

UNIKKAAQATIGIIT:

PUTTING THE HUMAN

FACE ON CLIMATE CHANGE

PERSPECTIVES FROM THE

INUVIALUIT SETTLEMENT REGION

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## 1.0 NAITOLIOGAK

Akongani okioni 2002 onalo 2003, meetikatarqtut tavvaoui talimat inuivialuit nunaini ovani Inuivialuit Nunataqviani Nunainni (ISR) elittok-saiyut taotuqtaini sila allangoqtoak. Tabkoa inuqaqneet okoamat Inuvik, Aklavik, Tuktoyaktuk, Oloksaktok, onalo Paulatuk. Tasamani metiq-paoqtoakmata kinatlo RC-d nalonaiyaktoan inuqnit okaosiqaqsoq, maliqtoksaqot, sila allangoqtoakmat talavani ISR elittogitiaqtat silaqtik allangoktoak, ona nuna kanogilitoak sila allangogami, ovalo kanoqtut inusiginiakpat sila allangoktoak naliak sivoniqmot aolaviginiaqpat inusiqmot.

Tasamani angitqiaq savaksak, metiotiginiakpat ajikotaniq nunami tasamani ovanilo As Labrador, Nunavik onalo Nunavut. Samna sivosiqsat savaqsak pannaiyaqniakpat opalonaiyaklotik sivoniqmot allangoliqtomi nuna silalo okaosigivaqniakpat metigagomik ovalo ayoitot esivgioktit silamik nunani savaqpakniakpat. Elaa samani sivoniqsami savaaginiakpat sunaqqut eliogailotik ovalo sivoniqsami nuna allangoliqtomi metiotigivaqniakpat. Nalonaiqtoak, sivoniqsa samani elittoqsiyat, nunami metiqtit savaagivaqniakpat opalongaiyaqlogo ovalo esoaksaklogo malgoq kanga ISR metiotani ovani Oloqsaqtomi ovanilo Paulatuk-mi.

Tamani naitolioqlogo esomalogitigiyat talimat ISR inuqaqtoat, samna onipqaksak emaitoniquq:

- Sila onaqsaligami kivataniq ovalo oaliniqmioni ISR inuqaqtoani. Tamaita inuqaqtoat nunat elitogitoaqtoat sila onaqsivaliayuuq. Kivataani inuqaqtoat nuna ajikotainik elisimaliqtoat sila onaqsaliqmat (onaqtoak) okiotlo kesiani, emailtoat, aoyangat niglaomaliqsoni.
- Tamaita inuqaqtoat nunat, tamaini kivataniq oaliniqmioq, elisimaliqtoat emaq sikoa haliyuuq ovalo nunap atani siqo mahaqtiliqtuuq. Okoa taimailiyut ayuksaotigivagat nunano aolaagiami nunani ovani ISR.
- Tasamani elittogitoaqtoat tabkoat kiqtoqgiat kivataniqmiot ovalo oaliniqmioq ovani ISR. Tamani oaliniqmioq nunani, kiqtoqgiat angiglitiaqtoat, amigaiqsotiqlo ovalo tamaneeqsakpaliktoat. Ovani Kivataani, emaitoat, nunani kiqtoqgiat miqiniqsaoyut, ekilivlotiq.

Ovani inuit meetiqtoat elittogiyut okoa Inuivialuit eliogaivaliqtoksat nutanik savaotiniq sila allango-taililogo. Ovani okoa emaitoqsat:

- Amigaitoqlogit tosaqaqteeqloqtoq sila suqaqot (i.e. cell phones, CBs, nalaotiqot ovalo sila taotoqtoaqlogo okoalo tagiomi nainaiqsimalogo nalaotiniq emaq sila allangoktoaq suliyami sivoganaqsioq ovalo nalonaiqsivloni aolaagiami.
- Esoaqsaqlogit ekiaqmiot piqsait ayoqnaqlogit, oqaqlogit sivoganaqtoat nunat ovalo nalaotiqot tosaqaqtoqtoq ovalo eligailotiq igloqpakniq nunani oqovikhanik emaq silaloqtoaqpat silaqiteeviqsanik emalo emaq emaqoqsigangat.
- Sanalotiq ovalo monagilogit nunani inuit sequteevit emaq niqqit kiqomayangitni emaq siqot nongotiqtoat kiqiteeviknik emaq ekitoanik angoniagiami sogaanik.
- Ekayuqlogit esivgiogait kanogilitoat savaat nanigiaqtoqtoat angoyait amiqliktoat manillogotait ovalo ekayuqtoaqlogit nanigiaqtoqtoat nutanik angoniagotiniq.
- Oktaqtoalogo emaq ematot emaq nammaganaqsioq kisiani emaq salumania taotoqlogo sivoganaqtoamiiq sila allangoqtoami. Oqaosigiyat niqqitlo esivgioklogit nammanigitiq.

Sapqonani metiotaini elisaiyuni, kafsit apiqotigilogit oktaktoat nuna taotoqlogo silalo, elisainiqotlo atoqtoqsanik, tosaatjutiniqlo ovalo pannagiqtoqtoq savaqatigiiqtoaqtoq katimayit. Tavvani esumaalotigiyat okaotigiyat kengoliqmi elangani "Sivomot Aolaloni" ona oktoqtoat kanoq alaqt Inuivialuit eliogainiaqtut savaotiksamingniq sila allangoqmat.

Samna onipqatoak elitaqnaqtok sivitoyoat ovalo kanoqtut esivgioklotik nunami tasamai ovalo somit inuqaqtoanit esumainik, elait nunat sila allangoqtomi ajiqeeqngitmata. Elait elitogiyait, suqqut savaqniaktoat ovalo sunatigut savaotiqtoqtoq homi nuna esumaalutaoyut Inuivialuit esuvagiyait taotoqtoqtoq, ovalo Inuit piomayait ovalo sivolioqyuit, esomaksaqsiqniakpait savaktaoyuksat nunani, nunaini, kanatami, asiniikyoat nunaitnilo.



## 1.0 SUMMARY

Throughout 2002 and 2003, workshops were carried out in five communities in the Inuvialuit Settlement Region (ISR) to collect observations on climate change. These communities included Inuvik, Aklavik, Tuktoyaktuk, Holman Island, and Paulatuk. Each workshop brought together representatives from the communities to discuss, through a series of guided discussions, the changes that the people of the ISR are seeing in their environment, the impacts or effects these changes are having, and how they have already or how they can best respond or adapt to them in the future.

As part of a larger project, workshops were similarly held in the regions of Labrador, Nunavik and Nunavut. A key goal of this project was to build local capacity to implement and carry out future environmental change workshops and research in communities in the region. In fact, this goal was realized, as regional representatives took the lead in organizing and facilitating two latter ISR workshops in Holman Island and Paulatuk.

By summarizing the main concerns of five ISR communities, this report shows that:

- Temperatures vary between the eastern and western ISR communities. All western communities have seen temperatures in all seasons rise. Eastern communities have also seen milder (warmer) winters but, in contrast, have seen cooler summer temperatures.
- All communities, both in the east and the west, have observed diminished thickness in ice and melting permafrost. These conditions have led to difficulties with travel in all areas of the ISR.
- A stark contrast exists in observations regarding mosquito populations between the east and the west of the ISR. In the west, mosquitoes are larger, more plentiful and have a longer season. In the east, conversely, both communities reported that mosquitoes are smaller, less plentiful and the mosquito season in this area is shorter.

The community workshops show what Inuvialuit require in order to develop further adaptation measures and to minimize the effects of climate change. These include such things as:

- Increased communication accessibility (i.e. cell phones, CBs, two-way radios) and better weather and ocean information to local radio stations in the face of weather unpredictability that is causing danger and uncertainty with travel.
- Making satellite imagery more available, marking unsafe areas, and increasing communication and the number of shelters on the land to aid in coping with bad ice conditions and low water levels.
- Rebuilding and maintaining community freezers as well as subsidizing household freezers to compensate for thinning and depleted ice and permafrost conditions causing a decrease in the number of animals harvested.
- Support to analyze potential effects of the projected decline in the quality of furs and trappers' incomes and the means to help trappers adapt to the changes influencing their livelihoods.
- Testing water to ensure confidence in security of the water system but also to be certain that water quality does not deteriorate as environmental conditions change. It was suggested that suspect meat should also be tested.

Throughout these workshops, a number of requests were made for environmental monitoring, educational tools, communications, and increased organization and partnering. These concerns are discussed in the final section "Going Forward" which aims to define some of the ways that the Inuvialuit would like to implement their responses to the challenges posed by climate change.

This report shows the importance and need of examining this issue from both the point of view of the region and from that of the individual community, since not all environmental



changes affect each area in the same way. From these findings, the proper course of action and appropriate resources can be directed to the areas of concern that Inuvialuit feel are the most pressing. Finally, this report was written in anticipation that these environmental observations, as well as Inuit needs and priorities, will be taken into account by decision-makers at the local, regional, national, and even international levels.

## 2.0 ACKNOWLEDGEMENTS

First and foremost, the workshop team would like to thank all of the workshop participants for their participation and for sharing their knowledge on climate and environmental changes. A full list of participants, organized by community, is provided on p. 30.

Acknowledgement also goes to the five communities, Aklavik, Holman Island, Inuvik, Paulatuk, and Tuktoyaktuk, for participating in the project and for providing space as well as resources for the workshops. The team would like to also thank the following specific individuals and organizations for their help, participation, efforts and humour during the workshops in Aklavik, Holman Island and Tuktoyaktuk.

Thank-you to Diane Dillon (HTC Administrative Support Officer, Joint Secretariat), Agnes Tardiff (Resource Person, Aklavik Hunters and Trappers Committee), Robin Fonger (HTC Technical Resource Person, Joint Secretariat), Barbara Armstrong (Regional Contaminants Coordinator, Inuvialuit Regional Corporation), Mark Buell (Health Liaison Officer, Inuvialuit Regional Corporation), Lillian Kanayok, Heather Hansen, Chris Alway, CKHI FM Radio Station, Debbie Raddi (Resource Person, Tuktoyaktuk Hamlet Office), and Eleanor Ross (Resource Person, Tuktoyaktuk Hunters and Trappers Committee).

We would also like to thank the following organizations and individuals for allowing their

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Finally, we would like to acknowledge those that provided the financial support for this workshop. They include Inuit Tapiriit Kanatami, International Institute for Sustainable Development, Ajunginiq Centre, National Aboriginal Health Organization, Health Canada, and Environment Canada through the Northern Ecosystem Initiative Program as well as CIHR through a fellowship provided to C. Furgal. Their financial support and interest in this work is greatly appreciated.

