

Climate Change and Adaptive Capacity in Aboriginal Communities South of 60 Assessment Report



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| Synthesis Discussion | Sydneysmith |
| Key Messages and Recommendations | Sydneysmith and CIER |
| Appendix A: Interview Schedule | Sydneysmith and Matthews |
| Appendix B: Summary of Climate Change impacts on Aboriginal Communities South of Sixty | CIER and Sydneysmith |
| Appendix C: Primary Case Study Report | CIER |
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1.0 EXECUTIVE SUMMARY

Aboriginal communities north of the 60th parallel in Canada are the focus of concerted efforts to document current climate changes and to understand processes of these changes, which will assist these communities in their abilities to adapt. Conversely, Aboriginal communities south of 60° are receiving less intensive efforts regarding the impacts of climate change, which has resulted in a lack of information about the risks climate change impacts pose to these communities. This scarcity of information about the threats and stressors Aboriginal communities south of 60° might face in both the near and long term puts them at greater risk.

In addition to a lack of understanding of the risks climate change poses to Aboriginal communities south of 60°, there is a lack of understanding of how prepared or capable these communities are; what social, technological or economic resources can they access to cope with and adapt to climate change and its related impacts. In other words, there is a lack of knowledge and information about the *adaptive capacity* of these communities. This report seeks to fill some of these gaps.

The Centre for Indigenous Environmental Resources (CIER) and researchers in the Department of Sociology at the University of British Columbia (UBC) formed a partnership (a project team) over three years to provide Indian and Northern Affairs Canada and Aboriginal peoples in Canada with greater knowledge and understanding of the vulnerability and adaptive capacity of Aboriginal communities south of 60°. The overarching goals of the project were to:

- Increase knowledge about the risks climate change poses to these communities and how these are linked to other challenges and stressors;
- Assess capacity of these communities to respond, manage or otherwise cope with direct and indirect effects of climate change, including the factors that may lead some Aboriginal communities to be more at risk than others;
- Illuminate the role of local and extra local institutions in determining how well or how poorly these communities are able to reduce the negative impacts and take advantage of potential opportunities associated with climate change.

These goals were approached through a combination of case study research and the review and assessment of existing knowledge. Our analysis included a combination of primary case study research and a thorough review and synthesis of existing community-based research undertaken to add depth and breadth to our assessment of vulnerability and risks, capacity and resilience. To provide a context and linkage to the specific concerns related to the impacts of climate change we also completed a review and assessment of recent research in this area and as far as possible attempted to link this to the specific concerns of Aboriginal communities south of 60. Finally, we also made an initial review of existing, community oriented, climate change adaptation tools to better gauge both the feasibility and utility of developing a specific tool or tools to assist Aboriginal communities south of 60.

The impacts of climate change on Aboriginal communities are likely to be as varied as the communities themselves. Climate change is a global environmental change phenomena, the impacts of which are felt, understood and reacted to by humans and other life at a very local scale. In the absence of the ability to accurately predict local outcomes of climate change people have sought to understand the ways in which communities may be exposed and sensitive to the impacts of climate change in the context of other things which may also threaten or undermine community wellbeing and prosperity. This research focused on the *vulnerability* of communities to hazards, risks, stressors and other challenges of all sorts, including those linked to or compounded by climate change; on the *adaptive capacity* of communities to respond, cope with and manage various disruptions, especially those related to climate change; and, on an *institutional analysis* of key processes concerning decision-making and governance as these relate to the management of social, economic and environmental change and challenge.

Along these lines, several key themes emerged. Historical experience and indigenous knowledge are vital to understanding current vulnerability and to any effort that may seek to enhance adaptive capacity. This includes acknowledgement and understanding of past injustices and their legacy in the contemporary social and economic conditions of many contemporary Aboriginal communities. It also includes acknowledging the contribution and benefits that accrue from processes of cultural revival, of re-invigorating indigenous knowledge and practice and merging it with contemporary aspirations. Strengthening the bonds between elders who had their culture taken away and youth who often struggle to know what theirs is, is a key part of this process. Finally, our examination of institutional processes and relationships highlighted community vulnerability related to leadership and decision-making, the interaction of

families and negative or counterproductive interactions with other levels of government and other external agencies and organizations. These institutional dimensions of vulnerability are especially important because it is through institutions that many of the important decisions and processes take place that are necessary to address climate change or at very least to develop the capacity to deal with it.

Climate change impacts are often not given high priority in Aboriginal communities, primarily due to other, competing stressors and problems that cannot be ignored; the so called *issue of other issues*. Many also adhere to the notion that Aboriginal peoples are “naturally” adaptable because their historical experience, especially in the last couple of centuries, has been one of constant and profound changes and subsequent adaptations to the social-ecological systems in which they live. Nevertheless, pre-existing vulnerabilities put communities more at risk to climate change in terms of both greater *exposure* and greater *sensitivity*. The impacts of climate change in turn are expected to compound and exacerbate existing risks and stressors that are already affecting the land, waters and activities of these communities and their traditional territories. Some compounding effects will be felt in terms of added costs (travel, maintenance, repair, etc.), others will add to existing pressures on resources (development, overharvesting/population pressure, loss of habitat), still others will elevate the risks of existing hazards (floods, drought, forest fires). Public health and safety concerns may also be associated with or increased by hazards such as extreme weather events (e.g. storms) and forest fires. Effective preparation and response to increased frequency and duration of severe weather events and forest fires depends on minimal levels of equipment, expertise, technical capacity and manpower much of which is well beyond local capacity and resources.

Alternatively, in communities where traditional harvest of land and aquatic resources are still an important source of sustenance, income, and cultural practice, these activities are likely to come under increasing pressure. Many traditional resources, such as wild game are already depleted from over-harvesting, habitat loss or pollution and climate change is expected to compound these effects in most cases, making attempts to revive this knowledge more difficult.

Building adaptive capacity necessitates an understanding and sensitivity to the legacy of recent history, for example, of residential schools, and of the Indian Act and its various amendments. Some of our respondents spoke of the problem of dependency in their community specifically, or of Aboriginal communities in general, as a legacy of their negative experiences of the past

century and a barrier to self determination. Our research indicates that those individuals and communities that appear the most resilient are those that are finding ways to effectively acknowledge the past and at the same time embrace the future. From this perspective, adaptive capacity is a function of overcoming past injustices by keeping alive important traditions, knowledge and practice and, at the same time, increasing self-determination in both economic development and governance.

Community economic development (for income, jobs, and other social benefits) and education and technology are regarded as important for achieving improvements in social and economic conditions. Adaptive capacity benefits as other issues are resolved or improved, freeing up precious time and resources which can then be applied to consideration of other planning and management issues, including climate change adaptation.

The sorts of responses that climate adaptation will entail – planning, resource management, infrastructure or even public health responses – will fall most often to those people who are responsible for governance and decision-making on behalf of the community. The interaction or *interplay* of institutions both within the community and between the community and external organizations, agencies and other, primarily governance, bodies are important precursors to effective adaptive capacity. Institutions provide the context and the cultural legitimacy for decision-making, hence the importance of achieving appropriate *fit* between climate change impact problems and the governance institutions that will ultimately have to deal with them. To this end the institutional perspective contained in this report is an important contribution to a more comprehensive understanding of current realities of Aboriginal communities and the prospects for adaptation to climate change impacts. Institutional dynamics include interactions between formal institutions just noted, but also encompass cultural dimensions, values, norms and the behaviour of individual actors, hence the pivotal role of decision-making in our analysis.

Aboriginal cultural values, norms and activities are tied closely to the land and traditional uses of terrestrial and aquatic resources, things which are important to community wellbeing, social cohesion and resilience, and many of which may be subject to a variety of climate change impacts. Vulnerability is frequently associated with the persistent erosion of many of these attributes of Aboriginal traditions and culture. In those cases where communities have been able to maintain or re-establish connections to the land, to re-establish strong linkages between

youth and elders, to find ways to draw upon both traditional and contemporary knowledge and practice, adaptive capacity we argue is or can be enhanced.

As Aboriginal cultures change and adapt, redefining traditional culture in the context of contemporary society, Aboriginal institutions invariably change and adapt as well. This will be an important source of adaptive strength going forward. Nevertheless, it is unlikely that Aboriginal communities south of 60 can go it alone, indeed few communities can. Hence, there is, ultimately, always going to be a role for governance agencies and institutions to support or contribute to local adaptive capacity. The form of such support is for others to determine. Knowledge is key. This includes information about the sorts of climate impacts to be expected, including where possible, the timing and severity of anticipated changes, but most importantly delivered at a scale relevant to community issues and decision-making context. Various sorts of tools for relaying information, for assessing climate risks and adaptive capacity strengths and weaknesses, for initiating and developing climate change adaptation plans, are increasingly available. Some of these are reviewed in Appendix E. Of equal (sometimes lesser, sometimes greater) importance to the development of adaptation tools, however, is the human or social capacity to act on climate impacts and adaptation information. Creating an institutional context whereby adaptation tools and related technical knowledge may be introduced through types of extension may be the most effective and lasting way to support adaptation and build adaptive capacity in Aboriginal communities south of 60.

2.0 INTRODUCTION

Aboriginal communities north of the 60th parallel in Canada are the focus of concerted efforts to document current climate changes and to understand processes of these changes (e.g. Arctic Climate Impact Assessment, ArcticNet, Community Adaptation and Vulnerability in Arctic Regions - CAVIAR), which will assist these communities in their abilities to adapt. Conversely, Aboriginal communities south of 60° are receiving less intensive efforts regarding the impacts of climate change. This lack of attention has resulted in a dearth of information about the risks climate change impacts poses to Aboriginal communities south of 60°. These impacts will often compound or be compounded by, current challenges and stressors, of which Aboriginal communities are known to have many (e.g. high and rising rates of poverty and unemployment, insufficient and unsafe housing, poor drinking water, and high rates of diabetes) (Royal Commission on Aboriginal Peoples [RCAP], 1996; Parry et al., 2007; Lemmen, Warren, Lacroix, and Bush, 2008). Although climate change impacts may not seem to present the same real and present danger outside of Arctic regions and low lying oceanic islands it is risky, and potentially very costly, to ignore the threats and stressors communities south of 60 might face in both the near and long term.

In addition to a lack of understanding of the risks climate change poses to Aboriginal communities south of 60°, there is a lack of understanding of the abilities and processes of these communities to cope with and adapt to change with respect to their cultures, social relations, economic wellbeing, and governance. Managing the effects of climate change will affect multiple facets of community life (social, cultural, economic, environmental). The social components of communities and the ways communities respond to change in general, of which little research has been done, will have a large influence on how they can respond to current and future climate change impacts. This relative lack of research and understanding potentially limits the capacity of people and institutions related to Aboriginal communities south of 60° to react and cope effectively and increases uncertainty about possible negative effects.

The Centre for Indigenous Environmental Resources (CIER) and researchers in the Department of Sociology at the University of British Columbia (UBC) have formed a partnership (a project team) to provide Indian and Northern Affairs Canada (INAC) and Aboriginal peoples in Canada with greater knowledge and understanding of the vulnerability and adaptive capacity of Aboriginal communities south of 60°. The overarching goals of the project are to:

- Increase knowledge about the risks climate change poses to these communities and how these are linked to other challenges and stressors;
- Assess capacity of these communities to respond, manage or otherwise cope with direct and indirect effects of climate change, including the factors that may lead some Aboriginal communities to be more at risk than others.
- Illuminate the role of local and extra local institutions in determining how well or how poorly these communities are able to reduce the negative impacts and take advantage of potential opportunities associated with climate change.

We addressed these goals in a holistic manner through a combination of case study research and the review and assessment of existing knowledge. Our analysis included a combination of 'Primary' and 'Secondary' case studies. The former entailed original research based on a series of in-depth interviews carried out in four First Nation communities across Canada. The latter, so called 'Secondary' case studies involved a review and synthesis of existing community-based research which added depth and breadth to our assessment of vulnerability and risks, capacity and resilience in Aboriginal communities south of 60 across Canada. To provide a context and linkage to the specific concerns related to the impacts of climate change we also completed a review and assessment of recent research in this area and as far as possible attempted to link this to the specific concerns of Aboriginal communities south of 60. Finally, we also made an initial review of existing, community oriented, climate change adaptation tools to better gauge both the feasibility and utility of developing a specific tool or tools to assist Aboriginal communities south of 60.

This report is by no means a definitive evaluation of the relative risks of climate change impacts, now and in the future, or of the capacity of Aboriginal communities south of 60 to cope with or effectively manage any of the challenges or hazards they might face. It is neither complete, nor comprehensive in its treatment of the full range of diversity of Aboriginal communities that exists across the country (e.g. see comment below on absence of meaningful assessment of Métis and Inuit communities in either 'Primary' or 'Secondary' case studies). We believe the report does, however, provide a holistic and in-depth account of the complex interaction of social, economic and environmental conditions and how these interface with both the unique and the mundane challenges associated with the impacts of climate change. While necessary in an endeavour such as this, to consider risks, threats and weaknesses, usually under the collective label of vulnerability, Aboriginal communities have told us they prefer to focus on the positive

aspects (i.e. strengths) of their communities, as there has been a long history of only focusing on the negative (i.e. problems). Therefore, we have attempted, as far as possible, to focus on the positive, to frame the discussion in terms of wherein lies the strength of Aboriginal communities to address climate change. We hope that this report adds the knowledge and understanding of the ways in which Aboriginal communities south of 60 will be challenged by climate change and how best their capacity to adapt may be enhanced. Any omissions or errors expressed in the report are, of course, the sole responsibility of the authors.

A note on assessment of Aboriginal vs. First Nations communities:

Although the intention of the project was to assess vulnerability and adaptive capacity of Aboriginal communities south of 60 in Canada including Inuit, Métis, and First Nations, in the end this was not feasible. Indeed, most of the literature, projects and case study communities that climate impact and adaptation researchers have worked with are First Nations (i.e. only one of our 'Secondary' case studies is concerned with an Inuit community). Given the current emphasis on First Nations, this report will be very limited in its ability to speak directly to the specific vulnerability and adaptive capacity of Métis and Inuit peoples. There are many studies in the north that have worked with Inuit communities, some of the findings of which it may be possible to extrapolate and apply, to some degree, to Inuit communities in the south. The greatest lack of research on climate change impacts and adaptation clearly exists with respect to Métis communities. This is a knowledge gap which bears consideration for further research in the future. Although the term 'Aboriginal' is used in this report the reader should note that the data, reports and interviews used in the preparation of this report are based almost entirely on First Nations' experience and knowledge. It is up to the reader to determine to what degree some of our findings may apply in a specific or general sense to the conditions and concerns of Inuit and Métis communities.

Layout of report

In this report, we provide the primary case study summary, secondary case study summary, synthesis discussion, key messages and recommendations for the study. The primary case study summary discusses the analytical framework we used to carry out our primary case study research and general conclusions stemming from this work. The secondary case study summary provides general conclusions from our secondary case study research. The synthesis discussion provides an analysis of our research from our primary and secondary case studies and secondary literature. The key messages and recommendations section outlines our major

findings from our research and recommended areas of focus to strengthen the adaptive capacity of Aboriginal communities south of 60 in the future.

Appendix A is the interview schedule used for the primary case study interviews. Appendix B provides an overview of current and predicted climate change impacts at the national and regional level. Appendix C outlines detailed results from case study communities and includes climate change specific to the community and community background information. Appendix D includes five reports each summarizing a secondary case study. Appendix E provides an assessment of the need for a tool to assist Aboriginal communities south of sixty to increase their adaptive capacity. The assessment includes a review of existing tools (e.g. vulnerability, risk assessments), and recommendations for the relevance of a tool for Aboriginal communities to respond better to climate change (focusing on strengthening adaptive capacity).

3.0 PRIMARY CASE STUDY ANALYSIS

3.1 ANALYTICAL FRAMEWORK AND RESEARCH DESIGN

“Governance is not simply government, but includes the complex interactions between and within government, business and ‘civil society’” (Adger, Brooks, Bentham, Agnew, and Eriksen, 2004).

The theoretical basis of the research carried out for the primary case studies component of the project and as laid out in Section 3 of the Year One Report was built upon two related but distinct conceptual frameworks. The first is based on a body of research that, in the absence of precise predictions of the future consequences of climate change, deals with the susceptibility of communities or social-ecological systems to harm or impacts from any quarter (Adger, 2006; Brooks, 2003; Smit and Pilifosova, 2003). This perspective, often referred to as the “vulnerability approach”, develops the concepts of vulnerability and adaptive capacity wherein the focus is on analysis of community attributes and conditions that are exposed and/or sensitive to risks, stressors and change that may be social or environmental (Smit and Wandel, 2006). Our second (but by no means secondary) conceptual frame is based on recent sociological analyses of environmental change inspired by an emerging area of research known as *new institutional analysis* (NIA). NIA is a process-oriented approach that focuses on the role of institutions in influencing societal outcomes, not as bureaucratic straitjacket but as part of culture (DiMaggio and Powell, 1983; Hall and Taylor, 1996, p. 13). Institutions are cultural expressions of organization that shape and guide behaviour as much as they are a creation of accumulated individual choices and decisions (Hall and Taylor, 1996; O’Riordan and Jordan, 1999). We use the concepts of *new institutional analysis* to investigate community adaptive capacity in the context of the dynamic interaction of local actors, culture and key social and governance institutions across multiple scales.

Nestled between these two theoretical approaches is a third conceptual frame that has emerged in the analysis of our interviews as an important bridging concept. We refer here to the concept of cultural or mental models (Denzau and North, 1994; Kempton, 1997). This ‘third dimension’ of our research provides a platform from which we analyse the various perceptions and understandings of climate change in our primary case study communities. Although not prominent in our initial design of the project, the mental model approach provides a useful link

between the adaptive capacity focus of our two main conceptual frames and local interpretations of climate change impacts and adaptation presented in the data.

Our goal in the remainder of this section is to summarise and explain these approaches as they were applied in the field and discuss briefly how the concepts developed during our analysis.

3.1.1 Vulnerability analysis framework

The vulnerability analysis framework focuses on identifying in situ community conditions, typically with a focus on those elements of community life that may be exposed and/or sensitive to a variety of risks and stressors (Adger, 2006; Brooks, 2003; Smit and Pilifosova, 2003). Our conceptual approach to the analysis of vulnerability in our four case study communities led us to examine a broad and inclusive list of conditions and factors that shape community wellbeing and the way in which people live, their livelihoods and economic conditions, social issues and environmental change (Smit and Wandel, 2006). Ultimately the application of the vulnerability concept involves identifying those dimensions of the community that people value or deem important. Conceptually, these are ingredients which allow the community to survive and flourish. They may be tangible and physical in nature such as natural resources and landscape features, or infrastructure ranging from roads to runways, from water and sewage systems to buildings and energy. There may also be 'social' dimensions of community life that are conceptually linked to vulnerability include, household and community economic resources and opportunities, historical and cultural factors, skills and education, and social relationships and networks (both internal, within the community and external, with other communities, organizations, agencies and governments) (Brooks, 2003; Smit and Wandel, 2006). Many of these social factors have important institutional dimensions and therefore may bridge our two main theoretical perspectives. Thus governance structures and processes may be relevant to assessing community vulnerability but they are also an important element of institutional analysis.

From this broad-based approach we seek to assess those features of community life which are subject to risk and stress, especially under conditions of change, with specific but not exclusive reference to the impacts that climate change will have in that context. Conceptually we explore 'conditions of concern', what is at risk, and what is exposed/sensitive. We do so in order to understand where, and in what ways, our communities are vulnerable. Ultimately our goal is to assess community vulnerability in the context of climate change impacts and adaptation (Adger, 2003; Smit and Wandel, 2006).

This goal is facilitated by mental and cultural models of the ways in which people perceive and understand (a) the effects of climate change on their community and (b) how prepared and capable they are to respond and adapt.

3.1.2 Understanding perceptions of climate change through mental models

Mental models are what people use to make sense of their environment based on their experience, values, ideology and knowledge (Denzau and North, 1994; Kempton, 1997). Such an approach is particularly germane in our case, as it allows us to unpack the ways in which the highly complex and abstract concept of climate change is understood and perceived. Denzau and North (1994) provide a useful definition of the mental model approach that links well to our focus on the institutional dimensions of adaptive capacity. We therefore quote them at length (1994, p. 3):

Ideas matter; and the way that ideas are communicated among people is crucial to theories that will enable us to deal with strong uncertainty problems at the individual level'. For most of the interesting issues in political and economic markets, uncertainty, not risk, characterizes choice-making. Under conditions of uncertainty, individuals' interpretation of their environment will reflect their learning. Individuals with common cultural backgrounds and experiences will share reasonably convergent mental models, ideologies, and institutions; and individuals with different learning experiences (both cultural and environmental) will have different theories (models, ideologies) to interpret their environment.

As our interviews attest, there is considerable uncertainty in Aboriginal communities about what climate change means and will mean for their communities and their future. Mental models will inevitably inform local decision-making involved in adaptation to climate change impacts, especially in the absence of detailed predictive models and proactive adaptation plans. Mental models are useful filters which people use in order to distil and make sense of information, in this case, information about environmental change. Kempton (1997, p. 20) cautions that in the context of complex processes such as climate change people may apply inappropriate or incomplete mental models which may lead them to draw invalid conclusions. Finally, the use of mental models analysis is useful to help elicit appropriate ways to share information and communicate between science-based knowledge and understandings and indigenous knowledge and understandings of climate change (Kempton, 1997).

3.1.3 Institutional framework

3.1.3.1 Institutions, governance and capacity

In this study we adhere to a definition of institutions that is distinctly sociological and encapsulates considerably more than 'organizations' or organizational structure. From the standpoint of our analysis:

... institutions are to society what habits are to individuals, namely the largely patterned and taken-for-granted processes whereby things are done within a societal and organizational context. As Portes (2006, p. 236) notes, institutions are largely seen as cultural constraints, or, to quote O'Riordan and Jordan (1999, p. 81), "Institutions are the multitude of means for holding society together, for giving it a sense of purpose and for enabling it to adapt". As such, "institutions have to involve rules, regulations and legitimating devices" (ibid, p. 82) that constitutes something equivalent to social glue. (Matthews and Sydneysmith, 2010, p. 224)

The vulnerability approach provides an explanation of the attributes and context of adaptive capacity in a given community or social-ecological context. However, adaptive capacity is not just a condition or set of conditions. It is a dynamic social process. Adaptation to changing environmental conditions is a social process that takes place at a local or regional scale, guided largely by institutional arrangements and relationships (Matthews and Sydneysmith, 2010). Citing a large body of research that has looked at interactions of social and environmental systems around the world, Young (2008, p. 119) asserts, "that institutions are among the important forces both in explaining what can go wrong in human-environment interactions and in responding effectively to problems arising in this domain". Agarwal (2008, p. 1) points out that institutions provide three important functions in climate change adaptation, "(a) they structure impacts and vulnerability, (b) they mediate between individual and collective responses to climate impacts and thereby shape outcomes of adaptation, (c) they act as the means of the delivery of external resources to facilitate adaptation and thus govern access to such resources." We have argued elsewhere (Matthews and Sydneysmith, 2010, p. 224) that institutions are 'mechanisms' for providing adaptive capacity and as such are 'agents of change' as much as they embody rules, guidelines and other cultural constraints on practice and behaviour (cf. Brunner et al., 2005). Analyses of the effects of environmental change on societies increasingly recognize the pivotal role of institutions, especially governance institutions

in determining the success communities may have in adapting to and managing such changes (Agrawal, 2008; Armitage and Plummer, 2010; Young, King, Leslie and Schroeder, 2008). Community resilience and adaptive capacity is, at least in part, a product of the effectiveness of institutions at linking human ingenuity and resources across multiple scales.

We argue that institutions and adaptive capacity are inextricably linked and that any analysis of that relationship requires one to focus on how institutions operate and examine the institutional processes at work which bring about adaptation. *New institutional analysis* is an approach which provides a conceptual framework for examining such dynamic institutional processes that we attempt to operationalise through an examination of culture, organizations and the actions of individual actors (Matthews and Sydneysmith, 2010)¹. The *new institutional analysis* frame looks at how actors behave within organizational settings. While not ignoring the cultural dimensions of institutions, it focuses on whether the institutional culture of such settings constrain actors from dealing effectively with new circumstances, or whether such organizational cultures can actually facilitate adaptive capacity (cf. Hall and Taylor, 1996).

Institutions that are weak or corrupt may limit or hamper a community's ability to adequately respond to a crisis or disaster event. We argue in our primary case study analysis that the effectiveness of state institutions, political accountability and transparency, and internal conflict can all impact the vulnerability and adaptive capacity of a community or group. Institutions determine the entitlements and access to resources and information by local people (Smit and Wandel, 2006). The concept of entitlement, that is, people's command over resources (i.e. their ability to secure income or food) is often central to discussions of vulnerability (Adger et al., 2004). Adaptive capacity is not only a function of the availability of the resources but also access to them, especially by those most vulnerable such as minorities, the poor, children, and women (Smit and Wandel, 2006) or, perhaps, Aboriginal communities south of sixty. Our interviews suggest that adaptive capacity is also the product of good governance at the community level and thus depends on the effectiveness of local governance institutions, including both political and administrative spheres.

¹ We have neither the space nor the mandate here to provide an exhaustive review of the literature on *new institutional analysis* and its application to problems of climate change impacts and adaptation. For such a review and a more in-depth presentation of our arguments for an NIA perspective and our approach to operationalise these concepts please see Matthews and Sydneysmith 2010, p. 230-236.

Aboriginal communities confront a challenging fusion of social and cultural institutions that are either rooted in traditional knowledge and history, or emanate from the transformative experiences of colonialism and the ongoing (re)negotiation of the relationship with wider Canadian society and institutions. Each community has unique experiences and a particular history that influences how its relationships with both local and extra-local institutions develop and change over time. For example, in the context of community governance, the duration of the election cycle in First Nations (i.e. 2-yr vs. 4-yr) may help or hinder the ability of local governance institutions to build resiliency or enhance adaptive capacity. Whether or not a First Nation has treaty status, is in the process of negotiating treaty, or is in some phase of treaty implementation will affect the institutional context of resiliency and adaptive capacity. The level of involvement with a tribal council and the level of support available from the tribal council may also affect community resiliency and adaptive capacity. The presence of a land use plan and/or a comprehensive community plan may assist local leaders in positioning the community to better deal with stressors such as climate change impacts and thereby enhance community adaptive capacity. Common indicators for governance or political capital include control of corruption, government effectiveness, political stability, regulatory quality, rule of law, voice and accountability, ability to deliver services, and civic freedom (Adger et al., 2004; Haddad, 2005).

3.1.3.2 Institutional analysis

Our assessment of institutional capacity in Aboriginal communities south of sixty involves a combination of approaches. Following from earlier work (Matthews and Sydneysmith, 2010) we begin with the assumption that the behaviour of actors is shaped by culture (values and norms) but also moulded by institutions, i.e. the culture of organizations that manage life in their community. From the *new institutional analysis* perspective developed above, institutions are dynamic social processes which both influence and are influenced by, individual actors living and working 'within' them (Hall and Taylor, 1996; Portes, 2006). Institutions shape and bound actions and thoughts but are also a product of the cumulative decisions and actions of individuals. In order to operationalise this concept we, therefore, focus on decision-making and how the individual interacts within a given institutional and organisational context.

In conjunction with our analysis of decision-making we also explore two illuminating dimensions of institutional dynamics inspired by the work of the Institutional Dimensions of Global Environmental Change (IDGEC) group of the IHDP (International Human Dimensions Programme on Global Environmental Change). In particular we deploy the concepts of fit and interplay as developed by Oran Young and colleagues (Young et al., 2008) to provide an

institutional focus and framework for our analysis. Fit refers to how well a given institutional context meshes with a particular biophysical setting or ecological problem and may be 'spatial' or 'temporal'.

Spatial fit is the degree to which the geographical or ecological space of concern, (for example, in the context of Aboriginal communities south of sixty this could be traditional territory, contemporary hunting or fishing grounds or treaty lands), are congruent with the management area or jurisdiction of the institution(s) which govern them. Spatial misfit occurs frequently because jurisdictional boundaries of most types tend to be aligned with political, economic or other social interests rather than biophysical or ecosystem features. Institutions may have jurisdiction that is too big or too small for the geographic scope of the problem which render it ineffective. For example, there is not one fisheries policy regime that can adequately guide the management of fisheries on Canada's coasts as this denies consideration of local context. Similarly, because of this context dependence, a 'one size fits all' climate change adaptation policy for Aboriginal peoples in Canada is likely to be ineffective.

Temporal fit refers to institutional time frames and the degree to which a community's institutions and organisations are changing at a social level to match change in the biophysical systems on which it depends. The temporal scale of environmental change tends to be either quite slow (e.g. forest succession) or rapid and catastrophic (e.g. extreme weather events) both temporal scales align poorly with most institutional timeframes which tend to be governed by such things as fiscal planning and budget cycles or elections. For example, the responsible resource regimes of British Columbia faced a monumental temporal misfit with the recent Mountain Pine Beetle epidemic in the province's interior which was decades in the making and then unfolded so quickly as to force only the crudest and reactive responses. Given our interest in climate change vulnerability and adaptive capacity we are particularly interested in identifying those instances of institutional 'misfit'. Both spatial and temporal misfits are common and difficult to resolve Young (2008).

