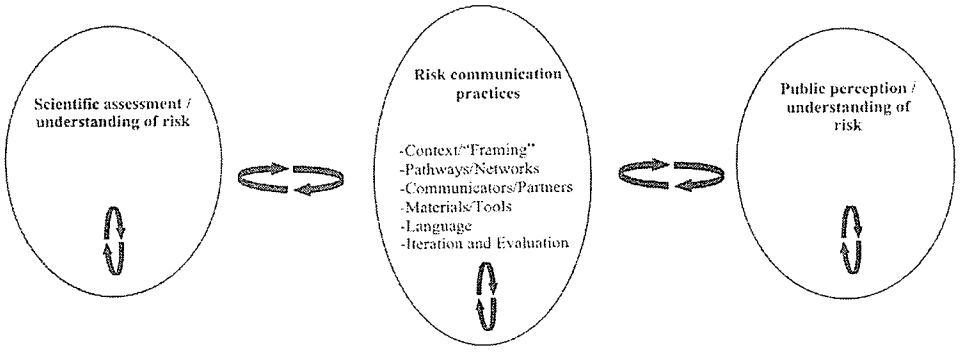


FIG. 1. Two-way communication model (adapted from Powell and Leiss, 1997).

The two-way communication model above would be effective in communities such as Sanikiluaq; however it involves a number of complicating factors. First is the apparent or actual disparity of views on the risks associated with contaminants in traditional food items in the north, arising from the complex cultural, social, and demographic factors that can influence risk perception and behaviour in these communities. Second is the ongoing need to build trust between risk assessors or scientists and the communities in regard to these issues. Finally, Northern communities need continuing support to develop local capacity, so that residents can engage in the scientific process of assessing, communicating and managing risks in and around their own communities.

Characteristics of northern communities themselves govern how communication takes place. Sanikiluaq is a small isolated community and communities such as this are primarily exposed to informal communication networks, carried out as people in the community work and visit with friends and family. Usher identified this as "contaminants gossip" which is an element of communities such as Sanikiluaq, whereby information gets passed around from person to person and though this information is not necessarily accurate, and in fact like gossip, it may become inflated, exaggerated or transformed. Such communities also lack access to specialized or expert information and resources,

either because it is not available locally or because it is often available in a language or format that is not easily accessible or understood. In fact the residents that were most knowledgeable and informed on the topic spoke English and as mentioned earlier, they got their information from documentaries on the television.

With greater access to media such as cable television, the internet and other forms of communication in the community (which was once isolated from popular media) these communities are inundated with messages and information concerning issues such as health and the environment. To date, there has been no formal education and communication of contaminants in the community. This may be due to the fact that there is currently no indication that any contaminants pose a significant threat to their health and well-being. However, 80% of the residents stated that they would like to be informed of contaminants issues in the north. The remaining 20% stated they would rather not hear anything on the topic because of lack of trust in outsiders and that they have faith in their own ability to determine if something is contaminated. In northern communities, people are most likely to turn to community Elders, and regional and local Aboriginal organization representatives. These people are therefore in the "frontline" for communicating and discussing contaminant information. These frontline workers have an immense responsibility because the whole community looks up to them, and makes decisions potentially based on their advice. It is therefore important to ensure that information is provided in an accessible, balanced and meaningful way (Department of Indian and Northern Affairs, 1997; Adger *et al.*, 2001).

Any information northerners receive about contaminants in traditional foods may have significant impacts on their diet, economy and way of life. NCP therefore, invests considerable time and resources for education, training, capacity building and communication. Several methods and activities have been used in some communities to

provide education and training and capacity building in the Canadian North. These include specific educational materials for the school curriculum, regional contaminants coordinators, frontline training courses, community tours, and Elder-scientist retreats. Of the many ways that the NCP communicates with community members, one-on-one communications and small groups have proven very effective (Department of Indian and Northern Affairs, 1997). None of the participants during their interviews recalled such activities taking place in the community; however it is important to note that not all residents are aware when such activities take place in the community

Another very important topic is that of youth education. It is evident that community youth are not adequately informed on the issue. The Aboriginal Partners and NCP identified the need for environmental education to support the capacity of communities and regions to deal with contaminants issues. Teachers in the Yukon, Northwest Territories and Nunavut were open to including such information. As a result, educational materials were developed to teach children and youth about contaminants in the North. The curriculum projects have brought the contaminant issue into northern classrooms where they have reached northern youth and will continue to be used for many years. To date no such projects exist in Sanikiluaq, however based on discussions with students and teachers at Nuiyak School, implementation of such curricula will be beneficial.

6.4 Environmental Health Risk Perception

Risk perception is probably one of the most important factors to examine when considering individual perceptions of the issues surrounding contaminants. The reason for this is that their insights are very much influenced by their individual perceptions of the health risks associated with contamination. Risk perception is the subjective

judgment that people make about the characteristics and severity of a risk (Slovic, 1982). Typically, analysts employ technically complex risk assessment calculations to evaluate risks; however the majority of individuals rely on intuitive risk judgments called "risk perceptions" (Strydom, 2002).

Examining risk perception is extremely beneficial in this case because it would help to develop a theory that predicts how residents will respond to contaminants and it develops techniques for assessing the complex and subtle opinions that people have (Slovic, 1982). Gaining insight into the concept of risk perceptions and the factors that influence it can have numerous benefits especially in terms of risk management, and it will also serve as a tool in facilitating effective communication processes.

Risk, in any context, is often a difficult concept to explain and communicate to the public (Furgal *et al.*, 2005). Therefore communicating about risks in the north poses a challenge due to social and cultural issues such as barriers of cultural differences, language differences and differences in knowledge systems. It is known that people's responses to various risks (especially those associated with external threats such as contaminants) are strongly associated with 'place-identity'. In fact most northern residents have lived in the same location for 20 years or more and therefore have a strong cultural, social, and physical attachment to their local surroundings, as well as participate in a high level of activity in their local environment (Jardine & Furgal, 2007).