 **Figure 1. Map of the Inuvialuit Region**





### 3.0 INTRODUCTION

Evidence of global warming is projected to become most apparent first in Arctic and sub-Arctic regions. Rising temperatures have already created a variety of changes to the environment, and these changes are expected to intensify. Some of these shifts include changes in the characteristics of the ecosystems that have supported traditional Inuit activities and life for centuries. Cycles and movements of migrating animals, a decrease in the period when it is safe to travel on the land and on the ocean, reduced access to certain natural resources, and the destabilization of trails have all become growing challenges for Inuit in the last few decades.

As residents of the higher latitudes, and users of the land and its natural resources, Inuit possess unique and specialized knowledge about the land. They are sensitive to the effects of climate change emerging in the North. Weather conditions, ice conditions, changes in flora and fauna, and physical changes to the landscape are all being closely observed by Inuit. Some of these changes are affecting their livelihood and culture, and affecting the subsistence and trapping economies that dominate northern communities.

In the past 30 years, and in the past decade in particular, Inuit have been confronted with very difficult challenges to the ways they use their environment. This report looks at the observed changes that are taking place in the ISR of Canada's Arctic, an area comprising 435,000 square kilometres of land and ocean that stretches from the Mackenzie Delta region to the high Arctic, and the responses by the people living in these communities to these changes. This report represents a synthesis of information expressed at a series of commu-

nity workshops held in five ISR communities between 2002 and 2003. These communities included Inuvik, Aklavik, Tuktoyaktuk, Holman Island, and Paulatuk. Each workshop brought together representatives from the communities and aimed, through a series of guided discussions, to help communities document their observations of environmental and climate change, the impacts these changes were having on aspects of Inuit community and individual life and what is already being done or could be done in response to these changes to minimize impacts and take advantage of whatever opportunities these changes may represent.

### 4.0 METHODS

#### 4.1 Pre-Workshop Methods

For all community workshops, standard methods were adopted and used. The workshop team included representatives from ITK, IISD and the CHUL Research Centre – Laval University. The team prepared written materials prior to the workshops outlining several exercises that could be used during the workshop to gather community observations of climate change and to develop a set of potential community indicators for monitoring change and climate change impacts. These exercises drew from participatory analysis and planning techniques including Participatory Rural Appraisal (PRA)<sup>1</sup> and Objectives Oriented Project Planning (ZOPP)<sup>2</sup>. ZOPP and PRA encourage participation by everyone at a workshop, allowing a community to identify and analyze its own problems. Pre-workshop meetings involving the four workshop facilitators (Scot Nickels, Pitsey Moss-Davies, Chris Furgal, Jennifer Castleden) and regional representatives helped to:

1. plan the workshops;
2. discuss objectives (overt and covert);

<sup>1</sup>Robert Chambers of the University of Sussex pioneered the PRA approach over twenty years ago. He has written extensively on its use in promoting local input into project planning and implementation. See for example Chambers, R. 1997 *Whose Reality Counts? Putting the First Last*. Intermediate Technology Publications, London.

<sup>2</sup>The ZOPP technique was developed by the German development agency GTZ. ZOPP is an acronym for Ziel Orientierte Project Planning (see ZOPP: An Introduction to the Method. 1987 Deutsche Gesellschaft Für Technische Zusammenarbeit (GTZ) GmbH, Frankfurt, Germany)



3. review the proposed workshop methodology;
4. adapt the methods as appropriate; and
5. plan training for regional and community representatives.

The facilitators agreed that an approach where all workshop participants – community members, regional representatives and facilitators would be co-investigators in the process. The workshops were intended to be a dynamic learning process for all, where everyone had an opportunity to investigate the issue of climate change and its meaning to their community. There was emphasis on animating a two-way exchange of information and perspectives on climate change.

To facilitate the commitment to co-investigation, the project team prepared a list of guidelines to follow during the workshops:

1. Have fun! The experience of learning and sharing knowledge with each other will be insightful and enriching.
2. Try to choose activities that are most appropriate for the people you are working with. Not all of the activities will necessarily be useful or practical for every group.
3. Be flexible in that the group or community may already have their own methods and techniques for sharing information. These ideas can be shared at the beginning of the workshop and incorporated as the group sees fit.

#### **4.2 During the Workshop**

Each workshop began with a series of opening questions related to the groups' hopes and expectations for the workshop. In order to ensure contribution from all workshop participants, people were split into manageable groups of five to six people (if required) for much of the work with groups periodically coming back into a plenary session to share the discussions of the smaller groups. After the opening discussions and introductions, groups were

asked to record the environmental changes they have noticed and heard about in their area that they believe are related to climate change on cue cards. These observations were recorded, one per card, and then posted on the wall for plenary discussion and the assembly of a timeline. When relationships were noted between observations (cause and effect or otherwise), these observations were grouped together. The participants were asked to arrange the observations according to when they started seeing each change. This was done in plenary with many participants going to the wall and grouping cards by decade.

Following the placing of the observations in the timeline, the small groups were asked to review the observations they recorded and discuss the associated impacts they are experiencing as a result of these changes. These were discussed from the participants' personal perspective. A plenary session was held and each group prioritized and recapped these effects for the entire group of participants in attendance.

After discussing the effects of the changes that have been observed, workshop groups discussed what could be done by individuals and communities to adapt or cope to these changes. Sometimes, there were already things being done in the community to adapt to environmental changes, and many of these were noted. Participants were also asked to discuss who they wanted to know about their climate change observations, from local officials to international organizations.

The final presentation of the workshop was directed at providing information to the participants as to how their information was connected to other environmental initiatives. At the national level these include DIAND's Inuit-specific multi-year strategy, Environment Canada's Northern Ecosystems Initiative, and ITK/IISD's Pan-Northern Monitoring Strategy. Internationally, it includes the Arctic Climate Impact Assessment (ACIA), initiated by the Arctic Council, among others.



### 4.3 Summarizing Workshop Observations

Throughout the course of the ISR workshops, hundreds of observations were recorded. Observations raised repeatedly during the workshop process and by more than one of the workshop groups were generally deemed the *most* important or most prevalent in that community, and were recorded as such. The remainder of this document aims to:

- 1) Highlight and discuss observations that are significant in all ISR communities (Sections 5.1 and 5.4). These are observations that indicate high priority concerns for all ISR residents, and should dictate the majority of future attention from scientific and governmental bodies.
- 2) Isolate which environmental changes are specific to more western ISR communities (Inuvik, Aklavik, and Tuktoyaktuk) from those specific to more eastern ISR communities (Holman Island and Paulatuk) (see map p. 3). The ISR spans several biogeographical regions, roughly characterized by the fluvial Mackenzie Delta in the west and the high Arctic polar tundra in the east. There are basic differences between the western and the eastern regions in terms of the changes taking place, and how these changes affect the people who live on the land. In some cases, a common environmental change has different effects in different parts of the Arctic, leading people from different communities to view these changes very differently.
- 3) Highlight and discuss observations that are unique to each ISR community. Issues that are distinct to certain communities may be overshadowed by the collective concerns of the region. By isolating concerns specific to each community, the aim is to better understand the differences that belie the varying priorities within the ISR. One example of this is the effects of thinner ice. In Inuvik, this affects the economy because the ice road is useful for fewer weeks of the year. In Paulatuk, it affects the economy because thinner ice has a negative effect on the seal population.

It is important to note that this report depicts only a synopsis of the observations discussed throughout the ISR workshops, and that if an observation does not appear here it is not necessarily because it is not considered a significant indicator of climate change to Inuit in that area. The individual workshop reports for each community should be referred to in order to get a more complete picture of the environmental changes taking place in that community and the required adaptations which residents reported need to be developed.

Overall, methods employed throughout the workshop process aimed to flesh out an honest representation of the intricate and unique climate change observations distinct to each community, and to give life to some of the real impacts that climate change is having on Inuvialuit. Due to the participation of the ISR residents in the community workshops, the detailed documentation of each community's observations, based on the rich and valuable traditional Inuit knowledge, has been recorded and is accessible for referral by local, regional, national and international bodies.

### 5.0 OBSERVATIONS

The following sections (5.1, 5.2, 5.3 and 5.4) describe the results of the five ISR workshops that were held in the winter of 2003. Section 5.1 summarizes all regional concerns and observations that were raised several times within each workshop and by all five communities. When warranted, some attention is also given to observations that were discussed in at least four of the five communities. Some concerns and observations were significant exclusively to the eastern or the western regions of the ISR, and these are discussed in section 5.2. Concerns that are unique to certain communities are discussed in section 5.3. Section 5.4 presents a summary of some of the new and unusual bird and animal species that are being seen across the ISR.

When possible, recommendations, reported in the communities regarding future action and research, are given. These are intended to ease



the challenges posed by the effects of climate change. In most cases, these recommendations are adaptations that residents have started to put into practice, but which need further support in order for them to be more effectively conducted. One example is the need to increase the capacity of certain communities to organize group hunting activities for Elders who are having difficulty accessing geese.

It may or may not yet be proven whether some of the changes reported by Inuvialuit are actual results of global warming, but even without scientific corroboration of their direct link to climate change, these observations are extremely valuable and represent legitimate changes and matters of genuine concern. They should be viewed as sound and compelling statements that describe the ISR environment and the environmental changes that are taking place there.

### 5.1 Regional (Common) Concerns

The following environmental changes have affected all five communities throughout the ISR (Figure 2). As a whole, these observations and their effects should be given high priority and consideration when deciding what action plans should be put into play to aid in the adaptation, mitigation, and monitoring of environmental changes. It is important to realize that although these changes are felt throughout the ISR, their effects can be very different given the economies, priorities, and values of each community. As much as possible, attention to the different effects and adaptations that each community expressed during their workshop are also described here.