In this study we are concerned with the fit of institutions and environmental problems but extend our application of the concept to address issues of fit as may occur between relevant institutions and other problems of a social, political, or economic nature. For example, a particular misfit articulated in several of our interviews is the problem of fit between the two year election cycle

and the aspirations of community managers and administrators to develop long-term community plans and economic development strategies.

The concept of interplay focuses on interactions, linkages and relationships between institutions. We maintain that institutional interplay, of various types, is highly relevant to our analysis of adaptive capacity. Young (2008, p. 31-33) and his IDGEC colleagues differentiate between several types of interplay in relation to whether or not the institutional interactions occur between institutions that are at the same level of social organization. Interactions within the community, between institutions such as the elected leadership and elders, exemplify 'horizontal interplay' as would interaction between, for example, Indian and Northern Affairs Canada (INAC) and Department of Fisheries and Oceans (DFO). A second broad type of interplay denotes that which occurs vertically, between different levels of social or administrative organization (Gehring and Oberthür, 2008). Vertical interplay, such as the interaction between Aboriginal communities and institutions of the Federal Government, is an important arena of investigation in the context of this project given important fiduciary responsibilities of the Government of Canada. The as yet limited interactions between Aboriginal communities and Provincial level agencies and institutions are another sort of vertical interplay that is likely to increase in the future. The gradual resolution of treaty negotiations in British Columbia assures that these interactions are bound to increase. Other types of institutional interaction that have been identified by IDGEC researchers include intentional interplay also described as political or planned and unintentional interplay, also described as functional or de facto (Young, 2008, p. 31-33). Research on institutional interplay is in its early stages and has largely focused on institutional interaction at the international and national level (Gehring and Oberthür, 2008). The analysis conducted here is both ground-breaking and nascent in that regard.

Climate change impacts and adaptation in Aboriginal communities south of sixty are likely to precipitate multiple institutional interactions that will result as a consequence of both planned and/or unplanned adaptations. Typologies of interplay may be of interest to analysts but perhaps more relevant to those involved in institutional interactions is whether or not such interactions are synergistic, i.e. create mutually positive outcomes and in what circumstances does interaction, whether vertical or horizontal lead to interference or disruption (Gehring and Oberthür, 2008; Young, 2008). Finally, Young argues that institutional interplay is increasing at virtually all levels of social organization as a result of the increasing complexity and interdependency of social-ecological systems. For Aboriginal communities confronted with

climate change impacts and adaptation, if managed correctly this may be a good thing, that is, if greater interaction can be marshalled into increased adaptive capacity.

3.1.4 Research design and method

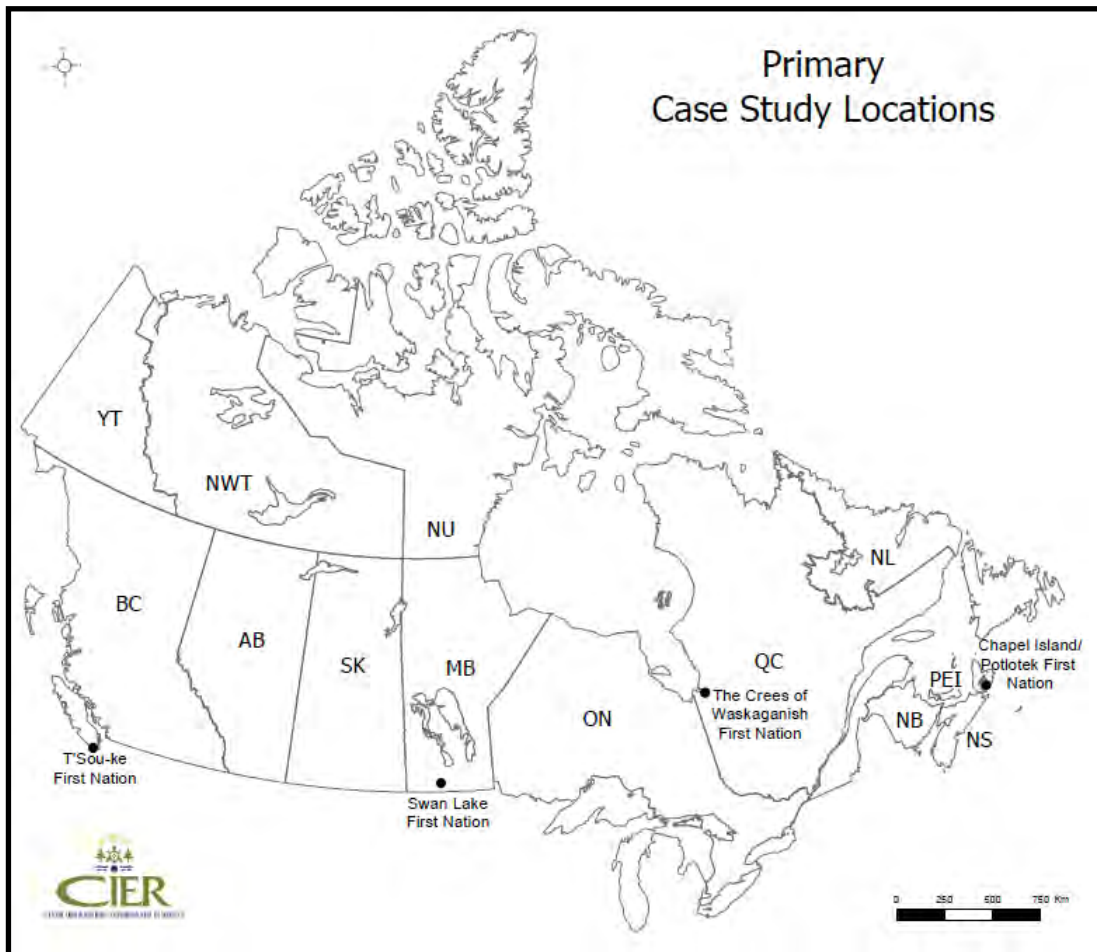
The research for the primary case studies, carried out in years two and three of the project, is based on sixty (60) interviews conducted across four communities chosen to capture at least some of the variety of First Nation communities across the country (Potlotek, n=13; Swan Lake, n=14; T'Souke, n=13; Waskaganish, n=20; see Figure 1 for map of case study locations). Interviews were in-depth, semi-structured meetings that typically lasted one and half to two hours. The schedule of questions used to guide the interview was developed in advance of the interviews and was structured with the aim to elicit responses on community conditions, perceptions and understandings of environment and environmental change and processes of decision-making, institutionalized roles and organizational culture (See Appendix A for Interview Schedule). Interviews were conducted with a purposive sample of community leaders and decision makers identified through prior familiarity with some of the communities and through preliminary consultations and meetings with community members. For our interview subjects we targeted people with positions, knowledge or responsibility within the community pertaining to governance, environmental and/or natural resource management, health, emergency planning, infrastructure, social services and education. In Aboriginal communities, as with other small, rural or resource communities, it is common for portfolios and responsibilities to overlap. In general our sampling strategy was to cover off as many of the key 'voices' in the community including those of influential or engaged elders.

All of the interviews were recorded but one with an individual who declined recording but still agreed to be interviewed. Interviews were professionally transcribed and coded using NVivo qualitative data analysis software. Coding and analysis of the interviews was guided by the interview schedule, but not bound by it as some of the analytical categories and codes emerged in the reading of the transcripts rather than being predetermined by the researchers (Yeung, 1997).² The analytical story that unfolds in Section 3.2 emerged from the voices of our respondents providing nuanced and contextual insight into:

² Note: all quotes cited in this report are followed by interview identification codes, e.g. #25

1. the social factors and conditions that shape respondent's sense of risk and confidence that they can manage change,
2. respondent's concrete and abstract perceptions and understanding of climate change, and
3. respondent's sense of the ways in which the institutions that govern their lives are effective and meet the needs (or not) of the community, enabling it to flourish and adapt under a variety of conditions and the prospect of change.

Figure 1: Map of Canada showing primary case study locations



3.2 ANALYSIS AND DISCUSSION

3.2.1 Introduction

The major contribution of the original research undertaken for this project is based on “primary case studies” carried out in four (4), very diverse First Nation communities across the country. These communities include Potlotek First Nation, located on the shores of Bras D’Or Lake in Cape Breton, Nova Scotia; the Crees of Waskaganish First Nation (CWFN) located at the south eastern tip of James Bay, Quebec; Swan Lake First Nation, located roughly 175 kilometres southwest of Winnipeg in south central Manitoba; and finally, T’Sou-ke First Nation located on the south west coast of Vancouver Island (See Figure 1).

These four communities provide a window into the diversity of conditions and experiences of First Nation communities south of sixty. Across the country there is enormous variety among First Nation communities and therefore in the types and ranges of both their vulnerability and adaptive capacity as it relates to climate change impacts and adaptation. Within each sub-region of the country there is greater diversity still³. Such diversity will remain a challenge for adaptation planning and programming.

The primary case studies explore community level contexts and factors that play a critical role in shaping adaptive capacity with a specific focus on the role of institutions and institutional dynamics. These are not easily measureable. In-depth interviews were used to identify community attitudes, behaviours, beliefs and understandings of community capacity and related community characteristics that may affect the capacity of communities to deal with change and stress. Questions asked dealt with changes and challenges facing the community including, but not limited to environmental change, to decision-making, leadership and the future prospects of the community. The analysis of those interviews that follows is driven by the conceptual frameworks developed and explained in the preceding section.

³ To illustrate this diversity, consider our the primary case study community in British Columbia - a relatively small, coastal First Nation, situated less than 25 kilometres from the provincial capital of Victoria. Many coastal First Nations are considerably more isolated, some accessed only by air or water. But there are also coastal First Nation nestled in the heart of major urban areas, especially Vancouver. Interior First Nation have different historical and cultural experiences, but also have different issues, challenges and opportunities, including those associated with climate change impacts and adaptation, compared to their contemporaries on the coast. In addition to size, geographic location, and relative remoteness BC First Nations also differ with respect to their level of engagement with the formal BC treaty negotiation process.

3.2.2 First Nation communities south of sixty: the context of vulnerability and capacity in four primary case study communities

The broader context of vulnerability (Adger, 2006) was elicited in the primary case studies through a series of questions about life in the community. Respondents were asked how they would describe their community to an outsider and to reflect on prominent characteristics of their community. Interviews explored the sorts of changes communities have experienced in recent decades encompassing issues and challenges related to the social, economic, and cultural dimensions of community life – including community health and wellbeing as well as issues related to the local environment, resources and the land. The analysis below begins by looking at vulnerability and adaptive capacity through a wide-angle lens to orient our understanding of the susceptibility of communities to the impacts of climate change within the broad context of existing social, economic and environmental conditions. Subsequently we focus more specifically on livelihoods and environmental change including perceptions and understandings of climate change.

There were both positive and negative dimensions to the conditions of life in the reserve communities visited for this project. Respondents generally saw their communities as close knit, 'friendly' and supportive, "people help each other" and place a very high value on family ties, on cultural traditions and on their connections to the land.

Life, for me here is, it's a wonderful life. This is home to me. And I get along with the people... You're never stuck on an Indian Reserve, if you're from here. You will never go hungry. You'll always have a place to stay. You'll always have a place, you know to hang your hat.... personally ... I like living on my reserve. (#25)

A sense of community cohesiveness featured prominently in many descriptions of community life, "... progressive, peaceful in a lot of ways... I think the closeness here of the people is impressive, the people here, the families" (#22). The concept of social cohesion is widely used in the social sciences and in policy circles in Canada, especially since the 1990s (J. Chan, Ho-Pong, and E. Chan, 2006). It is often used to describe attributes of closeness, cooperation and mutual support (Chan et al., 2006). For our purposes it is assumed that social cohesion is a

positive attribute of adaptive capacity in most situations (Chan et al., 2006; Rolfe, 2006)⁴ which is consistent with the ways in which it was articulated in the primary case study interviews.

Social cohesion in the case communities, the sense of being ‘closely knit’, of trust and mutual support is linked strongly to their connections to culture, place, traditional activities and livelihoods. In at least two of the cases respondents felt that there had been considerable improvements in cohesiveness of their communities in the past decade or two. Whereas in the past, internal conflict for example, between rival families, or weak community leadership, had seriously affected social cohesion in the community, contemporary improvements were linked to many positive outcomes in the community. There was a strong sense of ‘then’ and ‘now’ and that the current situation greatly improved the communities’ capacity to deal with other issues which continue to challenge them.

Notwithstanding these improvements, many of our respondents feel that people in First Nation communities continue to struggle with poverty and un/under-employment, with lack of control of traditional and contemporary resources, with the tension between traditional and contemporary systems of governance, and with the social and cultural legacy of the colonial period, the residential school system and its aftermath (Fleras, 1996; Tenant, 1990). Indeed, it is often argued that many of the social and economic challenges that face First Nation communities are perpetuated by institutional arrangements and relationships largely imposed or upheld by the Government of Canada. But in the communities interviewed for this project, it was recognized that it was not enough to simply “blame the government”. Generally, respondents acknowledge a more complex interplay of factors from multiple sources. Many of our respondents see First Nation peoples in a struggle between modern and traditional ways of life. This struggle underlies both vulnerability and adaptive capacity in a variety of ways.

3.2.2.1 Elders and youth: the future in the past

“We are who we are ... [we] can walk in both worlds and find the balance.” (#20)

⁴ Chan et al. (2006) provide a helpful discussion and critique of attempts to define social cohesion and arrive at more focused and intuitive definition which we attempt to follow here. Their proposed definition of social cohesion is, “Social cohesion is a state of affairs concerning both the vertical and the horizontal interactions among members of society as characterized by a set of attitudes and norms that includes trust, a sense of belonging and the willingness to participate and help, as well as their behavioural manifestations.” (ibid 290)

Perhaps nowhere are the links between vulnerability and adaptive capacity more pronounced than in the experiences and expectations of First Nation elders and First Nation youth. In trying to get at a succinct analysis of underlying conditions in First Nation communities and how these affect community capacity to adapt to change and stressors, including those that may be associated with climate change impacts, the complex tension between old and new provides a useful gateway. It is neither fair nor accurate to say that First Nation peoples are “stuck in the past”. Yet it is in the past where many of the defining strengths of First Nation communities are rooted.

Traditional livelihood practices rest on a foundation of rich and detailed indigenous knowledge (Dudgeon and Berkes, 2003). Much research has traced the origins of current challenges and problems in contemporary First Nation communities to the loss of language, of traditional livelihoods, and connection to land and natural resources (RCAP, 1996).

Elders in particular are very sensitive to how many and how quickly practices, knowledge and language are disappearing.

A lot of people know about the Cree culture...but lot of people don't practice it anymore ...they try to teach the young people; they don't take anything in though... because they don't bother with the traditional way of life anymore, the hunting and the fishing, because they live a different lifestyle today...they're living like white people today. (#44)

Indeed, for many, memories of the old ways are based on the stories and traditions that were relayed to them by their elders. That is because many contemporary elders have experienced many disruptions, not only of their livelihood practices and oral traditions, but of their lives in general. Based on our interviews it is the residential school system and the introduction of the elected Chief and Council system which are considered the most prominent factors which have undermined established pathways for the transfer of knowledge, language and institutions from generation to generation. Those currently in positions of responsibility in local First Nation governance see elders as vital to adaptive capacity and resilience. Elders are the critical link to traditional knowledge and culture which provides practical skills for survival in a changing environment and is an integral part of First Nation identity and self esteem. Our respondents regard these as important dimensions of social cohesion and cultural strength. We argue that they are key building blocks of any efforts to build adaptive capacity.

First Nation communities, however, find themselves in a “catch 22”. It is in the knowledge of elders about traditional life and about First Nation culture that communities look to for identity and strength to support or enhance community prospects for the future. Yet they are also acutely aware of the rapid and increasing infiltration of contemporary culture, technology and media. In our interviews this disconnection was brought up repeatedly; that youth were less and less involved in traditional activities; that time spent out on the land continued to decrease and with it, the indigenous knowledge and language considered so crucial to the maintenance of First Nation cultural identity. This erosion of knowledge and practice takes with it some of the most basic elements of community resilience, social cohesion and even health:

...our young people are more into the new technology than the way it was when I was growing up... in the summers I used to stay out on the land and harvest the fish ... for the winter and I didn't come back until almost when the fishing season is over and that's how my family used to be together. ... There was always something to do, but with the new technology it seems like our young are ... spending time on that instead of saying, "... I want to learn"... Parents today don't take out their children... like me for instance I don't take them out to the fishing spots where the families used to spend summer months. (#47)

...the youth have all kinds of [issues], they don't exercise...they're unhealthy, they're obese ...more and more youth with diabetes at an early age... When I was younger, my mom would never allow me to sit around, you know, she would always find something for me to do physically. Yeah, and that's why today kids are more prone to sicknesses and obesity and diabetes. The health issue is increasing in a negative way. That's how I see things. (#57)

Communities are especially concerned about the increasing use and infiltration of modern communications technology (e.g. computers, cell phones, video games) on healthy lifestyles and the general wellbeing among young people. Adults frequently maintain that communications and entertainment technology drives a wedge between old and new, is a distraction for youth, takes time away from other pursuits and hinders the flow of indigenous knowledge across the generations. Some indigenous knowledge is applied knowledge and is best transferred out on the land or water where people actually take part in traditional practices and activities. No one expects that this need take place in a cultural vacuum. Guns, outboard motors, snowmobiles, two-radios, GPS and four wheel drives are all widely used and adopted by First Nation peoples (Nadasdy, 2006). Technology, in this sense, is not the problem. What is missing is the act and experience of being out on the land, of elders and youth working and learning together in the

pursuit of culturally relevant activities that provide the opportunity and important avenue for the transfer of knowledge and social cohesion:

I think one of the things is we're getting away from the traditional lifestyle.... younger people aren't out that much anymore, even now like during the summer, I used to recall that every time I came in after school, when school was finished, out in the bush I would go for a couple of weeks and that's not happening anymore. Rarely, I think there's rarely anybody going out with the younger generations. I think they're into technology. (#41)

Respondents declared that the opportunity for these experiences, i.e. for sharing, communication and closeness across generations, is no longer an intrinsic part of life. Again the reasons are complex and rest on historical antecedents such as those of residential schools and related social problems that our respondents believe undermine family ties and closeness. Such factors are generally beyond the scope of this project. Yet they are important underlying elements of weakened adaptive capacity. The imbalance between traditional and modern ways of life also stems from structural changes in First Nation life; when children are in school and parents work, our respondents point out that there is not as much time to take youth out on the land and to pass along indigenous knowledge and practice. Other respondents noted that some young people are simply no longer interested in being out on the land.

Demographic trends in many First Nation communities heighten the importance of intergenerational interaction. Our case study communities had all experienced population growth and a relative increase in younger age groups in recent decades which they attributed, in part, to Bill C-31 and the broadened definition of a "Status Indian". Our respondents reported some negative impacts from the sudden increase in population, but overall seemed to recognize and welcome the social and economic benefits of a larger and younger population such as; more human and social resources, more people to drive the local economy, perpetuate culture, as well as to manage the affairs of the community and allow it to flourish. A stable or growing local population has many benefits for current and future adaptive capacity. Some even see a potential competitive benefit to having a working population on the increase, and to have their community growing while others are not. The challenge our respondents note is that there, "...are so many of them... a lot of people trying to find themselves in the community."

Capacity enhancements from a larger and younger population cannot be realized without resources and investment, so it should not be surprising if communities currently experience

more of the negative challenges of expanding numbers. Many of the challenges of disproportionately large numbers of youth are intertwined with other issues, such as economic development, un/under-employment. Responses to the related social problems are being met with varying degrees of success. Programs such as the Cree Nation Youth Council (www.creenationyouthcouncil.ca) are designed to actively foster greater interaction between youth and elders, to create the opportunities for the transfer of indigenous knowledge and broader cultural education. These sorts of initiatives help bridge between traditional and contemporary, Western lifestyles and in so doing make an important contribution to adaptive capacity. With respect to climate adaptive capacity, this fusion of past and present, of elders and youth, is especially notable and important in the context of community connections to natural resources and the land.

3.2.2.2 Livelihood resources and activities: processes and impacts of environmental change

First Nation peoples are among those in Canada considered at greatest risk to climate change. This is, in part, due to their proportionally greater dependence on natural resources including many traditional livelihood activities that have both cultural and economic implications for wellbeing and survival. In this section, we look at some of the key environmental changes that have taken place and the effects that these are having on livelihoods, traditions and adaptive capacity. Later we address the implications of climate change in terms of how they do or will affect aquatic and terrestrial resources and the traditional and contemporary practices used to exploit them.

The Land and “country food”: identity, culture and resilience

The land is the very essence of our relationship...as Indian people, with the outside world.
.... It's the link between us and the outside world ...you know, and...it gives you strength.
(#25)

...traditional food is [of] great importance to our culture because it...reminds us of who we are. (#45)

The land (and water) and access to traditional resources and livelihood activities are important dimension of community strength and cohesiveness. Many articulated a deep love and respect

for the land and argued that this close connection with their environment was a defining feature of their culture and of being First Nation. The land provides identity as much as it provides resources and livelihoods. The livelihoods and activities derived from terrestrial and aquatic resources, in turn, provide materials, but perhaps more importantly, inspiration for cultural traditions and practices.

We have very strong ties to our, our cultural ways that were passed down to us over the generations. Some of the beliefs, and some of the ways that we follow are from many generations back and I think that's what keeps our community pretty intact. I think the community vision is far reaching, we don't just look at the generation, like the generation that's here, we look at the generation far ahead and try to preserve, I guess, what we have in terms of mother earth and all of the resources that we have for those generations that are yet to come. (#23)

In the contemporary First Nations south of sixty, the role of traditional livelihood activities derived from hunting, fishing, trapping and the collection or cultivation of a variety of wild and domesticated plants is certainly not what it once was. Nevertheless the harvest of “country food” is identified, especially by community leadership and elders, as an important component of community health and wellbeing. Our respondents spoke of the health advantages of eating fish, game and wild or home grown plants in comparison to low quality, high fat, and high sugar processed foods that have entered First Nation peoples’ diets at an alarming rate in recent decades (Furgal and Prowse, 2008). The benefits of country food to First Nations, documented in research throughout Canada (Andre, Karst, and Turner, 2006; Arnason, Hebda, and Johns, 1981; Kuhnlein, 2009; Kuhnlein and Turner, 1991; Moerman, 1998), extend beyond the obvious health benefits. Hunting, trapping, fishing and gathering also embody important cultural practices and traditions. The maintenance of traditional techniques and knowledge provide a conduit for the transmission of language and traditional understandings of the environment. We argue that, based on many and varied responses to questions about coping with risks, of challenging social and economic conditions and other stressors communities face, that this sort of identity and connection with the land is an important, if somewhat intangible, component of community and household capacity. One respondent, with a particularly pessimistic outlook on the potential impacts of climate change, linked the maintenance of traditional practices to survival in the face of anticipated more drastic changes.

But the only ones that will ... survive is [sic] the ones that learned the old ways. They will go back in the bush. Those are the only ones who will survive. And those ones who didn't learn about the old ways, who didn't listen what the elders were saying, those are the ones who will start scratching their heads and say, what do I do? ...Where now we're just pulled away in the new society which seems to be a good life... One day you won't see that coming, and where are you going to go? You'll have to go in the bush, and you have to know how to survive some day. (#60)

Traditional foods and the activities and knowledge applied to obtain, process, distribute and consume them are important to First Nation lifestyles for their health benefits, for the connection they provide to cultural traditions and the land, and for the conduit they provide linking across generations to help ensure the survival of cultural traditions and knowledge. The processes and impacts of changes to livelihood resources and activities occur at many temporal scales. In the past three or four decades, however, key natural resources and access to them have come under increasing pressure from development and pollution, First Nation and non-First Nation harvesting pressure and other changes, discussed on a sector by sector basis below. The possible links to climate change related impacts are discussed later.

Fishing

The species, abundance and timing of fisheries and their importance in First Nation communities south of sixty is largely a product of location. In coastal locations, fisheries tend to include varieties of shellfish and crustaceans in addition to finfish. Fish, where available, are a highly valued and important part of the diet. The harvest, preparation and consumption usually carry cultural and ceremonial importance as well for the community. For example, salmon and oolichan are very prominent for coastal British Columbia First Nations. Although the latter has long been absent from the diet and livelihoods in the community of T'Sou-ke, Salmon remain important along with several species of ground fish, crabs, clams and other shellfish. In addition to traditional uses in T'Sou-ke, our respondents report that commercial salmon fishing was until recently an economic mainstay of the community as well, however, as with much of the BC coast the role of commercial salmon fishing in many small communities has drastically declined since the 1990s.

In Waskaganish, the Whitefish fishery was once a key seasonal resource, a prominent food staple that contributed to household subsistence and sharing and, on occasion, was sold.

Although fish and fishing is still a favourite pastime and important component of household diet, in recent decades it has undergone profound changes. On the one hand, similar to fisheries in many parts of the world, over-fishing, pollution and other environmental threats are presumed to have reduced stock levels and limited harvests. On the other hand, lifestyle changes, such as more wage based employment means people in Waskaganish do not spend as much time fishing as they did in the past. By far the greatest impacts on Waskaganish fisheries are a result of the Rupert River diversion. The outcome of the diversion has had many implications for life in Waskaganish and on some of the community's key resources, not the least of which is it has transformed when, where, and how, people fish. People have lost their favourite fishing places as the fish have moved to adapt to new stream flows and channel dynamics. In some cases life histories have changed as fish alter spawning behaviours as well. The collective impact of these interconnected changes in the fishery on the community amplifies the shift away from traditional foods eaten and the negative health effects of increased consumption of processed foods.

Well, they turn to other sources of food, or fish... traditional food...had a lot of healthy benefits to it. Now, you know, they stay in town and eat other foods which might not be as healthy. That contributes to, you know, diet and health problems. (#45)

It is difficult to measure the cultural impact of such disruptions of traditional resources and activities on the abstract notion of adaptive capacity. Culture and cultural practices are always changing, yet for some people, especially those old enough to remember, something is lost.

... I think it affects them because you were created to eat certain food for different seasons...the season of spring came June [when] we felt like eating fish. ... there's a time that you know that you're going to eat fish and you crave that... I was created for four different seasons to eat this kind of food for this season.... So when fall comes... I'll want to eat moose or wavey. No more fish. You know every season our diet, the food changes, and every season there's different food that we crave, it's so amazing. (#47)

Fishing is also an integral part of community life in Potlotek for subsistence and cultural purposes. There is also an economic contribution to the community from the commercial exploitation of finfish (haddock and pollock), lobster, crab and oyster. Eel are a particularly important traditional sea food, especially for mid-winter feasts and are prominent at other cultural events. Eel and cod, no longer fished commercially, are protected. First Nation-only fisheries are for subsistence and ceremonial purposes only. As in Waskaganish, young people

are less inclined to fish these days. It falls to elders to keep the practices and knowledge alive, and to community leadership to make attempts to reengage youth with traditional practices such as fishing through special, cultural revitalization programs. There is a sense of resignation in the community that fisheries of all types are generally in decline due to the familiar trinity of causes, namely; over-harvesting, pollution, and competition and disease from introduced, exotic species.

At this point social-ecological and economic factors are putting far more pressure on the fisheries themselves than explicit climate change impacts. Evidence from the primary case study communities indicates that fishing is declining in its cultural importance as well. This is, in part, a result of changing lifestyle, but also because fishing is less and less viable, especially as an economic pursuit. The general trend is substitution of fish and seafood with less healthy, processed alternatives. The communities attempt various programmes to keep at least culturally significant fisheries going and as part of increasing attempts to maintain and reconnect young people with cultural practices and indigenous knowledge associated with fishing.

Hunting and other land-based traditional activities

Land-based activities such as hunting, trapping and the collection of wild berries, plants and other non-timber forest products (NTFP's) have a long tradition and historically important place in First Nations cultures and livelihoods. In all of the communities we interviewed most such activities were on the decline for a variety of reasons. Whether in the relatively remote community of Waskaganish or the peri-urban community of T'Sou-ke, communities spoke of the health benefits of consuming wild meat and of the physical and psychological benefits of hunting and of being in the bush. T'Sou-ke and Swan Lake, are illustrative of communities where access to wild game and opportunities to hunt have been squeezed out, sometimes over the course of several decades, by agriculture and the creeping expansion of urban/sub-urban development. For residents of T'Sou-ke the only adaptive measure available if they are to keep wild meat on the table is to travel to other parts of the province where they seek permission from local communities to hunt in the traditional territory of other First Nations.

Some interviewees report that fewer people are hunting these days as compared to when they were young. Others point out that there is a renewed interest in hunting driven to a large degree by people's desire to re-invigorate cultural practices. When 'country food' is available community

members are committed to the traditional practice of sharing game meat with family, friends and neighbours. T'Sou-ke has communal freezers available to store wild foods including meat and fish for this purpose, as well as a programme, Healthy Eating Active Living (HEAL) which encourages and enables community members to hunt and provide game meat for elders and for use at community functions. Some struggle with the fact that, even in the context of Aboriginal and Treaty rights, hunting has fundamentally changed as it is now governed by non-Aboriginal institutions that control hunting seasons, gun safety and conservation. Some consider this a barrier to trying to engage young people in traditional activities.