These factors are indicative of the importance of their physical surroundings as a determinant of individual and community health and well-being, whether it is through the provision of traditional foods or medicines, or the ability to get out on the land and practice traditional pursuits such as hunting and fishing, the environment is paramount in the health of individuals (Jardine & Furgal, 2007). They recognize the cultural values of biodiversity and the environment and plants, animals and ecosystems are at the core of their attachment to the land. The continued use of wild foods and medicines allows Inuit

people to pass on cultural knowledge to future generations, to use and maintain places of cultural value, and to benefit their spiritual and physical well-being. Therefore, even when there are no provable direct health effects, Indigenous peoples' holistic concepts of health, balance, and harmony, and the interrelatedness of health and environment lead them to regard social and cultural effects as health effects (Wheatley, 1997).

Many factors influence the extent to which community residents will understand and respond to the risks associated with contaminants. Some of these factors are internal to the residents themselves (e.g., personal experience and perceived importance to the individual), which may be difficult to establish and comprehend (Knuth, 1990). The perception of risk is a product of several key factors. First, traditional cultural understandings of risk include relatively high levels of uncertainty that place positive value on remaining open to contingency and context (O'Neil *et al.*, 1997). Second, people maintain a high level of confidence in their ability to detect problems and are relatively resistant to external information which may suggest health risks. And finally, uncertainty as a positive traditional value when compounded with conflicting, scientific information creates enormous ambiguity in risk perception (O'Neil *et al.,* 1997).

Several theories have been proposed to explain why different people make different estimates of the risks posed by certain hazards. Two major theories have been developed by social scientists: the Psychometric Paradigm, which focuses on individual psychology; and Cultural Theory, which looks at culture and society. (Slovic, 1987). Individual and societal responses to risks are multidimensional; and political, social, economic, and psychological factors interact in complex and poorly understood ways.

One of the most perplexing problems health professionals are faced with today is why some relatively minor risks or risk events, as assessed by technical experts, often elicit strong public reactions, which has occurred in some northern communities such as in the case of Broughton Island and Sugluk in section 2.3. In situations such as this, the

threat of contaminants interacts with psychological, social, institutional, and cultural processes in ways that may amplify or attenuate public responses to risk. People's perceptions and attitiudes are determined by a variety of quantitaive and qualititaive characterisics, including a hazards's degree of controllability, the dread it evokes, its catastrophic potential and the equity of its distribution of risks and benefits (Slovic, 1987). Cases such as Broughton Island show the importance of research aimed at understanding how people think about risk and highlight the important role it should play in informing management and communication processes on contaminants in the community.

6.5 Mixed Messages

Mixed messages occur when communities receive verbal or non-verbal information that seem to contradict each other. Some elders stated that they sometimes hear that their food in the north is contaminated but it is still safe to eat, a concept, which is difficult for many residents to grasp, *"How can food have something bad in it and still be good to eat?"* – Louisa Ipaak (Elder). Typical reactions to this behaviour can result in confusion, anger and in even some cases a desire to cease communication. In many northern communities, there is often the classic case of mixed messages, wherein different messages are received from different sources, both at the same level (government agency versus government agency) and at different levels (agency versus community members). It is not merely that mixed messages are transmitted because of differences in the understanding or interpretation of words or terminology; but different messages are given by different information sources (Burger, 2000). The risks from contaminants in country foods, for example, are complicated to understand, even more so when language differences, conceptual differences, and cultural differences are factored in. Northern residents' perceptions about contaminants have been influenced by

early alarms, then assuaging messages, and more recently, confusing and contradictory double messages by communicators. As a result some residents are definitely wondering if food is safe to eat, but the messages remain mixed and the nuances difficult to grasp (Myers *et al.*, 2005).

The problem of contaminants creates a complex situation affecting the heart of the culture and traditions of the Inuit population, particularly in relation to nutrition and health. From the health expert's viewpoint, food is understood and treated as both a risk and a protective factor for health and well-being. Consequently, the content of the message disseminated to the Inuit population is often ambivalent and confusing because it focuses concomitantly on potential risks related to chronic exposure to contaminants as well as positive health aspects of a diet based on fish and marine mammals. Therefore, it is important to examine the relationship between expert and Inuit knowledge, more specifically in the way they incorporate one another.

6.6 Differences in Knowledge Systems

It is undeniable that forms of knowledge in northern communities (Traditional knowledge) are different to those found in the south (Scientific knowledge) (upon which many scientific findings related to environmental issues are based) (Furgal *et al.*, 2005). Scientific knowledge refers to a product of Western or European approach to empirically studying, researching and recording observations of phenomena (Boyer, 2002). Traditional knowledge on the other hand refers to a knowledge system based on tradition that is created, reserved and dispersed. This information is passed from generation to generation and is determined by factors such as land use, environment, region culture and language (Crowshoe, 2005). Indigenous approaches to risk place

high value on remaining open to contingency and context. The general approach is highly consistent with traditional cultural approaches to risk management in everyday life. It stands in marked contrast to scientific approaches which value certainty and uniformity in risk assessment and to the general western cultural approach which tends to be highly symbolic and ideological (O'Neil *et al.,* 1997).