#### **Changes to Weather:**

**Higher temperatures** have been observed throughout all the ISR communities. The rise,

 **Figure 2. Summary of Shared Concerns**

<b>All ISR communities reported the following environmental changes taking place in their area:</b>	
<b>Changes to Weather</b>	<ul style="list-style-type: none"> <li>• Higher or "high" temperatures, winter lows not as extreme.</li> <li>• Less snow.</li> <li>• More wind in summer.</li> <li>• Weather is less predictable overall.</li> </ul>
<b>Changes to Landscape</b>	<ul style="list-style-type: none"> <li>• More erosion of banks and shores.</li> <li>• More sedimentary deposits in oceans and rivers.</li> <li>• Rougher and less safe trails; decreased accessibility of animals, fishing areas and camps.</li> <li>• Sea Ice: — Diminishing thickness.               <ul style="list-style-type: none"> <li>— Early spring break up.</li> <li>— Delayed fall freeze up.</li> </ul> </li> </ul>
<b>Changes to Vegetation</b>	<ul style="list-style-type: none"> <li>• Number / size of plants in general are on the increase.</li> <li>• Territory of willows is expanding.</li> <li>• Size of willow plant is increasing.</li> <li>• Decrease in the number of berry-producing plants.</li> <li>• Berry-producing plants are producing fewer berries.</li> </ul>
<b>Changes to Fauna</b>	<ul style="list-style-type: none"> <li>• Caribou migration routes are changing.</li> <li>• Many new and unusual species.</li> </ul>
<b>Changes to Insects</b>	<ul style="list-style-type: none"> <li>• Many new and unusual species.</li> </ul>
<b>Increased Stress and Awareness</b>	<ul style="list-style-type: none"> <li>• Concern for overall pollution levels/ contaminants, and risk to human health.</li> <li>• Desire for organization on Inuit climate change issues.</li> </ul>



however, is not uniform. Western communities (Inuvik, Aklavik, and Tuktoyaktuk) have seen temperatures in all seasons rise, particularly during summer months. Eastern ISR communities are experiencing milder temperatures as well, but not in summertime when conditions are cooler and damper. Throughout the ISR, winter temperatures are milder than ever before. Several residents of each community commented that temperatures are not dipping as low as before and cold “snaps” are not lasting for as long as they used to.

Aside from the temperatures themselves, other indicators have helped identify a rise in temperatures. These include an increase in freezing rain during the winter months (Inuvik and Paulatuk); snows of a heavier consistency (Inuvik); a higher prevalence of fog (Inuvik) and more cumulonimbus cloud formations (Aklavik and Tuktoyaktuk). Residents directly relate each of these occurrences to higher temperatures.

Though less frigid winter temperatures are generally welcomed, they also come with their own challenges. In the western regions, where trapping is still an important part of the economy, animal fur has been negatively affected (discussed in section 5.2, p. 12). Changes to sea ice, wind patterns, animal migration, and permafrost are all thought to be results of changed temperature patterns. Impacts from these (such as impacts on travel routes, or increased fog) are discussed within the following sections of this report, along with recommendations and possible ways to ease human adaptation.

**Less snow** is a serious concern all over the ISR. In the west, less snow has created drier soil conditions, resulting in fewer plants and fewer berries. It has also meant there is less runoff, and that lake and river levels are lower. It is believed that low water levels have increased water temperatures, have affected the quality of fish meat and have caused spawning to commence earlier in the spring. In the Delta region, lower river levels have also meant more hazardous conditions for boating and certain areas have become impossible to navigate. In

other areas, people are concerned about the additional wear to ATVs and skidoos (caused by traveling over rocky and muddy terrain). In some instances, less snow forces people to travel on the ocean, which is considered to be more dangerous at certain times of the year.

**More wind in summer** has a dangerous effect on travel, since high winds on the ocean can create waves large enough to strand or capsize boats and also to threaten homes and camps situated near the ocean. High winds can be extremely dangerous, so planning trips on the open water or even on the open ice can be very challenging. Strong, variable winds in autumn cause sea ice to break up before refreezing into a rough surface that is difficult to travel by skidoo. In these cases, people are forced to travel around rough areas of sea ice. The overall result has been fewer hunting trips, or longer more expensive ones.

Weather throughout the ISR in general has become **more variable and therefore less predictable**. This affects everyone but particularly hunters, trappers, and guides. Elements of the weather that were once accurate predictors of weather, such as winds and clouds, can no longer be relied upon. Primarily, this makes choosing safe travel routes more crucial, and also more difficult to do. Consequently, people are less likely to go out of town unless weather is forecast to remain stable for a long period of time. Psychologically, the landscape is perceived as less accessible, and hunting activities are associated with more fear and uncertainty than before, particularly by the younger generation.

**Recommendations:** Many uncertainties related to weather could be mitigated by better access to weather information and communication, especially through greater accessibility of personal communication devices such as cell phones and CBs, and better local scale weather information available to local radio stations. Creating better communications between the communities and the Coast Guard, as well as improving infrastructure (such as shelters on the land) could also improve search and rescue



effectiveness. The more information people have access to, the more correct their interpretations of the weather will be, which will lead to safer outings. Community residents in the ISR requested these forms of improvement in weather monitoring, information and communications in relation to the impacts associated with effects of unpredictable changes in weather.

### **Changes to Landscape:**

**Erosion of banks and shores** is a primary concern, particularly for those whose homes are near river embankments or those concerned about the deterioration of meaningful sites (such as graves and historically significant areas). Reclamation projects, such as those that have been undertaken in Tuktoyaktuk and in Inuvik, are an ongoing expense. Insecurity and worry beset those whose homes are threatened by physical degradation of foundations, or nearby banks and shorelines.

Over the long term, water currents carry earth and rock downstream, where it is deposited in areas where accumulated sedimentation creates further problems. **More sedimentation** encourages plant life to propagate in water. In many areas, algae and increased effluence have created murky-tasting drinking water of questionable quality and safety. Also, rivers that were once channels for boat transportation are now too shallow to navigate with ocean-worthy vessels. Sandbars and shallow areas have become a hazard in many areas.

There is strong consensus that certain qualities of **sea, river, and lake ice** have changed. This includes 1) diminished thickness of sea and freshwater ice, likely caused by shorter and warmer winters; 2) early spring break up of ocean, river and lake ice. This is believed to be caused by #1; and 3) delayed freeze up of ocean, lake and river ice believed, in the west, to be caused by longer and warmer summers and, in the east, by temperatures that are not as low in the winter. In the Delta and on the tundra, the ISR is dominated by poorly drained and waterlogged terrain. It is hard to estimate how far-reaching the effects of changing ice patterns can be to Inuit, whose culture and

economy are rooted in their environment. Water, whether it is frozen or liquid, dictates people's activity on the land.

Trappers and hunters are affected by thinner lake and river ice. They generally access the land on foot, by skidoo, or by ATV and are required to cross numerous streams, rivers and lakes in order to reach animals. Once ice starts to get thin, trappers' ability to access their trap line is hindered, and **overland routes** become dangerous and obstructed. The safety of certain travel routes, and the timing of thinning ice, can no longer be relied upon. This introduces fear and unease. Many people are very hesitant to take part in hunting activities unless ice conditions are known to be safe. In essence, the changing conditions of the land have made a psychological barrier to hunting as well as a physical one.

On the ocean, **rougher, thinner sea ice** has far-reaching effects. Thin ice inhibits traveling to camps in the fall and spring when the sea ice is changing and travel routes become dangerous. People are required to choose their routes more carefully. Rougher and thinner sea ice can lead to shorter hunting trips when hunters choose not to go out at all, in order to avoid the risks associated with hunting in changeable or unknowable conditions. Other times, it may result in longer trips when Inuit are forced to take roundabout routes to avoid dangerous sea ice.

As a layer between the ocean and the air, ice cover has the effect of reducing humidity and preventing foggy conditions. **Earlier break-up** of sea ice has resulted in more foggy days, conditions that are risky for any activity on the land. Further, sea ice has a protective quality for people who travel on the open water since it keeps waves down. Obviously, less sea ice means there is also less protection from rough water.

People have adapted to these increased risks by increasing communication efforts. Few will leave town without a radio, and people discuss forecasts, wind, ocean and ice conditions, as



well as their travel route before leaving town. Another adaptation has been to build more stationary seasonal hunting camps far from town. This means hunters can remain relatively more sedentary when they hunt, while also being able to access animals that may be far from town.

**Recommendations:** It is recommended that residential drinking water, along with other sources, be tested more regularly and this information be made available to community residents. This is becoming increasingly essential not only to ensure confidence in security of the water system but also to be certain that water quality does not deteriorate as environmental conditions change. Inuit are aware that several mining and drilling operations in the area have stored tailings and other contaminants in the permafrost, a practice that may be back-firing as the climate warms and areas that were permanently frozen begin to thaw. Inuit are concerned that seeping contaminants, as well as increased effluence and higher levels of algae, are all serious threats to their water supply and to their well being.

In order to aid decision making when planning trips, it would be very useful if current satellite imagery were made available to residents. This could help to determine areas of thin or rough ice, shallow areas in rivers, or snow cover. It could also aid in determining some of the long term changes to landforms, like pingos, sand dunes, and shorelines.

Increased communication resources for local inhabitants would aid in helping people to forecast weather. Simply making CB and two-way radio more widely available would increase safety, and allow people in town to have information from people who are already out on the land. Other communications, like weather and ocean reports from drilling camps and weather stations, should also be made more widely and easily available. Such information should be regularly distributed through the community radio stations.

### **Changes to Vegetation:**

ISR residents have noticed that there are more plants of all types growing in previously barren areas. For the most part these are **willows** and sometimes **grasses**, which have experienced an increase in their territory and their size. In the west, these changes are thought to be related to higher overall temperatures. In the eastern areas around Holman Island, the northward shift in willow territory also indicates a northward expansion of the tree line. It is not clear if rain has caused the expansion of willow and grasses, since some areas report higher rain and others less.

All ISR workshop participants also agreed that there is a decrease in the number of **berry plants**, and that those berry plants that have survived are producing fewer berries. This began in the 1980s but has become widespread in the last five years. The reasons for this vary depending on the area. Less rain and increased drought-like conditions in the west are negatively affecting cranberries, yellow berries and blueberries. In the case of cranberries, it was reported that plants are not only producing less fruit but that the fruit is very pale, possibly due to stronger solar rays. In recent seasons, some fruit-bearing plants have dried up before fruit has a chance to develop, and in other cases the only plants bearing fruit are those that grow in shaded or boggy areas. In general, berry harvesting is taking place earlier in the summer (July or early August). Conversely, there are concurrent reports that blueberries, when healthy, are growing to sizes never before seen.

In the west, where summer temperatures have been lower and conditions very rainy, many berries simply do not ripen, or ripen very late in the season but then freeze.

The reduced number of berries is not having a serious economic effect on this region. Berry picking is however considered a culturally important activity to Inuit and losing this way of life is seen as serious. It is a well-liked family



activity and it is a favourite way to spend time on the land. Also, it is one of the few activities that can be enjoyed by four year-olds and 84 year-olds alike.