...and the laws are getting stricter. We have to have permission to hunt on property. Now those rules and regulations hamper our ability to have a good sustainable food system. I travel 3 different provinces to harvest my food. Where I used to travel 3 miles to harvest my food, I now travel 1200 miles to harvest my food. (#16)

Although Potlotek is slightly more remote, or at least more rural than T'Souke, respondents report a similar decline in the importance and involvement of their community members in hunting due to declining natural resources, increasingly difficult access due to competing land uses and the spread of private property, rising costs, and regulatory barriers.

In the more northern and isolated community of Waskaganish people still have access to big game such as moose and caribou, and relatively abundant waterfowl such ducks and geese and other smaller species such as ptarmigan, grouse, and rabbits. The goose hunt still enjoys prominence as major community cultural event. School and work calendars are built around the seasonal arrival of large flocks of geese in the spring when whole families go into the bush for a week or two to take part in the annual tradition.

People in Waskaganish were the only ones in our study to report changes in environmental conditions and wildlife behaviour that seemed to be overtly associated with the effects of climate change. The earlier ice break-up is having major implication for the goose hunt because traditionally they have hunted from the ice. Where previously they could travel to hunting grounds by snow machine in mid-April, more expensive options, such as flying into the hunting grounds by helicopter, now have to be considered or the practice abandoned for safety reasons. In some cases the geese are less accessible as hunters note changes in migration patterns and timing, perhaps also linked to changing environmental conditions.

...and then with the hunting, you know they're being affected on the coast as well because people can't sit out on the bay anymore like they used to because of the condition of the

ice today, they have to sit close to the shore, that's where they do their hunting. Even on Charlton Island out in the bay, they used to kill so much geese there but now today they can't kill anything much over there because the geese are changing their flight patterns and flying much higher when they should be, like, flying low around this area this time of the year, but now it's like they're not really stopping over anymore... (#44)

Trapping in First Nations south of sixty is likely on a more precipitous decline than hunting. Other than Swan Lake which reported only one person still trapping, "because he enjoys it and has done it his whole life", only in Waskaganish did people report trapping as an important livelihood activity. And even there respondents noted declining participation as young people take note of the disappearing global market for fur, increasing costs, uncertain wildlife populations and the apparent long term negative impacts of climate change. Despite the negative long term outlook for the viability of fur-trapping the Cree Trappers Association (CTA) is an active proponent and supporter of traditional lifestyles and livelihood practices. It develops programs to support and encourage the continuation of land based activities, accesses funds through Hydro Quebec and the James Bay and Northern Quebec Agreement in an effort to keep people involved. At the request of the members, the CTA undertook a climate change study in a few of the First Nations to help identify climate change impacts and develop adaptation strategies. They are also working with others to maintain a website with a section to track climate change impacts <http://www.creegeoportal.ca/geoportal/>. The CTA also takes measures such as marking dangerous ice and making announcements about ice and weather conditions to help improve safety and respond to certain impacts associated with climate change.

Nevertheless, it seems people, especially among younger generations, recognize that the long term viability of some activities is tenuous. The following passage is a poignant reminder of how First Nation life has changed and what the implications are for traditional harvesting practices such as hunting and fishing but perhaps most notably, for trapping.

You know, in the old days, when my mother was... entertaining suitors who she was going to marry, she had two choices. She had a choice of a young man who was always in school down south and a trapper which is my dad. So, you know, the lady that was raising her said, "You go with the trapper. He's always going to put food on the table." So he's going to have something to eat. "Don't live with that schoolboy. He's never going to have... he's never going to have anything to eat." So what happened was she married the hunter and, you know... we've lived a good life as a family who never had any

shortage or anything. But the other guy who went on to be a very... worker for the Cree Nation. He's been working for the Cree for 30 years...in an office ... and he makes a good living. But that's not really the point. The point was her mother ... recommended that she live with the trapper. Now if the same situation was presented to a parent these days and the girl said, "I have these choices. I have this educated guy or this trapper." I think most times they would say go with the educated one, don't live with the trapper because you're never going to have the nice car or whatever. So it's kind of like a social... component of why the trapper has declined in importance in the eyes of, [young people]. (#45)

A variety of berries, edible plants and other non-timber forest products were once a key component of First Nation diets (Andre et al., 2006; Arnason et al., 1981; Kuhnlein, 2009; Kuhnlein and Turner, 1991; Marles, Clavelle, Monteleone, Tays, and Burns, 2000; Moerman, 1998). Similar to the fate of fishing and hunting the decline of time and effort devoted to seeking out and picking berries and other plants is due to a familiar host of inter-linked causes; spread of agriculture and other development, over-harvesting in certain areas, substitution with store bought food, declining interest in land based activities especially amongst young people, and reduced access to traditional harvesting areas.

Our respondents did speak to a modest resurgence of interest in wild plants and berries for the interlinked benefits related to health (e.g. the physical activity of collecting itself and dietary benefits) and culture (e.g. revival and transfer of indigenous knowledge to younger generations). Berry picking is very social and often coincides (or coincided) with other seasonal harvesting events such as 'scooping' whitefish in Waskaganish. It is considered a "good family activity" with clear benefits for social cohesion.

Although, people in Waskaganish report, that warmer summers in recent years have had a negative impact on berry production and a community member from Swan Lake noted explicitly that:

Climate change is going to have an impact on our berry production. ... everything this year was a month to 6 weeks late in harvesting. Normally, I would have finished my harvesting of my raspberries at the end of July, here I was in September still harvesting my raspberries.... just before the frost comes. (#16)

It is unclear as to what the impact of climate change might be on berries and other wild plants. What is known is that access to traditional foods has been in decline in recent decades and has impacted people in various ways, ranging from interlinked health effects to diminished social and cultural values associated with harvesting, processing and consumption. For many middle-aged and older members it is simply disheartening not to be able to gather and eat foods that were a taken-for-granted part of life and the progression of the seasons, to “have to eat less, [of] something you’ve been used to having all your life.”

From the perspective of those living in Canada’s urban centres and large cities the importance of ‘country food’ is hard to imagine. Cities in Canada are typically blessed with an enormous variety of fresh, nutritious foods. First Nations residents, if not impoverished, are generally less well off economically than most urban residents. Similarly, their communities are also often quite remote. Hence access to store bought food comes at considerable cost and often with additional logistical challenges. The bought foods that are available to First Nations people south of sixty are for the most part, less fresh if not heavily processed and of lower quality and nutritional value than those available in the supermarkets of Canada’s cities. The desire to resurrect, as much as possible, traditional food harvesting practices is not some quaint desire for a subsistence diet made up entirely from ‘country food’⁵. Neither is it a panacea. There is no expectation or longing for lifestyles of the past. But, the contribution of traditional foods for First Nations people south of sixty it is an adaptive strategy with clear benefits for community health and wellbeing, social cohesion, and cultural revival; important qualities and contributors to adaptive capacity. Whether climate change impacts these resources in a negative or a positive way remains to be seen, but in all likelihood outcomes will be mixed.

3.2.2.3 Social dimensions of vulnerability: historical legacies and contemporary challenges

The temptation in any analysis or discussion of climate change impacts and adaptation is to assess the physical risks and (potential) damage and focus on the necessary technical preparations and response. Adaptive capacity is most often equated with the technical and physical capacity to respond to, cope with, or manage the technical and physical impacts of

⁵ Not to mention the practical limitations as noted by one respondent, “If everybody would go back to the land, we’d be overharvesting, you know, what’s available out there, so.” (#48)

climate change. Increasingly, however, research is seeing adaptive capacity in more holistic terms. Our investigation and interviews with four case study communities supports such a perspective. The linkages between social conditions and challenges and adaptive capacity are alluded to throughout this report. Here we take time to focus specifically on some of the more significant past and present social issues and conditions and attempt to relate them to the overall suite of conditions which, we argue, collectively determine vulnerability. The specific sorts of risks or vulnerabilities we discuss are those identified by our respondents during the interviews.

The impacts and legacy of the residential school system has been well documented, analyzed and discussed in numerous other contexts, government reports, third party assessments and academic research (Barnes, Josefowitz and Cole, 2006; Chartrand, Logan and Daniels, 2006; RCAP, 1996; Stonefish, 2007; Wesley-Esquimaux and Smolewski, 2004). In the context of this research, the important thing to note is where the residential school experience resides as a dimension of vulnerability and adaptive capacity. In our interviews, it is clear that the legacy of the residential schools remains influential in people's lives and that of the community.

Well, in my lifetime I know the residential school played a big role in decimating our culture, it actually really hurt us... where you weren't allowed to practice your culture, or you got in trouble if you did. (#37)

Well, I hate to say this but, again it goes back to the residential school system...they haven't dealt with the issue of sexual abuse. I think that's the one major, major thing that holds everything back. (#27)

The legacy of the residential schools is not only restricted to the generation that was actually in the schools, most of whom are now elders, but extends down through children and even grandchildren.

[We] have to heal the people who went through residential school, it's gotta start from there [with] the elders. Then you work your way down to the children. ... (#27)

People draw specific linkages between residential school experiences and contemporary social conditions, including issues related to lack of self esteem or confidence, motivation and trust. In turn people feel that these social 'outcomes' of the residential schools have secondary effects that contribute to other social problems such as substance abuse and poor parenting.

Our respondents maintain that the residential schools undermined First Nations cultures in multiple ways that have only gradually come to light with the passage of time. Loss of language and self-esteem were immediate effects. A less obvious outcome was the cultural opportunity cost for the children of residential school 'victims' who were denied the opportunity to experience traditional land based activities and to go through the process of learning indigenous knowledge. Residential schools, as was initially intended, (broke or at least) weakened the chain of oral tradition through which knowledge of the environment and resources was passed down.

... the other problem is the participation of young people. Like, let's say for my age, you know, we've gone through the residential school issue, problems and the effects. We still haven't been able to solve all these issues, all the trauma we've been through....And some of us have never gone in the bush [to hunt or trap] ... some people haven't gone out, haven't had the opportunity or were never given the opportunity. (#41)

It is not really possible to quantify the impact of the residential school system on contemporary social conditions or community capacity to cope with risks, change and other challenges such as might be associated with climate change. But by listening to the people who went through the experience and to their descendents there are clear linkages to notions of capacity and resilience that, if ignored, will likely curtail the effectiveness of any measures designed to enhance capacity. Or as one respondent more directly put it;

[We] have to focus on healing the people within the community. It's hard to face your issues but... nothing will ever change until that healing starts. (#27)

There are other past experiences leading to the social risks and problems that seemingly weaken adaptive capacity at the community level such as the economic factors discussed in the next section. Notwithstanding these challenges, respondents in our communities do not passively accept these outcomes as inevitable or permanent. As we have shown, people generally acknowledge the existence of a variety of social problems and a melee of historical experiences and social conditions from whence they have come. Our impression from our interviews is that, to varying degrees, these communities have moved beyond the 'problem recognition' phase and are focusing on steps to address problems, make improvements, and, in the language of this report, build capacity and resilience.

Response to social problems at the community level include the development of networks of people in community to respond to social challenges and increasing calls from band members for community leadership to be more proactive about social issues. Respondents recognize clearly both the challenge and the potential of their youthful population.

People speak of providing young people with positive role models and connecting them with elders and traditional values as a way to overcome social problems created by idleness, neglect and substance abuse. In Waskaganish for example, the Cree Nation Youth Council (CNYC) has well developed youth programmes to help fulfill their mission to:

... facilitate the development of capability, leadership, and a joy of life in the Youth, in order to have a better future for the Youth and People of the Cree Nation. This includes the full intellectual, physical, emotional and spiritual potential of Youth as individuals, and their growth as responsible and joyful members and contributors to the Cree Nation (<http://www.creenationyouthcouncil.ca/> retrieved March 11, 2011)

Communities appear to be increasingly proactive in their attempts to confront social risks and challenges as a scan of various community websites indicates. Programs aimed at youth and other community members offer leadership training, parenting workshops, substance abuse counselling and various other forms of skill development. These sorts of initiatives are a positive indication that the social dimensions of resilience are being addressed, even if not for the explicit purpose of enhancing local capacity to adapt to climate change impacts. Social outcomes may seem an indirect dimension of climate adaptation but this should not diminish the policy relevance of addressing such issues, so much so, because these are issues which matter to communities.

3.2.2.4 Contemporary Economies: conditions and challenges

The economic base of First Nation communities south of sixty varies across the country depending on location and the general mix of the local or regional economy. Federal government transfer payments and project funding underwrite the core of 'official' governance capacity at the band level, so in this respect the financial dimensions of institutional capacity are only indirectly influenced by local economic conditions within the communities themselves. That said, economic issues and conditions in First Nations are still influential determinants of vulnerability and adaptive capacity at the community level.

Many First Nations in recent history have had their local economies founded on a combination of traditionally oriented livelihood activities and extractive resource industries, most notably forestry and commercial fisheries. They have had to grapple with many of the same challenges that have faced other resource-based communities in Canada in recent decades (cf. Ommer and Coasts Under Stress Research Project Team, 2007). People we spoke to were aware of broader processes of change, notably advancements in technology and harvesting practices that are less labour intensive, and of supplies that have been diminished by prolonged and in some cases unsustainable rates of harvesting. No one interviewed identified globalization pressures and the effects of changing world markets, nevertheless, the impact at the community level is well understood – fewer jobs. In a small community with limited opportunities, the impacts of collapsed or greatly diminished resource industries go well beyond a person's ability to make a living. For many it is a way of life. All their skills are vested in a single industry – forestry or fishing – and many are of an age where it is difficult to learn new skills. The inability to feed one's family leads to low morale and ultimately is a drag on cohesion and wellbeing of the community which, as we have repeatedly argued, are key dimensions of adaptive capacity. In BC where forestry and fisheries were once king, many resource communities face uncertain futures, a fate shared by the community of T'Sou-ke.

I know in the previous generation, there was like two jobs for a man to get and that was mainly logging and fishing. So yeah, most people were employed by the forestry industry, there is nothing left now. Especially now that the logging companies are selling off other land to build condos and stuff. (#31)

In other regions of Canada, as exemplified in Waskaganish and Potlotek, commercial forestry was, and is, less prominent and its demise has had less profound effects on the community. Firewood harvesting is a nominal, forest-based economic activity that provides some jobs for the local community. Among the people with whom we spoke, local economic activity was always a critical issue. Every community identified the need for more local business to be established, especially businesses that would be viable over the long term and provide a small amount of stable, ongoing employment for band members. Community leaders seem to long for the economic and social benefits that they see as so clearly linked to steady jobs. Some respondents expressed concerns about internal barriers created by poor attitudes and lack of commitment on the one hand and lack of appropriate skills and training on the other.

Others identified the need to be proactive about trying to counteract 'economic leakage', urging members of the community to support local business rather than being drawn 'off reserve' to surrounding towns and shopping centres.

We're supporting an economic base in all the surrounding communities, around this reserve. We put millions of dollars into those communities, and I think we can do better by establishing our own businesses here, and spending money on ourselves. (#25)

Of course, these issues of local business opportunity, job creation, training and work ethic are intertwined elements of local economies that are, in the communities we visited, caught up in different stages of economic transition. At the moment there are more challenges than out-right successes but there appears to be an increasing desire for and focus on local economic development as a key piece of self determination, and community vitality and viability (Matthews, 1976).

this is my personal vision of the community. I want to see my community run on its own, employment, plentiful, people have jobs, and that employment creates economy ... where the funds stay right in the community, and the families are happy.... And we have people that are going out for education, you know, because we're all assets to the community [and] if somebody goes out and tries to get a doctorate, you can bring that back to the community, or if somebody goes out to be a teacher, comes back to the community. Or somebody goes out to be a heavy equipment operator, and comes back too, all those different professions or trades, I like to see those people come back. But it's up to the community to create that opportunity...that's a big challenge that we have right now... [but]... that's my vision. (#48)

In the context of climate change impacts in the future there are clear adaptive capacity benefits if First Nation communities south of sixty can transition to a position of greater, rather than lesser economic vitality and independence.

3.2.2.5 Infrastructure and water

Physical infrastructure is an important dimension of climate change vulnerability and adaptive capacity in multiple contexts and across most scales of society, including First Nation communities south of sixty. In the context of climate change impacts they reflect opportunities and threats to community well-being and prosperity, both as sources of potential exposure-

sensitivity and as opportunities or objects of adaptation. The exposure and sensitivity of various types of infrastructure (e.g. roads, storm sewers, utilities, etc.) to extreme weather events for instance, are among the more easily identifiable examples of potential vulnerability. Infrastructure disruptions can range from mildly inconvenient to catastrophic and life threatening. First Nation communities south of sixty are not very well positioned to be exceptionally proactive with respect to infrastructure adaptation, whether in the form of planned upgrades, emergency repairs or ongoing maintenance. We observe that technical expertise, equipment upgrades and maintenance and investment are the critical elements of the adaptive planning and management of infrastructure. Most First Nations would have to access such resources externally, such as through application to the First Nation Infrastructure Fund established by the federal government in the 2008/09 budget, although expected to be terminated in 2011 (<http://www.ainc-inac.gc.ca/ih/ci/fni-eng.asp>).

Infrastructure is essential to community life on many levels for, in many ways, development only, “extends as far as the sewer.”⁶ Our respondents noted many benefits from the expansion of, or improvements to, various types of infrastructure in recent decades. Such development brings with it the opportunity for economic improvement and self-determination.

For the community of Waskaganish infrastructure development has both enhanced community conditions and brought new challenges and threats to community wellbeing. Quebec Hydro’s massive James Bay hydro-electric project initiated in the 60’s has resulted in major ecological changes to the region around Waskaganish. As part of various settlements with Cree communities affected by the project, significant improvements to local community infrastructure were made. The community was connected to the electricity grid which is much cheaper, cleaner, more abundant and reliable than the diesel generators it replaced. Some roads have been upgraded and paved and an all season connector was built in 2001 from the community out to the Route de la Baie James, the main highway leading to the south. The road in particular has had profound impacts on the community.

Notwithstanding these improvements, the community, especially elders are ambivalent as to whether or not community life, and we might suppose adaptive capacity, is much improved. The most obvious tradeoffs are the impacts the Rupert River diversion has had on traditional lifestyles, especially in regard to the availability and access to natural resources. The diversion

⁶ Community leader from Cape Breton, N.S. in a Forum on Community Planning and Sustainability, 1982

of the river has substantially altered the flow of the river and caused considerable ecological change, stream channel dynamics are different, water levels are frequently lower which, as noted in the previous section, has impacted hunting, fishing, camping, trapping, and river navigation.

In many respects the road is viewed locally as very much a mixed blessing. Better access provides numerous opportunities and generally reduces the cost of living. But respondents also speak of the negative influence on local culture, and especially on youth, that follows with greater access to the outside. For many, the increased instances of drug and alcohol abuse, more rapid infiltration of western consumer culture and values, and other changes, tend to undermine the integrity or stability of local life and cultural traditions. Advances in communication and information technology and improved transportation links, reduces isolation and in the process transforms First Nations societies – adaptive capacity is enhanced on one level, but vulnerability is also extended.

Potlotek has seen a general increase in infrastructure in the community in recent decades including new housing, upgrades to water treatment and distribution systems, and new facilities such as a school, gas bar and health centre. Investment in this sort of community infrastructure enhances adaptive capacity in a general sense. It improves the capacity of communities with respect to the delivery of specific services – for example, education, jobs or crisis intervention – which improves community life. The contribution to adaptive capacity, in the context of climate change, are indirect perhaps even negligible. However mundane a water system upgrade may seem, safe drinking water is something that is taken for granted in most of Canada. These sorts of small improvements can enhance community health and wellbeing, contributing in subtle and immeasurable ways to adaptive capacity and illustrate its sometimes intangible character.

3.2.2.6 Water

Water is often a central topic in discussions of climate change, impacts and adaptation. It is not really possible to circumscribe our discussion of water in a single section of the report. It does not stand alone as an infrastructure, health, environmental or climate change issue. Rather, as one of our respondents more eloquently put it:

...water is one of the main, main, things that we are dependent on in our traditional territory. Our river, our lakes... they are the most integral part... the heart of our traditional territory, [water] is like the veins that keep us alive...we're so dependent on that river for

survival...for our salmon. We're all connected to these resources and water is integral for our forests... its everything. And, if that changes, it doesn't change one thing, it doesn't change things for [just] us, it changes things for all of us, and the animals and the environment. So, it's not just us that we're concerned about, it's [a] concern [for] everything on mother earth. (#37)

The implications for water in the context of climate change therefore touches communities in many ways. Clean drinking water supplies are a major infrastructure challenge for many First Nation communities and has been the subject of substantial government investment under the First Nation Water and Wastewater Action Plan established in 2006 (<http://www.ainc-inac.gc.ca/enr/wtr/wap-eng.asp>, retrieved March 11, 2011). Managing waste water and linked issues of pollution of fresh and saltwater waterways, is a major concern in coastal and lake areas around T'Sou-ke and Potlotek.

Sooke Basin and the Sooke Harbour; they're very high fecal, coliform counts...it seems to fluctuate with major rain events, after a big rain, it washes all the pollutants down off the roads, oils, stuff like that, antifreeze, anything leaking from vehicles or septic fields, septic fields running down (#38)

Water systems and infrastructure vulnerabilities are often pre-existing issues for communities and they are potentially highly susceptible to climate change impacts such as an increase in extreme weather events that is often cited as a key expected impact of climate change (Lemmen et al., 2008). But these systems do lend themselves to planned interventions and investment that can reduce the exposure of a region or community to negative, water related impacts of climate change. On the other hand, T'Sou-ke, which is dependent on the greater Victoria water system that comes out of the Sooke reservoir, is also vulnerable to future supply limitations which is a growing concern due to the combined effects of population growth (i.e. increased demand) and predicted longer, drier summers in the region (Walker and Sydneysmith, 2008).

3.2.3 Climate change in context: perceptions and understandings of environmental change and adaptation

Against the backdrop of community conditions, the stressors, challenges and risks that provide the context for understanding community vulnerability and adaptive capacity, we explored

people's perceptions and understanding, or 'mental models' of climate change. In this section, we examine specific issues and changes that First Nations people in communities south of sixty understand to be linked to global climate change. We are interested in perceptions of changes in the biophysical world around them and how they understand these to be impacting their environment, communities and way of life. In addition to these 'mental models' of climate change and its impacts, we are also concerned with immediate impressions of the implications of these changes and what, if anything, people think should be done to respond to them.

3.2.3.1 Perceptions and understandings of climate change and its impacts

Not surprisingly, perceptions of change in climate, weather and the seasons vary considerably. Some people emphasize changes in winter snowfalls, others on the earlier arrival of spring and its effects on ice or wildlife. Some are concerned about the effects of extreme weather events in relation to its potential impact on infrastructure and transportation routes. Some worry about maintaining food supply, while the focus of others is on the potentially negative impacts on health and well-being and the prospect that emergency services could be compromised, food supplies cut off, or critical infrastructure damaged. Others note subtle changes in the land and nature around them, changes in seasonal timing or in wildlife behaviour that may suggest potentially deeper changes.

When asked in general terms, "what do you think of when you hear climate change?" we received a very broad range of both analytical and emotive answers. A common tendency in the mental models of climate change people was the equating of climate change with changing weather patterns. These perceptions were often linked to increases in extreme weather, extremes which are also less predictable;

Ah, I think about the weather that is changing, like there's more tornadoes and they're coming towards Canada.... so, the climate changes a lot, like, every year. (#51)

... I think of hotter weather, you know, and milder winters. Unstable weather. Ah, natural disasters. You know the whole thing comes to mind. (#05)

Frequently, the same respondent would associate the mental model of 'climate change equals changes in weather' with various changes in seasons. Seasonal changes sometimes manifest as shifts in the timing of when one season gives way to another;

...the seasons are screwed up; they don't happen on a regular basis (#32)

...in spring it seems to be hot, too, and summer's closer right...and it's hotter, and snow melts really fast... and the precipitation is more. The snow is very different...it's not the snow that really stays long... it's different types of snow when it snows... And I saw lightning at the end of February, January, not January, December. Rain, it's raining more here in December now. (#60)

People in Waskaganish state that winters are noticeably shorter, snow comes later, there is less of it and it melts earlier, spring arrives earlier and lasts longer, bringing about an earlier thaw. Some people noted that summers are shorter, but also drier increasing the risk of forest fires. Similarly, in T'Sou-ke, Swan Lake and Potlotek weather is perceived to be less predictable and that extreme events such as thunderstorms, windstorms and tornadoes are more frequent. The sense that seasons are changing is widespread and remarkably consistent across all four communities. While Waskaganish experiences climate change effects similar to what is well documented in the Canadian Arctic, the more southerly communities in this study also report the effects of warmer winters;

The lake doesn't freeze anymore. I mean the Bras d'Or Lake which is, which has some salt water, you know, ah, when I was a little girl, back in the '40s I would skate all the way to, French Cove across, from Chapel Island and then skate to St. Peters and then they used to have ... horse races. And cars on the Bras d'Or Lakes in St. Peters. Those are the changes on the Bras d'Or Lakes. (#08)

...well, my father, he was born in 1933, and he said when he was a teenager the Sooke River used to freeze right over in the wintertime and he could push his canoe across on the ice. And the last winter that went by, we had a thin layer of ice and it lasted a day or two and it was gone. ... what he experienced, it was never that cold for myself as a youth growing up. (#38)

Sometimes these perceptions of change are linked to strongly held cultural beliefs and understandings about the environment. These understandings reflect a sense of dread or fear

that the strong and taken-for-granted bond between First Nation peoples and nature is threatened by an uncertain environment; a Mother Nature that, “can’t make up her mind”.

One of the things we believe is the weather is not going to harm us. That’s a strong belief, if you look after mother earth, it won’t harm you. And the weather is part of mother earth... Our Indian names are connected to the weather. My granddaughter’s Indian name is connected to the weather, to the thunder and the lightning. My grandson’s Indian name is the same...connected to like the whirlwind, the tornados.....Now sometimes I feel worry when I know there’s tornado warnings. I never used to feel like that... I was never scared of the weather because I strongly believed that a tornado wouldn’t touch an Indian. And those things are changing, you know? Maybe because, well the weathers changing, so there’s more tornados.... I spend a lot of time in the bush. I’ve always seen the sun set in a certain place. Like I’ve always watched the sun, where it rises, and where it sets. [Now it seems] like it is slightly off track. I don’t know if I’m imagining it, but it looks like it [to me].
(#23)

The implications for people, for community livelihoods, health and wellbeing are closely linked to their perceptions of the biophysical changes. Some people framed their concerns in the context of immediate impacts on community life. For example concern about the implications of changing weather patterns and climate on key resources such as water, or a general concern that key plant animal resources will be affected;

Climate change for me is when you start seeing changes in the environment, where we see less, moose or, you know if we don’t see any beavers being killed as much, those kind of things... I think I’ll see more of our healthy foods disappearing. Like ... there wasn’t much blueberries, you know, so you could say blueberries is healthy for you. (#46)

The sense of fear or concern amongst some people, about the impacts that these changes now that they are in motion express a sense of inevitability.

I think there’s kind of a quiet fear, I accept things the way they are. Who am I to argue? Because I am not going to change nothing. So you know, I just accept things the way they are. And I think a lot of the people do. But I think there’s some that... wonder. Sometimes, I wonder myself. I lay there looking up at the sky and say, "what the heck’s going on around here? (#25)

The combination of fear and resignation produces for some the worry that climate change is but one more pressure eroding the last vestiges of traditional lifestyles:

One of the things that really pops into my mind and my daughter made me aware of it, was when those caribou were caught on the ice, that floating ice and how many were lost. Our way of life is what I think of, losing our way of life completely...worried I guess about future generations and how the weather's changing. You know we're using up our water ... being so wasteful, we're not saving anything for future generations and if we don't change, I worry about my great-grandchildren, our whole way of life has changed. You know, when I think of climate change, I think of our life in total, our health, our language, everything about us and who we are as Indian people. It's all impacted. (#23)

I think it's just an acceptance by the people that's, it's changing, because we don't know what's gonna be, what's happening next year, because every year seems to be different. (#41)

There are two interesting perspectives that emerge from the perceptions of change and the loss of a "way of life" expressed by our respondents. First, in the mental model that links climate change with the loss of a particular way of life, First Nations lifestyles are not conceived of in isolation. That is, notwithstanding the culturally powerful connections between First Nation peoples and their traditional territories, they also perceive their lifestyles and livelihoods to be embedded in larger contexts:

We think it doesn't have an impact on us being such a small isolated community, but everything that happens out there will reach us here... (#45)

Second, not only is First Nations life seen as connected to wider economies and social processes, some people also articulate a collective obligation to mitigate human induced global environmental changes. Climate change is perceived as a symptom in this mental model, a symptom of a broader and more general malaise between society and the environment. A symptom, that for at least, one respondent is like a canary in a coal mine, a warning bell for humanity;

Well, [the] changes in our climate and changes in our environment [that] are happening right now, are good. It makes us aware. It gives us alarms and alerts that we need to change our ways of doing things, right? So that we can protect our Mother Earth. So, climate change is good, because it makes us keenly aware of the impact of our behaviour.