Conventional contaminant research is, by definition, analytical and reductionist in approach, and therefore a high degree of specificity is a desired end point. By contrast, traditional knowledge of the environment is holistic, inclusive, and fluid (Myers *et al.*, 2005). Even in non-indigenous communities, it is often a problem for the general population to grasp scientific concepts, but in northern communities, such information is also being layered into an entirely different worldview and mode of understanding. Therefore, when scientists introduced communities to the issue of contaminants, a concept based on "invisible" knowledge that could not be visually validated, many northern residents had difficulty believing, comprehending and trusting sources outside of the community. Especially in communities such as Sanikiluaq where Elders teach and firmly believe that they will "see" changes as they occur and is therefore based on a culture of being able to visibly identify changes and problems as they occur. As a result scientists were faced with varying degrees of suspicion, skepticism and mistrust (O'Neil *et al.,* 1997). Northern communities therefore fear that efforts by southern scientists and authorities to assess and manage the risks of contaminants in the north will result in further disruptions and of little benefit for local residents (Furgal *et al.*, 2005)

Chapter 7
Community Priorities

When residents were asked why so many people were not aware of contaminants issues in the north, 87% of the people stated that the community is facing bigger challenges such as climate change, living conditions and health problems. Therefore, since it is not an issue that people feel threatened by, they are generally unconcerned and likely unaware. When people were asked about the major concerns they have about environmental change issues, none of the participants expressed concerns about contaminants but rather climate change, health issues and standard of living.

7.1 Climate change

"My main concern is with the weather because that's what is really affecting us. I really don't think too much about contaminants." – Emily Takatak (Elder)

The residents of Sanikiluaq are becoming increasingly concerned about the effect of climate change on the community, as these changes are having a direct effect on their culture and lifestyles. Evidence of climate change is being seen right now by many people in the community who are noticing changes in spring ice breakup, snow quality and quantity; they are also watching polar bears waste away because of a lack of sea ice. In addition to this, vital travel routes linking communities to each other and to harvesting sites are becoming dangerously unpredictable.

Some people outside of the Arctic assume that climate change would be a good thing for Arctic peoples, if it means that the weather will get warmer. Unfortunately, that is unlikely to be the case. Arctic peoples are well adapted to their environment, and to using the plants and animals that are adapted to the cold northern weather. As the weather gets warmer, people, plants and animals are becoming stressed (Elias & O'Neil 1995; Wheatley, 1997).

Past generations have skillfully adjusted harvesting activities and lifestyles to environmental changes, but now the rapid climate change, combined with social, economic and political conditions, presents new challenges. Through ways of life closely linked to their surroundings, the Inuit have particularly insightful ways of observing and interpreting environmental changes, however their local surroundings are becoming unfamiliar, making people feel like strangers on their own land (Elias & O'Neil, 1995).

7.2 Human Health issues

"Contaminants don't seem to be an issue in terms of health. The reason is that there are more important issues such as long term smoking and the effects of high sugar diets. So it's not that the issues from contaminants don't exist, it's just that there are bigger ones." –Community Nurse

Another major problem facing the community of Sanikiluaq are increased rates of health conditions such as diabetes, cancer and cardiovascular disease, which are the major health problems currently facing the community (Burns, 2007). The nature and magnitude of health issues in the community is a major concern for many residents. Current health indicators of this include rates of mortality and morbidity; cancer and cardio-vascular disease incidence and treatment outcomes; suicide; alcohol and substance abuse; family violence; and communicable diseases (Canadian Institute of Health Research, 2007). In a study conducted by Jardine and Furgal (2007), the most important concerns or health risks identified through responses to various questions include activities involving alcohol, drugs and smoking. However, participants in this study also expressed concern regarding contamination to their land from anthropogenic sources, although to a much lesser extent than lifestyle related risks (Jardine & Furgal, 2007).

According to Statistics Canada many northerners experience lower health

status than their southern counterparts. For example, life expectancy among Aboriginal people in some regions is as much as 12 years lower than the national average for both sexes (Statistics Canada 2001). Existing health status issues in Inuit populations 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 communities to respond. When many of these factors overlap and the population is already facing some critical health 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) It has been recognized that northern communities in the country face unique challenges and that there is a need to expand the assessment of vulnerabilities to include these communities (Furgal & Seguin, 2007).

7.3 Standard of Living

"We have to deal with so much poverty out here, it's hard to even think about more problems like contaminants" - Anonymous

For Inuit communities in Northern Canada, this is a time of great challenges. While many communities are being faced with numerous social, economic and political changes, poverty continues to cast a heavy burden on many northern communities. Many remote communities are challenged by limited access to health services, lower average socioeconomic status, crowding (in 2001 20% of Inuit households were crowded compared to 2% of non-Aboriginal households in Canada) and poor-quality housing, and concerns regarding basic services such as drinking water quality (Statistics Canada 2001). Living in conditions such as these can also lead to bigger problems, such as poor health, substance abuse, crime and increased suicide.

In addition to this, Indigenous groups have higher low income rates than other

groups in the country. In Sanikiluaq only 34% of residents were estimated to be employed and have earnings with an average earning of $19,519 (Statistics Canada, 2001). In fact, industry, Aboriginal groups, government organizations and other interested parties repeatedly pointed to a lack of literacy and low levels of education as major barriers to Aboriginal job creation and Aboriginal participation in the wage economy.

Basic education levels in many northern communities are much lower than in the rest of Canada. Indeed, the value of formal education and training remains under-appreciated in some Aboriginal communities and among some Aboriginal leaders for social, cultural and historical reasons. Without these basic education levels, meaningful Inuit capacity will continue to be elusive (Department of Indian and Northern Affairs Canada, 2007). When confronted by such problems it is easy to understand why the issue of contaminants would not be ranked very high in community concerns.

Chapter 8
Risk Benefit Analysis of Traditional Food Consumption

8.1 Introduction

Another objective of this research is to assess how the community weighs the risks and benefits associated with the consumption of traditional food when posed with the threat of contaminants. For many Inuit, cultural identity is linked to the procurement and consumption of traditional foods; so the presence of contaminants can undermine trust in the safety of these foods and the important role they play in communities. The management and communication of the risks posed by environmental contaminants in the food chain of northerners comprises a very challenging issue for health and environmental professionals; and unfortunately, risk management and communication strategies in the past have often resulted in confusion and distrust (Furgal *et al.*, 2005).