#### **Changes to Fauna:**

Since the early 1980s, migration routes of **caribou** have changed. In most communities, this means that caribou are not available at the “habitual” time of year in “habitual” places. ISR residents had several possible explanations for these changes. In Aklavik, an introduced musk ox population, as well as changes to habitat caused by climate change, are both being blamed. In most other areas, earlier break-up and later freeze-up of river and lake ice are believed to be forcing caribou herds into different areas. Softer soils due to melting permafrost may also be making travel more difficult for the animals. It is assumed that longer mosquito and black fly seasons may be taxing caribou and their young. In Holman Island, where the number of mosquitoes has actually decreased, caribou are being found further inland (away from town) since there is less reason for them to stay near windy shores.

Other problems accompany the change in migration patterns. Around Holman Island, the number of caribou has decreased, and those that are harvested have been much thinner than usual. In Inuvik it has been noticed in the last 30 years that caribou have developed swollen joints. Some are infected with parasites and worms that burrow in their flesh. These caribou, if hunted, end up being thrown away or fed to dogs. The result is that people are becoming more wary of caribou meat and selective about the health of the animal that they kill.

As discussed earlier in this section, the effects of warmer temperatures (thinner lake and river ice, earlier thaws etc.) have made overland travel and hunting expeditions more problematic for hunters. This affects hunting of all kinds, but especially caribou hunting since herds are further away. There is less desire to go out on the land when conditions are change-

able and dangerous, since hunters generally do not wish to take undue risks. The result is that the risk and the effort of finding caribou may outweigh the benefit of the hunt, so hunters may choose not to hunt as much.

#### **Changes to Insects:**

There are numerous “new” and unusual insects being seen in the ISR lately. Biting and stinging insects, though they are not necessarily new, are on the rise. Spiders, bees, wasps, and unknown insects like “flying ants” are very worrisome to northerners who have not seen them before and who worry that they may carry diseases. A more detailed discussion of insects that are new to the ISR is listed in Figure 6 on p. 24.

#### **Increased Awareness and Stress:**

Uncertainty could arguably be one of the most important impacts that climate change is having on Inuit. So far we have seen that climate change, and the uncertainty that it brings, decreases the overall amount of time that people spend on the land. With trapping, hunting, and foraging becoming less accessible and convenient, people are sometimes deprived of their livelihood, and sometimes forced to find new economic pursuits. This can leave them without their most meaningful and customary ways to practice their culture and to express it to future generations.

#### **Contaminants:**

Although environmental contaminants seem like a matter that is totally separate from climate change, Inuvialuit see these two issues as closely linked. For one, contaminants in the Arctic sometimes originate from mine tailings that are stored indefinitely underground, frozen in permafrost. It is believed that warmer temperatures and melting permafrost are threatening to release some of these contaminants into the groundwater and soil. Two, global circulation patterns in the atmosphere already bring airborne pollutants to the Arctic where they accumulate. Inuvialuit are worried that shifts in



air circulation patterns, and possibly in water circulation patterns, may increase the input of foreign contaminants into the local ecosystem. Far from being separate issues, climate change and contaminants are closely linked in the perspective of ISR community residents.

The potential relationship between climate change and contaminants in the North is a serious concern, since some contaminants bio-accumulate in animal organs and flesh, particularly seals and fish. Inuvialuit feel that the natural indicator for higher contaminants is a decline in animal and human health. Already, in Paulatuk, some char that are deformed have been noticed. In Holman Island, people have noticed an increase in the amount of cancer and diabetes in their community and wonder if it is from the increase in contaminants.

Since contaminants and human health are so closely linked, they are matters of utmost importance and high priority. A perceived lack of information compounds their fear. To solve this sort of problem is no simple task, but several suggestions are made in the final section of this report “Going Forward”. Suggestions include, bolstering communication and information dissemination, and creating strategic partnerships, as ways to help put people at ease and answer some of these important questions.

#### ***Desire for Organization:***

As discussed in the Inuit Climate Change Roundtable, held in March 2003 in Ottawa, there is a recognized need for greater organization in the effort to monitor and mitigate climate change. In the ISR, there is a feeling of isolation that goes beyond simple geography. Information, outreach, education, and resources can seem far away. Establishing an umbrella organization for northern communities would create a structure capable of tending to their multifaceted needs. Basically, it could facilitate the communication of requirements, ease information dissemination such as the results of monitoring programs and educational materials, and also help to share ideas on adapting to the changes being seen in the environment. This

idea is discussed in further detail in the final section of this report entitled “Going Forward”.

**Recommendations:** Residents feel there are many questions and a lack of hard facts surrounding contaminants, their presence and effects in the region. At the moment, residents are aware that there are threshold levels for eating certain types of meat, but they would still like to see more education channels and **outreach materials** concerning this issue. They would like to see more resources devoted to testing suspect meat. Also, they would like to see more resources aimed at **monitoring** contaminants and climate change indicators, and they would like to have more information made available to them from around the Canadian Arctic and from other nations.

#### **5.2 East-West Discrepancies and Patterns**

A number of differences and patterns exist in observations reported in eastern versus western ISR communities regarding their observations of climate and environmental change (Figure 3). Several potential reasons for discrepancies exist. One is that Inuvik and Aklavik are settled in the Mackenzie River Delta, a region with solid differences from the coastal maritime regions where Holman Island and Paulatuk are located. Tuktoyaktuk is located between the two areas, and can be characterized by climate and fauna similar to that found in the Delta area as well as the polar maritime climates more characteristic of areas to its north and east. Aside from being within (below) the tree line, Inuvik and Aklavik in the Delta area can also be characterized by fluvial lowland terrain, with countless lakes and discontinuous permafrost. Paulatuk and Holman Island are situated on rockier terrain, more likely to have continuous permafrost.

#### ***Changes to Weather***

In the western ISR, weather patterns are dominantly *continental*. This means that the area typically receives short, cool, humid summers and cold, snowy winters. By contrast, Holman Island and Paulatuk are in a ‘Polar’ climate zone, and are more likely to experience very cold and dry weather in all seasons. These overriding weather patterns should be kept in mind when



**Figure 3. Summary of East-West Discrepancies and Patterns**  
 Isolating the environmental issues specific to eastern and western areas of the Inuvialuit Settlement Region

		<b>West</b> (Inuvik, Aklavik and Tuktoyaktuk)	<b>East</b> (Holman Island and Paulatuk)
<b>Changes to Weather</b>	Precipitation	<ul style="list-style-type: none"> <li>Precipitation is harder to predict.</li> <li>More dry spells, droughts = lower water levels.</li> </ul>	<ul style="list-style-type: none"> <li>More rainy days; heavier rainstorms (HI).</li> <li>More freezing rain (P).</li> </ul>
	Summers	<ul style="list-style-type: none"> <li>Summer storms are more extreme (tornados) and summer temperatures are warmer.</li> </ul>	<ul style="list-style-type: none"> <li>Summer temperatures are cooler.</li> </ul>
	Storms/Winds	<ul style="list-style-type: none"> <li>There are more thunderstorms, and more fog.</li> <li>Winter storms are fewer and less intense.</li> </ul>	<ul style="list-style-type: none"> <li>Unpredictable wind directions.</li> <li>Prevailing wind direction has changed.</li> </ul>
<b>Changes to Landscape</b>	Rivers/Ice/ Water levels	<ul style="list-style-type: none"> <li>More sedimentary deposits.</li> <li>Lower water levels.</li> <li>Thinner ice and melting permafrost.</li> </ul>	<ul style="list-style-type: none"> <li>More erosion and deposits (P).</li> <li>Low and high water levels noted.</li> <li>Thinner ice and melting permafrost.</li> </ul>
<b>Changes to Vegetation</b>	Vegetation	<ul style="list-style-type: none"> <li>More willows and grasses.</li> </ul>	<ul style="list-style-type: none"> <li>Very few berries and berries ripen later.</li> </ul>
<b>Changes to Insects</b>	Mosquitoes	<ul style="list-style-type: none"> <li>Number of mosquitoes has increased.</li> <li>Length of mosquito season has increased.</li> <li>Insects seem larger.</li> </ul>	<ul style="list-style-type: none"> <li>Number of mosquitoes is fewer.</li> <li>Shorter mosquito season than before.</li> <li>Mosquitoes are smaller than before.</li> </ul>
<b>Changes to Fauna</b>	Geese	<ul style="list-style-type: none"> <li>Fewer geese. Migration route has changed.</li> </ul>	<ul style="list-style-type: none"> <li>More geese.</li> </ul>
	Fish	<ul style="list-style-type: none"> <li>Fish are spawning earlier.</li> </ul>	<ul style="list-style-type: none"> <li>More turbot, salmon and cod. Also larger.</li> </ul>
	Mammals	<ul style="list-style-type: none"> <li>Cougars are new to the tree line areas.</li> <li>Fur-bearing animals: fewer muskrat and beaver.</li> <li>Wolverine: fur is priming later and is shorter.</li> <li>Hare: fur is thinner and more yellow.</li> <li>Fox: fur is thinner, yellow, priming later.</li> <li>Wolf: fur is thinner, yellow, priming later.</li> <li>Numbers of otters have increased.</li> </ul>	<ul style="list-style-type: none"> <li>Polar bears are more of a nuisance.</li> </ul>
<b>Increased Stress</b>		<ul style="list-style-type: none"> <li>Economic effects of environmental change.</li> <li>Physical erosion of cultural/gravesites.</li> </ul>	<ul style="list-style-type: none"> <li>General stress caused by change.</li> <li>Fear of the unknown.</li> </ul>



comparing regions within the ISR. While comparing the changes that each area has experienced in the last few decades, it is important to remember that changes are relative to the weather typical of the area.

Characteristics of climate change that are reported to be taking place in the western region of the ISR are fundamentally different to those being experienced in the east. All communities in the west have reported increases in temperature in all seasons. Winter lows are less extreme and there is an increase in uncomfortably hot summer days, particularly at mid-day. Less precipitation and more drought conditions have led to lower water levels in the Delta area (this is discussed at length below). Dry conditions have also had an impact on the local vegetation, particularly berry plants, which sometimes dry up before the end of the season. Surviving plants have not been able to produce fruit or it is produced in much smaller quantities.

Shorter and less intense winter storms are sometimes a welcome change as safety is increased and there is less threat to property. Calmer winds have created safer conditions for hunting, with there being fewer whiteouts and a decreased potential for freezing skin.

Summer temperatures, precipitation, and storms are more extreme and unpredictable. Storms “come up faster” and are more likely to be violent. Fog is very hard to predict (when it will arrive or when it will lift). Fog is more common now than before and it is an added difficulty when out on the land. The overall result is that people have become more fearful especially when traveling on the ocean. This affects everybody, but is most significant to hunters who cannot travel safely and who have a hard time planning a safe trip.