And [the] synergy of all human beings working together, either to minimize this damage, or go on the road of annihilation.... And, so this climate change is good, because it makes us aware of our environment. It's positive that it's happening and we have to cope with it and say now, it's like... our health ... what happens when we get sick? We have to have a different strategy in order to affect ... change, so that we can get back to a state of wellness again. This climate change, it's simply like a headache, it's a symptom that something's gone wrong and now we got to try to figure it out. If we put a Band Aid on top of Mother Earth, it ain't going to help. We got to change our behaviours, so that all of us collectively can help heal it, if we can. It has to do with our attitudes towards our environment. You don't miss the water until the well runs dry, right? And, the well is running dry quickly all over the place as our foodstuffs get diminished, the natural content of our food gets diminished. The quality of our meat and proteins gets diminished. The quality of our air and water gets diminished, because of our behaviour. We have to do something with it. So, I see it as a positive change. Finally, people are waking up. (#16)

In contrast to this rather globalist and progressive perspective, two additional mental models of climate change were also evident in our interviews. One of these is the conflation of climate change with depletion of the ozone layer in the upper atmosphere, "...climate change? ... I always think about the ozone layer" (#56). This is not particularly unusual or unique to First Nations and in fact has been well documented in other research on mental models of climate change (Bostrom, Morgan, Fischhoff, and Read, 1994; Kempton, 1997). While climatologists are quite specific about the differences in chemical and physical processes that lie behind anthropogenic climate change versus ozone depletion, lay publics – including First Nation peoples according to our findings – hold different views that see processes and problems of our atmosphere as linked.

In the other mental model, current changes in the climate, whether based on direct experience or on expert knowledge absorbed through media and other avenues, are framed by some as merely part of the natural cycles of the atmosphere, climate variation in the parlance of climatologists. This mental model of climate change tellingly illustrates the diversity of understandings and perceptions of climate change, its impacts, and the threat that it might pose to First Nation communities.

...climate change, I just think it's probably a cycle of... I think it's probably a cycle that we go through every once in a while. It warms up and then every once in while it cools down on us. So, I'm not too certain on whether or not it's actual change in climate, myself. (#03)

Well, the way people talk about it is that its changing like it's never changed before and I'm not sure that that is the case. ... 'cause climate has changed substantially over the years and it will change back to the way it was before. (#19)

In some of the interviews respondents seemed convinced that climate change was clearly just a part of the natural cycle of climate variation. However, some did see human activity as contributing to climate change in such a way that would ultimately require adaptive responses.

... I know it's just the way it is with mother earth, it changes all the time ...So, it's just a cycle, it's the way of life. I think what's happening is that we're going through a cycle now but we're speeding it up. And, so we've got to adapt to that speed. (#37)

We did not see clear evidence of a “climate change denial” mental model, however, there were strong indications of uncertainty as to whether or not climate change is actually “real”.

Like, you always say climate's changing, but I guess there's some years where everybody would agree to it and then ... Like, one year we had a hiccup, last year...we had a cold June, July, August, whatever, and everybody's going, "What the hell they mean climate change. (#03)

3.2.3.2 Community adaptation: perspectives on urgency and capacity

Climate change is like, you know, what are you going to do about it? (#04)

Underlying people's perceptions of the causes and occurrence of climate change are two important sets of perceptions about: (a) the urgency of climate change in general and especially in the context of other issues and challenges faced by the community; and, (b) observations and perspectives on the community's capacity to deal specifically with climate change. These perceptions are in many cases closely linked to mental models of the specific impacts of climate change, they extend the mental model analysis to what people think can or ought to be done about it.

“The issue of other issues”

It is clear from the discussion in Section 3.2.2.3 that First Nation communities south of sixty face a myriad of challenging conditions, risks and stressors that command much of the attention, energy and resources of community leaders and administrators. Elsewhere, we have encountered this phenomenon and characterized it as the “issue of other issues” (Sydney Smith, Matthews, Satterfield, and Young, 2007). The sentiment was articulated in numerous ways in our primary case study communities. Health, education and other social issues are always of more immediate concern, as are employment and the alleviation of poverty. The two lengthy quotes below compellingly articulate an important barrier to the elevation of climate change adaptation on the agendas of First Nation communities south of sixty.

... I think when people are in a survival mode, the last thing on their mind is climate change. And when you're always in survival mode who's going to worry about your language? Who's going to worry about the loss of language when you're in survival mode wondering where you're going to get your next can of beans, you know? That gives you an understanding where climate change sits within our mentality. You know, poverty sucks! Poverty does strange things to people. Poverty makes you greedy. When you get money, you blow it because you've lived in poverty for so long. Take a look at these big large payments that are coming out of the Indian residential school payments. I know people who got 180,000, they're broke already. You know why? Because they live in poverty all their life and they just go out and spend all the things they've ever wished for. And it's gone. They're hitchhiking down the road. So where do these people put climate change? It's not even in their vocabulary? (#25)

Climate change is probably not on the top of the list. Because, looking after our families on a daily basis is a major challenge for many, so being employed, to look after your family and children, is probably top of the list here... Dealing with ... social issues are always a challenge, so looking after folks that maybe need some counselling in all kind of areas, mental health, or alcohol and drug things like that. These are issues, that are still here and need to be dealt with and looked after and on a daily basis would come before climate change solutions... Educating our children, ... looking after our health, ... we have so many health issues that we suffer, diabetes, heart, so finding the means and ways to deal with all those are likely on the desk before someone's going to say, "I want to find the solutions or make this climate change thing better. (#29)

The message is consistent; “We have bigger immediate issues at hand like: lifestyle of community, ensuring people are fed, housed and, educated, etc.” and there simply is not

enough resources or capacity to go around, let alone be proactive about climate change. Some also recognize that there is a substantial knowledge gap with respect to the specific nature of climate change impacts in terms of both timing and severity. Such gaps in knowledge combined with a dearth of available resources, constrain the capacity of communities to be proactive about climate change in the present. However, they are also an indicator as to where and how adaptive capacity might be upgraded and improved.

... in order to say how important [climate change is] we have to understand first what it's going to cost [to adapt], what are the real changes [that are] going to happen...we have to understand what climate change is? Then you give it to the community members for them to understand, too. I know you can read on the internet or listen to the radio what's happening, but as a community, you know, most have to translate things. You know, like because our people know the area, you know, where is that change going to happen, where are we going to see the effects in terms of water or land, you know, like if there's a lot of heat in the summer, which areas is more likely to have a forest fire. (#48)

Not a local problem

In addition to the 'issue of other issues' and underlying gaps in knowledge and capacity, there is also a strong sentiment that climate change is, for reasons of both scale and timing, not a sufficiently urgent issue to warrant the allocation of scarce community resources to attempt any sort of planned or proactive adaptation. Climate, in this perception, is a global scale problem that is simply too big and too remote to bother with;

[The] problem generally for the whole concept [of] climate is that for most people ... you can't really get it, at an intellectual level... once you've experienced it you get it. And I think that's why so little is being done in the world... the people who are experiencing it don't have the resources to deal with it and the people who do have the resources aren't that aware of it. Until you get something like Hurricane Katrina . . . (#36)

In other words, the challenge with climate change is that it is a large and complex issue that is difficult to grasp at the local scale and simultaneously is perceived as geographically remote. The prevailing attitude is that climate change is someone else's problem. Furthermore, climate change adaptation and climate change mitigation, which are defined by researchers and policy makers as two distinct societal responses, are rarely articulated as separate issues in lay circles. Additional caution is needed in the interpretation of mental models in which climate

change is regarded as occurring somewhere else and responses regarded as the responsibility of remote others. This occurs because responding to climate change is framed locally primarily in terms of reducing emissions of green house gases. It is also because adaptation is not perceived as a proactive action in response to the specific threats of climate change, but rather as a generalized condition of First Nation life.

We will adapt, as always, but not prepared

The two previously discussed dimensions of community adaptation and perspectives on urgency and capacity focus on why First Nation communities cannot or will not concern themselves with climate change impacts and adaptation. This is however, only part of the story. Mental models of climate change adaptation are more complex and seemingly contradictory. Many of our respondents assert that there are too many other issues that take priority over climate change and, furthermore, that the problem and its possible solutions are not local concerns. It is a perspective that is shared by many other communities in other contexts in Canada, that is, it is not especially unique to First Nation communities south of sixty (Sydney-Smith et al., 2007). Our interviews reveal an additional perspective that more directly articulates the nature of capacity in First Nation communities to deal with and manage risks and challenges associated with changing conditions, including those associated with climate change. In this instance, capacity is not perceived to be overrun by too many other pressing problems, or for resources to be spread too thinly between other competing issues and challenges. Rather, the focus is on the long history of First Nation peoples adapting to perpetually changing circumstances and environments. In this mental model, adapting to the risks and challenges of change in general is the norm and, therefore, adapting to climate change should be no different.

In all of the communities in which we interviewed, people saw themselves and First Nation peoples in general as having always faced complex and perpetual processes of change. The challenges and changes of the past two hundred years or so have been particularly demanding. They have produced constant and at times quite dramatic social, economic and cultural upheaval. It is argued that such experience has fostered an innate capacity to cope and adapt to change of virtually any sort. In fact, for some this laissez-faire approach to adaptation is normalized as part of “being First Nation”:

Indians have, this conception that, "I'll deal with that bridge when I get to it." ... That's part of our being, I guess...Like, when I was going to university ... my professor says, it so happens she's a Native ..., like me, and she said, "Natives don't give a shit about tomorrow... And it's true. That's the way we ... perceive it, we kind of live for today. Worry about tomorrow when it comes. (#05)

Just as indigenous knowledge is based largely on the accumulation and communication of experience, so to in this view is the capacity to adapt to changing conditions. From this First Nations perspective it seems not to matter whether change is brought about by external political economic forces or environmental change. The longitudinal perspective of First Nations is such that even the dramatic changes experienced by the James Bay Cree in the case of the Quebec Hydro developments in their traditional territory are viewed, not as a onetime event, but rather as part of a much longer time series of ongoing change;

... we're always in a constant state of growth and constant state of change, so it's something we're quite used to ... we always expect change to come up, and especially with I guess a lot of development around us even with the diversion of the river and all that work that came out of it and all the effects that we're seeing. It's something that has been I guess normal in our world in a way because we've always seen change. (#45)

The expectation that First Nation communities will simply, "Do what we've always done, adapt" (#04) speaks to a willingness and pre-disposition to cope with and adjust to changing conditions as they occur. This may or may not be a uniquely First Nation perspective on adaptive capacity and it is not clear whether or not changes and related adaptations are more frequent or increasing in the contemporary era. It is highly possible, however, that such attitudes could be a barrier to any overt attempts to enhance adaptive capacity. In fact, this sort of fatalistic approach to adaptation, while in many circumstances quite possibly the only available option, does not exemplify strong or effective adaptive capacity. In this sense it may be more accurate to speak simply of the ability to cope. However, for some, even the most basic cultural attributes that may contribute to the community's ability to cope may have been eroded over time by the loss of traditional, adaptive 'strengths' such as the ability to adjust easily to changing wildlife patterns. At the same time, this sort of indigenous knowledge-based capacity may also be less relevant in the future, as the two following quotes suggest.

We Cree people, we always adjust to environments. We find adjustments. But it's getting scary in the future because the environment is still changing, you know, us Crees, we're known to be nomadic. We go where the animal goes. But now we have communities. We're not as nomadic as we used to be. (#60)

No, I don't see the hunting and fishing getting any better either because of the limited places you can go to do these activities. It's getting smaller and smaller. People just have to adapt. I guess that's what we've been doing over a hundred years. (#21)

Furthermore, there seems also to be recognition that coping strategies based solely on the cultural expectation that 'things' are going to change, are limited and reactive. In the context of climate change impacts, people don't really know what to expect. Planning is not possible, other than in relatively minor adjustments in timing or practices, such as the response in Waskaganish to the more unpredictable arrival of snow and Canada geese to alter the school calendar to facilitate family participation in the hunt.

In the end, this sort of 'capacity' to cope is limited and, we argue, is more accurately described as a function of First Nation resilience. Yes, such communities have faced innumerable changes in the past and present; and yes, they have, and continue, to adjust to and cope with such changes with highly variable degrees of success. However, in the context of climate change, it may be a mistake to speak of the presence of 'adaptive capacity' based simply on the premise that "we've done it before, we'll do it again". There is a tendency in the literature to accept that adaptive capacity and resilience are the same thing (Brooks, Adger, and Kelly, 2005; Cutter et al., 2008). We argue here that they are not and that one important difference is the inference that adaptive capacity implies preparation and the potential to be proactive. Adaptive capacity, seen in this light, assumes at least some planning has taken place and that certain resources, contingencies, materials and equipment, and plans or protocols to deal with change are in place in the event that there is something to adapt to. It is quite evident that this is not the case in the First Nation communities in which we worked. No community respondents considered their community to be "prepared for climate change". This is not surprising given that climate change is perceived to be both less urgent and less relevant to the current, day to day concerns of the community. It may come up as topic of discussion, possibly for future consideration, but as one respondent put it, "In terms of, 'okay how are we going to deal with this?' it's never gotten to that level of discussion." (#25) The cultural model of adapting to things as they come reinforces the inclination not to bother with adaptation planning as it is not culturally relevant. In fact some go

so far as to say that there is no point in planning to adapt because they do not have the knowledge or information to know what it is for which they should be preparing to adapt.

Well we can never forecast climate change, it only comes when it comes around and we have to adapt to it. And that's the way we've been living. Even outside the community, we have to adapt to it...I think it's just an acceptance by the people that's, it's changing, because we don't know what's gonna be, what's happening next year, because every year seems to be different. (#41)

The need for planning and action

Despite the uncertainty, there is yet one more layer of complexity to add to the mental model of community adaption that is emerging and, again, it appears to at least partially contradict other dimensions of First Nation perspectives on change, capacity and urgency. First Nation people generally view their communities as culturally equipped to respond effectively to change on the basis of their experience with upheaval, threats and challenges to their way of life. Climate change is perceived as spatially and temporally remote and therefore the responsibility of distant others. Moreover, climate change impacts are a relatively low priority due to multiple competing issues and concerns. Nonetheless, there is some appetite in the communities we interviewed to take the prospect of climate change seriously and to make some attempt to plan or prepare for future changes, even if the precise impacts are relatively unknown.

I think... that climate change means we need to start making decisions now about how we're going to function in the future and plan for the future. And hopefully be able to predict, you know, based on where it's going, ... what it's gonna be like and will we be eventually tropical here and what kind of impact is that going have on vegetation and fish?...yeah, I think that climate change needs planning. We need to plan for it....It's obviously happening. We gotta start getting our stuff together. (#35)

Although this sentiment is not widely articulated, it speaks to an emerging awareness that was often framed in the context of the need for more conscientious environmental behaviour in the community in general. That is, in the present context, those who call for proactive climate adaptation are generally those who place a sustainability frame on the future in general. This is not by any means a universal sentiment, but an emerging perspective that will no doubt play a role in the way adaptive capacity develops, particularly in relation to dimensions of indigenous knowledge.

Perceptions of readiness and who is responsible

Perceptions of climate adaptation readiness, how prepared the community is and who is responsible for leading and implementing adaptive responses, are as varied as perceptions of climate change itself. Our respondents spoke of both individuals and institutional responsibility but questioned whether or not people were 'ready for climate change' at either level. In the community of T'Sou-ke people were split between those who believed that the community was prepared to deal with climate change impacts and those who felt it was not, although some of the latter concede the community was 'headed in the right direction'. In Potlotek, some respondents suggest that their community, and indeed the region as a whole, is unprepared to deal with potential impacts of climate change.

I don't believe there's anybody in this community or anywhere else for that matter, in all of Cape Breton, that's dealing with climate change... (#05)

Similarly, in Swan Lake and Waskaganish, respondents do not regard people in the community as especially prepared, but this does not come as any sort of surprise given the strong sentiment of "we've always adapted" discussed above.

Even more than issues of readiness, the issue of who is responsible for responding to climate change is even more relevant to our analysis of adaptive capacity and our goal of assessing how it might best be enhanced. We find a strong sentiment among our respondents that individuals need to play a role, "Everyone needs to adjust their lifestyle in their own way." (#26) On one level individual responsibility is framed primarily as mitigation, that is, the most important individual response to climate change is to use less energy. Mitigative actions are seen as part of the overall need for individuals or households to pursue more sustainable lifestyles. Sustainability and sustainable behaviours in this context is typically (and we would argue inadequately) exemplified by such things as household recycling. Some respondents feel that "young people need to wake up" to the idea that climate change and sustainability will be defining issues of their future, it is they who will face the brunt of climate impacts. In a more inclusive and widely articulated view there seems to be two key dimensions to views of who is responsible and how this responsibility should be enacted. First, our respondents acknowledge the need for community buy-in; a mandate to respond to climate change at the community level needs broad support from community members.

It needs a program to go through and really understand all the effects of climate change and how the risk, vulnerabilities, liabilities, opportunities. It needs to work in more depth...cause there are a few people who are sort of championing it, this whole area but we need to get everybody on line. (#36)

The need for widespread support stems from the necessity to foster a sense of urgency among community leadership in order to lead to real action. As we have discussed above, First Nation communities are confronted with many competing priorities and therefore a broad base of support for action on climate change within the community is a necessity in to justify such action. Second, and again in keeping with the perceptions and understanding of climate change we elaborated earlier in this section, many of our respondents argue that a good portion of the responsibility for climate change response lies with government, especially senior levels of government. People articulate their understanding of how government is responsible, who within government is responsible, and how those in government should proceed to enact those responsibilities. But the prevailing perception is that it is government that has the resources, the expertise (or at least access to the expertise), and the mandate to initiate and lead action on climate change.

The impacts of climate change occur primarily at the local and regional scale which forces communities on to the front lines of adaptation. Simultaneously, communities are rarely equipped with the surplus resources and expertise to effectively adapt even reactively, let alone in an anticipatory fashion, at least not without some form of partnership or support from wider society and external levels of government. The interaction of community and the province is perhaps the key arena within which adaptation planning and action can formulate and be initiated. It is, therefore, through institutional arrangements and relationships between these different levels of society that we can find and assess many of the key social processes and avenues for adaptation. It is to such an institutional analysis that we now turn.

3.2.4 Institutions, governance and adaptive capacity

In this section, we focus on the role of institutions and attempt to identify various dimensions of institutional capacity. We single out institutional capacity as a specific and important element of the more encompassing term, adaptive capacity. Here we are paying special attention to the role of a range of institutions that frame and guide life in First Nation communities south of sixty. While we include in our discussion social institutions in a broad and encompassing sense, our

specific interest is with governance institutions insofar as it is through governance that communities will engage in the various challenges of adapting to the impacts of climate change. This does not, however, mean that we are focused exclusively on the formal agencies of the state or the political and administrative arms of community government. These are important, but we argue that their role in adaptation is a function of quite fluid social and cultural processes. In the previous section we have explored in some detail many of the social, economic, political, cultural and environmental conditions that shape the vulnerability and hence the adaptive capacity of communities to manage stressors, risks and change. We have placed community perceptions and understandings of climate change within this milieu. Now we look at institutional capacity as the outcome of various social processes involving the interaction of key cultural and governance institutions and, in particular the roles and actions of individuals operating within these institutional environments. We focus on multi-level decision-making as our point of departure to explore such processes and to attempt to assess the influence and effectiveness of the myriad institutions that affect the lives of the four First Nations that comprise our primary case studies.

We can think of the range of policies and legislation, treaties, governmental agencies, local and extra local departments and organizations, and other social, political and economic entities as the institutional landscape within (or upon) which individuals and communities function and carry out their daily lives. These key institutional structures range from federal policies and legislation such as the Indian Act, to local elements of community governance and organization. They provide the context for a host of community functions including decision-making, planning, budgeting and administration.

The Indian Act of 1876 and its subsequent amendments are the key pieces of federal legislation that govern the relationship between the Federal Government and First Nations. A detailed analysis of this legislation and its myriad related policies was not the subject of this investigation. However, what we do provide is a distillation of the ways in which the Act and other dimensions of the federal-First Nation relationship influence decision-making, organisation, planning and other institutional elements of local adaptive capacity. If we are talking about the institutional landscape of First Nations, the Indian Act may be thought of as the base-map.

3.2.4.1 Dimensions of institutional capacity: community governance, decision-making and culture

The concept of institutional ‘fit’ speaks to the relationship between governance regimes and that which they are intended to govern, including biophysical, social or economic systems or some combination thereof. In the context of capacity to cope with the impacts of climate change, community governance is a central institutional feature. It is through the workings of local governance structures and processes that those people charged with carrying out various planning and administrative functions will both respond to and, in some cases, attempt to anticipate the effects and consequences of climate change. In our interviews we used in-depth inquiry about decision-making to help us understand how people think about and attempt to operationalise their responsibilities. We argue elsewhere that institutional capacity is a function of individual actors operating within and according to a suite of cultural and institutional structures and processes (Matthews and Sydneysmith, 2010). A focus on decision-making illuminates both positive and negative aspects (strengths and weaknesses) of local governance capacity some of which are quite local in nature, some with strong historical antecedents, and still others a function of institutional interplay between local or First Nation institutions and those “external” institutional arrangements which originate with the Government of Canada.

Institutional capacity in the context of the two-year election cycle

The structure of local community governance in most First Nation communities in Canada south of sixty is based on a system of an elected Chief and Council. Generally, Chief and Council are elected to a two-year term during which they are responsible for typical community planning, organization and administration activities including budgets, and the dispersal of funds to various community operations and projects. Our interviews revealed both strengths and weaknesses related to decision-making processes, leadership, and the availability of appropriate social and human resources.

The ‘fit’ of the two-year election cycle is problematic for effective governance on numerous levels. First, there is a temporal misfit with respect to both planning and the stability of leadership.

... there’s not enough time to establish anything or do anything. ... and that kind of holds people back when they’re always trying t [get re-elected]... you can only really do something in one year and then the other year you try to get re-elected. (#02)

In the context of climate change adaptation this is critical as many adaptive responses require relatively long term planning, either because it is a case of trying to anticipate future effects that are somewhat uncertain, or because time is needed to align a broad range of resources and commitments with other institutional levels and partners. A second outcome of the short election cycle is the pressure this puts on community leaders to focus on campaigning and getting elected to the detriment of planning and policy oriented activities. In addition to the 'opportunity cost' of not planning, our interviews also indicate a social capital cost, as social cohesion and positive relationships are undermined by the acrimony that often arises under the pressure of seeking election. Such acrimony in politics at the local level, especially in communities that often number only in the hundreds, is heightened by the lack of social distance between antagonists.

... We have our Chief and Council cycle, which are a couple of turns...similar to a lot of reserves, where we have an election, we have an elected Chief and Council. They get nice and cosy in their jobs ... and, about a year and half in...they know there's an election coming and so all the mudslinging and that begins happening... this happens again and again. (#07)

Third, while we encountered no evidence of any sort of deep-seated or systemic corruption associated with elections, some respondents gave examples of petty corruption. These were minor incidents of candidates attempting to curry favour with voters around election time, arguably a 'natural feature' of elective politics at all levels. Fourth, the institution of an elected Chief and Council in general is an institutional misfit with respect to climate governance and capacity. We have spoken repeatedly in this report about the well known importance of culture and traditions to First Nation people and argued that institutional capacity is an outcome of the interaction of institutional processes, individuals, and culture. In fact, to put what First Nation peoples say about the importance of culture into the language of this report, culture is a central feature and determinant of adaptive capacity.

The INAC system of government for most tribes in BC or Canada, it's not our style of government...the hereditary chieftain-ship was taken away, then INAC came in and enrolled an election system, which wasn't a part of our people. And, that made us weaker, because we were so strong government-wise before...now with the election system sometimes it hurts us because it splits families up... (#37)

This is not to say that there is a strong desire to return to the hereditary system, only that there are limitations or weaknesses with the current system in the context of adaptive capacity. The message from the communities themselves is that there are strengths in traditional forms of governance which, if they could be better woven into contemporary institutional arrangements, would improve the 'cultural match' of governance (Cornell and Kalt, 1998) and improve trust, support, and allegiance to local institutions responsible for running the affairs of the community.

Institutional dimensions of decision-making and community governance: Chief and Council, band administration and elders

...the Band Council...that is the Indian Act government, it's not ours. The other one was ours. (#08)

The two year election cycle is but one structural feature of community governance institutions. The elected chief and band council comprise the central decision-making body in most First Nation communities south of sixty. As such it is the Chief and Council who wield considerable influence over community affairs. They are a key community institution. Conceptually, if we argue that adaptive capacity is determined by the effectiveness of community governance, then it follows that the effectiveness of community governance is largely, although not entirely, dictated by the effectiveness of Band Council and the elected Chief. Of course Chief and Council do not make decisions in a vacuum. Nevertheless, many respondents linked both strengths and weaknesses of local decision-making either directly or indirectly to the community's elected officials; not necessarily to specific individuals but (perhaps unconsciously) to the institutionalized roles of Chief and Council.

Analysis of the processes of decision-making reveals both commonalities and contradictions in people's views about how things get done and whose agenda gets acted upon. Many respondents agree that decision-making is centralized in the hands of Chief and Council but the implications of this concentration of power is qualified and viewed quite differently across our small sample of communities. Centralized decision-making is viewed positively insofar as Chief and Council provide vision and leadership, but in the process of deciding on a specific course of action seek input from community members and are viewed as making a genuine effort to seek community consensus in a manner reminiscent of more traditional, consensus-based decision-making practice.

... The doors are open. Our meetings are open unless there's something confidential that can't be [discussed publicly] . . . I mean you can't run the community without the community. (#15)

There were others, however, who felt that centralized planning and decision-making was detrimental in a number of ways. First, these respondents were concerned about lack of community input and lamented that this was in opposition to First Nation values and traditional forms of consensual decision-making. This was especially expressed by some elders who lament the declining use and relevance of indigenous knowledge. In the past, even after the transition to the imposed system of elected governance, the input and advice of elders was sought in most decisions. Nowadays, if elders' input is sought, it is primarily with respect to traditional activities and ceremonies. This does not sit well with many people in the communities, not just elders, but those who can perhaps see their own time as an elder just over the horizon.

... I know that I'm gonna be an elder one day and... I would like to be part of that decision of my grandchildren and my nieces... I would love to be part of those decision-makings, you know, but we're not. We elect 6 Councillors and a Chief and they're the ones who are making the decisions. (#12)

Second, the elected Chief and Council system is viewed by some as a product of colonialism. Respondents subscribing to this view feel alienated from the institution of community governance and tend to lack trust in community leadership. They argue that views that run counter to those of Chief and Council do not carry any weight and are effectively blocked. The outcome is frustration with representative governance, disengagement and apathy.

Well I think all the decisions really ... are pretty much made by Chief and Council and I don't think that's right. ... they do have meetings ...to try to inform the...people [and] sometimes ... not everybody comes, because people feel like they're not listened to anyway, so why bother coming [to council meeting]. Like, we've opposed a few things and we've tried... petitions and nobody listens to us, so I guess that's one of the main reasons why they don't come... (#27)

Third, it was felt by some members that overly centralized decision-making and exclusive governance practices within the band council and administration creates apathy especially among community members who may already feel alienated from participation in community

affairs. A disengaged community tends not to have high levels of social cohesion, conditions that do not enhance adaptive capacity. In fact, one community's clear disconnect between those on the 'inside' of community decision-making and those on the outside, is revealed in the following quotes:

...The Band Council, they make all the decisions. They have assemblies in the summer time and they have other meetings ... it's hard to get a quorum ...and sometimes the meetings just get postponed [because] people don't show up. ... people know that the Band is gonna make the decision anyway... it's hard sometimes to make your point to ask for projects to help your community, 'cause you know everything stops at the Band Council. (#57)

For their part, Band officials, both elected and unelected, express very different perspectives on their approach to governance and public engagement. First, they may feel that they make considerable effort to be inclusive and to actively seek community input on various issues of community governance and planning and, in some cases, even trying to use incentives to increase involvement in community meetings and assemblies. Second, leaders in one community lamented how leadership had difficulty thinking long-term and getting things done because their time was monopolized by the "petty concerns" of individual community members. For example, the practice of relatively minor requests like citizens appearing as agenda items at Band Council meetings, or administrative staff time being taken up to "order paint". Third, from the perspective of numerous elected and unelected Band officials who we interviewed, they are elected to lead and to make decisions in the best interest of the community. Decision-making is framed by these people as a matter of finding the right balance between responsibility and accountability;

...ultimately it's the people who decide on a lotta things but there's a lotta things that we decide on our own 'cause that's what we're elected to do ... You know, you can't go to a meeting and tell everybody ...well I'd like to make a decision but I gotta take it back to my people, ... you don't have time to go take that to your people, you know, you're elected for a reason, you gotta make decisions for your people, and, good or bad, you know, you live with them... (#17)

In at least two of the First Nations, respondents expressed confidence and trust in the centralized decision-making role of Chief and Council and the relationship between the wider

community and local governance institutions. In these communities, there is a more fully developed sense that there are three institutionalized dimensions of community decision-making and governance; Chief and Council, Administrative Staff, and elders. Important distinctions are made between; (i) relatively mundane, day to day decisions that are critical to many community functions but are not subject to public scrutiny; (ii) those larger or long-term strategic decisions which impinge on the community's future; and, (iii) decisions that have important traditional dimensions or cultural ramifications.