8.2 Results

The following table shows reflects the results from responses when participants were asked whether they would still consume traditional food if they were told (by scientists) their food was contaminated.

Table 8: Traditional food consumption choices

	Yes	No	Maybe
Elders	40%	47%	13%
Youth	0%	90%	10%
Women	0%	80%	20%
Community	13%	73%	14%

From the table above it can be seen that responses varied across the different groups; community youth and women of childbearing age mainly stated that they will not consume food said to be contaminated mainly because they don't want to risk becoming

ill. Community youth also have more trust and confidence in technology and scientists. One elder stated "*nowadays there are a lot of new changes; we have a lot more equipment, computers, telephones, electronics, all sorts of things so I understand why the youth will put all their confidence into something that we cannot see. For example if there were animals were being tested, the younger generation would take those results and believe in it and they have every right to. But in my years, they didn't have all those technologies so we could only tell by seeing or hearing from the elders*". 10% of youth said "maybe" as it depends on the situation, specifically, if there are other food sources available in the home, an issue that will be discussed further. 20% of the women of childbearing age also said "maybe" for the same reasons as those of the community youth; however these women also stated they would consult with an elder before making a decision. Elders were the only participants where a portion of them said they would still consume food said to be contaminated. Their main reason for this is that they question the intentions and accuracy of scientists, who some Elders believe to be inaccurate or have ulterior motives. The elders that said "no" stated that it wasn't necessarily that they believed the scientists but that they did not want to risk becoming ill.

8.3 Discussion

In research conducted to determine the current impact of contaminant concerns on food behaviour in the North, Furgal et al. (2003) found that concern over contaminants was not a determinant of food choice in one Labrador community, while Kuhnlein et al. (2003) reported that 42% of women interviewed in five western Arctic communities indicated "concern over contaminants" as a reason why they did not serve more country foods to their families, and approximately 30% reported this as one of the top three reasons for this behaviour. In the case of Sanikiluaq only 2% of the people interviewed stated that the threat of contaminants was the reason for the change in their diet.

Several researchers have previously reported on diet-related behaviours in the north (e.g. Kuhnlein *et al.*, 1996; Furgal et al., 2003), but still few have looked in detail at perception and behaviour related to general environmental and health risk-taking to help us understand and put into context the reaction to potential or perceived risks related to country food. In addition to this there are also other socio-cultural and socio-economic factors that influence such decisions and will determine how the community perceives the associated risks and benefits.

8.3.1 Sociocultural Considerations

As discussed earlier, traditional food is considered to be an integral component of Inuit health and well-being. Furthermore, the hunting, fishing and gathering of traditional food and the subsequent sharing of these items with individuals throughout the community are social activities bringing together individuals, families and generations. For example, in Sanikiluaq, when hunters return to the community after a successful hunt, hunters place flags on their skidoos, so the community will know the hunt was successful. It is also announced on the radio and the catch is shared amongst the community. In such cases it can be seen that traditional foods form and maintain an important social and cultural fabric among individuals which supports community health and well-being (Van Oostdam *et al.*, 2003). When confronted by the knowledge of contamination in the food chain and the decision of whether to eat traditional foods and maintain the cultural practices essential to sustaining their ethnic identity, individuals are making a cultural assessment of risk and having to decide between culture and health. Giving up traditional food could mean giving up important aspects of culture (Briggs, 1997).

In terms of traditional food consumption, there are special behaviours that should be considered in evaluating risks and benefits of consumption. Food is an important part

of a culture, because it serves economic, social, aesthetic, ceremonial, and religious functions. One example of the cultural influences in food preference is the acknowledgement by many residents that their traditional food is a marker of their identity; they assert that by choosing to eat hunted animals rather than store-bought foods that Inuit identity is maintained. "Being a genuine Inuk means that the individual holds a cumulative knowledge that is derived from direct contact with the environment." When cultural traits (such as hunting or eating Inuit foods) are threatened, their sense of "ethnic rootedness" is threatened. It is not merely the pursuit and product of the hunt that signifies the importance of traditional foods, but rather an overall feeling of well-being which prevails when a more traditional lifestyle is assumed (Briggs, 1997). Therefore, if traditional foods are culturally revered, it may be difficult to perceive these foods as "hazardous," particularly if immediate negative health effects are not experienced.

Any change, especially if they are related to aspects of rapid culture change or threaten aspects of cultural identity, in a community, can have numerous catastrophic effects. These may include loss of self-esteem, loss of social solidarity (sense of community), loss of culturally meaningful social activities, a switch to less healthy foods, worsened economic conditions, and increases in violence and substance abuse (Ship, 1997). Consequently, it is not uncommon for individuals in the communities to resist changing their consumption habits, especially when considering other issues such as lack of trust in risk communicators, mixed messages, as well as lack of resources to incorporate changes. In addition to this, certain ethnic groups also are subject to special health concerns (Cartledge, 2002; Burger, 2000). For instance, many people in the community suffer from high rates of diabetes and obesity; therefore reduced traditional food consumption could exacerbate these problems.

Within this cultural context, environmental resources such as traditional foods can be seen as essential for cultural survival (Roe, 2003). Therefore, it is becoming

increasingly important to understand the subjective dimensions of risk perception among Indigenous peoples. Assuming that risk will be perceived by the lay public in its "pure" form (as a probabilistic relationship between exposure and adverse outcomes) is misguided. Humans, as social creatures, have a more comprehensive view of risk (Kasperson et al. 1988) based mainly on issues related to their culture or lifestyle. Given the various social and economic changes impacting northern peoples, the contaminants problem is only one factor among many affecting the social and economic status of people in the north. The connection between people and the land is under multiple stresses. However, the risk of losing the connection to the land would, in turn, have additional consequences for the well-being of both the people and the land.