In the eastern region of the ISR, changes with precipitation were unique to each community. Paulatuk residents noted an increase in freezing rain, which is dangerous for hunters and is discouraging for travellers. The community

of Holman Island has seen an increase in rainy summer days and heavier rainstorms.

Paulatuk and Holman Island have also experienced unpredictable wind directions, with the prevailing wind direction in Paulatuk reported to have shifted from southwesterly to westerly. Coastal communities are very sensitive to changes in wind conditions as they affect everything from sea ice, tides, temperature, bugs, to a plethora of other things. In Holman Island, high winds coupled with high tides can become very dangerous and can threaten roads and homes along the shoreline. High winds may break up land-fast ice, or crowd a bay with ice pans making access and safety on the sea ice very uncertain. People have not been able to adapt to these conditions easily. They are more reluctant to go out on the land since there is a greater degree of fear and inaccessibility associated with hunting.

Summers were found to be getting cooler in the eastern region of the ISR. It is unusual that in a workshop aimed at collecting observations related to global warming patterns, that observations indicate *lower* summer temperatures, but this is the case in Holman Island and to some degree in Paulatuk. This phenomenon conflicts with typical assumptions of climate change – that temperatures will go up throughout the globe. It is important to remember that one of the consequences of climate change is a general disruption of regular water and air circulation patterns and that, together, these may result in some areas cooling. In the eastern region of the ISR, it is not known exactly what is causing cooler summers. One possibility is increased cloudiness (higher humidity causing less sunshine at ground level). It may also be due to cooler localized ocean currents and wind currents. These possibilities have yet to be explored.

**Recommendations:** Since weather is more variable and less predictable, people in the west have adapted by using cabins (in winter) and by overnighting at established summer camps while out on the land hunting, fishing and traveling. This allows them to access far



away areas without traveling back and forth as much. Increasing the number of cabins out on the land can both increase the accessibility of certain areas (making the region more attractive to hunters) and offer life-saving shelter in rough conditions.

Marking unsafe areas (such as putting up buoys and markers) would also likely be effective in helping people navigate shallow, rough waters, and help when traveling in fog. Efforts to do this in the past have sometimes resulted in the markers being blown over or engulfed in ice. An investment in durable, high quality buoys would help to make the expenditure more worthwhile.

Increasing communication and access to information would help to ease fears and would help people to plan safer trips. Sources of weather information might include Environment Canada, or direct access to information from some of the regional weather offices including Herchel Island, Yukon, and Inuvik. It could also be useful to access weather information from places that are “upwind”, so as to know the incoming weather (and perhaps ice conditions as well). Community radio stations could become responsible for collecting and broadcasting the weather conditions in outlying areas.

Improving capacity of the local coast guard and search and rescue operations is another option, although it is assumed pre-emptive efforts (like communications and information sharing) may help to decrease the need for responsive ones (like search and rescue).

### **Changes to Landscape**

In terms of the physical changes that are being seen throughout the ISR, the eastern and western communities are seeing some similar changes. Observed changes in the Inuvik and Aklavik areas can be related directly to the estuarine landscape where they are located. An **increase in sedimentary deposits** coupled with decreased water levels (since the 1970s) has made traveling in the summer and fall very challenging. Sandbars are a constant hazard in some areas. In some cases, it is believed that

sedimentation increases effluence and has a negative impact on the quality of drinking water.

In the east, in particular in the community of Paulatuk, a similar trend in landscape change has been observed. Residents have noticed an increase in the erosion of banks and shorelines, especially in deltas. The Hornaday River was mentioned as a specific example, with reports that it is filling with sediment.

**Lower river water levels** compound the problem of higher sedimentary deposits (and may in fact be the cause of them). Also, lower precipitation, especially in the wintertime, means that lakes are not being replenished. The result is that it is difficult to travel by boat, particularly in smaller creeks, and this makes it harder to access hunting areas and camps. Traveling to the ocean is also more difficult. Schooners that were often used up until the 1960s are not used much anymore since their deeper keels do not allow them to navigate the rivers. Another possible result of lower water levels is that river and lake temperatures are warmer in the summertime, which may be affecting the quality of fish meat, as sometimes netted fish are “soft”.

In the east, similar reports of low water levels and consequent difficulties with fishing and traveling were made in the Holman Island workshop. In fact some residents commented that some rivers have run dry altogether. Conversely, in Paulatuk, the second community in the east, residents reported that higher tides (and high winds) are causing higher water levels and stronger currents. High water levels and subsequent river conditions in this community are thought to be causing increased erosion and therefore increased sedimentary deposits. Conversely, as previously discussed, increased sedimentation in the west has been attributed to opposite conditions, lower water levels in rivers.

There was consensus in the Inuvik and Aklavik workshops that **the thickness of river ice has diminished** since the 1970s. In Tuktoyaktuk, thin ice was noticed in the 1980s. As a result of diminished ice thickness, spring break-up



on rivers occurs earlier in the season, lasts for less time, and is less dynamic and noisy. This has three main effects: 1) A decreased number of months that the ice road can be of use (discussed in the Inuvik specific portion of section 5.3). 2) A decreased degree of safety on the river itself. Thin river ice is a serious hazard to hunters who use the river as a corridor for travel in the winter. 3) A decrease in the amount of trapping that can take place. Late formation of river and lake ice means that the land is less accessible by skidoo or by foot. This can have serious economic effects for some families.

The Delta region is in an area of discontinuous **permafrost** (i.e. 50% to 90% of the land is permanently frozen due to lack of solar heat). Warmer summers, milder winters, less snow, as well as other changes related to climate change have started to melt areas that were once frozen and to increase the depth of the “active layer” that lies overtop of permafrost during summer months. The effects on the western ISR are multiple: 1) storing meat is more challenging, and this problem is compounded by the small, and sometimes malfunctioning, community freezers. The impact on Elders is highest as their capacity to hunt is challenged by old age and they rely on community freezers to supplement what is otherwise available to them. 2) There are an increased number of mudslides, especially at banks and shores in the region. 3) An increase in the amount of slumping, resulting in roads and homes needing to be moved.

Similar observations of diminished ice thickness and melting permafrost were observed in the eastern region of the ISR. Both communities have seen travel become more dangerous as a result. Travel to camps in the fall and spring has been inhibited because sea ice is changing and unpredictable during these seasons. Hunting trips have become shorter also as a result of these ice conditions.

**Recommendations:** People have adapted to traveling on shallow rivers by using flat bottom boats. These boats are not appropriate, however, to use on the ocean and few people

have the capacity to buy two different types of boats. Residents have also tried to find different routes to safely access the land and the ocean, though this is not always successful, and comes with its own dangers. One solution might be to mark one river route from the towns to the ocean (with buoys), allowing people to use a corridor that is relatively safe for deeper keeled boats and outboards. Dredging may be required in some of the shallow areas to create the required depth, and this may need to be repeated each year in order to maintain a safe route.

Residents are unsure of the quality of the drinking water. Their concern is based on two main factors: 1) the increased effluence and “swampy” taste and; 2) the possibility that melting permafrost may contribute to the release of previously frozen contaminants. It is recommended that residential drinking water along with other sources, be tested regularly and this information be communicated to residents to secure individuals’ confidence in their water source.

It was suggested that the Mackenzie River around Inuvik and Aklavik be monitored with the aid of satellite imagery to track changes and determine areas that are under the greatest threat of low water levels, degrading shores and banks, higher sedimentation and emerging sandbars.

Ice houses, gas-powered freezers, and community freezers should be considered as ways to moderate the effects of thinning and depleted permafrost. Most hunting activity in the area takes place in the spring and summer months, putting a seasonal strain on community and household freezers. Out on the land during the summertime, permafrost is key to storing meats until they can be transported back to town. It would take a substantial amount of gas, manpower, and ongoing maintenance to rebuild and manage the freezer. Alternatives could include subsidizing the cost of household freezers.

A cost-benefit analysis should take place to determine what, if any, actions would most benefit the community.



### **Changes to Vegetation:**

The three western ISR communities have seen numbers of willow and grasses rise in their region. In the Aklavik workshop, it was noted that there has been an expansion in the territory of the willow. The height of these plants is greater as well. In contrast, in the eastern region of the ISR (where there were few observations on vegetation) in the community of Paulatuk the number of grasses has decreased. In addition, a change in the growth of berries was noted in both eastern communities. Berries are less plentiful and are seen to ripen later, or not ripen at all now.

### **Changes to Insects**

It is interesting to note the disparate experiences that different areas of the ISR are having when it comes to mosquitoes. In the west, the number of mosquitoes has increased, along with the length of the “bug season” and the size of mosquitoes. This is partly explained by the increase in stagnant water (caused by lower river and lake waters) and a thicker “active layer” of soil overlying melting permafrost. It is also likely caused by longer spring and fall seasons that the area is experiencing. It is believed that more mosquitoes drive caribou north to the shores where higher winds may give them relief from the biting insects.

In Holman Island and Paulatuk the exact opposite seems to be true. There are fewer mosquitoes, the length of the mosquito season is shorter than before, and the insects themselves are smaller. It is probably relevant that both towns also reported longer winters with freezing temperatures lasting well into the spring, which effectively decreases the number of weeks per summer that mosquitoes can survive. Furthermore, the terrain in the eastern ISR is dominated by rocky tundra and continuous permafrost so it is not as ideal for mosquito breeding as the Western Delta region.

### **Changes to Fauna**

Since the 1990s, several changes in the quality and characteristics in animal fur have started to

take place. Terrestrial mammals such as **hare**, **fox**, **wolf**, and **wolverine** have been affected. Changes include yellowing of the fur, a decrease in the amount of guard hair, and shorter fur overall. Priming takes place later in the fall season due to temperatures staying warmer later. This is of economic importance to all ISR communities, but particularly to the western ISR where these changes have been more pronounced and where trapping is a mainstay of the economy. To compound the problem, **muskrat** and **beaver** populations in the Delta have decreased since the 1990s. The result is that people are not taking part in hunting or trapping as much, since the economic benefits may not outweigh the cost of the hunt. Additionally, seamstresses are sometimes required to buy furs at the local co-op, which can be very expensive.

It is noteworthy that there has been a rise in the number of sightings of **cougars** in the Delta region. However, cougar are a worry for residents that come into contact with them, especially while out on the land. It is not understood yet how to behave during such encounters in order to avoid tragedy, or what the true dangers might actually be.