It is uncertain as to why, but in these communities we just described governance institutions appear to be more stable, there is a greater degree of community trust in the elected leadership, administrative staff possess the skills, mandate and capacity to carry out their roles, and sufficiently robust institutional structures are in place in the form of guidelines and policies that provide a context and legitimacy for decision-making. In these situations, the day to day operations happen more easily and are less subject to decisions biased by favouritism, nepotism or corruption.

What we do is, we'll look at an issue. We analyze an issue and we come to a consensus as Chief and Council.... at the same time, we ... look at the guidelines, if there is such a thing. ...We have to function within those boundaries and ... follow certain policies and ... guidelines ... (#25)

Our interviews support the perspective that the separation of executive and administrative responsibility improves the efficiency of local governance as it provides better space for elected leaders to concentrate on larger issues and long-term community development and planning.

... our election code should not determine and impact the administration staff and, our administration policies should have no impact on our election code. They had to be separated... so that what you're administering is programs for the community, you're not the gatekeeper for electoral systems. (#16)

Meanwhile, maintaining continuity in Band administration staff improves stability. We have already noted that this is a challenge under the two year election cycle which creates the propensity for high rates of turnover in community leadership as well as in administration. In communities where elections generate internal animosity, sometimes apparently fuelled by the short term of office, respondents acknowledge the challenge of trying to maintain consistent implementation of policies and bylaws made all the more difficult when staff are in a constant

state of flux. For some communities, stabilizing Band administration has become a priority with clear benefits for local institutional capacity. Not all communities are equally effective in achieving this separation of executive and administrative spheres of responsibility. On the surface, these may appear to be relatively minor administrative issues, but they nevertheless have real implications at the community level. In the context of adaptation and communities attempting to mount effective responses to external stressors such as climate change impacts, the capacity of local governance to plan and implement adaptive strategies requires local resources to be working together as effectively as possible. Resources and capacity tend to be in short supply anyway, so inappropriate or wasteful allocation becomes a serious detriment to adaptive capacity

Yet another challenge to the institutional capacity of community governance that is at least partially solved by improving stability and continuity on the administrative side of community governance is the problem of institutional memory. Without addressing the election cycle question which, despite ample criticism and negative perspectives expressed in our interviews, apparently continues to enjoy support from some quarters, administrative continuity is one concrete way to enhance institutional capacity. Without continuity of staff in the Band office and administrative positions, it is very difficult for the incoming leadership to know where the previous council left off, and, therefore, where they should begin. Respondents acknowledged that changing the policies and decisions of one's predecessors is sometimes misconstrued as a way of asserting power and 'leadership'. Several respondents spoke specifically to the value of new leadership being willing to make use of existing policies and bylaws and indeed this was increasingly the practice in at least two of our communities. We see this as a clear indicator and important dimension of institutional capacity.

Elders are also an integral, institutionalized dimension of community governance. They possess specific cultural and ecological knowledge and play important, though changing roles in decision-making. We argue that the role of elders is institutionalized because "elderdom" transcends the individual. The culturally defined role of the elder and their contribution to decision-making is more than simply passing along old knowledge about traditional ways. Many respondents speak to the inclusion of elders' knowledge and advice and it is evident that elders are still highly relevant and respected.

... sometimes there's a requirement to make a culturally appropriate decision, that's important also. So we do that...We ... go to the elders [and]... they gave us options ... (#25)

Nonetheless, the framing of responses as to how elders are engaged and the tension between old and new ways of life suggests an emerging recognition that the role of the elder as a governance institution is changing and may indeed be on the wane.

They [elders] are like advisors. And that's again, that decision is involved with culture. Whereas when we have to deal with Indian Affairs, that's totally different again... So, we have to adapt these things... to the situations as they come and it's up to us to recognize what they are [i.e. traditional or contemporary] (#25)

We therefore make the observation that one possible approach to enhancing institutional capacity is to find a way to maintain, and preferably improve or reinvigorate, the contemporary role of elders in governance. There are many cultural and social reasons why this may be both possible and desirable in First Nations. Again, this is not to suggest that the 'solution' to adaptive capacity in First Nations is a return to the "old ways". Rather it is a recognition that many important improvements or advances in community governance and the institutional capacity to cope with the contemporary challenges of life in First Nation communities appear to be linked to finding ways to successfully navigate the marriage of modern and traditional forms of social organization and cultural practice. Institutional capacity may be realized through the fusion of contemporary-western knowledge and practice and traditional values and institutions.

Internal social dimensions of institutional capacity: families, leadership and human capital

Elders and their traditional knowledge, the elected Chief and Council, and the professional managers and administrative staff who work for the band or its subsidiary committees and boards, are the main institutional pillars of adaptive capacity at the community level. Other social and cultural factors which influence and shape these core institutions include families, the role of leaders and leadership, and human capital (i.e. the stock or level of skills, training and education in the community, including knowledge of culture and indigenous knowledge). There are undoubtedly others, however, these were the dimensions most consistently identified in our interviews. Some of these dimensions may be properly viewed as institutions in the sense that

we are deploying the term here. Others are social features that are not overly influential in their own right, but nevertheless need to be taken into account in order to appreciate fully the complexity and subtlety of institutional capacity, fit and interplay.

Families play a large role, directly or indirectly, in decision-making and in the social and cultural dynamics of the community. In our analysis we consider families as an institutional dimension of the community and how it works. The language of clans and clan systems no longer resonates with the First Nations we spoke to, rather families are regarded as one of the major dimensions of the way in which social relationships are organized and transferred in the community. Whether or not families are regarded as cultural remnants of historical clan systems seemed to depend upon individual interpretations. However, all communities we visited spoke to the central place of families in the make-up of the community. Social relations and networks originate with and are anchored by family. Family is a source of strength and cohesiveness, of values and support, especially in times of crisis.

Whenever there's an emergency or a crisis the family always pulls together. It doesn't matter, um, who the family is that's in trouble, the whole Nation pulls together. Um, sometimes there are some families that, you know, they have confliotions but they put that aside and they gather together in emergencies or deaths or things like that. Tragedies. And good things...Sometimes they all sit in their corners but they're still there. (#32)

Interfamilial relationships are relevant to our discussion because they can have a significant effect on social cohesion, and therefore capacity. In closely knit communities where many people are related and the degrees of separation are small, these familial links are both a source of strength and conflict. Some communities spoke of disagreements between families lasting for very long periods of time, in one case, decades. There can be many reasons behind tension and animosity although our interviews indicate that it often stems from the differential influence families enjoy, especially in community politics and decision-making. Such influence is often, although not always linked to family-size.

... we have large groups of families, or dominant groups in the community who play important roles in decision-making at the administrative level and social levels, and if you have a small family then usually you just kind of go with the flow. (#07)

Community members generally recognize these tensions and the negative effects that they have on their community. There is a sense of hope that more recently things may be improving,

as respondents in each community recounted various ways in which their communities had been working towards overcoming past tensions between families, albeit with varying degrees of success. Each community seemed to be at a different stage in the process of overcoming these past differences, but regardless there was widespread agreement that it was something worthwhile and for the betterment of the community. Concrete measures being taken including attempts to ensure representation, preferably balanced representation, of key families within and across governance institutions including Band Council, various community boards, committees and departments.

... When we develop these committees or authorities...we try to get a family, like each family, covered through that committee...try and make it fair to everybody. (#21)

... we do try to make sure that there's representation on any committees and that kind of thing. We make sure that each branch of the family is included. (#35)

This may be a first step in a broader process of institutional change whereby the tension between old (i.e. hereditary, clan based) and new (Indian Act system of elected Chief and Council) systems of governance, leadership and decision-making is diminishing. Gradual processes of institutional change have brought some communities to the point where the social and cultural tensions created by an externally imposed governance system are (finally) beginning to work themselves out. For example, communities have what appears to be a growing appreciation of both the challenges and opportunities of interwoven familial ties and governance. The challenge of governing your relatives is recognized;

[For] the government people...a lot of the things to do with our issues on reserve or to do with Native people is just a number to them... [but] when a Chief and Council or administration is governing their band, they're governing people they live with. They're governing their families... I think that it's a blessing and yet it's also really hard. (#29)

From this recognition there is an emergent trend towards more overt and transparent separation of administrative roles and responsibilities in the band office from the direct influence of the political leadership of the community. Our interviews suggest that this is an ongoing process in each of our study communities, although such processes are at very different stages of advancement and are unfolding at different rates. The institutional role of families appears to be shifting. On the one hand;

Family is the heart of who we are and where we get strength from... (#20)

Families are everything, 'cause that's what keeps you together... it's your parents that teach you...values [and] what's important (#32)

On the other hand, the trend is towards increasing commitment to act more as a community and less as discreet family units so as to remove or limit narrow family interests from unduly influencing community decisions.

...[we] need to separate administration from politics because families [are] so close that everyone is essentially related to one another and decisions sometimes can be based on family interests but this has gotten better though. (#18)

The institutionalized role of families is an important dimension of governance processes. Family allegiances shape the behaviour and choices of individuals in decision-making processes and thereby shape institutional capacity. Apparent shifts in the articulation of families and contemporary governance structures illustrate the gradual and largely uneven process of institutional change. Communities are grappling with how to overcome the negative aspects of family rivalries and simultaneously draw on the cultural and social strengths families provide with respect to values, culture and traditional knowledge. These sorts of social attributes or dimensions are difficult if not impossible to measure in any objective sense, yet they are repeatedly raised in discussions of decision-making, coping with stressors and risk, and managing and adapting to change.

Similarly difficult to measure dimensions of adaptive capacity include issues of leadership, and levels of, or access to critical skills, education and expertise. There are many subtleties to the ways in which these factors contribute to the capacity of a community to adapt to climate change impacts. For example, it is difficult to prove that one particular type of leader or style of leadership adds more or less to community capacity or resilience. Nevertheless, from our interviews it is clear that people recognize as important attributes of good leadership or the necessity of an effective "issue champion" in furthering a particular goal or initiative. The important role of leadership is exemplified in one community in particular where respondents spoke about the benefits of a relatively young chief who is comfortable and engaged with contemporary society;

...the difference with [the community] is now because ever since _____ became Chief ...we've moved forward, maybe because s/he's younger, you know, closer in age to most people in the community, that's important now... (#32)

Yet, at the same time there is respect for familiarity and experience with traditional values, knowledge and practices.

I would say it came with _____, being elected Chief. S/he's always, always tried to get the cultural way of life back. It's probably been one of his/her main priorities and it's been very successful... (#39)

Similarly, many respondents recognize the value of education, skills and knowledge but with the unspoken understanding that it is relevant to both traditional values and culture, and to contemporary society and economy. We argue that these are basic building blocks of robust institutions and necessary for a First Nation to effectively function in the increasingly complex and globalized world of the 21st Century. Ultimately, the challenge for First Nation communities south of sixty is one of integrating and balancing their two worlds. On the one hand they must keep cultural values alive such that traditions, knowledge, and language for example are preserved, but also to be dynamic enough to continuously evolve and adapt to the changing world around them. On the other hand they must enable the acquisition and application of new knowledge, experience and technology in ways that are culturally relevant and enable First Nation communities to engage and benefit from interaction with contemporary Canadian institutions.

So, there's kind of a bridge, I guess, that needs to catch hold, to be built. The people from my generation, like I'm in my 50s, we learned by working hands on. The generation that's here is learning by pushing buttons. So there needs to be some kind of a bridge that's built there. So that we can adapt to their lifestyle and they can bring some of our values to the forefront. (#23)

Institutional interplay: interaction and relationships with other levels of government and external organizations

Climate change adaptation is a multi-level problem that poses both routine and unique challenges for First Nations. It follows that community adaptive capacity is, to some degree, dependent upon support or assistance from higher levels of government and other 'external' organizations and actors. Some of this interaction fits under Young et al.'s (2008) concept of institutional interplay. We explored the scope and character of these interactions in our four

research communities to get a better understanding of the perceptions of trust, communications (e.g. knowledge sharing, information exchange), and other attributes that may conceivably contribute to adaptive capacity. We investigated several types of important relationships with external organizations and actors that influence numerous dimensions of institutional capacity in these communities.

From a governance standpoint, the relationship between First Nations and the Federal Government of Canada is obviously significant. This is not a singular relationship by any stretch as there are many federal agencies and departments that may interact with First Nations in a variety of ways. Hence in the context of the four communities south of sixty that we visited, we concentrate only on those dimensions of the relationship that seem to bear most directly on adaptive capacity, especially in the context of environmental change.

Indian and Northern Affairs Canada (INAC) is, of course, the key federal agency and custodian of the constitutionally enshrined relationship between Canada and First Nation peoples. As the source of federal legislation and regulations that have had numerous complex and often negative impacts on First Nation people, INAC is frequently the target of sharp criticism. Earlier we discussed the legacy and ongoing impact of the Indian Act on the social dimensions of adaptive capacity. Many of our respondents, especially the middle-aged and elders, point to the Indian Act, particularly its definition of “status” and imposition of a “foreign” system of governance, as key historical factors that served to weaken local institutions and traditional forms of governance and authority. Resultant internal breakdowns such as the widely noted escalation in inter-family conflict have had a lasting effect on conditions and relations within communities which, we have argued, are central parts of adaptive capacity.

...INAC, the legacy of the Indian Act... played a role in separating families and making it so we argue amongst ourselves when we shouldn't be doing that... And, you know, it's at a time when we're all together as one, you could have separation because of the legacy of the Indian Act, and residential schools... (#37)

Similarly, efforts to repair or reverse some of the negative outcomes of the Indian Act have had unintended negative effects on local conditions. One of the study communities spoke very specifically about the local effects of Bill C-31 and its intent to “return” Aboriginal status to Aboriginal women who had married non-Aboriginal men. Intended to ‘right’ one of the wrongs of the Indian Act, the Bill has had some unintended consequences. While it did remove a source of

friction and malcontent between those with “status” and those without, the friction was not resolved simply by having those with regained status move onto the reserve, and members were left to work out these conflicts. Also, the distinction between status and non-status was more than simply the difference between those who enjoyed a host of federal entitlements and rights, including the right to live on the reserve, and those who did not. Our respondents spoke of people who grew up ‘off-reserve’ as having being raised differently, without the same cultural upbringing. With Bill C-31, people with very different personal histories were effectively thrown together to work things out. In practical terms, the change in status also precipitated a massive influx of people onto relatively small and often under-resourced reserve communities, in some cases leading to a quadrupling of the population within a decade. Even in communities that managed to avoid overt tension experienced different solitudes; separate and distinct communities living within the community. It has taken time for the sorts of social cohesion which we contend are an essential ingredient of adaptive capacity to return these communities.

The capacity of First Nations to adapt to climate change will hinge very much on the nature and quality of the interactions between federal and local level institutions. Yet this interplay is problematic from an institutional and adaptive capacity standpoint on a number of levels. The interplay between federal institutions with jurisdiction and responsibility over several hundred First Nations with strong, but highly localized, cultural and social-ecological identities faces challenges of fit and scale. The whole notion of First Nations legislation at the federal level is difficult to implement with even remotely equivalent effects across the country. There will always be winners and losers as some communities benefit while others face new or exacerbated challenges from institutional adjustments. There is a temporal dimension to questions of fit and scale in the context of institutional interactions between Band and federal levels. That is, the quality of interplay can change over time as it did in the case of the population influx that accompanied Bill C-31. Initially this caused hardship in the community noted above, and strained local resources and relationships; however, over time the additional people bolstered social and human capital resources, strengthened ties to surrounding communities and in the end probably enhanced the overall capacity of the community.

It is doubtful that much can be done to ‘fix’ problems of institutional fit and interplay between local First Nation and federal level institutions given the shear range of contexts at the local level and the complexity of institutional demands and interests that need to be satisfied at the federal level. For example, challenges arise from the simple reality that federally designed

institutional structures often have a top down feel to them that may create mistrust and resistance for those on the receiving end in local communities. It is an important dimension of any effort to enhance adaptive capacity in the context of environmental change to be aware of the institutional challenges involved. There are other ‘types’ of so called ‘functional interplay’ (Young et al., 2008) revealed in our interviews that suggest opportunities to enhance the interaction of local and federal institutions. To begin with this may require a more process-based approach to institutional design that recognizes the role of key actors and places less emphasis on institutional structure, in other words, institutional arrangements that are less about organizational structure and more about institutional interactions that build trust and cooperation.

People we interviewed identified two specific types of functional interplay with INAC. First, is a slight twist on the widely held view in First Nation circles that the relationship between Canada and First Nation peoples ought to be a government to government relationship. In the communities we examined, respondents often saw this interaction as similar to that which exists between higher levels of government and municipalities.

if you look at it in terms of government to government relationship, and, or compare it say a municipality, whatever they get, we don't get nearly what a municipality would get to run their businesses you know, to run their administration, to provide for the people. It is, it's below poverty level, you know, break it down and do the math on the per capita formula, it's insane that they would expect us to survive on it. (#35)

This is a practical interpretation in First Nations who are often clients of the state wherein resources from higher level of government flow to the community and the community is responsible for delivering local services. There are, of course, numerous differences between First Nations and municipalities (e.g. Aboriginal and Treaty rights). For our respondents, the relevant comparison is in respect to the support provided by Canada and the expectations of what the community should or could do to provide basic infrastructure and services.

... I remember one year I was never so frustrated with Indian Affairs. We got a report on our Fire Department ... telling us how our department was not up to standards and we weren't doing this and we weren't doing that but then there's no money attached to any of it. (#11)

... I felt like they were holding us to a standard that they would use for say, a Canadian Forces base but ...you can't hold us to a certain standard ... hold you accountable for not doing something that you don't have the proper resources to do. (#11)

Second, in slight contrast to the government to government view, many respondents described the functional role of the federal government as a series of programme based granting agencies. INAC in this context is seen as one source of such grants and programmes, although in most interviews not in a particularly favourable light. These negative perceptions, which we see as dimensions of interplay, included the view that INAC was simply not the most relevant or useful branch of government for addressing specific community needs.

... INAC, I don't think would be helpful in any of those situations. INAC would be able to, you know, we could apply to them for funding for capacity building, once something was established... if we ... needed training or something like that. (#39)

They don't get involved to assist us... they're more of a hindrance 99% of the time... they're there, supposedly, on our behalf but I've never seen that in all my [time]. (#17)

INAC is frequently referred to as overly bureaucratic, slow to deal with, and slow to respond or address problems.

Yeah, they're not really there for anything. I don't know what . . . guess it's just hard to try to get useful help from them. There's so many hoops and stuff that you have to jump through, but I know that they, with our _____ project they helped with that. (#39)

... INAC ... doesn't really have a good reputation for our people. It's [too] bureaucratic, it's people we give our reports to, source of our problems. I've never approached INAC [for help]. (#02)

As the final quote above illustrates, the perception of excessive or inadequate bureaucracy quickly becomes an institutional barrier to effective interplay. We noted earlier that there are practical limitations to achieving effective interplay across different institutional contexts that operate at quite different spatial and temporal scales. But to the degree that institutional interplay between First Nations and governance institutions from higher, specifically federal, levels is an important factor in adaptive capacity of these communities. 'Improving' the functional interplay of these institutions is a potential pathway to enhanced capacity. Such interactions with Federal Government agencies, however, are hampered by negative

perceptions held by our respondents. One specific source of negative perception is the problem of staff turnover within federal agencies, especially INAC, and the effect that this has on the working relationships with people in the community.

...it all depends on the people that are in that organization, you know, ... once you get to know people then you...can build up a relationship there eh...[it's] not the organization itself but the people (emphasis added)... INAC is a good example. As soon as someone knows the system and we're able to work with them, or manipulate them into our way of thinking ... as soon as they reach a point where they're an asset to us, then they move them on eh? Then you start all over again. (#17)

In other contexts this same sentiment is expressed in different ways but the message is the same; namely that the actor is a critically important element in institutional relationships, and especially so in the context of the First Nations we visited. Anecdotal evidence arose in numerous interactions between researcher and interviewee where the discussion was directed towards inquiry about the workings or responsibilities of different institutions.

Frequently respondents showed little familiarity with the objectives, and in some cases even the existence, of specific institutions involved in environmental governance or even other important community issues. However, once the individual person or persons responsible for a particular programme or initiative was identified, there was sudden recognition and understanding of institutional roles, responsibilities and potential. In other words, for our respondents the ABC Agency or Institute of XYZ is almost irrelevant. If our respondent could identify or knew of Joe from ABC or Jane from XYZ, the institution was instantly more relevant and understandable. The actor in this context animates and gives meaning to institutional relationships, or, to put it another way, institutional interplay appears to be enhanced by social connections and trust.

Many of the points we have made in the preceding discussion of INAC are generally applicable to the relationships and interactions that take place with other federal agencies. For coastal First Nations, the relationship with the Department of Fisheries and Oceans (DFO) is probably the next most important federal institution. We spoke earlier (Section 3.2.2.2) of fisheries resources, their place in First Nations livelihoods and economies and the implications of their susceptibility to various risks and stressors, including climate change. Given the mandate and focus of DFO, effective institutional interactions and alignment between First Nations (i.e. those where fisheries are important) and the DFO is likely to be a key dimension of adaptive capacity.

Indeed we received many comments and answers in our interviews that speak to the nature of their working relations with DFO or at least with DFO sponsored programmes and staff.

T'Sou-ke Nation, for example, has a co-management agreement with DFO and is involved in a number of different programmes and initiatives, some directly with DFO, others with a variety of partners and organizations including Environmental Non Governmental Organizations (ENGOS), other levels of government, and other First Nations. Indeed, when it comes to adaptive capacity in the context of fisheries institutions, institutional interplay is likely to play a prominent role given both the vulnerability of fisheries to human impacts and environmental change and the large number of stakeholders involved.

Connections to external organizations, agencies, communities, and other levels of government are likely to be an increasingly important dimension of adaptive capacity for First Nation communities south of sixty in the context of climate change. Our respondents spoke of increasingly positive interactions with municipalities and neighbouring communities.

Respondents in at least three of the four communities in which we interviewed, spoke about improved relationships that they attributed in part to a decline in racial prejudices. From an institutional perspective we also see a fit between community governance institutions that have broadly similar scales of interest and mandate.

In contrast it seems that fit and interplay with Provincial governance institutions is often strained. First Nation peoples are seen by many actors within provincial agencies and departments as the 'responsibility' of the federal government. However, provincial jurisdictions have strong vested interests and mandates in natural resources and other issues that are very relevant to Aboriginal concerns. This institutional disconnect is likely well known in governance circles we suspect, however, given the expected vulnerability of natural resources to climate change it seems difficult to overstate the importance of productive interplay and good fit between the multiple institutions and multiple levels of governance that are involved if these sectors and the multiple communities that depend upon them are to adapt successfully.

But a lot of times... it used to be this province wouldn't want to do anything with the reserve... but on some stuff now their opening up and they're realizing it's a benefit to them to help out....I mean if they're helping us with our watershed, then ultimately our watershed flows ... off the reserve. So, I think they're realizing now that if they work with the communities they can help protect whatever they need protected... to limit any environmental damage. ... everybody's starting to realize it's in their interest to work

together to keep it going...when I was a kid that kind of cooperation never really occurred...It was always, "What you do in your community is your problem," and it's only in the last 10 or 15 years that their starting to get together to realize it is beneficial to everybody to work together. (#03)

3.2.5 Conclusion

The interviews for the primary case studies generated over one hundred hours of recordings and some 1500 pages of transcribed text. The interviews were carried out in four communities that, with the noted exception of Métis and Inuit communities, broadly represent some of the diversity of Aboriginal communities south of sixty. The analysis and discussion has, for the most part, concentrated solely on the data from those interviews. The goal has been to present a narrative of the conditions and contexts of vulnerability and adaptive capacity in Aboriginal communities south of sixty through the eyes of the people who live there.

The impacts of climate change are fundamentally local, as are adaptations and many dimensions of adaptive capacity (Agarwal, 2008; Matthews and Sydneysmith, 2010). Part of the latter category, adaptive capacity, derives from sources external to the community or is a product of interaction with individuals and groups lying beyond its immediate confines. In this discussion we have sought to increase our understanding of two important features of the climate change question that we believe are most central to the discussion of (a) how climate change is or will impact Aboriginal communities south of sixty and (b) how prepared and able those communities are, or can be, to respond effectively to the uncertain effects of climate change. First, we have explored the context of vulnerability and capacity in four First Nation communities south of sixty. The interviews and analysis concentrated on social, economic and environmental conditions and attributes of the community that comprise dimensions of exposure, sensitivity and change. This is a discussion that attempts to answer the question, "what is life like here?" It identifies key historical factors and contemporary conditions that create the context for how the community is affected by both internal and external stressors, risks and change. From such an analysis of the precursors of vulnerability we begin to garner an understanding of the features of adaptive capacity and community resilience.

It is risky to generalize across the four communities assessed in this study and even more so to attempt to infer anything specific about the entirety of Aboriginal communities south of sixty in Canada. Nevertheless, there are similarities in many of the broader attributes such as the

legacy of residential schools, the gradual erosion of traditional livelihoods and infiltration of contemporary ones, and the relationship with the federal government of Canada. Our interviews add to previous studies and reports which identify social problems ranging from poverty and unemployment to substance abuse and poor community health and wellbeing as challenges which disproportionately affect Aboriginal communities in comparison to other communities in Canada. These sorts of challenges we argue, increase the vulnerability of the community to environmental changes, hazards and risks that are the likely outcome of climate change. Communities respond to these challenges in different ways, at different rates and scales, depending upon a multiplicity of local conditions, attributes and resources, that is, depending upon their adaptive capacity. Our interviews indicate that one of the key features of those communities which seem to be overcoming or at least making inroads on the various challenges (i.e. exposure/sensitivities) noted above are those which are able to find ways to fuse traditional knowledge and values with contemporary perspectives, to fuse traditional livelihood practices and pride with contemporary education and economic development. The vulnerability of the past and present is overcome by the fusion of old and new, of traditional and modern.

Second, we explored community perspectives and understandings of the urgency, impacts and risks of climate change. In so doing we elicited a number of mental models which illustrate how climate change impacts and adaptation mesh with broad issues of vulnerability and adaptive capacity. We found many different and in some cases conflicting perspectives on causes, urgency, in terms of the potential risks of climate change, and how prepared the community ought to be. Perceptions of climate change phenomena – causes and impacts – are socially constructed meanings based as much on personal and cultural interpretations as on scientific explanation and understandings. The two key messages from this part of our inquiry are first, that currently climate change impacts are secondary to a host of other more pressing concerns, the so called 'issue of other issues'. Second, that Aboriginal communities, as the original peoples of this land, have a millennial perspective in which 'adaptation' and 'adaptive capacity' are simply modern terms for what Aboriginal peoples have always done; respond and adjust to the inevitability of social and ecological change. Based on this interpretation of our interviews we do not, however, conclude that Aboriginal communities south of sixty, or even just those people we spoke to, believe climate change to be a non-issue. Rather, there is in some quarters, genuine concern that climate change is, or will, impose an additional burden, nevertheless, as 'adaptive people' they will somehow manage to cope. But people, especially managers and leaders, also recognize that climate change could be a 'game changer' that

planning and preparation is prudent and that in order for it to be effective, under current institutional structures and arrangements, external resources and other forms of support are necessary.

Third, through an analysis of community governance and decision-making we looked at the ways individual actors operate within existing institutional structures and how their actions both shape and are shaped by various institutional processes. To achieve this we attempted to apply the concepts of 'fit' and 'interplay' introduced in our discussion in Section 7 of the work of Oran Young and colleagues of IDGEC (Young et al., 2008). In this analysis, we observed the positive and negative dimensions of institutional interaction at several scales. In the four communities in which we interviewed, all have an elected Chief and Council. This is a common, though not universal, form of Aboriginal governance in First Nations in particular. Band Councils are the key governance institution in communities where the elected Chief and Council system is used. Problems of 'fit' between the local governance institutions (i.e. Band Council) with the biophysical realm of the community is uncertain and difficult to assess, in part because the geographic extent is unclear (e.g. is it limited to the reserve or is it defined by 'traditional territory'?) and often discontinuous (i.e. both reserve lands and traditional territories are fragmented by other jurisdictions and land uses). We were also partially limited in our technical capacity in this research to fully assess geographical and ecological dimensions of the community and its biophysical realm. Ultimately, however, assessment of problems of fit is challenging due to multiple institutional interests in environmental and natural resource management. In fact, the problem of fit may best be understood by focusing on the interplay of local governance, provincial agencies and federal interests all of whom usually have a stake in the biophysical realm with which a community may identify.

We also discussed the temporal problem of fit in relation to the election cycle wherein a number of our respondents raised issues with respect to the destabilizing effects of having local leadership up for election every two years. Generally, our interviews indicate that this is considered a detriment to effective planning, especially strategic and long term planning, which may be necessary to proactively address issues related to climate change impacts and adaptation. The notion that the short election cycle is a 'check-and-balance' against poor leadership being in power for too long is, we would suggest, outdated and paternalistic at worst. At best, it is just a bad fit between institutional structure – the election cycle – and institutional processes concerned with governance and planning.

What does this mean in the context of climate change vulnerability and adaptive capacity? Mostly, in terms of institutional analysis, problems of interplay are critical. For example, we found this to be the case in the context of decision-making at the community level where important interactions occur between Chief and Council and a number of other institutional dimensions both within the community and without. Families and elders, we argue have both discreet and overlapping institutional roles in the community, some of which are particularly germane to decision-making. Interactions between families, elders and council were characterized in both negative and positive terms in our interviews. For our respondents, a sense of what we would describe as enhanced adaptive capacity was clearly correlated with positive interplay between council and other local institutions.