8.3.2. Socioeconomic Considerations

Another important matter in northern communities in terms of contaminants and traditional foods is that alternative food sources may not be readily available. In poorer communities, families may lack sufficient income to purchase alternative foods (Vaughan, 1995). A case like this occurred in the community when residents were told not to eat merganser birds as high levels of mercury were detected however all residents interviewed for this study that were aware of the advisory continued to eat the bird. When asked why they made the choice to still eat it, they all stated because it is a source of food, one elder stated "Because it's food, you never waste food, especially when you can't always afford to buy food from the store".

Even though there have been many socio-economic changes in northern communities, traditional foods have remained important and desirable for most northern peoples. Indigenous identity is partly defined in terms of living off the land and producing food from lands and waters (Egan, 1999; Myers *et al.*, 2005). In Sanikiluaq for example, a small scallop fishery has been initiated, which generates a break-even source of

income for a few families, selling to the local market (Myers *et al.*, 2005); in addition to this, all of the elders interviewed reported sharing their catch with other households.

Both land use and a traditional economy persist in the northern parts of Canada's provinces and territories. This land-based economy has remained a cornerstone of the mixed economies of many northern communities, and despite predictions to the contrary, it has not been replaced by the modern wage economy (Myers *et al.*, 2005). Northern residents may not always have the means to acquire healthy alternative foods. Many Indigenous peoples have only seasonal employment; the off-season procurement of traditional foods will certainly help families and communities economically (Kuhnlein, 1996).

Chapter 9
Traditional Knowledge and Scientific Knowledge: The Value of Knowledge Integration

9.1 Introduction

Traditional Knowledge refers to a knowledge system based on tradition that is created, preserved and dispersed. This information is passed from generation-to-generation and is determined by factors such as land use, environment, region, culture and language. It is typically rooted in activities such as storytelling, ceremonies, medicines and dances. (Crowshoe, 2005). Scientific knowledge is a product of Western or European approach to empirically studying, recording and recording observations of various phenomena (Boyer 2002).

Traditional Knowledge has played a role in the earliest form of resource management. When one considers how the Inuit of the north lived off the land and its resources it is no surprise to learn that their traditional practices stressed the importance of resource management and environmental protection. As environmental protection efforts progress in northern regions, the strategies of Traditional populations should be considered in the creation of co-management policies. Undoubtedly Scientific Knowledge has numerous benefits and has played a pivotal part in the development and evolution of the contemporary world we live in today. In spite of this however, science is not free from flaws and is subject to certain limitations.

In the past Traditional Knowledge became increasingly marginalized. The reason for this is that the role of science and technology took precedence and strongly influenced most environmental planning and decision-making. The opinions and concerns of the people that have been impacted by and experienced these changes have been largely overlooked. However, it is important to note that elucidation of these

perceptions and concerns, which are based on culturally framed qualitative factors, is critical to risk management (Egan, 1999). It is therefore important to examine the role of traditional knowledge in the community, the reception of scientific knowledge as well as examine possible linkages between the two knowledge forms. The following table shows participant responses when asked which knowledge system they would trust in regards to information and advice on contaminants.

9.2 Results

Table 9: Traditional versus Scientific Knowledge

	Traditional Knowledge	Scientific Knowledge	Both
Elders	64%	29%	7%
Youth	15%	60%	25%
Women	20%	80%	0%
Community	33%	56%	11%

9.3 Visual Traditional Knowledge

To put Traditional knowledge in the context of contaminants, 73% of the residents interviewed stated that they were not concerned about contaminants because they will be able to tell if something is contaminated by using their Traditional knowledge and can therefore make an informed decision whether or not to consume it. When discussing the invisible nature of contaminants elders stated that the animals will exhibit certain behaviours or physiological indicators (such as fish heads bigger than the body, fishes traveling "lop-sided" and skinny animals) that will indicate whether it is contaminated; as well, in prepared foods there are certain indicators of contaminants such as changes in the colour of animal livers, blotches on seal fat and low fat content. Dinah Kavik described this as "Visual Traditional Knowledge", as their forefathers taught them that they will always be able to see the changes in the world as they occur. Traditional

Knowledge explains the world on the basis of centuries of observation, oral interpretation and the passing on of events and patterns, with an emphasis on the observable and a belief that humans and the physical and biological world are completely intertwined (Usher et al., 2005).

Given the complexity and different social perceptions surrounding contaminants issues in the north; one challenge that science faces is the development of forums and learning environments that better support more informed decision-making. This can only be achieved by developing strategies that are based on the priorities of the community, which incorporates both traditional and scientific systems (Rahman, 2000).

Chapter 10
Linkages between Traditional and Scientific Knowledge

10.1 Community Cases

In terms of contaminants, finding linkages between traditional and scientific systems has proven to be quite difficult, primarily because when food or animals contain contaminants there are normally no visual signs, and "seeing" changes is a significant part of Inuit traditional knowledge. The following outlines the most common changes reported by residents, which they believe may be caused by contaminants and possible linkages to scientific data.

10.1.1 "Blisters and blotches on seal and beluga skin"

Research conducted by Foster (1995) show that some POPs disturb production of the pigment in red blood cells, which in severe cases lead to the disease porphyria. Symptoms include skin damage after exposure to sunlight which results in blistering and edema of skin. The porphyria develops as a consequence of liver damage. Species differences in experimental porphyria caused by polyhalogenated aromatic compounds are attributed to differences within and between species, the physiological state of the animal, route of administration, age, and feeding schedule (Strik, 1987). In addition to this, skin lesions are one of the most striking changes in mammals exposed to PCBs. PCBs are absorbed through the skin and cause chloracne and chemical burns on contact with the skin. In Turkey and Japan, hexachlorobenzene and PCBs have been responsible for outbreaks of porphyria (Kimbrough, 1978).