Since the early 1990s, Inuvik, Aklavik and Tuktoyaktuk residents have seen the spring **goose** migration patterns shift eastward, away from their communities and into the eastern ISR lands. Today, longer travel is required in order to hunt geese, and overall these birds are harder to locate. One response has been to organize an Elders goose hunt to ease some of the difficulties that the seniors have in accessing geese. The drop in availability in goose meat (and the concurrent drop in availability of ducks, in some communities) has forced Mackenzie Delta residents to look to other communities for these meats, usually Holman Island, Sachs Harbour, and Paulatuk, which are located in areas that seem to have benefited from the eastern shift in the goose migration route. Unfortunately, intercommunity sharing continues to be hindered by the lack of well-maintained community freezers.



In the eastern ISR, where communities are situated on the coast, **polar bear**, and to some degree grizzly bear and wolves, are coming closer to town than ever before, and inhabitants are fearful of them. It is not yet understood whether these animals are driven by changes in their environment brought about by climate change, or if they are simply lured by garbage and stored meat. It is likely however, that thinner sea ice and earlier break-up forces polar bears off the ocean and onto land earlier in the season, where they have less access to the seals that make up most of their diet. It should be noted that grizzly tracks have been seen on the ice, and that polar bears have been seen within the tree line, indicating that they are exploring territories outside of their typical habitat.

**Recommendations:** Thinning ice across the ISR (discussed earlier) and the decline in the quality of furs means that trappers' safety and income from the traditional fur-based economy are threatened. Given the projected increases in temperatures over the next several decades, changes to the land and to the quality of fur may not be reversible. There is a need to further analyse the potential effects of the projected decline in this culturally and economically significant industry, and a need to develop the means to help trappers adapt to the changes that are influencing their livelihoods.

It is strongly suggested that to counter unforeseen fluctuations in the patterns of many animals (i.e. geese), the community request support to fix and maintain the community freezer. This might help to bolster intercommunity trading in country food, easing the disproportionate availability of certain species, and helping to store meats.

Another positive impact of increasing the capacity for freezers is that they could also help to keep animals out of town and away from camps, as animals such as bears and wolves do not easily detect properly stored and frozen meat. If meat is stored or disposed of improperly, there is a possibility that some animals may grow accustomed to identifying

villages and camps as sources of food. To deter the development of "problem" bears, some towns in the eastern areas of the ISR may also wish to consider secure, bear-proof garbage cans in their communities.

### **Increased Stress**

Although there is little direct consequence to subsistence, health, or livelihood, there is a great deal of concern over the erosion of cultural sites in the western areas of the ISR. This includes the erosion of grave sites and of areas that were felt to be culturally important, such as old whaling beaches, lookout sites, and ancient graves. These are considered to be significant places in the lore and ancestry of the area, and there exists significant anxiety over their deterioration.

In all communities where workshops were held there was much fear and anxiety voiced regarding the tentative accessibility of game, hunting camps, and fishing areas, as well as rougher and less safe travel routes. Also, fear of the unknown, particularly where disease and contaminants are concerned, is extremely disconcerting (this is discussed in detail in section 5.1, p. 7). Overall, it cannot be ignored that climate change is having serious effects on all aspects of the environment. In a region so closely tied, culturally and economically to the land and sea, this is having deep repercussions. People are fearful of the attrition of their culture and well being (both economical and mental) as activities that must, by necessity, take place on the land are becoming more difficult, less safe, and economically unfeasible.

### **5.3 Community-Specific Concerns**

Despite numerous overlapping observations and concerns in the ISR (discussed in the previous section), appropriate attention should also be given to some of the unique environmental changes that have been observed in each community. These changes also have deep and significant impacts on the economies and wellness of the people that reside in the ISR. The following are some of the environmental observations that are unique to each ISR community (Figure 4).



**Figure 4. Summary of Community-Specific Concerns**

<b>A summary of environmental concerns unique to each ISR community</b>	
<b>Inuvik</b>	<ul style="list-style-type: none"> <li>• More forest fires.</li> <li>• Warm water is affecting the quality of fish meat.</li> <li>• Numbers of insects are increasing and staying longer in the fall.</li> <li>• Ice roads threatened.</li> </ul>
<b>Aklavik</b>	<ul style="list-style-type: none"> <li>• Weather has become more violent (tornados).</li> <li>• Earlier spawning of fish.</li> <li>• Number of whales has decreased.</li> <li>• Changing drainage patterns.</li> </ul>
<b>Tuktoyaktuk</b>	<ul style="list-style-type: none"> <li>• Permafrost is melting quickly.</li> <li>• Herring are thinner. Their numbers have decreased.</li> <li>• Numbers of ptarmigan have decreased.</li> <li>• Algae in rivers and lakes has increased.</li> </ul>
<b>Holman Island</b>	<ul style="list-style-type: none"> <li>• There are fewer mosquitoes.</li> <li>• Seals are negatively affected by less snow and ice (skinny, harder to raise pups, poor pelts).</li> <li>• Polar and grizzly bears are closer to town.</li> <li>• Diabetes and cancer are more prevalent.</li> </ul>
<b>Paulatuk</b>	<ul style="list-style-type: none"> <li>• “Mosquito season” is shorter.</li> <li>• More char are deformed (their spines and heads).</li> <li>• Higher ocean levels and tides cause stronger currents.</li> <li>• More freezing rain.</li> </ul>

***Inuvik***

*More Forest Fires:*

Residents from Inuvik were the only ISR residents to express deep concern over the increase in the number of forest fires in the region since the 1970s. Settled within the tree line, forest fires concern them more than any other ISR community. Residents link this phenomenon to two things. 1) More frequent “dry seasons” and drought-like periods, with less precipitation at all times of the year. 2) The perceived “increase” in forest fires may also be a result of how forest fire management has changed in the past. Forest fires are left to burn for longer periods of time now, so long as they are not threatening people. Forest fires affect the community in a variety of ways. First of all, there is a certain amount of natural fear and anxiety that is tied to the idea of forest fires. Also, in the short term, animals (muskrat, bear, mink,

marten, etc) are scared away from burn areas and this makes trapping impossible. Migration routes, in addition, circumvent recent burn areas. And in the long term, forest fires reduce the availability of berries.

*Warm Water is Affecting the Quality of Fish Meat:*

Shallower, warmer rivers and lakes are believed to be having adverse effects on local fish. Several Inuvik residents complain that after several hours caught in fish nets, fish die more quickly. Also, their flesh becomes soft, particularly on top, and is not able to be dried as it is mushy and “cooked”. The result is that some fish have to be thrown away as they cannot be preserved or eaten fresh. To avoid fish dying in the nets and rotting, fishers no longer leave their nets in the water overnight and they limit the time that they leave their nets in the water during the daytime.



*Number of Insects are Increasing and Staying Longer in the Fall:*

Contrary to the reports from Paulatuk, Inuvik residents are finding that the “bug season” in their area has become longer and that there are more insects and more different insect species than ever before. Sand flies and mosquitoes are the greatest worry since they are not only a nuisance but they are believed to carry disease. While in town, residents cope with this problem by installing screens on windows. Caribou may be reacting to the increased bug and mosquito population by spending more time closer to the coast where the wind offers respite.

*Ice Roads Threatened:*

Inuvik is a unique community as it one of the only Inuit communities with ice roads linking it to the south. The quality and longevity of these ice roads have an enormous impact on the economy of Inuvik. Residents have noticed that the longevity and the condition of ice roads have deteriorated since ice forms later in the fall, and breaks up later in the spring. This affects people’s mobility on the land, since ice roads are used as avenues to access game. It also affects the cost of doing business, eating, and living in general, since transporting goods into Inuvik by air is much more costly than trucking goods in. The decreased existence of ice roads has affected people in that 1) they are forced to use alternate routes when traveling on the land; 2) they are much more dependent on outboards in the spring and on skidoos in the fall (expensive items which may or may not be available); and 3) they are forced to pay higher prices for store-bought foods at a time when alternatives (the local game) are not easily accessible. Besides greater monitoring and communication, there are few things that can aid in making the ice road safer.

**Aklavik**

*Weather has Become More Violent:*

A tornado sighting (away from the community) was reported in the past two years. Although it had little physical effect on the community,

it has left a deep impression that the possibility for unusual and extreme weather exists. It also drove home the fact that micro climates (weather patterns that are very localised), whether they are caused by climate change or not, can be extremely powerful. The community would like to know how to prepare for this type of an event.

*Earlier Spawning of Fish:*

It is not certain what causes this. Warmer waters, faster break-ups of river ice, increased sediment, and less run-off are all presented as possible causes.

*Number of Whales has Decreased:*

Only in the past few years have bowhead whales become less common. Since the early 1990s, Aklavik residents have hunted bowheads, and have come to rely on their meat. The decrease in whales, or in whale sightings, has meant that the community has had to trade with other communities for meat when they need some. They have also learned to rely on the community freezer to help with their supply when they run out.

*Changing Drainage Patterns:*

There are several possible causes for this. Less snow is believed to contribute to less spring runoff and lower water levels overall. Also, melting permafrost is believed to be the cause of entire lakes draining. Furthermore, increased sedimentary deposits and sandbars have changed the character of certain parts of the river Delta. Overall, the landscape is drier than it was in the past.

**Tuktoyaktuk**

*Permafrost is Melting Quickly:*

Mudslides, landslides, and erosion, as well as “disappearing” pingos (used as a reference when out on the land) are all more common now due to melting permafrost. In town, roads and infrastructure are threatened. It is suggested that this is brought on by more rain and higher temperatures.



*Herring are Thinner, their Numbers have Decreased:*

Thinner and fewer herring are a concern that only Tuktoyaktuk residents have voiced, though other communities have the same concern for other fish species. Residents have adapted to this by beginning to fish for herring earlier in the year.

*Number of Ptarmigan has Decreased:*

This was described as a long term trend. It is believed that the ptarmigan are migrating closer to the river now. With fewer of them found near town, capturing enough to make a meal is difficult and more energy must be spent traveling to find them.

*Algae in Rivers and Lakes has Increased:*

Tuktoyaktuk residents believe this is related to low water levels, and more stagnant waters. They have also noticed that the taste of freshwater from lakes is “swampy”. People prefer the freshwater that comes from icebergs in wintertime.

**Holman Island**

*Effects of the Decrease in Snow and Sea Ice:*

There are numerous concerns shared between the communities (see Figure 2 on p. 7). One of these common concerns is the affect the decrease in the thickness of sea ice is having on animals and travel route access in the regions. It is significant that, although each community voiced alarm over this recent environmental change, not all communities find it important for the same reasons.

One example is the following: While other ISR communities link the effect of thinning ice to the decreased accessibility of travel routes and game, Holman Island residents link the diminished thickness of sea ice directly to its effects on seals, and to some extent on polar bears. Thinning ice means that break-up takes place earlier in the year, when mother seals are nursing their young on the sea ice. Holman residents maintain that the advent of break-up

significantly decreases the amount of time that seals spend with their young. They have reported that seal pups have become fewer and also skinnier, and that there has been a decrease in the quality of their pelts, possibly indicating malnourishment. They have also noticed that polar bears are forced off the oceans earlier in the season and onto land, thereby spending more time closer to the community.