Finally, interactions with external bodies, especially with provincial and federal levels of government are especially important in the context of adaptive capacity for reasons that have been articulated throughout our analysis of the primary case studies. That is, the problems of climate change are fundamentally local, but adaptive capacity depends on community resilience and effective linkages, positive interactions, and institutional support from external sources. Effective interactions can be enhanced by improved cultural understanding, such as acknowledging the significance of the actor in Aboriginal institutions where face-to-face relationships are especially important.

The institutional capacity of communities is highly complex and somewhat elusive. Challenges to the effectiveness of governance institutions abound. In the end it seems one of the most hopeful signs of improving or enhanced adaptive capacity is, fittingly, expressed in the words of a two community members;

...we've gotten used to adapting to new situations...we're still strong...We're still able to carry out our traditional activities... our language is still strong, our culture is still strong... a lot of us are able to do both, the traditional lifestyle and the non-native culture ...using modern technology and stuff like that... we're adapting, we're trying to take the best of both worlds ... using our traditional way of life, and also a modern way of doing things... (#45)

We can walk in both worlds and find the balance. (#20)

4.0 SECONDARY CASE STUDY SYNTHESIS

4.1 INTRODUCTION

In order to better understand climate change risks and adaptive capacity in Aboriginal communities south of 60°, we not only carried out our own qualitative research, we also looked at existing studies by other researchers; we called these “secondary case studies”. We used these studies to complement our primary research and provide a synthesis of existing knowledge and a broader basis for understanding the key issues and challenges.

The project team obtained the secondary case studies through a search of secondary literature as well as discussions with informal network members about relevant research on vulnerability and adaptive capacity of Aboriginal communities south of 60. We found studies that took place in the following communities:

1. Hopedale Inuit, Labrador
2. Shoal Lake and James Smith First Nations, Saskatchewan
3. Montreal Lake Cree Nation, Saskatchewan
4. Blood Tribe, Alberta
5. Haida Gwaii, (Queen Charlotte Islands) British Columbia⁷

This section provides an assessment and distillation of research with a similar or related methodological approach and focus on issues around climate risks, impacts, vulnerability and adaptive capacity. More in-depth descriptions of each secondary case study are provided in a template format (structured around our main research interests) in Appendix D.

In assessing the secondary case studies, we wanted to determine what the case studies told us about our overarching research questions:

- a. What are the risks climate change poses to these communities and how are these linked to other challenges and stressors?
- b. What factors contribute to the adaptive capacity or resilience of these communities?

⁷ Note both non-First Nation and First Nations individuals took part in the Haida Gwaii study; Old Masset is the First Nation community in Haida Gwaii. When the Haida Gwaii study is mentioned, it includes all participants, when Old Masset is mentioned, it is only referring to responses from Old Masset residents.

The results and discussion section outlines the general themes and key messages from the secondary case studies. There were some challenges in assessing the research since all the studies differed in their approach and research design. For example, some studies spoke in terms of exposures and sensitivities, while others looked at risks to the community. One looked at perceptions of risk among individuals, while another looked at the ability of institutions to assist in responding to current and future changes. Due to this diversity only the general themes that arose from multiple secondary case studies are presented here.

4.2 RESULTS AND DISCUSSION

4.2.1 Risks climate change poses to Aboriginal communities

a. Climate change impacts in Aboriginal communities

There are some climate change impacts currently being observed by Aboriginal communities, mostly around general warming trends and increased variability in the weather. Several secondary case study communities reported milder/shorter winters, decreases in snowfall and changes to the timing and duration of seasons (particularly the later onset of and shorter winter). For community members in Blood Tribe, consequences of warmer winters are less snowfall, more colds (bacteria may survive better without extreme cold temperatures), kids not going sledding because of the lack of snow, some birds not migrating, more grassfires during the early spring, and more mosquitoes in the summer time. For residents in Hopedale, the milder winters and changes to snow quantity and duration (change in volume of snow pack) have combined with other factors to affect animal behaviour, and therefore the accessibility and availability of wildlife and other resources.

b. Risks that climate change poses to communities

Climate change impacts are currently and will in the future pose a number of risks related to safety, health and economies in Aboriginal communities south of 60. Increases in frequency and intensity of events such as forest fires in Montreal Lake, Shoal Lake, and James Smith First Nation, and extreme weather events in Haida Gwaii and Hopedale will be a direct threat to the health and livelihoods of these communities. For increased forest fires, there are risks to human life as well as the potential for increased respiratory problems. In terms of increases in extreme weather events there could be impacts such as the loss of access to food and other goods and

services (e.g. damage to roads), and damage to critical infrastructure (e.g., highways/roads, airports, buildings, properties, sewer networks, communications and power lines, etc.). In areas of predicted increases of drought and/or floods, communities will face increased risks of water shortages, water contamination, and increased diseases (increase of animals carrying diseases). Economic impacts could include impacts to agribusiness (cattle, irrigation) from drought, increased costs to repair damaged infrastructure from floods, forest fires and extreme weather events, and a decrease in forestry activities due to forest fires.

Climate change also poses risks to communities concerning their cultural practises and sacred sites. There is a risk to safe travel on land and water when engaging in traditional activities (e.g. hunting, fishing and gathering), for example, due to changing ice thaw/melt in Hopedale and lower water levels from drought in Shoal Lake/James Smith. In some cases this means increased cost for travel, by having to travel further. In other cases, this means community members are not able to carry out their traditional activities on the land, which means they suffer loss of traditional food, social activity/leisure/recreation and cultural survival. For those that have already faced threats to their cultural practises, climate change impacts pose a risk of limiting efforts to revive these practises on the land and water. Elders, who are critical to communities as indigenous knowledge holders, are especially susceptible to health impacts from climate change due to their higher susceptibility to health issues, lower incomes, social isolation and higher likelihood they are suffering from other health conditions. A further risk will be the loss of important cultural sites from the impacts of climate change. For example, there is potential for environmental damages to clam beds, culturally modified trees (CMTs), berry gathering sites, and other areas for food subsistence due to erosion on Haida Gwaii.

c. How climate change is linked to other challenges and stressors

The secondary case studies noted that Aboriginal communities will be more affected than other communities by climate change impacts, partly due to existing challenges and stressors. Also, the ability of communities to respond to climate change impacts is low or limited, due to existing challenges and stressors they face in their communities. The existing challenges and stressors in Aboriginal communities that often take priority over less pressing issues like climate change include:

- Challenges around housing conditions, health and social problems, and economic issues

- Eroding cultural practises and values
- Declining social cohesion
- Dependence on external bodies for funds

Many of the secondary case study communities listed poor housing conditions, health and social problems and economic issues as existing challenges in their community. All secondary case study communities listed inadequate housing conditions as an issue, ranging from general poor housing conditions (e.g. mould) and need for repairs in existing houses as well as housing shortages and overcrowding. Many of the secondary case study communities reported major issues concerning the health of community members, for example general poor health, diabetes, cancer and poor mental health.

All the secondary case studies spoke about social problems affecting the community members, including, drug and alcohol abuse, gangs, violence, suicide, vandalism, and lack of parenting skills. This is especially an issue among the younger members in the community. Poverty and limited economy were also commonly cited as challenges in Aboriginal communities, including issues around, high unemployment/ limited employment opportunities, limited income levels, and lack of access to capital and economic activity.

Some studies discussed the issue of eroding culture and loss of traditional practises (e.g. ceremonies, medicine), values, language, education and knowledge, which is seen as a negative change in the community. The reasons behind this loss of culture included historical events such as residential school and decreased availability of traditional resources, such as wildlife (e.g. not enough reserve land to support wildlife populations) and plants (e.g. logging in cedar and medicinal plant harvesting areas). Several studies specifically spoke of their youth that are less engaged in traditional ways and land-based activities, which was attributed to an increased use of technology (e.g. TV, phone, computers) and seen to cause increased cases of substance abuse and suicide in the youth.

The secondary case studies also discussed issues around the erosion of social cohesion in the communities, such as divides in the community, people not working together, and problems with nepotism or lack of equal opportunity, which limits the communities' ability to deal with change.

Though completely unrelated to climate change or environmental changes, apathetic attitudes, political corruption, disrespect, and lack of cooperation serve

to undermine inherent strengths in communities and weaken social cohesion. In turn, this erodes social capital and the effectiveness of decision-making and action within communities toward commonly shared goals and plans, such as preparing for and adapting to climate change impacts. (Walker et al., 2007, p. 108)

One study spoke about negative attitudes (e.g. the 'stubbornness' of local people, their inability to work together and to agree on things, apathy, and general disrespect for the land and natural resources) as a vulnerability of their community. A few studies described causes of divisions in their communities, such as residential schools, amalgamation of multiple bands onto one reserve, and unequal access to land of different band members.

Several case study communities talked about issues around dependence, which had negative consequences for the community. Several studies described the dependence of their communities on government assistance, namely federal transfer payments, which prevents communities from addressing issues or problems that require more funds than are provided (e.g. poor drinking water quality in Shoal Lake). In one study participants saw social assistance programs as a source of dependence, where members lost their capacities they developed over the generations to cope with climate. This dependence can lead to feelings of disempowerment and lack of control by community members

d. Perceptions of climate change and how that relates to risk

Generally Aboriginal communities in the secondary case studies do not place climate change as a high priority issue in their communities. For some communities, this is because they do not observe climate change impacts having a significant impact currently. For others there was a lack of understanding of longer-term changes or impacts, and lack of awareness about the connection between specific weather events (e.g. floods, drought, scarcity of water) and climate change impacts currently and in the future. One community perceived the risk with immediate hazards (e.g. storm surge, flood hazards and extreme weather) and saw them increasing in the future, yet did not invest in emergency preparedness and preparation at the community or household level. This could be partially due to the fact that members seemed to view adaptation simply as a way of life, since they have always responded to changing environmental conditions. The lack of awareness or concern about current and future impacts, combined with

the view of adaptation as a way of life, increases the risk of these communities. It means that communities may have limited means to respond, plan and adapt and adaptive strategies remain largely reactive and potential inadequate to respond to future impacts.

In summary,

- Climate change poses a number of risks to Aboriginal communities concerning their safety, health and cultural wellbeing.
- Aboriginal communities are faced with many competing challenges and stressors in their communities that decrease their adaptive capacity
- The existing challenges and stressors Aboriginal communities face will hinder their ability to respond to climate change impacts and will be exacerbated by climate change impacts
- The secondary case study communities do not place climate change as a high priority issue in their communities and are therefore more at risk to the impacts of climate change

4.2.2 Factors contributing to adaptive capacity of Aboriginal communities

The secondary case studies highlighted a number of qualities in Aboriginal communities that contribute to their adaptive capacity, including:

- Culture, including indigenous knowledge and values
- Social capital/cohesion
- Effective leadership

A few case studies identified historical factors that have affected adaptive capacity in a negative way, including:

- The Indian Act and residential schools
- Challenges related to land (e.g. ownership, relocation)

Many secondary case study communities identified their culture as a source of community strength, one that increases resilience and reduces vulnerability. For one study, a historical sense of place and attachment to the environment and strengthening of culture and language, were seen as elements of adaptive capacity. One study talked about traditional beliefs and culture helping individuals overcome social problems (e.g. substance abuse, unstable family life, violence and limited education) or historical issues in their community (e.g. current land tenure

conflicts). A few studies discussed efforts to enhance adaptive capacity through investment in cultural related programs such as: language forums, opportunities for young people to learn the culture (e.g. teaching youth land skills in school, Family Camp), revival of traditional societies, and involvement of elders and use of indigenous knowledge by band staff and post secondary institutions. Several studies acknowledged indigenous knowledge specifically as an indicator of or contributor to adaptive capacity in Aboriginal communities. This knowledge “would allow an individual to make informed decisions, earn a living, and thus improve their resiliency and adaptive capacity to environmental and/or socioeconomic changes”.

The studies also described the importance of cultural values and participation in the informal economy as factors contributing to adaptive capacity. Examples of these cultural or traditional values were peoples’ work ethic and their spirituality to make it through their challenges in life. If people had a work ethic, it meant they had a will “to work hard to earn a living”, while spirituality was “the source of strength during difficult times and often gave individuals the will to persevere” (Ermine et al., 2008, p. 20). The role of the informal economy, such as food sharing networks, help enhance adaptive capacity in Aboriginal communities, as Walker et al., (2007, p. 141) explains:

If typical “indicators” of adaptive capacity (e.g., wealth, formal education, employment rates) were applied only at the community level, results would suggest a high overall vulnerability. For instance, a historically high dependence on natural resources, low and unstable household incomes, and high unemployment rates suggest a high vulnerability and low adaptive capacity. However, at the household level, socio-economic resilience is enhanced by income diversification and food gathering/stockpiling, while at the community level, a high social capital (e.g., social networks, knowledge, and support), combined, suggest a much higher adaptive capacity than would be interpreted from income and employment statistics alone.

Researchers and community members identified the importance of social capital/cohesion (i.e. community relationships) in Aboriginal communities, in that it has helped them respond to challenges in the past and will assist them in responding to future challenges. One community described this as their greatest strength being that ‘people stick together’, that they have mutual respect and strong ties with each other and with the land. Community and cultural events were seen as important factors, in that they strengthen and maintain social relationships, networks and community events. Described in one study as the ‘supportive, networked and sharing-

oriented nature of the community' (e.g. hunters and fishers sharing country foods), these relationships helped communities confront problems in the past or get through difficult times (e.g. flood), and will help in future challenges such as climate change.

While not directly related to adaptive capacity, several case study communities discussed the importance of leadership (e.g. active, transparent, and culturally appropriate) in their communities. This was sometimes expressed as the need to increase local decision-making power and governance (e.g. involvement in decision-making regarding natural resources and land use planning), or recognizing the most positive change in the community or region as the increased control of services and decisions by the Aboriginal leadership (Band council, Labrador Inuit self government). By gaining more control, leaders can better address the interests, concerns and needs of their members, and ensure values, culture and language are given priority. One community, whose leadership was known for being vocal on behalf of the community, was assessed as having a strong institutional capacity, which was anticipated to help the community adapt to future change.

A few challenges around decision-making were cited, such as communication challenges (e.g. lack of communication, or low turnout to community meetings), which led to negative perceptions of the leadership. Some other challenges include delays in the implementation of platform promises and also in the accountability due to a lack of an opposition. Other challenge included having multiple band governments governing one community. Some communities described concerns about mistrust of the leadership, nepotism and 'unfairness in the distribution of resources', which one study described at exposures of the community.

Several case studies discussed historical factors, such as colonialism, the Indian Act and the residential schools that have reduced the adaptive capacity of their communities. These historical factors controlled or influenced all traditional systems in Aboriginal communities, from their governance systems and economies to their traditions and ceremonies. In one study, the author asserts that it is the consequences of the Indian Act and residential schools that has led to once 'proud, independent, and capable people, to now face socio-economic challenges similar to the poorest and marginalized sectors of societies found in Developing countries'. One study talked about problems around being marginalized by government, which resulted in 'cultural segregation and identity loss' and has limited community wellbeing and development. Through the control of political structure the Indian Act has been a contributing factor to

problems in the community such as mistrust of leadership and tensions between families over occupancy rights. Unresolved residential school experiences are seen to contribute to and prolong issues of drug and alcohol abuse, addictions, family and community tension and violence, disintegration of traditional family structures and means of raising children, and erosion of cultural practices and languages.

Several case study communities discussed challenges related to land (e.g. relocation from original lands and land ownership), which have had negative effects on the community that continue today. A few studies discussed situations where the members were forced to move from their original settlements, in one case the community was moved to a new area (e.g. resettlement) and in another members were forced to join other reserves (e.g. due to reserve appropriation). This was seen as having significant emotional impacts on members who had to move (e.g. loss of hunting areas, insufficient housing in new area) and contributed to community tensions in communities with people from different reserves. In another study, unequal access to land occupancy rights within a reserve is the primary source of conflict within and between families. One respondent described the importance of the land to their community and the importance of not selling it:

There are places everywhere around here that have a Blackfoot name, and a story and song that goes along with every place name, all the way back to the North Saskatchewan River, near Edmonton, and all the way down to Yellowstone, where the people all have land and stories and songs that go with each of these places, and they are really closely connected to the land, and if we start selling it then we are selling our soul, as far as I am concerned. We are selling part of ourselves and our history; that's not to be the case, we are supposed to preserve it for our youth, not sell it. (Magzul, 2007, p. 20)

4.3 CONCLUSION

In conclusion, the major findings from the secondary case study analysis are:

- Climate change currently is not causing significant problems for case study communities, but is predicted to have a greater impact in the future (i.e. although some changes have been noticed, they are not as pronounced as in communities North of 60)
- Future climate change impacts will pose a number of risks concerning safety, cultural practises and health for the case study communities
- Climate change will exacerbate current challenges and stressors in the communities, such as poor housing, health problems, social problems, erosion of cultural practises and values, decline of social cohesion, poverty and limited economy, dependence, and decreased availability of culturally important species
- Climate change is not a priority for case study communities and their ability to respond to climate change is low, partly due to competing stressors at the community level as well as a lack of awareness of climate change current and future impacts
- There are qualities of secondary case study communities that are important contributors to adaptive capacity, such as culture (e.g. indigenous knowledge, participation in the informal economy and traditional values), social cohesion and effective leadership.
- Some case studies explored historical factors that have affected the adaptive capacity of Aboriginal communities such as the Indian Act and residential schools.

In general, the findings from the secondary case studies strongly support and are in line with our own conclusions developed from our primary case studies (outlined in Section 3.2).

5.0 SYNTHESIS DISCUSSION

How will climate change impact Aboriginal communities south of 60? What are the relative risks that these impacts pose for Aboriginal communities and in what ways are they linked to other challenges and stressors? What is the nature of adaptive capacity in these communities and in what ways might some Aboriginal communities be more at risk than others? These are the guiding questions of this project. In this section our goal is to address these questions by drawing together the main conclusions and key messages emergent from our 'Primary' and 'Secondary' case studies and our review and assessment of recent scientific literature on climate change impacts south of 60.

The impacts of climate change on Aboriginal communities are likely to be as varied as the communities themselves. Appendix B of this report provides a comprehensive overview of national and regional climate impacts and projections based on a recent research assessment completed by Natural Resources Canada in 2007 (Lemmen et al., 2008). Rather than recap the details of climate impacts discussed there, we will focus in this synthesis on an integrated discussion of climate impacts and how these are linked to, overlap with or even counteract other risks and challenges Aboriginal communities face. To address the question of the nature of adaptive capacity we will reflect on the complex of issues raised in our analysis of 'Primary' and 'Secondary' case studies with a particular focus on the interdependent character of vulnerability, capacity and resilience.

Climate change is a global environmental change phenomena, the impacts of which are felt, understood and reacted to by humans and other life at a very local scale. Ideally it would be most effective to be able to generate reliable predictions of how climate change will impact local resources, ecosystem services and socio-economic conditions in order that appropriate plans and responses could be developed to manage and ameliorate these effects and take advantage of any prospective opportunities or benefits that might arise (Smith, Klein and Huq, 2003; Cohen and Waddell, 2009). Modeling tools are improving all the time, but remain limited and often are of insufficient detail and specificity to be really useful at the local scale at which communities will face the brunt of climate impacts. That said, embracing a scenarios-based approach to thinking about and planning for future climate change impacts and adaptation is something that communities can and should aspire to when and as such resources are available and accessible. In the absence of the ability to accurately predict local outcomes of climate change

people have sought to understand the ways in which communities may be exposed and sensitive to the impacts of climate change in the context of other things which may also threaten or undermine community wellbeing and prosperity. Although contested and debated by many researchers a commonly used short-hand for the range of multi-faceted approaches to research in this way is the so-called 'vulnerability approach'. The goal is to help understand how different risks and threats are linked and how, given an array of challenges and finite resources, a community can best position itself to maintain and improve community wellbeing now and into the future. In essence these are the dimensions of adaptive capacity and resilience. A useful and real analogy to consider is the tragedy of the mountain pine beetle outbreak which has devastated the interior forest industry in British Columbia over the past 10+ years. The pine forests of central British Columbia have always been at risk to cyclical outbreaks of this endemic pest. Forest management practices over the latter part of the 20th century increased the susceptibility of thousands of hectares of forest land by suppressing fire and creating large tracts of even aged stands. Climate warming created a "perfect storm" that enabled an outbreak of the beetle several orders of magnitude beyond anything previously experienced. Climate change did not 'cause' the mountain pine beetle outbreak, but it was an important contributing factor. It was part of a set of social, historical and ecological conditions, interlinked in complex and dynamic ways, which together had both unpredictable and unmanageable effects. We suggest that such a fate may be avoided by Aboriginal communities south of 60, if such communities are able to give consideration and develop capacity to adapt to the direct and indirect impacts of climate change.

In both our 'Primary' case study communities and the 'Secondary' cases covered by other researchers there are common themes with respect to a wide range of social, economic and ecological risks and challenges. Each community might not experience all conditions in the same way or even have the same mix of exposures and sensitivities, but there are definite patterns that emerge. Four prominent themes that emerged from this project are presented here, although it is likely there are others that may be of relevance and interest.

First, the contemporary reality of these communities is shaped by a complex legacy of colonialism, the Indian Act and its various amendments, the residential school experience, and the gradual but persistent erosion of culture, language and traditional lands, knowledge and practice. Second, the social and economic conditions of the communities are generally below-average by Canadian standards. For example many experience relatively high rates of un- and

under-employment, substance use and abuse, single parent households, poverty and sub-standard housing. These processes are linked, indeed in some respects they are mutually reinforcing in their predominantly negative effect on community resilience and adaptive capacity. The combined effect of cultural atrophy and difficult socio-economic conditions does not foster a healthy, vibrant, or forward looking community. Rather it undermines community health and wellbeing, fosters negative feelings such as defeatism and lack of self esteem and trust as we learned from our primary case study interviews.

Third, respondents in both 'Primary' and 'Secondary' cases speak of the difficulties and challenges which arise from the tension between old and new. On the one hand elders lament and struggle with the loss of culture and traditional practices which is as detrimental to social cohesion and resilience as the infiltration of low quality processed foods, televisions, and other, negative aspects of contemporary consumer culture. The point is not that a return to a so called traditional way of life is a solution to contemporary challenges or vulnerability. The point is that in Aboriginal communities where traditional and contemporary knowledge, practice and values are often at odds communities seem to struggle more generally with coping and it is more difficult to manage a wide range of community functions, especially those which pose risks and or otherwise stress or threaten community life. Therefore, vulnerability persists.

Fourth, our examination of institutional processes and relationships highlighted community vulnerability related to leadership and decision-making, the interaction of families and negative or counterproductive interactions with other levels of government, external agencies and organizations. These institutional dimensions of vulnerability are especially important because it is through institutions that many of the important decisions and processes that need to be undertaken to address climate change or at very least to develop the capacity to deal with it, take place

Overall the suite of existing conditions which in their combined effect leave communities either more or less vulnerable to risks and stress work in complex and interconnected ways. While it is to be expected that no two communities are exactly alike in specific terms of their exposure or sensitivity, the point is to identify the policy relevant connections to the anticipated impacts of climate change. Generally speaking, as with the mountain pine beetle example above, climate change will tend to compound the exposure-sensitivity of communities as it will bring not only

new challenges and risks but will also make existing exposure-sensitivities more difficult and costly to contend with.

For example, it is widely expected that managing the effects of climate change at the community scale will always entail added costs and demands on already over taxed community resources (Walker and Sydneysmith, 2008). Infrastructure impacts are a particularly salient example, where climate change outcomes such as more extreme weather events (e.g. coastal erosion, flooding), changes in timing and intensity of rainfall (storm sewer overload, flooding), mild winter temperatures or shifts in the timing of seasons, may all effect infrastructure and entail elevated repair and/or maintenance costs.

Alternatively, in communities where traditional harvest of land and aquatic resources are still an important source of sustenance, income, and cultural practice, these activities are likely to come under increasing pressure. Many traditional resources, such as wild game are already depleted from a combination of over-harvesting, habitat loss and/or pollution; climate change is expected to compound these effects in most cases. In those communities where the rediscovery of traditional knowledge and practice is actively being pursued to enhance cultural revival and community resilience, climate change may have a detrimental effect on supplies of and access to traditional resources and opportunities to practice traditional activities.

There are also public health and safety concerns that are either associated with or increased by hazards such as extreme weather events (e.g. storms) and forest fires. Both extreme weather events and wild fires are predicted to increase under climate change. The communities in our 'Primary' and 'Secondary' case studies were in general, minimally prepared for emergencies, natural hazards or disasters and had little sense that they might be at greater risk of such events in the future as a result of climate change. Although some reported having gone through emergency planning processes of some sort, effective preparation and response to increased frequency and duration of severe weather events and other hazards (e.g. forest fires) depends on minimal levels of equipment, expertise, technical capacity and man power, much of which is well beyond local capacity and resources.

In sum there is a twofold effect with respect to the ways in which climate change impacts will interact with pre-existing conditions and susceptibilities to risk. On the one hand, given de facto vulnerabilities with which communities are already contending, the current or potential impacts

of climate change do not typically garner a high priority at the community level as an issue or set of issues to take action on. Climate change impacts under this view are more or less ignored and allowed to run their course while community resources are directed towards more immediate and pressing needs. This laissez faire approach is compounded by a common assumption among the communities we interviewed that Aboriginal peoples, with a long history of adapting to change, are innately adaptable and therefore, will simply adapt to climate impacts when and as they occur. On the other hand, climate change is a compounding influence which will in all likelihood exacerbate existing risks and stressors that are already affecting the land, waters and activities of these communities and their traditional territories. Some compounding effects will be in the form of added costs (travel, maintenance, repair, etc.), others will add to existing pressures on natural resources and traditional territory (e.g. from pollution, overharvesting/population pressure, loss of habitat, agriculture, resource extraction and the spread of urban/sub-urban development), and still others will elevate the risks of existing hazards (floods, drought, forest fires, etc.).

To this point we have concentrated on vulnerability, seemingly a negative exercise focused on dimensions of weakness, and attempts to understand that which is under threat or can bring harm to a community. Ultimately the objective of this research is to inform community leaders, government agencies and others who share responsibility for the wellbeing and prosperity of Aboriginal communities south of 60, on ways to enhance and develop capacity to address climate change impacts. In other words, the goal is to reduce vulnerability. We have discussed above, and devote considerable space in our 'Primary' case study analysis, to questions of the nature of vulnerability and the importance of having a clear understanding of current conditions and their historical antecedents. As much as outsiders with an interest in Aboriginal issues, including climate change impacts and adaptation, may wish to not "dwell on the past" and would rather focus on "solutions", on proactive actions and planning for the future, the past cannot be ignored. Building adaptive capacity necessitates an understanding and sensitivity to the legacy of recent history, for example, of residential schools, and of the Indian Act and its various amendments. Our research indicates that a new generation of leaders is gradually emerging in Aboriginal communities and those individuals and communities that appear the most prepared to deal with an uncertain future are those that are finding ways to effectively acknowledge the past and at the same time embrace contemporary challenges and opportunities. In the context of climate change, this means adaptive capacity is a function of overcoming past injustices by keeping alive important traditions, knowledge and practice and, at the same time, increasing

self-determination in both economic development and governance.

Some of our respondents spoke of the problem of dependency in their community, specifically or in Aboriginal communities in general, as a legacy of their negative experiences of the past century and a barrier to self determination. Both “Primary’ and ‘Secondary’ case communities identified overcoming such dependency is as an important dimension of improving conditions, although the process is unclear. Community economic development is obviously important, not only for the income and jobs but perhaps more so for multiple other social benefits. Similarly, education and technology are regarded as important for achieving improvements in social and economic conditions. The benefit for adaptive capacity, we argue, is the accompanying reduction in some of the negative community attributes which consume time, resources and energy. If the social, human, economic and technical resources of a community are used up dealing with high unemployment, substance abuse, and crime then little is left over to learn about and plan for emergencies, risk management, infrastructure replacement or resource impacts of climate change. In effect there is an opportunity cost to dealing with pressing social and economic problems. Thus, one of the outcomes of social and economic development and related improvements in community conditions is that it provides space for consideration of other planning and management issues, including climate change adaptation.

The sorts of responses that climate adaptation will entail – planning, resource management, infrastructure or even public health responses – will fall most often to those whose job it is to manage the affairs of the community: its leaders and administrators. These people are responsible for governance and decision-making on behalf of the community. They operate within an institutional context that includes both local and extra-local institutions. It is an arena in which the interlinking of contemporary and traditional knowledge and practice is especially evident. Such interlinking is salient to adaptive capacity because the effectiveness of local governance depends on it and, therefore, so does the effectiveness of planning and responding to the sorts of risks and challenges likely to be associated with climate change. For example, our respondents spoke of effective governance as including: (i) an inclusive, transparent decision-making process; (ii) clear communication between leaders and community members; (iii) long term, policy driven planning, and (iv) clear separation of the institutional roles of elected officials and administrative staff. Equally important is making use of traditional decision-making practices including input from elders and involvement of different families in decision-making. These self-assessments are illuminating as they indicate that in certain communities there is a

sophisticated understanding of the strengths and weaknesses of their governance and institutions. We suggest that such self-awareness probably enhances local capacity.