10.1.2 "Animals are thin"

Skinny or thin animals were the most common visual indicator that Elders believed to be a possible sign of contaminants. Normally it is extremely difficult to tell whether any of these changes are as a result of contaminants; however there is some research that indicates that the presence of certain POPs may result in weight loss. Some of the health effects of POPs occur at levels to which all of us are exposed in our daily lives and among these low-exposure effects are excessive weight loss, and increased mortality (Sinclair, 1999). In addition to this, in the case of birds and mammals, porphyria development due to PCB intoxication (previously discussed) is correlated with loss of weight (Neal, 1985).

10.1.3 "The livers in some of the animals look different from what we're used to over the years"

In the body, many toxic chemicals are converted into less toxic substances that can be excreted. The liver is the site for most of this detoxification, and many organic contaminants stimulate the production of specific liver detoxification enzymes. Measurements of these enzymes are now used as biological indicators of the levels of contaminants in an animal. Unfortunately, these same enzymes are also capable of breaking down hormones. This side-effect of detoxifying high levels of contaminants can increase the breakdown of hormones and impair critical hormone-dependent functions (Kimbrough, 1985)

According to the Wisconsin Department of Health and other health agencies, exposure to PCBs can cause liver damage, in fact, the liver is the major target organ for PCBs. Because liver function affects many different systems in the body, such damage could have far-reaching effects. PCBs are known to induce microsomal liver enzymes,

such induction may lead to hepatogenic porphyria and increased degradation of endogenous steroids in the liver, hepatomegaly (enlarged liver) and liver hemorrhage. In a study conducted by Rice (1995) it shows that animals that breathed very high levels of PCBs had liver and kidney damage, while animals that ate food with large amounts of PCBs had mild liver damage. Skin exposure to PCBs in animals resulted in liver, kidney, and skin damage. Liver enlargement, liver necrosis, and porphyria are also some of the health effects noted in PCB poisoned birds in Green Bay (Goldstein *et al*, 1974).

10.1.4 "Animals are not having as many pups"

Wildlife studies demonstrate that contaminants can cause modifications of gonadal and reproductive tract development; mal-functioning and abnormal synthesis or metabolism of hormones. A number of abnormalities seen in the reproductive system of various wildlife species correlate with similar abnormalities described as rising in human populations (Pohl *et al.*, 2005)). Reproductive hazards are those that interfere with the normal production of gametes, conception, and in utero development. The contaminants that have been widely studied are polychlorinated biphenyls (PCBs), hexachlorobenzene (HCB), and lead.

The reproductive and developmental effects of PCB's have been well documented (Neal, 1985). A study on mice tested the effects of long-term feeding of PCB's. The mice were given PCBs in peanut oil for a ten-week duration. The rats developed longer estrous cycles and the frequency of ova that implanted was decreased compared to controls (Kendall *et al.,* 1994). The consequences of exposure to compounds with estrogenic activity can include feminization of the male, developmental abnormalities of the reproductive tract, decreased semen quality, and premature sexual maturation (Foster, 1995).

In multi-generational studies, HCB has been found to be an ovarian toxicant. Studies on monkeys have shown altered steroidogenesis. In a study on cynomolgus monkeys, HCB treatment resulted in depressed ovulatory levels of estradiol and decreased response to ovulation induction. Also demonstrated in monkeys: degenerative changes in primordial follicles and the ovarian germinal epithelium at very low levels of HCB's. (Kendall *et al.,* 1994) Pup viability and lactational index were also decreased at higher doses.

Recent studies provide evidence that low-level lead exposure can cause reproductive problems. Maternal blood lead levels are associated with increased incidence of preterm delivery and decreased gestational age, and low birth weight. Reductions in fetal growth put the fetus at increased risk of morbidity and mortality. (Pohl *et al.,* 2005; Rice 1995)

10.1.5 "A lot of animals seem sick nowadays, many of them have infections"

One of the most sensitive targets for organic contaminants may be the immune system, the body's primary defense against disease. The thymus, which normally produces antibodies to fight against infectious, can waste away and cease to function. There are signs that animals with high levels of organic contaminants are more susceptible to infections. POPs also limit cell-mediated immunity, the branch of the immune system that fights cancer cells and parasites (Foster, 1995).

10.2 Summary

Though the above shows possible linkages between Traditional Knowledge and science, research in this area is limited and inconclusive. There are several different factors that can account for these changes which may have nothing to do with contaminants. In addition, will be animals with high levels of contaminants that won't exhibit any of these changes. While these results suggest that the visual signs described above by the Inuit may very well be indicators of contaminants, it is important to note that there is no current research or literature to support these views and therefore can be identified as a major gap and an area for research development. To date most of our knowledge of the toxicology of organic pollutants comes from studies of laboratory animals, studies with a few species of wild animals or studies of the association between contaminant levels and effects in wild animals. There are many uncertainties associated with these studies. Thus, when contaminant levels in Arctic biota reach biological effects thresholds determined from studies, it should be interpreted as a warning signal rather than as evidence that such effects actually do occur in the Arctic (Arctic National Oceanic and Atmospheric Administration, 2007).

Chapter 11
Conclusion

Environmental change is upon us and is one of the most serious trials northern communities currently face and will continue to face in the future. To date, the impacts of environmental phenomenon such as climate change and long-range contaminants have had major implications for the environment, culture and health of Indigenous peoples. Indigenous cultural and spiritual well-being put them on the front lines of these global environmental changes and rapid social and economic realities (Ford, 2003). Many of the global environmental challenges they face, are caused by actions beyond their borders, activities that bring no economic advantages, but rather burden them with the cost of environmental degradation (Egan, 1999; Ford, 2003).