*Decrease in the Mosquito Population:*

Although the community of Paulatuk has noticed a decrease in the mosquito season (the number of weeks each summer that mosquitoes survive), it was only in Holman Island where residents were concerned over the apparent decrease in the local mosquito population. It is uncertain what the cause of this is, though the increase in wind and drier conditions could be causing a drop in the number of these pesky insects.

*Polar Bears and Grizzlies are Closer to Town:*

In general, this is seen as a danger and a nuisance. It is also frightening, and residents have become very careful in terms of how they store their meat and dispose of animal remains.

*Diabetes and Cancer are More Prevalent:*

The community has expressed concern over these two diseases and stressed that they do not know why they seem to be more prevalent now than ever before. Also, they would like to know how to cope with these diseases and find out whether their occurrence is related to genetic or environmental factors.

**Paulatuk**

*Shorter Mosquito Season:*

Throughout the ISR (Inuvik in particular), and in other areas of the Arctic, mosquito populations have benefited from the milder and sometimes damper climates. This is not true in Paulatuk, where residents are reporting a shorter mosquito season. It is not certain what the exact cause for this is although higher winds



near the coast and cooler, drier summers have been considered as possible contributors to shorter mosquito seasons.

*More Deformed Char:*

Some char have been found with misshapen spines and at least one captured char had a bulge on its head. Also, the meat of some char is pale, not bright pink. It is suspected that contaminants may be causing these deformations and the worry is that bioaccumulation of contaminants in fish will lead to the further poisoning of seals and humans who eat char.

*Higher Water Levels in the Oceans:*

Higher tides cause stronger currents, which result in changes in the characteristics of the coast and erosion of the shorelines and beaches. One good example can be seen at Johnny Green Bay, once a thirty-foot-high lookout for whalers. Over time, its height has decreased greatly.

*More Freezing Rain:*

In the past few years, Paulatuk residents have observed more freezing rain. This is dangerous for hunters both on the land and on the sea. In addition, it was noted that freezing rain sometimes drives caribou away as they search for feeding areas free of freezing rain. This furthers the problems for hunters as caribou move further distance away and are sometimes out of reach.

**5.4 New and Unusual Bird and Animal Life**

Except in the case of Holman Island, it seems very apparent that 'new' southern bird species have started making themselves more at home at higher latitudes (Figure 5). There are almost twenty recognizable new bird species being noted by local inhabitants. In the western ISR, tree-line birds such as robins, kingfishers, and blue jays have been more commonly sighted since the 1980s. In Paulatuk, tree-line birds have been noted since as early as the 1960s and have become increasingly common since then. Gulls, ravens, and crows, though already common to the area, have all notably had an

observed population surge in all communities since the end of the 1980s.

Holman Island stands alone in this regard.

Besides a greater number of geese, the community did not report many new or unusual birds. This is likely due to Holman's location on the northern archipelago, and a geography that cannot support other species beyond high Arctic maritime birds. Of the five communities discussed here, Holman has the most unvaried landscape in comparison to the others with landscapes including tundra, tree line, Delta, and/or ocean that can support a wider array of bird life. Although bird life may be a good indicator of climate change in the other four communities, it is likely that birdlife is simply not symptomatic of environmental changes in the Holman Island area.

Hardy animals, such as fish and insects, make up the majority of observations of new and unusual (and typically more southern) animal species (see Figure 6, p. 24). Except for an increase in the size and prevalence of salmon and the recent appearance of cougars in the Delta region (which may or may not be related to climate change), there is little consistency or pattern to the species of unusual animals visiting the region. What is significant, however, is that *all* communities reported seeing new species from the south, and that these sightings continue to become more and more common.

It should be noted that flora and fauna typical to the region (such as polar bear, char, seals and fox) are not considered on these tables. Increases in their population and changes in their patterns and behaviours are considered in other parts of this report. Further, observations that are extremely unusual (such as pelican and dolphin sightings) have been included in Figures 5 and 6, in order to create a consistent and thorough report, and to omit the preconceived notions of non-residents as much as possible.



 **Figure 5. New or Unusual Bird Species Observed in the ISR**

	<b>Inuvik</b>	<b>Aklavik</b>	<b>Tuktoyaktuk</b>	<b>Holman Is.</b>	<b>Paulatuk</b>	<b>TOTAL</b>
<b>Robin</b>	●		●			2
<b>Goldfinch</b>	●				●	2
<b>Hummingbird</b>	●	●			●	3
<b>Heron</b>	●	●	●			3
<b>Eagle</b>	●				●	2
<b>Vulture</b>	●	●				2
<b>Raven</b>			●		●	2
<b>Crow</b>		●				1
<b>Gull</b>			●		●	2
<b>Kingfisher</b>		●				1
<b>Red Grebe</b>			●			1
<b>Blue Jay</b>					●	1
<b>Goose</b>				●		1
<b>Shorebird</b>		●				1
<b>Songbird</b>	●	●				2
<b>Pelican</b>			●			1
<b>Magpie</b>			●			1
<b>Snowy Owl</b>					●	1
<b>TOTAL</b>	<b>7</b>	<b>7</b>	<b>7</b>	<b>1</b>	<b>7</b>	<b>29</b>



**Figure 6. New or Unusual Animals Observed in the ISR**

		<b>Inuvik</b>	<b>Aklavik</b>	<b>Tuk.</b>	<b>Holman</b>	<b>Paulatuk</b>	<b>TOTAL</b>
<b>Fish</b>	Jellyfish	●					1
	Eel		●				1
	Salmon (increase)	●			●	●	3
	Turbot (increase)				●		1
	Cod (larger)				●	●	2
<b>Insects</b>	Grasshopper		●			●	2
	Ant	●	●				2
	Yellow Jacket		●				1
	Hornet		●				1
	Bumblebee			●			1
	'Reddish' Beetle				●		1
	Dragonfly				●		1
	Spider					●	1
<b>Reptiles</b>	Lizard	●					1
<b>Amphibians</b>	Frog		●				1
<b>Mammals</b>	Cougar		●				2
	Lynx		●				1
	Beaver					●	1
	Rat					●	1
	Shrew					●	1
<b>Marine Mammals</b>	Dolphin		●				1
<b>TOTAL</b>		<b>5</b>	<b>9</b>	<b>1</b>	<b>5</b>	<b>7</b>	<b>27</b>



## 6.0 GOING FORWARD

Currently, there is great concern over some of the changes taking place in the ISR. Residents' awareness of the various environmental threats at play in Arctic regions is not always coupled with the knowledge of what can be done to help mitigate their effects. It is important to ensure that Inuit have the capacity and resources to participate in regional, territorial and federal climate change and energy-related activities so that they can make informed decisions regarding the impacts of climate change and the effects of measures to address climate change. Inuit can then determine the most appropriate mitigation and adaptation actions to minimize adverse effects on the health and quality of life in their communities. To do so, they need the capacity to initiate an ongoing strategic planning process, centered on a long term Inuit climate change strategy.

This section discusses some of the ways that Inuvialuit would like to go about responding to these challenges. These include:

1. Create an organizational structure responsible for overseeing and coordinating an Inuit response to climate change.
2. Increase communication and information that is available to the region.
3. Increase the amount of monitoring that takes place so as to develop quantifiable knowledge regarding the changes taking place in the North.
4. Increase local participation in scientific research that takes place in the area, so as not only to include the perspectives of hunters but also those of Elders, youth, and women.
5. Access more information on alternative energy, identify potential renewable energy and energy efficiency projects, promote renewable energy and energy efficiency technologies in the communities, including better access to household energy audits.

These five points are discussed below.

### 6.1 Organization

There is a need for an Inuit-specific organizational structure. Many Inuit needs would be answered by installing a full-time climate change resource person at the national level (possibly at ITK) with full-time regionally based people in the communities. This committee could focus on climate change issues that link regional, national and international organizations. They would manage the relationships and partnerships between research bodies and communities. They would manage and promote the communication channels that are required for information exchange and education initiatives surrounding the climate change issue. They would coordinate and promote alternative energy efforts in the ISR (and in all Inuit regions), and they would help to source funding for proper monitoring of climate change indicators.

This is required to ensure that Inuit from all regions and communities:

- are informed of the potential health and environmental effects associated with climate change;
- can participate in the federal government decision-making process on climate change;
- can assist the federal departments involved to deliver their climate change mandates;
- are able to participate in the scientific and policy initiatives required to define and react to the impacts climate change may bring to the Arctic;
- are able to participate in energy-related programs and initiatives; and
- have the capacity to make informed decisions regarding the impacts of climate change.

There is a further need for an Inuit-specific coordinating committee to focus on climate change that links regional, national, and international organizations. Similar to the Inuit



health model, funding should be available to include organizations like the Pauktuutit Inuit Women's Association, youth and the Regional Inuit Associations.

An Inuit-specific mechanism could promote meaningful Inuit responses and solutions. Capacity building and effective participation is critical. Cooperation and coordination are essential to this process. Inuit and the Arctic ecosystem are at the vanguard of global warming and as a result, it is essential that recognition, respect, and support be provided to Inuit now and in the future.

## **6.2 Information Dissemination**

Inuvialuit need a well-entrenched, two-way communication strategy. The overall purpose would be to have relevant, complete, up-to-date and accessible information for Inuit to increase their understanding and control over climate change-related issues and problems, and to assist Inuit in making their own, informed lifestyle decisions.

During the workshops, Inuvialuit voiced specific items that they felt were important to understand, and which they felt would be helped by the implementation of a well-organized communication strategy. These include:

1. Basic climate change material that can help Inuvialuit understand what causes climate change, signs of climate change in their area, and other information on natural science.
2. Reports on present and future potential health and environmental effects of climate change in the North.
3. North American laws and regulations, as well as the international accords that aim to moderate the effects of climate change. Inuvialuit have little or no control over many of the environmental problems they are experiencing. These are problems which come from southern and foreign places and which leave Inuit wondering why laws are not more effective, and why penalties are not high enough to deter polluters.

4. New energy-related technology options and renewable energy and energy efficiency measures.

It would be best if this information were available in schools, but also in community centers and other public buildings so that everyone could have access to them. This information should be made available in Inuktitut.

It is important that information dissemination does not take place as a one-way channel. It is equally important that knowledge regarding effects of climate change or the success or failure of adaptation and mitigation efforts is directed outward to people who need this information. Informal and formal dialogues with other communities, as well as people in the scientific and governing bodies would have great benefit.