In order that local governance institutions and decision-making practices are to be infused with the knowledge of both the present and the past then it helps if these bodies of knowledge are more widely interconnected in the day to day life of the community itself. Both 'Primary' and 'Secondary' case study communities identify cultural values, traditional knowledge and practices as important dimensions of community wellbeing, social cohesion and resilience, all of which we regard as essential for capacity. Many of these values, norms and activities are tied closely to the land and traditional uses of terrestrial and aquatic resources, things which the community deems important and which may be subject to a variety of climate change impacts. Whereas vulnerability is associated with the persistent erosion of many of these attributes of Aboriginal traditions and culture, in those cases where communities have been able to re-establish connections to the land, to re-establish strong linkages between youth and elders, we argue adaptive capacity is or can be enhanced.

The exact impacts of climate change on Aboriginal communities south of 60 are largely unknown and difficult to predict with great certainty. There is however, very high certainty that the global, average temperature of the atmosphere is warming. It is also well understood that this warming drives a whole range of complex changes in Earth's climate that include changes in precipitation, sometimes less, sometimes more, changes in extreme weather activity, both frequency and intensity, and changes in the timing of seasons. Although these are important to consider, at the scale of human communities the secondary and tertiary effects of atmospheric warming are what will affect people's lives the most directly. These changes, in hydrology (e.g. floods, glacial melt, drought, spring runoff timing and/or intensity, stream temperature) or in ecosystems (e.g. habitat changes, species migration, disease or pest outbreaks, extinction) will settle over the land as they will, with great spatial and temporal variance. As with any human community, the impacts of these changes on Aboriginal communities south of 60 will be a function of social factors and conditions in the community itself. How these communities respond and cope with such impacts will emerge from local decisions made reactively or proactively about what to do, when and how. Local institutions, (e.g. community leadership, families and elders), interacting with institutions at other levels of governance, (e.g. federal and provincial agencies, the economy) will be the primary vehicles through which these communities will navigate the uncertain terrain of climate change. The capacity to adapt, in other words,

originates with the local, the social and the institutional. Efforts to improve 'adaptive capacity', therefore, are much more likely to succeed when these factors are taken into consideration early and often.

6.0 KEY MESSAGES AND RECOMMENDATIONS

This research project was focused around trying to answer three guiding questions:

1. What risks does climate change pose to Aboriginal communities south of 60, how are these risks linked to other challenges and stressors, and what factors lead some communities to be more at risk than others?
2. What factors contribute to an Aboriginal community's adaptive capacity and resilience?
3. What is the institutional capacity of Aboriginal communities to cope with and manage climate change in the context of other challenges?

Key Messages about Aboriginal Communities south of 60

- **Climate change impacts are often just one of many factors**, including pollution, overharvesting, lack of access and development that already affect the land, waters and activities of Aboriginal people in their traditional territories.
- **The potential risks of climate change compound – and are compounded by – existing challenges:** Social, economic, historical factors put communities more at risk to changes and stressors in general and impede their ability to respond effectively.
- **The 'issue of other issues' is a barrier to the adoption of proactive adaptation planning.** Communities face many interconnected social and economic challenges and risks that supersede consideration of long term climate change impacts at the present time.
- **Social and ecological change is inevitable, therefore so is adaptation.** There is a strong sentiment that Aboriginal communities are resilient precisely because they have long, historical experience with adapting to risks and threats imposed on them by nature and a host of external social, economic and political forces.
- **Healing from the past** – individually and collectively – is an important precursor to developing or enhancing community capacity and resilience to face the uncertainties and risks of climate change.
- **The cultural dimensions of adaptive capacity are critical:** at least as important as (if not more than) the various technical, human and financial resources that are also necessary to effectively adapt to climate change.
- **Cultural connection to the land (and water)** increases exposure and sensitivity to climate change impacts.

- **Cultural connection to the land (and water)** is a source of community strength and resilience that contributes to adaptive capacity.
- **The fusion of past and present** – the ability to balance traditional and modern ways of life is vital: combining Indigenous Knowledge, cultural values and practices with contemporary knowledge, technology and development is the key to meeting complex social-ecological challenges of which climate change impacts are but one part.
- **Attributes of effective governance and an engaged membership that enhance adaptive capacity and resilience in the eyes of community respondents:**
 - Inclusive, transparent decision-making
 - Communication between community leadership and community members;
 - Making use of traditional systems of decision-making (e.g. elders);
 - Long term vision, planning and decision-making
 - Self-sufficiency and motivation (vs. dependency) of leaders and members
 - Healing from the past
 - Willingness to accept change
 - Education and awareness building
 - Reaching out to others
 - Overcoming past differences
- **The short, two-year election cycle is frequently a detriment to local adaptive capacity:** Respondents maintain that having local leadership up for election every two years is destabilizing and a detriment to effective planning, especially strategic and long term planning which may be necessary to proactively address issues related to climate change impacts and adaptation.
- **Effective and positive interactions, linkages and relationships between local institutions are a critical dimension of adaptation and adaptive capacity.** Chief and Council are the core community institution in many First Nations that is ultimately responsible for managing the community's response to climate change. Families and elders, have both discreet and overlapping institutional roles in the community, how they interact with community leadership, whether positively or negatively has important implications adaptive capacity.
- **Institutional interactions with external bodies, especially Indian and Northern Affairs Canada (INAC), Department of Fisheries and Oceans (DFO) and other federal agencies, are potentially very beneficial to local adaptive capacity.** No community is an island; therefore while the problems of climate change are

fundamentally local, adaptive capacity depends on community resilience and effective linkages, positive interactions and institutional support from external sources. Effective interactions can be enhanced by improved cultural understanding such as acknowledging the significance of the actor in Aboriginal institutions where face to face relationships are especially important. Institutional interactions with Provincial Government departments are varied and underdeveloped; as such they represent an untapped potential opportunity for mutual cooperation to enhance capacity.

- **There are a multitude of climate change impact and adaptation tools currently in existence or under development** (by academics, governments, and non-government organizations). Aboriginal communities should be encouraged and assisted to use and evaluate these tools to assess local issues and capacity to address climate change impacts. Aboriginal communities south of 60 are extremely diverse and any tool that is used by the community will have to be adapted to their specific context.
- **Extension and outreach is a pivotal strategy to enable the effective access and use of climate change impacts and adaptation information and tools:** Many Aboriginal communities do not have the resources or capacity to implement existing tools. Therefore, there may be a greater need for assistance to communities in accessing, adapting and implementing tools, i.e. extension workers or people on the ground (vs. technology) who understand the tools and can make use of them as well as adapting tools to fit individual community contexts.

We make the following recommendations for areas of focus to better assist Aboriginal communities south of 60 in responding to current and future climate change impacts:

1. *Mainstream* climate change adaptation and adaptive capacity enhancement into existing programmes and initiatives concerned with a wide range of Aboriginal issues including; health, environment and natural resources, community planning, economic development and education.
2. *Translate* climate change scenarios. Support and encourage adaptation planning through projects that (a) provide locally relevant and meaningful regional climate impacts data and (b) work with communities to attempt to understand how prospective climate changes will impact future prospects and wellbeing of the community. Providing climate change scenarios will provide locally specific information and assist in filling the climate change knowledge gap identified by 'Primary' case study communities, which in part

prevented response to current and future climate change impacts. It is imperative that this information is translated into a format that is meaningful at the community level. Implementing scenario work with communities would tie in well with any long term initiatives being implemented, like comprehensive community planning.

3. *Extension*: Invest in programs that provide technical expertise and support to assist communities in adaptation planning. In many cases Aboriginal communities will not have the resources or capacity to engage in adaptation planning. Extension and outreach personnel are necessary to assist communities with accessing, adapting and implementing tools. Experts would be able to make use of and modify existing tools on adaptation planning to fit individual community contexts.
4. *Inform policy* with quantitative analysis of dimensions of climate change risk, vulnerability and adaptive capacity. The current study provides the in-depth, qualitative analysis to help identify appropriate areas of focus for a broader, quantitative approach at the national scale. This would assist in making more broad generalizations about climate change risk and adaptive capacity in Aboriginal communities south of 60, which would inform and prioritize areas of focus.
5. *Research* on Métis communities south of sixty. Our research and existing research focused on First Nations. Inuit, Métis and First Nations are different in how they govern themselves and their land (e.g. Chief and Council vs. municipal vs. President/locals). We identified in the previous section that the greatest lack of research on climate change impacts and adaptation clearly exists with respect to Métis communities (due to smaller relative numbers of Inuit communities south of 60, who in some cases identify with Inuit peoples north of 60. To get an accurate and more complete understanding of adaptive capacity of Aboriginal communities south of 60, it is necessary to fill this large knowledge gap.

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APPENDIX A
INTERVIEW SCHEDULE

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1.0 PRIMARY CASE STUDY INTERVIEW SCHEDULE

1.1 SECTION I: COMMUNITY, INSTITUTIONS, AND COMMUNITY CHANGE

I would like to begin by asking you a few general questions about this community...

1. To begin with, if you were to describe this community to an outsider, what would you say? What is life like here?

Prompts: What are the people like, the land, the economy, what do you do for fun, what is a typical day for you? What sorts of things go in to making a livelihood here? What would you say are some of the really good things about this community? And what are some of the not so good things?

2. Who is all involved with making decisions/getting things done in the community? What sorts of departments, councils, groups or organizations are there in the community and what sorts of things do they work on?

Note: community institutional structures Prompt: C&C, councilors with portfolios, public works, other staff, resource management staff, emergency preparedness staff, community groups, etc; stability of portfolios/departments, do changes in council affect changes in staff?]

3. How important are family or clans in the way of life in this community? Do they play a prominent role in community affairs or in the making of decisions? In a crisis/emergency?.
4. Has life in the community been changing in recent years? If so, how?

Prompts: how people live/treat each other, activities that people do, the economy, education, health,

1.2 SECTION II: LIVELIHOODS, ENVIRONMENTAL CHANGE, IMPACTS

Let's talk some more about the way of life in the community, especially about how people support and feed their family.

Go through questions 5-8 for each topic

- Hunting and trapping
- Fishing
- Activities in forest or bush or land (collect plants, pick berries, forestry jobs, farming/ranching)
- Water resources (Rivers, streams, lakes, ocean); Domestic water resources (ground water (wells), drinking water supply)

- Weather or climate
- Other environmental changes

5. Do people _____?/What about _____?

POSSIBLE PROMPTS: is it used for household consumption, sharing, commercial?

6. Has _____ been changing in recent years or in your lifetime? In what ways?
[If relevant] Why do you think it is changing?

POSSIBLE PROMPTS: in terms of abundance, availability or seasonal timing of species?

Seasonal changes in water levels, temperatures, timing of spring runoff?

7. Does the change in _____ have any effect on the community or the way people live here? In what ways?

8. Who / What types of people in the community would you say are most affected by this change? (INTERVIEWER: probe: e.g. youth? Elders? Men? Women?) In what ways?
(Try to determine from this if these are good or bad changes)

9. As I listened, I heard you talk about changes that have occurred in..... [INTERVIEWER: Remind respondent of all the areas identified so s/he doesn't focus on the last one]. Is this correct?

10. Now that we have discussed all these changes, what would you say are the (a) the top two or three positive changes from what we discussed? And (b) which are the top two or three negative changes from what we discussed?

PROMPT: By 'negative change' I mean what, in your opinion, poses the greatest risk or threat to the community and the way people live here?

1.3 SECTION III DECISIONS ABOUT MANAGING AND COPING WITH CHANGE

NOTE TO INTERVIEWER: in the latter part of this section you will have to make a judgement based on the discussion above as to which specific resources, activities, or challenges to focus on. This should be driven by the ranking at the end of Section II.

Okay, this next set of questions concentrates on how decisions are made about what should or can be done to manage or cope with some of the changes and challenges you have noted above; what groups, organizations or individuals are responsible and so on...

[NOTE TO INTERVIEWER]: Go through questions 11-14 below focusing on their top 3 ranked negative changes.

11. You mentioned that _____ was changing. How is the community/members responding to this? Are there any groups or even individual people in the community who are doing anything about that? Who? What are they doing? What else might they do?
12. What do you think your Band or Tribal Council is doing to deal with these changes and challenges? What else might they do?
13. Are there any groups or organizations from outside [name of community] who are responsible for dealing with changes that you identified above? [INTERVIEWER – AGAIN PROBE SYSTEMATICALLY FOR EACH CHANGE AND WHO MIGHT BE RESPONSIBLE]. Who? What are they doing? What else might they do?
 1. For example, does INAC get involved in these issues in any way? Is it helpful?
 2. Would you turn to any federal/provincial government departments/agencies for help?
 3. What about NGO's or other external organization or group?
14. You didn't mention _____[ask each: Hunting resources, fishing resources, forestry activities, water resources, community safety and emergency preparedness] but do you know who is responsible for managing this [individuals or groups within community, Band or Tribal council, external groups such as NGO's, provincial and federal departments]? Do you have an emergency preparedness plan?
15. What helps your community deal with these changes (what helped in the past)?
16. What holds your community back from dealing with these changes?

1.4 SECTION IV ENVIRONMENTAL & CLIMATE CHANGES IN CONTEXT

You mentioned earlier (Q15) that environmental changes are/are not related to changes you might be seeing in the weather or climate OR I asked you earlier about any changes in weather or climate that you may have seen. Let's talk a bit more about climate change.

17. What do you think of when you hear the term climate change? (determine if person see's CC as a problem or not)
18. What groups do you think would be most responsible for helping the community deal with possible climate change?
 1. [If groups] What do you think they are doing?
 2. [If groups] What do you think they should do about climate change?

19. [If identified CC as a concern] How prepared would you say the community is to deal with possible impacts or environmental changes that might be related to climate change like those you have identified, or which might occur in the future? Why? What else might they do? [How do you perceive local institutions ability to deal with climate change?]
20. [If time] How important do you think climate change is for this community when compared to some of the other changes and challenges that it faces such as _____
[INTERVIEWER: Specify some they have identified]

1.5 SECTION V ABOUT THE INTERVIEWEE

Okay, these last questions are about you, just so we know something about you and your background in the community.

21. What community organizations or groups are you a part of now, or have you been in the past? [PROMPT: Boards, committees, Band Council etc.]
22. How would you describe your role or position in the community? For example, what sorts of activities are do you get involved with?
23. Now I'm going to ask you a funny question, would people think of you as a community leader, or for anything in particular that you do in the community? Is there anything that you're well known for?
24. How long you been have in the community? Were you born here?
25. Finally, what are your thoughts about the future of this community? How might you answer or complete the sentence, "If only....or What if..." [finish it in any way you like, thinking about the future of the community]

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CLIMATE CHANGE IMPACTS

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1.0 INTRODUCTION

Against the backdrop of long-term climate variation, global average temperatures are increasing due to the build up of greenhouse gases (GHG's) in the atmosphere from industrial activity, especially the combustion of fossil fuels (Solomon et al., 2007). This human-induced rise in global temperatures, *climate change* as it is more properly called, leads to a number of changes in regional climate patterns and related geoclimatic, biophysical and ecological *impacts*. In turn, human communities are affected by these impacts in dynamic and complex ways.

In order to increase our understanding of the impact of climate change on Aboriginal communities south of 60 in Canada, this section provides a summary of current scientific knowledge of observed climate changes which are already happening as well as projections of future climate based on output from general circulation models (GCM's) most widely used in the climate change literature (Solomon et al., 2007). We present information at a national and regional scale and, where possible, attempt to ground the discussion in the specific context of our case study communities.

2.0 NATIONAL PRIMARY CLIMATE CHANGE IMPACTS

There are many biophysical climate impacts that are currently happening and predicted to happen in Canada due to climate change. Canadians are witnessing the impacts of climate change across the country such as, severe weather, changes to precipitation patterns, milder winters, decreases in ice quantity and quality for winter road travel, and increases in pest problems.

- In Canada, an increase in average temperature is predicted to be more pronounced than lower latitudes and most other regions in the world throughout the next century (Solomon et al., 2007; Lemmen et al., 2008).
- There has been a fluctuation in temperatures observed in the northern hemisphere over the last 1000 years, however, in the last 150 years temperatures have increased steadily with the increase of greenhouse gas emissions (Rosenzweig et al., 2007)
- Within Canada, different regions will observe different increases in temperature.

2.1 CURRENT TRENDS

The average annual temperature in Canada has been steadily increasing for decades.

- Over the past 50 years the **average temperature** in Canada **has increased by 1.3°C**, most of the increase has occurred in the winter and spring (Lemmen et al., 2008; Meunier, 2007).
- The **warmest temperatures** globally since 1850, were **recorded in 11 out of the 12 years** from 1995 to 2006 and based on ice core data, the current concentrations of atmospheric carbon dioxide equivalents are the highest on record in the last 650,000 years (The Government of British Columbia, 2008).
- Climate models **predict that increases of 5.0 to 10.0°C by 2090** are possible for Canada, which is a much larger increase in temperatures than the projected global average temperature increase of 1.4 to 5.8°C (Environment Canada, 2003).

Numerous, non-climatic or secondary impacts associated with the warming climate have been observed which include (Lemmen et al., 2008):

- A **reduction** in **glacier cover** and annual duration and extent of **snow cover**
- River-, sea-, and lake-**ice reduction** in duration and extent
- **Permafrost changes** due to warming and deepening of the annual thaw layer
- Sea-level rise
- **Changes** in the **water levels** and peak timing of flow in rivers and lakes
- Plant phenology (leaf development, flowering, fruiting, etc.) events occurring earlier
- Changes in plant and animal distributions
- An increase in storm activity, forest fires, heat waves, and flooding
- **Growing seasons lengthened**, increasing plant productivity
- **Enhanced coastal erosion** due to decrease in ice cover, increase in sea level, and increase in storm activity

2.2 RECENT CLIMATE TRENDS AND PROJECTIONS FOR CANADA

If we consider the temperature trends that we've experienced in our most recent history and extrapolate these trends into the future, we can see a prediction of what our future may hold. Blair and Smith (2009) have produced a series of five maps (pages 5 to 7) showing temperature trends using linear regression ($p \leq 0.05$) in the adjusted and homogenized historical climate

data in Canada from the period of 1970-2007. These maps are very similar to those used in Canada's national assessment (Lemmen et al., 2008, p. 45, [Figure 8 after Hengeveld et al., 2005]) except they highlight the period now focussed on by the International Panel on Climate Change, i.e. the recent temperature record, thereby eliminating some of the data "noise" from the 1948-1969 period. These maps also extend to 2007 thereby including four additional years of data to those included in the national assessment.

What is "Adjusted and Homogenized"?

"Adjusted and homogenized" means that the data has been corrected for any potential errors in collection that would affect the data's accuracy. The raw data included monthly means and daily maximum, minimum, and mean temperatures from 1970-2007 from the National Climate Data Archive of Environment Canada. This data was then tested for accuracy using nearby stations as reference points, so that any inconsistencies that could be explained by changes in non-climate factors such as site exposure, location, instrumentation, or observation methods, could be corrected (<http://ec.gc.ca/dccha-ahccd/default.asp?lang=En&n=70E82601-1>).

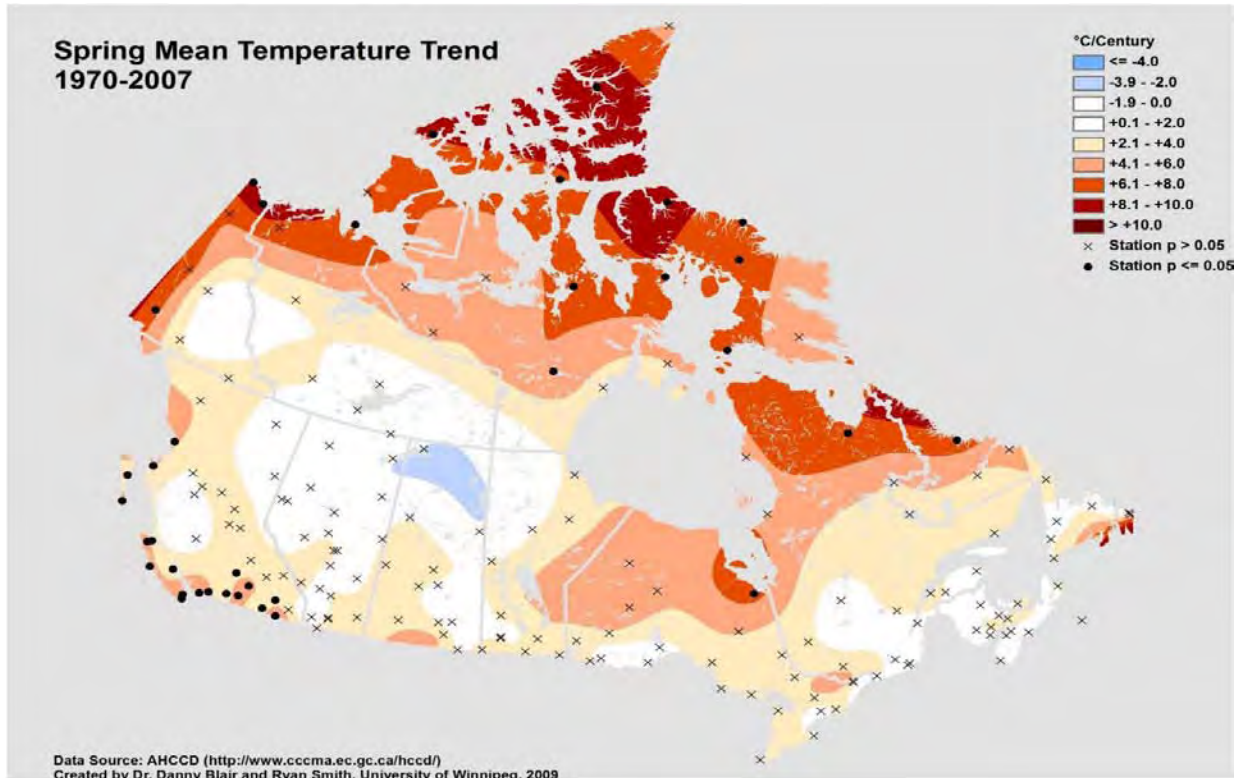
The maps are a visual representation of mean temperature trends from 1970-2007 across Canada for each season, and for the year as a whole. As you can see, the warming trends across the country are much more pronounced in the winter, and much less pronounced in the summer. However, warming trends are significant in some areas around the country in all seasons.

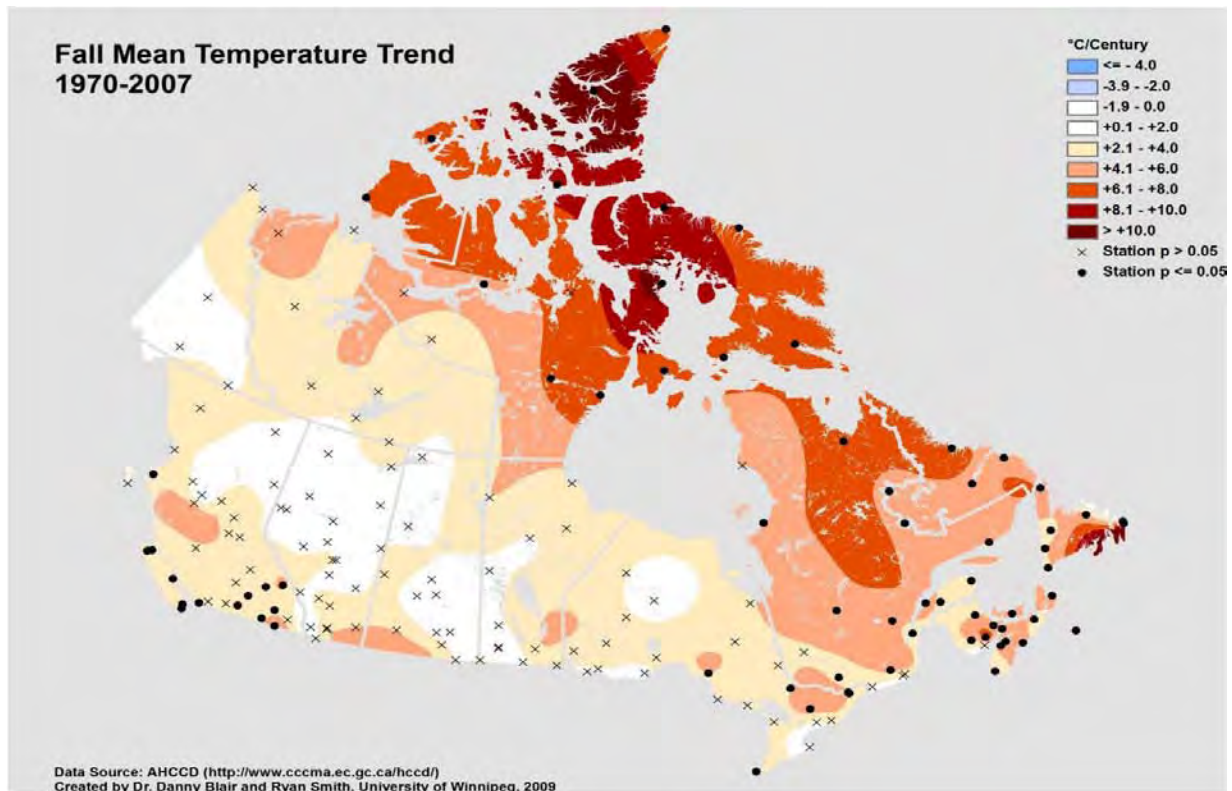
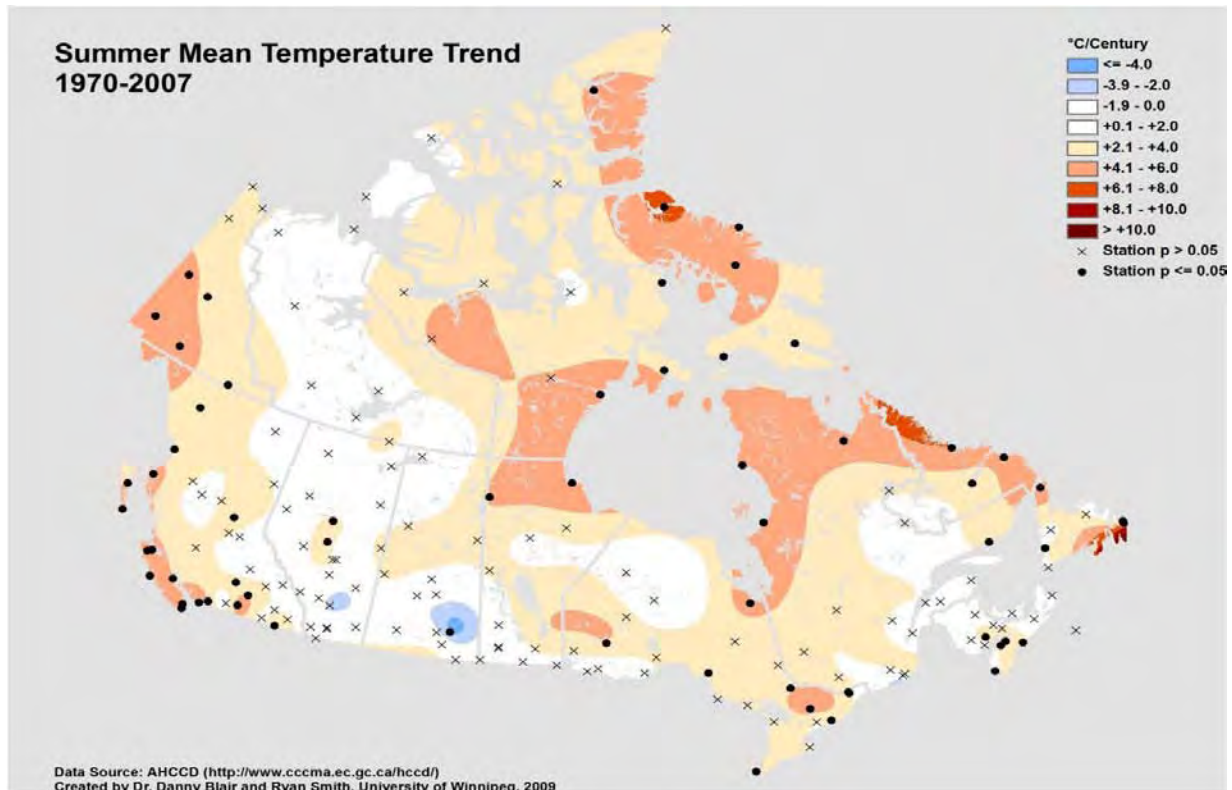
What's the Difference?