In addition to this, environmental health issues are becoming a major concern due the changing nature of and exposure to environmental hazards. For this reason, effective management of health risks in these communities is of paramount importance. Risk, in any context, is often a difficult concept to explain and communicate to the public (Furgal, 2003). Therefore communicating about risks in the north poses a challenge due to social and cultural issues such as barriers of cultural differences, language differences and differences in knowledge systems. It is becoming increasingly evident that perspectives of health risk must be understood within the context of interconnected social, economic and cultural milieus that define different communities (Jardine & Furgal, 2007). One of the first steps in achieving this is to examine not only people's perceptions of these health risks but also the factors that influence these perceptions.

In the community of Sanikiluaq the word "contaminants" has a wide range of interpretations, and there are different levels of comprehension and awareness among community, elders, youth and women of childbearing age. From the previous results it

can be seen that generally there is a moderate level of awareness and a low level of comprehension of contaminants issues in the community. One significant obstacle in the proper comprehension of contaminants in the community is the translation of the word "contaminant" into Indigenous languages such as Inuktitut. As a result of this issue, there is a lot of opportunity for misconceptions and misinterpretation to occur. There is still a great deal to be learnt regarding issues regarding the reception and comprehension of contaminants issues, in particular, the belief that there will be visual indicators of contaminants which will allow residents to make informed decisions, which is often not the case. Though a few studies have been done regarding this issue, more emphasis needs to be placed on understanding and incorporating the historical and psychological factors associated with current belief systems. Given the central importance of country food to Inuit communities in the North, understanding and developing ways to better communicate information on contaminants, country foods, and health is critical (Furgal et al., 2005).

Controversies over the management of health and environmental risks have been receiving increasing attention, as more communities have contested experts' assessments and proposed strategies for management of risks (Hertzman, 1992). Scientists and policy analysts need to be open to the many interpretations of (contaminants) risk, rather than opting for a central plateau in risk assessment and management (Connelly & Knuth, 1998; Slovic *et al.*, 2004). What is being advocated is a post-modern form of risk analysis; one that is open to various local perceptions of risk, including scientific perceptions. Perspectives which contest the boundaries of science and which resist risk assessment and management activities must be encouraged and incorporated into the risk communication process. By including local knowledge in the risk assessment and risk communication process, we expand our understanding of the

social and cultural context in which the perception of risk occurs (O'Neil *et al.*, 1997; Reinert *et al.,* 1991).

In the past, risk managers have attributed differences in knowledge systems to the lay person's irrationality and lack of knowledge (Mithcell, 1992). However, research on public's perception of risks, shows that lay people have a rich conception of risks which takes into account values and qualitative factors while experts typically focus on quantitative or technical dimensions of risks (Slovic, 1987). The overall recognition that public concerns about risk are legitimate and reflect a broader notion of rationality has led scholars to encourage the incorporation of public understandings of risk in risk-related conflicts, which also has the potential to build trust between communities and experts (Gowda, 1999; Park *et al.*, 2001).

The scientific assessment and understanding of risks needs to translate the scientific findings of the assessment into understandable and meaningful language; explain uncertainties, gaps in understanding, and ongoing and needed research; and build trust in the credibility of the scientific process. Mean-while, public perception and understanding of a risk would help to inform the "framing" or contextualization of the issue, identify specific concerns and questions the public may have in relation to the risk, and identify conditions that will help the public build the skills and capacity needed to understand and participate in the assessment, communication, and management of the issue. The interaction between the scientific and public "communities" is iterative and linked, and both are integral components of the risk communication process (Powell and Leiss, 1997; Furgal et al., 2005). This process employs various modes of communicating with or engaging individuals in the scientific and northern communities, often with the aid of materials or tools, to bridge gaps across languages, cultures, and worldviews. Ideally, the process is iterative and ongoing: its participants are aware of lessons learned and

incorporate this new knowledge into current and future communication practices.

The issue of contaminants is a very sensitive and controversial topic and therefore most be handled with utmost accuracy, efficiency and sensitivity, and achieving this may be one of the most effective steps in the communication and management of contaminants risks. It is evident that more time and resources also needs to be invested listening to and understanding the needs of the communities as each community has different needs as well as different cultural, social and economic contributing factors which influence their perceptions. In other words, there is a need to move away from the mass generalizations with take place in risk management in northern communities and instead tailor communication and management strategies appropriate to each community. In addition to this, it is quite evident that the inadequacy of Indigenous terminology affects much of the utility with which communication is received, so undoubtedly there is need for more emphasis on the formal development of Indigenous terminology related to contaminants and other environmental change issues, as it will certainly be beneficial in communication processes.

As seen in the case of Sanikiluaq, the majority of elders don't perceive contaminants as a threat to them because they have been taught by Elders that they will be able to "see" changes in the environment and they have confidence in their system whereby animals will exhibit certain behaviours or traits which will indicate if something is contaminated. To date there has been no research to formally evaluate and find linkages between community indicators and science, which is an area for much needed research.

Perhaps the most important message from perception research is that there is wisdom as well as error in public attitudes and perceptions. Lay people sometimes lack certain information about hazards. However, their basic conceptualization of risk is much

richer than that of the experts and reflects legitimate concerns that are typically omitted from expert risk assessments (Slovic, 1987). As a result risk communcations and risk management efforts are destined to fail unless they are structured as a two-way process. Each side, expert and public, has something valid to contribute. Each side must respect the insights and intelligence of the other.

11.1 Communication recommendations

The most effective method of communication would be community-controlled communication. This involves tailoring communication to the needs and interest of the community. This involves, allowing communities and their decision-makers to decide what information should be communicated and how it should be communicated. Prior to any communication the decision-makers in the community should collaborate with experts (both internal and external) and determine what information would be useful and appropriate for the community (Witte, 2001). Formal communication should then take place in the form of community workshops where information is communicated by residents and elders with the assistance of experts, such an approach would also facilitate capacity-building. Time and resources would need to be invested in the training and education of those people communicating contaminants information, which is an initiative being undertaken by many NCP projects.