Once clear channels of information flow are in place it will become far easier to effectively make use of community-based front-line communicators. As people based in Inuit communities, they would be able to answer questions and serve as sources of knowledge on climate change related matters. Their role would be essential in ensuring that Inuit build the capacity and resources to participate in regional, territorial and federal climate change and energy-related activities.

## **6.3 Monitoring**

The extent of climate change, and the degree to which it affects an area, can only be known through proper monitoring. By collecting climate change observations, an appropriate toolbox of climate change indicators can be developed. During discussions, communities pointed out areas where they felt monitoring these indicators would reveal significant trends. For example, Aklavik residents would like to see the landscape at Shingle Point monitored, since its harbour has degraded and the land there has subsided to the extent that people fear it may disappear altogether.



#### 6.4 Partnerships/Scientific Inclusion

Many participants voiced a serious desire to be included as equal partners in scientific and policy initiatives that arise from the changes in the Arctic that are brought on by climate change. They would like:

- to have a say where research resources are directed;
- to participate in scientific, mitigation, and impact and adaptive initiatives to suggest ways of using Inuit Qaujimagatuqangit (IQ) in studies and in the monitoring of climate change, and;
- to ensure the participation and training of Inuvialuit youth in the technical and scientific areas of climate change, so as to encourage skill development, as well as to lay a foundation for lifetime awareness and sensitivity to this issue.

A good example of where partnering with scientific bodies could be of enormous benefit comes from the Paulatukmiut, who wish to have their drinking water monitored. Not only would this serve the initial purposes of guaranteeing purity, quantifying contaminant levels, and easing people's fears that water quality is not affecting human health; it could also grant opportunities to people from Paulatuk to learn about this aspect of the environment and take on the responsibility to oversee the health of the town drinking water supply.

#### 6.5 Alternative Energies

Inuvialuit expressed a desire to be involved in developing a plan to identify potential renewable energy and energy efficiency projects and to promote these technologies in their communities. This would ideally be done in consultation with appropriate organizations and appropriate federal government incentive programs should be used. Community and household energy planning initiatives, including energy audits, should be a part of this process.

#### 7.0 CONCLUSIONS & RECOMMENDATIONS

The workshops in the ISR elicited community perspectives on climate and environmental change in this region. Climate change is affecting many aspects of the environment in this region. In fact, it is in the Arctic regions where many of the most drastic effects of climate change are already being seen. Local temperatures rise in the face of global warming and the physical environment, vegetation, animal and human life are all affected by the resulting changes in a variety of successive steps and chain-like processes. Being the last level of the chain for many impacts, humans are forced to respond, cope and adapt to changes directly to themselves and to those in the environment around them. As Inuit are so closely tied to the land, sea, and waters around them via the species these environments provide, and as the Arctic environment is one that is exhibiting very rapid changes in the face of global climate change, it is important to better understand Inuit and northern community perspectives on these issues and to begin to work with communities to develop adaptation measures. The following diagram (Figure 7) summarizes the influence of global warming on Inuit communities.

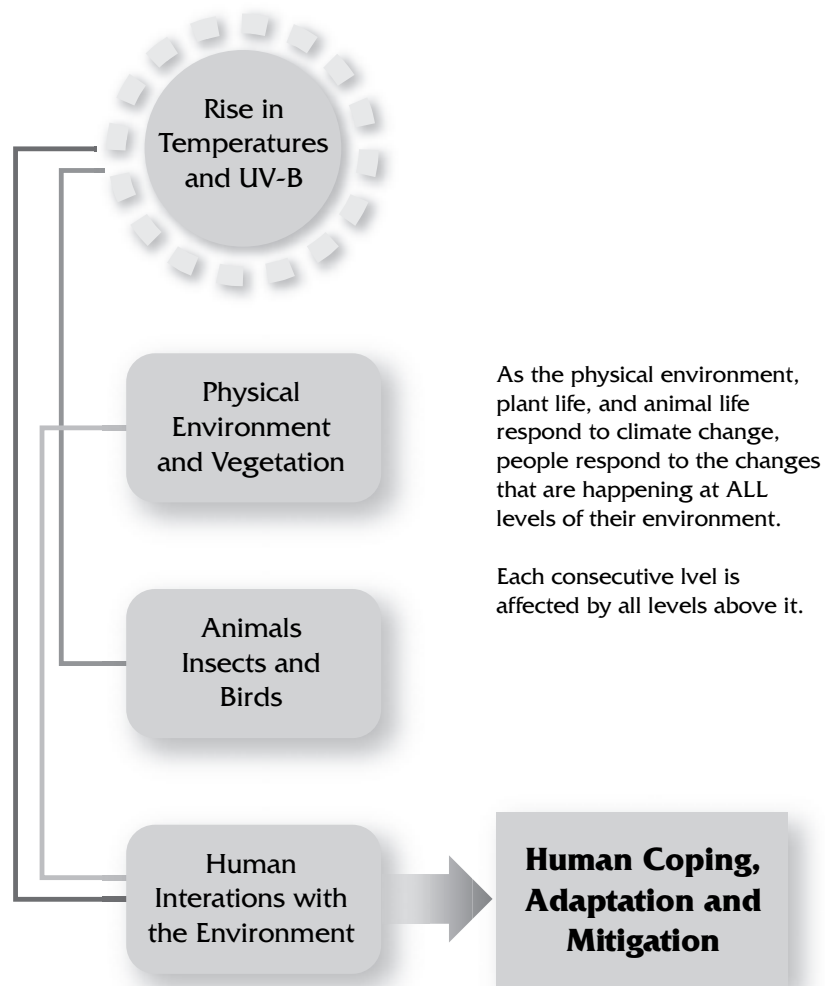
To understand the climatic and environmental picture of the region as a whole, it was important to look at five distinct communities in the analysis of change occurring in the ISR. The five communities who participated in these workshops were Aklavik, Inuvik, Tuktoyaktuk, Holman Island and Paulatuk. Owing to the uniqueness of each community's specific location as well as to their varied proximity to each other, a comparison and contrast of differences and similarities was possible within and between communities as well as between the eastern ISR and the western ISR. This report presents this analysis in Section 5.0, covering shared concerns between all ISR communities, comparisons and patterns between eastern and western ISR communities and finally a short



synopsis of changes unique to each community. Further, throughout this report recommendations for future action and research as well as adaptations to be made by communities or those already being used at the community level were made with regards to many of the changes

observed. Based on the community workshops and perspectives expressed by residents in attendance, a summary of these recommendations with regards to future research and action on the issue of climate change and community adaptations for the ISR is presented in Figure 8.

**Figure 7. Influence of Global Warming and Increased UV-B on Inuit Communities**





 **Figure 8. Summary of Recommendations**

<b>Concern</b>	<b>Recommendation</b>
Unpredictable weather makes travel uncertain and sometimes dangerous.	<ul style="list-style-type: none"> <li>• Increase communication accessibility (i.e. cell phones, CBs, two-way radios).</li> <li>• Better weather and ocean info (from drilling camps, regional weather stations and Environment Canada) to local radio stations.</li> <li>• Better communication between coast guard and communities and build capacity within coast guard.</li> <li>• Build more permanent shelters on land.</li> </ul>
Ice conditions and low water levels make travel uncertain and sometimes dangerous.	<ul style="list-style-type: none"> <li>• Make satellite imagery more available to community residents to track changes and areas of greatest threat.</li> <li>• Mark unsafe areas with durable, high quality buoys; mark safe routes for deep-keeled boats and outboards.</li> <li>• Better communication and shelters on land.</li> </ul>
Thinning and depleted ice and permafrost conditions are putting a strain on storage space and capacity in community and household freezers.	<ul style="list-style-type: none"> <li>• Icehouses, gas-powered freezers and rebuilt community freezers should be considered as ways to moderate the effects.</li> <li>• A substantial amount of gas, manpower and ongoing maintenance to rebuild and manage the community freezers would be needed; alternatives include subsidizing household freezers.</li> </ul>
Thinning ice and warm temperatures are causing a decline in the quality of furs; trappers' incomes are threatened.	<ul style="list-style-type: none"> <li>• Analyze potential effects of the projected decline in this culturally and economically significant industry.</li> <li>• Develop the means to help trappers adapt to the changes influencing their livelihoods.</li> </ul>
Changes in current and future fluctuations in the patterns of many animals (i.e. geese and caribou).	<ul style="list-style-type: none"> <li>• Communities should request support to fix and maintain the community freezers.</li> <li>• Intercommunity trading in country foods should be bolstered.</li> </ul>
Contaminated drinking water and increased contaminants in meat.	<ul style="list-style-type: none"> <li>• Water should be tested regularly to ensure confidence in water sources and to monitor changes.</li> <li>• Education on these issues should increase.</li> <li>• More outreach materials to communities.</li> <li>• Suspect meat should be tested.</li> <li>• Monitoring contaminants and climate change indicators.</li> </ul>



## 8.0 APPENDIX



**Figure 9. List of Workshop Participants**

<b>Inuvik</b>	William Vaneltsi, Lucy Adams, Ruby McLeod, Sarah Tingmiak, Johnny Banksland, Andy Tardiff, Joe Teddy, Mary Teddy, Walter Elias, Jessie Colten, Elias Aviugana, Maureen Elias, Deva Gordon, Elizabeth Firth, Albert Bernhardt, Agnes Nasogaluak, Catherine Mitchell, Mary Allen, Louie Goose, Roy Goose (observer), Lynn Lau (observer).
<b>Aklavik</b>	Danny A. Gordon, Annie B. Gordon, Carol D. Arey, Jacob Archie, Danny C. Gordon, Pat Kasook, Jerome Gordon, Louisa Kelanik, Jim B. Edwards, Agnes Edwards, David John, Alice Husky, Gary Montgrand, Ruth Furlong, Faye Gordon (observer).
<b>Tuktoyaktuk</b>	Maureen Pokiak, Agnes Felix, Noah Felix, Lena Anikina, Dennis Raddi, Bradley Voudrach, Ernest Pokiak, Emmanuel Adam, Billy Jacobson, Ernest Cockney.
<b>Holman Island</b>	John Alikamik, Lisa Alikamik, Anita Oliktoak, Joshua Oliktoak, Ryan Oliktoak.
<b>Paulatuk</b>	Connie Green, Josie Green, Peter Green, William Kuptana, Brenda Ruben, Edward Ruben Sr., Kathy Ruben, Larry Ruben, Mary Evik Ruben, Peter Ruben, Veronica Ruben, Gilbert Thrasher Sr.