11.2 Research Contribution

In terms of risk perception research, though there are still many questions left to be answered, however, this thesis has added new insights to the social, cultural, economic and psychological factors, which influence risk perception among the Inuit. There is significant literature that discusses influential factors such as problems with translation to indigenous terminology, education and communication on contaminants,

mixed messages, and differences in knowledge systems. However, it was quite evident from interviews and discussions with residents that many people don't perceive contaminants to be a threat because of bigger challenges facing the community such as climate change, living conditions and health problems. These are problems that are visible to them and everyday they are experiencing the direct effects of these issues. As a result most residents don't consider contaminants a risk therefore; the current invisible, non-threat of contaminants influences their perception of the issue.

In addition to this, it is evident from the results that different groups within the community get contaminants information from different sources, which ultimately affects their understanding and perception of the issue. With elders being the most knowledgeable on the topic, they gain their information from the media sources as well as being out on the land and taking part in traditional activities and therefore had a better understanding of the issue, while community youth knowledgeable on the topic for their information from class and therefore had a more "text book" definition of the issue did not have a clear understanding of the issue, due to the lack of the practical, "hands-on" experience that some of the Elders had from being out on the land and taking part in traditional activities.

11.3 Future Research

It is quite evident that there are still many gaps that need to be addressed in risk perception research. Some of the major areas include the specific psychological and cultural factors which make it difficult for northerners to comprehend the invisible nature of contaminants. Another important area which should be examined more is finding linkages between traditional knowledge or IQ and scientific knowledge; both knowledge systems have unique and invaluable information which would be beneficial to future

communication on contaminants. In addition to this, incorporating the two systems would undoubtedly improve the reception and comprehension of contaminants communication.

In terms of areas of recommended research, areas in the Western Arctic such as Tuck and Sachs Harbour would be beneficial to study, due to the fact that there is current data showing increased levels of contaminants due to climate change. It would be therefore be beneficial to study areas where the threat of contaminants are a potential issue in the community and compare the levels of comprehension and awareness in areas where contaminants are not a threat.

Appendices

Appendix A –Interview / Questionnaire Questions

1. What type of traditional activities do you normally take part in?
2. Has your level of these activities changed and if so why?
3. Do you eat traditional foods, store-bought foods or both?
4. Do you consume the same amount of traditional foods as you have in the past and if not why?
5. Have you noticed and changes in the environment and if so what?
6. What would you say are some of the causes of these changes
7. Who or what are being affected by these changes?
8. What does the word "contaminants' mean to you?
9. In your opinion what are some of the causes / sources of contaminants
10. Where did you learn or hear about contaminants?
11. Would you like to learn more or be more informed on contaminants issues?
12. What are some of the major concerns you have about the environment?
13. Do you feel threatened by or concerned about contaminants?

Appendices

Appendix C - Approval Form and Informed Consent Document

Transcribed and Edited Interview Review

A copy of this form will be returned to you for your records and reference. If you would like more detail or have any questions, please contact Jadie Clifford-Peña at (204) 474-7376, jadie_clifford@yahoo.ca or my professor, Dr. Jill Oakes, at (204) 474- 7352, jill_oakes@umanitoba.ca. You will be provided a complimentary copy of publications of this work. Please take the time to read this carefully. Please sign either line (1) or line (2) below.

I have been asked to review my transcribed and edited interview and provide any additional comments or suggestions for revisions.

1) I have reviewed my transcribed and edited interview and have no further comments.

_____	_____	_____
Participant's Name (Printed)	Participant's Signature	Date

OR

2) I've reviewed my transcribed and edited interview and have attached my comments.

_____	_____	_____
Participant's Name (Printed)	Participant's Signature	Date

_____	_____
Researcher's Signature	Date

Informed Consent Document

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, please feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The purpose of this project is to learn more about Inuit perceptions of contaminants in the community of Sanikiluaq. The objectives of this study are to determine the impacts of contaminants on community lifestyles; to assess how the community weighs the risks and benefits associated with the consumption of Traditional food; to gain and understanding of community perceptions; and to assess the levels of comprehension and awareness in the community. This project is part of a master's thesis, titled *Human Perceptions, Comprehension and Awareness of Contaminants in Sanikiluaq*. Your interview will take about one to two hours to complete. Once the interview is transcribed, you will receive a draft for review. Your reviewed interview will be included in an essay, article, poster, or book. You will receive a complimentary copy of all publications to show my appreciation for taking the time to participate in this master's project.

If you would like the interview taped, please let me know. If you do not want to be taped, that is not a problem; I will write down the information you would like to share, it is completely your decision on what you feel more comfortable with.

Accept Audio Recording	Accept Written Record
_____	_____
Participant's Signature	Participant's Signature

The interview themes or questions focus on how you perceive contaminants and how contaminants affect you and your community. You do not have to discuss themes or questions you do not feel comfortable with. You may also end your participation in this project at any time during the interview process.

This research is funded by the Northern Contaminants Program, ArcticNet Networks of Centres of Excellence Canada, and the Northern Scientific Training Program.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the project and agree to participate. In no way does this waive your legal rights nor release the researchers, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the project at any time, and/or refrain from discussing any themes or questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

If you have any questions, please feel free to contact Jadie Clifford-Peña at [redacted] or my advisor, Dr. Jill Oakes at [redacted]. If you have any concerns or complaints about this project you may contact any of the above-named persons. A copy of this consent form has been given to you to keep for your records and reference.

Participant's Name (Please Print)	Date
Participant's Signature	Date
Researcher's Signature	Date

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