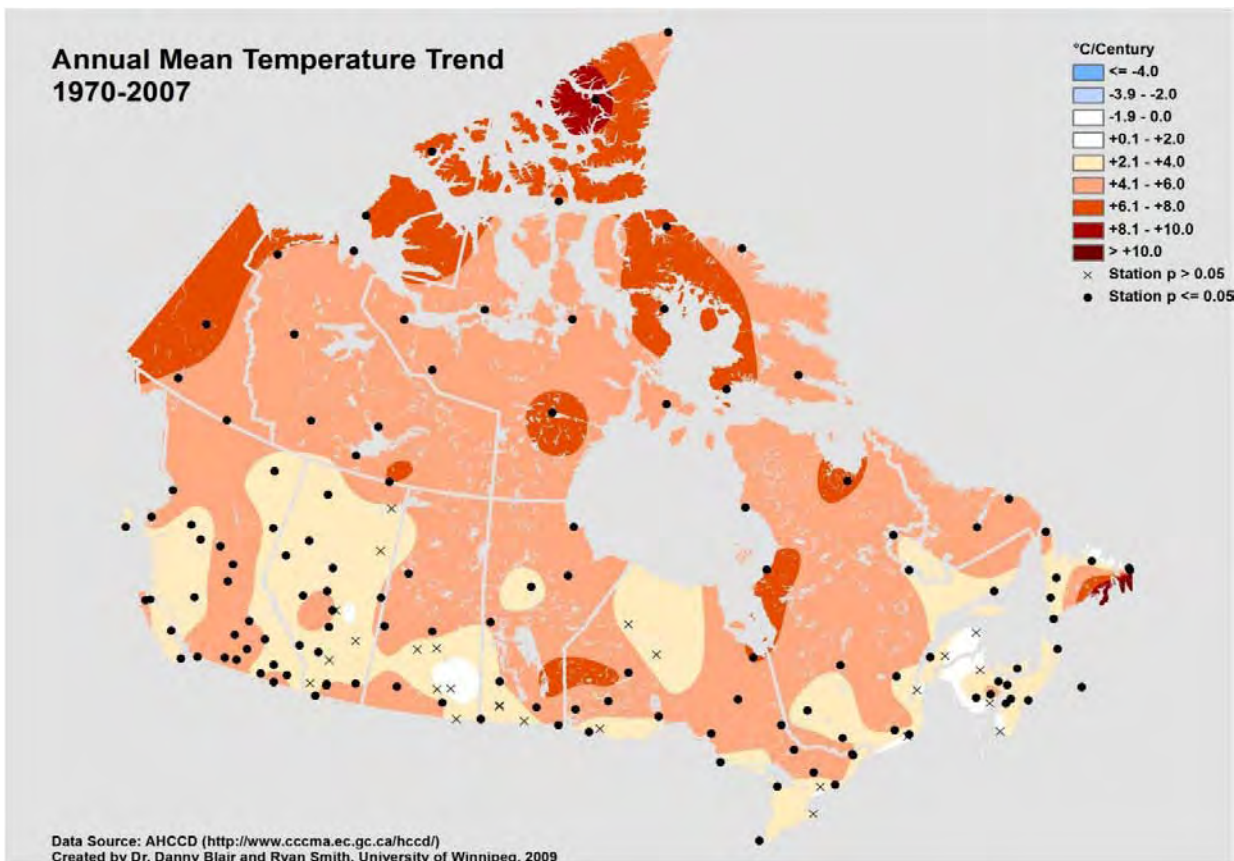
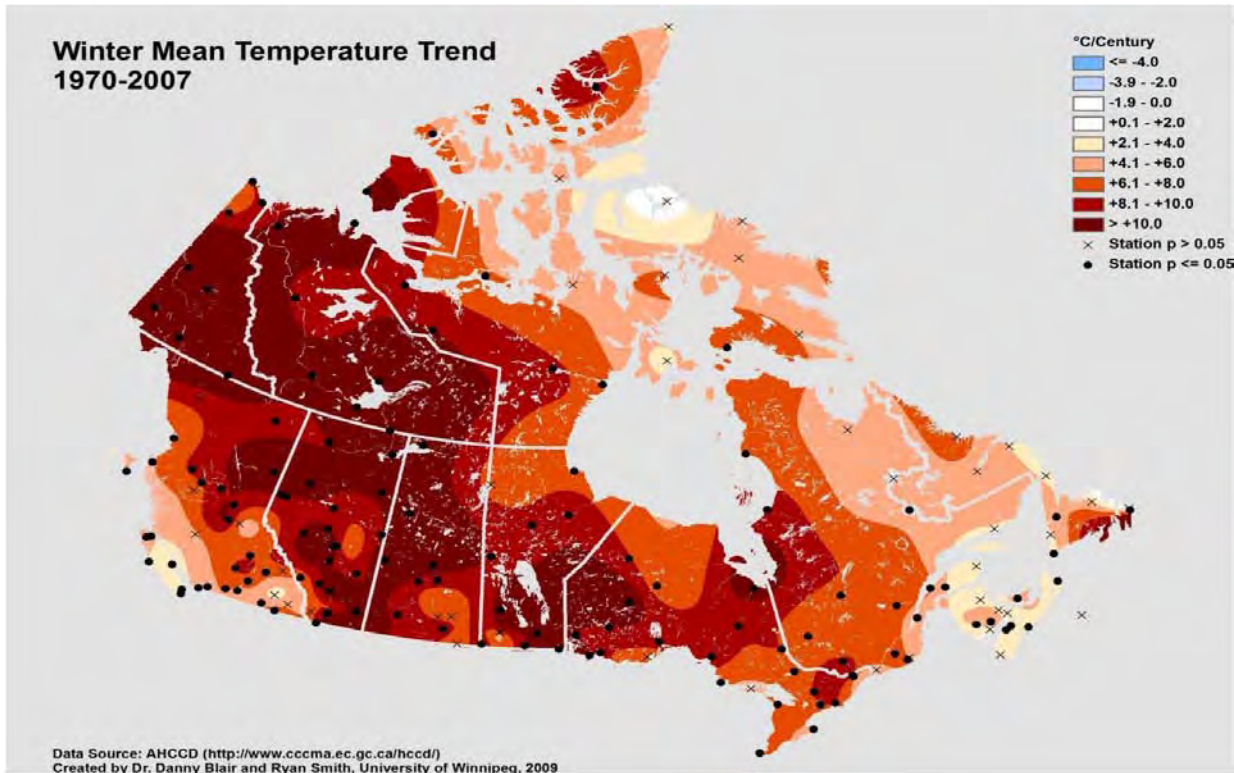
°C/Century takes the 38 year time period and calculates the linear trend in temperature out for 100 years. In other words, the maps show what **would happen** over a 100 year period if the trends **already observed** in the past 38 years were to continue for an entire century. Assuming no change in trends, the maps show how much the temperature will change during the period of 1970-2069.

These trends in temperature are shown neither as degrees per year, nor as a change in degrees over the 38 year period, but as degrees of change per century, as you can see in each map's legend. In the legends, you'll see a number scale with the heading **°C/Century**. If you'd

like to approximate a conversion to the 38 year timeframe rather than have the °C extrapolated out to 100 years, you can just divide by 3. It won't affect the relative color changes you see, just the magnitude of the increases. Finally, each station on the map was analyzed to see if its change in temperature was statistically significant ($p \leq 0.05$). A statistically significant change in temperature means that it is very unlikely to have happened merely by chance. Those stations whose trends were statistically significant are delineated with a dot (•), and those that are statistically insignificant are delineated with an x.







2.3 CLIMATE PROJECTIONS

As seen from the map series a continued **trend of increasing temperature and changes to precipitation** are expected across Canada, posing several risks and impacts.

- Climate is expected to become **warmer, wetter and more variable** in Canada (Lemmen et al., 2008).
- In all regions of Canada it has been found that even small variations in precipitation and temperature have an effect on **stream flow patterns** (Mehdi et al., 2002).
- Gradual shifts in climate conditions are predicted to result in **increase climate variability and frequency of extreme weather** and extreme climatic events and associated **natural disasters** (Lemmen et al., 2008).
- **Flooding** from high intensity rain fall, **storm surges, storms, heat waves and drought** are some events predicted to **increase in magnitude**.
- Climate change in Canada threatens **extinction** for up to 30% of plant and animal species and **decreases in global food production** due to the effects of climate change (The Government of British Columbia, 2008).
- Other predicted effects of climate change in Canada include (National Round Table on the Environment and the Economy, 2010):
 - Changes in snow patterns
 - Changes in oceans and freshwater systems affecting plants, animals and food webs
 - Shifts in the geographical distribution and composition of ecosystems
 - Changes in the patterns of natural disturbances
 - Both an increase and decrease in water supply
 - Water stress
 - Effects on water quality

3.0 REGIONAL PRIMARY CLIMATE CHANGE IMPACTS

To provide a region by region summary of climate impacts across Canada we have followed the format used the 2007 federal report, *From Impacts to Adaptation: Canada in a Changing Climate* (Lemmen et al., 2008). The regions focused on are: Atlantic, Quebec, Ontario, Prairies, and British Columbia.

In each region a summary overview of each region's current and predicted (future projections and trends) biophysical impacts due to climate change is provided. These regional summaries are not intended to provide an in-depth review of climate change but rather to highlight the biophysical impacts of climate change based on information available. Some of the larger regions are broken up into sub-regions and where possible to specific primary case study communities.

3.1 ATLANTIC REGION (POTLOTEK CASE STUDY)

The Atlantic region includes the provinces of New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland and Labrador. Commonly, the provinces of New Brunswick, Nova Scotia and Prince Edward Island are collectively referred to as the Maritimes and account for the southern portion of the region. In Atlantic Canada the majority of communities are located along or near the coast (Vasseur and Catto, 2008). Coastal zone impacts such as sea-level rise, coastal erosion and storm surge are especially salient in these regions.

3.1.1 Current Trends

Temperature and Precipitation

For the Atlantic region, although local variation exists, temperature and precipitation trends have been documented throughout the region due to climate change.

- From 1948 to 2005, seasonal temperatures in Atlantic Canada have increased by 0.3°C (Vasseur and Catto, 2008).
 - Summers have shown the greatest increase in temperature (+0.8°C mean), whereas winters have shown a decrease in temperature (-1.0°C) (Vasseur and Catto, 2008).
- Between the years 1948 and 1995, Atlantic Canada has experienced an **increase in average precipitation of ~10%** (Vasseur and Catto, 2008).
 - Precipitation has continued to increase throughout the 90's (Vasseur and Catto, 2008).

Storms, Storm Surges, and Sea-Level Rise:

In accordance with increases in temperature and precipitation, Atlantic Canada is prone to impacts from severe seasonal and inter-annual events such as: winter cyclonic storms; summer heat and drought; tropical cyclones; and flooding (Vasseur and Catto, 2008).

- There is evidence of recent trends towards **greater frequency and extremes** of these events.
- The Northern Atlantic has experienced an **increase** in **hurricane frequency** and **intensity** since 1995 (Vasseur and Catto, 2008).
- **Storm surges** have caused a substantial amount of property damage and destruction over the past 15 years in all four provinces (Vasseur and Catto, 2008).
 - Storm surges are higher in coastal waters and directly correlated with an increase in sea level rise
 - Currently storm surges in excess of 3.6 m above mean sea level occur every 40 years.
- **Sea-level rise** is attributed to glacio-isostatic rebound as indicated by **greater coastal erosion and flooding** of coastal areas.
- Some areas of Atlantic Canada have already experienced **salt-water intrusion** to fresh water reserves because of sea-level rise (McKenzie et al., 2006).

3.1.2 Climate Projections

Temperature and Precipitation

Although there is some variation in the climate projections, general patterns emerge in future projections of temperature and precipitation in Atlantic Canada (Vasseur and Catto, 2008).

- It is projected that by **2050**, the Maritime Provinces will experience an **increase of 2 to 4°C in summer** temperatures and an increase of **1.5 to 6°C in winter** temperatures (Vasseur and Catto, 2008).
- **Precipitation** is also anticipated to **increase** following a trend started in 1948, with more evident yearly variation (Vasseur and Catto, 2008).
- Atlantic Canada is expected to experience **drier summers** in inland regions (Vasseur and Catto, 2008).

Sea Level Rise

Approximately 80% of the Atlantic Canada coast is considered to be moderately to highly sensitive to sea-level rise which translates to the longest stretch of coastline in Canada sensitive to sea-level rise (McKenzie et al., 2006).

- As a result of post-glacial uplift that occurred since the last ice age, much of Atlantic Canada with the exception of Labrador is undergoing tectonic subsidence or lowering (McKenzie et al., 2006).
 - Sea-level rises 20-30cm per century due to subsidence in the Atlantic region (McKenzie et al., 2006).
 - Adding the predicted sea-level rise to what is already occurring in Atlantic Canada results in a **sea-level rise of 70 to 80 cm by the end of the 21st century** (McKenzie et al., 2006).
- A rise in sea-level of as little as **10 cm could have serious impacts** on Atlantic Canada (McKenzie et al., 2006).
 - These impacts include: a greater risk of **coastal flooding, accelerated coastal erosion, changes in sea and river ice, loss of coastal habitat, coastal sedimentation, salt water intrusion** on freshwater reserves (McKenzie et al., 2006).
 - Increased erosion from sea level rise and/or run off can also affect **marine habitats and water quality**.

Weather and Weather-Related Events

Climate change is expected to cause an increase in frequency and/or severity of severe weather related events, such as ice storms, heavy precipitation events such as extreme rain and snow falls, drought and high winds (McKenzie et al., 2006).

- A warmer atmosphere can hold more moisture causing the potential for **extreme snowfall** in winter and **ice storms**.
- Decreased sea ice from warmer temperatures will expose more moisture to winter air masses also potentially resulting in greater snowfall (McKenzie et al., 2006).
- Estuarine processes in the coastal zone, wetlands and freshwater resources could be impacted by extreme precipitation events (McKenzie et al., 2006). Large precipitation events can also trigger **landslides** and **avalanches** effecting ecosystems (McKenzie et al., 2006).
- As sea level continues to rise, the frequency of **higher storm surges** increases as well.

Ecosystems

Natural systems have been exposed and have adapted to changes in climate since the last glaciation. However, these changes occurred over long time periods and were not coupled to the same degree as the present with the effects of human activity.

- A sudden change to climatic conditions may **challenge the ability of natural systems to adapt** (Vasseur and Catto, 2008).
- Climate change is expected to **modify ecosystems** and **dominant species** through conversion (i.e. where subdominant species replace dominant species) or migration (long-distance movement of a new species that can adapt to the new conditions) (Vasseur and Catto, 2008).
- Life cycles of plant and animal species may be affected by seasonal changes.

Aquatic and Marine

Climate change is expected to change freshwater and ocean temperatures, sea-ice duration and extent, and areas used by species for feeding and spawning, which will directly impact aquatic and marine ecosystems, and species.

- Climate change is expected to affect the **extent** and **duration of sea-ice** (Vasseur and Catto, 2008).
 - This could result in enhanced coastal erosion and **displacement of breeding areas** for those animals dependant on ice-marginal conditions. .
- Streams and wetlands serve a vital role in recharging aquifers and trapping nutrients before entering coastal waters. Streams and wetlands in Atlantic Canada may be impacted in several ways (Vasseur and Catto, 2008).
 - Change in the timing and severity of flood pulses could **impact breeding sites**, especially for migratory birds, amphibians, and waterfowl.
 - If summer water levels are reduced the groundwater will likely not be fully replenished, small **streams may dry up** and reduce wetlands producing **poorer quality water** and **less habitat** for wildlife.
 - If flooding becomes more frequent and extreme there may be more interaction with land practices and result in **more water pollution** from pesticides, nutrients, and other contaminants including wastes.

Forests

Changes to natural disturbance regimes and exposure to extreme weather events due to climate change may have significant impacts to forests in Atlantic Canada (McKenzie et al., 2006).

- Projections show a northern **migration of forest** types with a warming climate, which could result in a loss of Acadian forest species (McKenzie et al., 2006)

- Projected increases in forest fires and extreme weather events (e.g. increased damage to forest stands, increase chances of pathogen outbreak) will cause additional physical impacts to forests (McKenzie et al., 2006)
- Warmer conditions could also create better conditions for native or invasive pests (McKenzie et al., 2006)

3.2 QUEBEC REGION (WASKAGANISH CASE STUDY)

The Quebec region is divided into northern, central and southern parts as each part is quite different from the other. Northern Quebec is characterized by tundra vegetation and a harsh climate (Bourque and Simonet, 2008). The central part of Quebec is covered with dense boreal forest that contains a significant amount of biodiversity (Bourque and Simonet, 2008). Southern Quebec is densely populated and includes the coastal zones of the St. Lawrence estuary and part of the Gulf of St. Lawrence. Due to the vastness of the Quebec region there will be substantial differences in temperature and precipitation that has occurred and is predicted to occur.

3.2.1 Current Trends

Temperature and Precipitation

Although there has been significant variability across the Quebec region, general trends of **increased annual temperature**, increased total **annual precipitation**, and a **decrease in ice cover** have been observed over the last several decades (Bourque and Simonet, 2008).

- Quebec has experienced a **rise** in temperature in the western and central parts of southern Quebec by **0.75 to 1.25°C** from 1960-2003 (The Government of Quebec, 2008; Bourque and Simonet, 2008).
 - The greatest warming occurred during the winter and summer for this period (Bourque and Simonet, 2008).
- The increase in summer and winter temperatures have resulted in **changes to growing degree days** and **length of frost free days** along with other climate indicators (Bourque and Simonet, 2008).
 - There is evidence the length of the growing season is increasing (Bourque and Simonet, 2008).

- Since the 1990's there has been a significant temperature rise observed in the northern part of the province, leading to **permafrost thaw** (The Government of Quebec, 2008).
 - Recently the temperature of permafrost in northern Quebec rose an average of 1 to 1.5°C and the active layer (the surface layer that thaws during the summer), deepened (Bourque and Simonet, 2008).
 - Snow and ice conditions have become unpredictable and permafrost degradation is causing land subsidence and expansion of thermokarst lakes (Bourque and Simonet, 2008).

3.2.2 Climate Projections

Temperature and Precipitation

Quebec is expected to experience an increase in temperature, especially in the northern part of the province and in the winter months (The Government of Quebec, 2008).

- **Winter** mean temperatures are expected to **increase** by **2.5 to 3.5°C** in Northern Quebec and **1 to 2.5°C** in southern Quebec by 2020 (Meunier, 2007).
- Summer temperature rise for northern and southern Quebec is expected to be 1 to 2.5°C by 2020 (Meunier, 2007).
- Greater **variation of precipitation patterns** is predicted along with **increased frequency of heat extremes, drought, rain**, and winter warming (The Government of Quebec, 2008).
- **Sea level** is expected to **rise** with an increase in **coastal erosion** (The Government of Quebec, 2008).

3.2.2.1 The Northern Subregion

It is suggested that the northern part of the province will experience the most impact from climate change due to the changes in snow and ice conditions as a result of the predicted temperature increases (Bourque and Simonet, 2008). Various impacts are expected in northern Quebec including:

- Degradation to the permafrost layer resulting in ecosystem disturbance
- Peat bogs and wetlands may **dry** or **expand**, changing drainage networks
- **Shrub populations** may **expand** due to milder summers and greater snow cover protection, transforming ecosystems significantly and impacting wildlife
- The distribution of **animal species** is expected to **move northward**

- **Water temperatures will rise** and the hydrological regime will be affected to the extent that precipitation, evapotranspiration, and subsurface flow are affected
- **Changes to hydrology** will have a significant **effect** on regional **aquatic wildlife** (Bourque and Simonet, 2008).

3.2.2.2 The Central Subregion

The central part of the province, characterized by boreal forest and numerous lakes, rivers, and reservoirs, is predicted to experience increased temperatures (Bourque and Simonet, 2008).

- This anticipated warming is expected to accelerate the change in equilibrium between climate and forest that began with warming over the last century (Bourque and Simonet, 2008).
- Climate change is also expected to **change** the dynamics of natural disturbances, such as **forest fires, drought, insect outbreaks**, and the **frequency of extreme weather** events (Bourque and Simonet, 2008).
- The increasing CO² in the atmosphere may result in a fertilizing effect on **forests**, leading to an **increase in net productivity**.
 - However, nutrients and other factors may limit any gain from this (Bourque and Simonet, 2008).
- **Species** are expected to **migrate** in response to temperature increase; however, the rate of forest tree species migration would depend on the rate of dispersal per species and also soil fertility limitations depending on species soil nutrient requirements (Bourque and Simonet, 2008).

3.2.2.3 The Southern Subregion

Coastal zones are generally more vulnerable to climate change, which in southern Quebec, includes the St Lawrence estuary and part of the Gulf of St. Lawrence. The predicted impacts for this coastal zone area include:

- **Sea level** is expected to **rise** increasing **flood risks, salt water intrusion, and coastal erosion** (Bourque and Simonet, 2008).
- A **reduction** in the duration of **sea ice cover** and **freeze up period** is expected (Bourque and Simonet, 2008).
- The **frequency and severity of storm surges** is expected to **increase** (Bourque and Simonet, 2008).

3.3 ONTARIO REGION

The Ontario region is divided into southern, central and northern subregions based on physiographic, social and economic characteristics. Southern Ontario is characterized by mixed plains and the Great Lakes ecosystems. It is the most densely populated and includes major cities such as Toronto, Ottawa, and Windsor (Chiotti and Lavender, 2008). The central subregion of Ontario is characterized by Canadian Shield covered by boreal forest and includes more than half of the Ontario region (Chiotti and Lavender, 2008). Much of the landscape in Northern Ontario is low lying with poor drainage combined with areas of Boreal Shield and includes the coastal areas of Hudson and James Bays (Chiotti and Lavender, 2008). With very different geography, landscapes, climate and other characteristics across the subregions, the impacts of climate change, both at present and in the future, vary throughout Ontario.

3.3.1 Current Trends

Temperature and Precipitation

In Ontario, recent trends in temperature increase and precipitation pattern changes have been attributed to climate change.

- **Annual average temperatures** have **increased** by **0 to 1.4°C** across Ontario from 1948 to 2006 (Chiotti and Lavender, 2008).
 - Larger temperature increases have been observed in the spring (Chiotti and Lavender, 2008).
 - Trends show the largest increase in warm days between 1950 and 2003 has been in the northern part of the province (Chiotti and Lavender, 2008).
- **Change in precipitation patterns.** For example, snowfall has declined in the central part of the province but increased in the northern part of the province (Chiotti and Lavender, 2008).

This trend in increasing temperature has led to many other trends that have been documented in Ontario.

- **Near shore temperatures** at several locations around the Great Lakes have shown an **increase** since 1920 (Chiotti and Lavender, 2008).
 - The warming of the Great Lakes may have contributed to harmful impacts on the aquatic ecosystem associated with **extensive algae blooms** and **non-native invasions** of vertebrates and invertebrates (Chiotti and Lavender, 2008).

- **Changes to ice-cover and ice-free seasons** in southern and northern subregions.
 - The **ice-cover** period on the **Great Lakes** has been **shortened by 1 to 2 months** in the last 100 to 150 years (Chiotti and Lavender, 2008).
 - There has been a **reduction in numbers and health of polar bears** and changes to the aquatic and terrestrial ecosystem in the Hudson Bay area (Ontario's Expert Panel on Climate Change Adaptation, 2009).
 - The dependable **ice cover** in Eastern Hudson Bay that seals depend on for birthing and Polar bears depend on for hunting is **melting 2 to 3 weeks** earlier than 20 to 30 years ago (Chiotti and Lavender, 2008). Similar trends are occurring in the western part of Hudson Bay as well.
 - The decrease in sea-ice cover and earlier melt has led to long-term declines in the body condition of polar bear populations located in the western and southern part of Hudson Bay due to the bears having less time to forage and accumulated the fat they need for the ice free season (Chiotti and Lavender, 2008).
 - The western Hudson Bay population has experienced a decline from 1200 to less than 950 individuals from 1987 to 2004 (Chiotti and Lavender, 2008).
- Changes to aquatic and terrestrial ecosystems, especially in the northern subregion.
 - In 1997, a **shift** occurred in the **fish community** in northern Hudson Bay from Arctic to subarctic species (warmer water species) coinciding with a 50% reduction in mid-July ice covering Evans Strait from 1981 to 1999 (Chiotti and Lavender, 2008).

Extreme weather events and associated natural disasters are common in Ontario and Ontario has experienced some of the most severe extreme weather events in Canada (Chiotti and Lavender, 2008).

- Major storms with **freezing rain** and **high winds** are common across the province at least twice a year.
- The **highest frequency of tornadoes in Canada**, occur in the southern part of the Ontario (Chiotti and Lavender, 2008).
- It is evident that there has been an **increase in frequency and severity of extreme weather events** (Ontario's Expert Panel on Climate Change Adaptation, 2009).
 - The 1998 ice storm remains the costliest natural disaster event in Canadian history (Chiotti and Lavender, 2008). The ice storm not only affected Ontario, but southwestern Quebec, southern New Brunswick and Nova Scotia, and portions of the northeastern United States were hit with double the amount of freezing rain received in any other storm (Chiotti and Lavender, 2008).

- Recent **heat waves, drought, flooding, and warmer winters** in Ontario have resulted in impacts including **forest fires** and **lower water levels** in the Great Lakes (southern Ontario), and outbreaks in **water-borne diseases** (Chiotti and Lavender, 2008).

3.3.2 Climate Projections

Temperature and Precipitation

All future climate scenarios suggest an **increase in annual temperature** and almost all predict an **increase in annual precipitation** within the next 20 to 50 years in Ontario (Chiotti and Lavender, 2008).

- The maximum amount of warming is expected to occur in the winter in the northern part of Ontario (Chiotti and Lavender, 2008).
 - **Annual temperatures** are expected to increase by **2.3 to 3.0°C** in the south of the province and **3.2 to 4°C** in the far north of the province by 2050 compared with annual temperatures from 1961 to 1990 (Ontario's Expert Panel on Climate Change Adaptation, 2009).
 - The number of warm **days over 30°C** is projected to **more than double** by 2050 (Chiotti and Lavender, 2008).
- **Total precipitation** is not expected to change significantly by 2050 in the southern part of the province; however, a **5 to 15% increase** is expected in the **north** (Ontario's Expert Panel on Climate Change Adaptation, 2009).
 - In the southern part of the province most of the increase in winter precipitation will fall as rain, in the north most of the precipitation will fall as snow (Ontario's Expert Panel on Climate Change Adaptation, 2009).
 - Precipitation is expected to increase in the spring as well with the greatest increase to be experienced in the far north (Ontario's Expert Panel on Climate Change Adaptation, 2009).
 - Combining the **increase in winter and spring precipitation** will **increase** the risk of more **extreme spring run-off and flooding** (Ontario's Expert Panel on Climate Change Adaptation, 2009).

With predicted increases in annual temperatures and annual precipitation, Ontario will experience many other climate change impacts.

- It is predicted Ontario will experience **milder winters** and **warmer summers** (Chiotti and Lavender, 2008).

- **More frequent and severe of droughts, wind and rain storms, ice storms, heat waves, and tornadoes** are also expected (Ontario's Expert Panel on Climate Change Adaptation, 2009; Boland et al., 2004).
- **Increased evapotranspiration** is expected with the increase in temperature, resulting in **drier conditions** during the growing season (Boland et al., 2004).
- Evaporation and evapotranspiration rates are expected to increase and affect moisture availability due to warmer temperatures and **longer growing seasons** (Chiotti and Lavender, 2008).

Forests

Climate changes that occur over a relatively short period of time can have serious consequences on long lived forests, which are particularly important in Ontario as forest currently covers more than 74% of the land in Ontario (Boland et al., 2004).

- Warmer and drier conditions are expected to impact Ontario's forest directly (Boland et al., 2004).
- Water availability for forest plants depends on precipitation, soil capacity, and evaporative demand.
 - The balance of soil water of forested sites affects forest productivity (Colombo et al., 1998).
 - Because of shallow soils, moisture retention is limited and trees are **susceptible to drought** in this region (Chiotti and Lavender, 2008).
 - Therefore, the **frequency of forest fires** is expected to **rise** especially in the boreal forest, which covers most of Ontario's landscape (Boland et al., 2004).
- Insect outbreaks, disease, fire and wind are considered to be the primary sources of natural disturbance in the province, all of which are expected to be impacted by climate change (Chiotti and Lavender, 2008).
- A longer growing season, increased atmospheric CO² concentrations, increased frost-free period, and changes to the moisture supply and disturbance regime are all factors that will affect forest productivity (Chiotti and Lavender, 2008).
- Understory growth is expected to increase and potentially delay forest regeneration after a disturbance (Chiotti and Lavender, 2008).
- Climate stresses leave trees **more vulnerable to pests and disease** (Boland et al., 2004). The greatest impact of climate change will most likely be the **frequency,**

severity, and **duration of insect population and disease outbreaks** (Colombo et al., 1998).

- The development of plant disease epidemics has been linked with two main environmental factors, temperature and moisture (Boland et al., 2004).
- **Spruce budworm** is considered the most damaging forest insect in Ontario (Chiotti and Lavender, 2008).
- Drought and late springs are projected to increase due to climate change, which will favour spruce budworm infestations (Chiotti and Lavender, 2008).

Aquatic Ecosystems

The predicted temperature increases across Ontario will affect the aquatic ecosystems in many ways.

- Predicted warming is expected to lead to further **changes in ice cover extent and duration**, namely a **decrease** (Chiotti and Lavender, 2008).
 - Greater rates of evaporation and therefore **water loss will occur on lakes** with less ice cover (Chiotti and Lavender, 2008).
- Further warming of aquatic systems will exacerbate the issues of **algae bloom** and **non-native species** establishment (Chiotti and Lavender, 2008).
- All of the Great Lakes are expected to experience **water temperature rise**. The deepest and coldest lake, Lake Superior, is expected to rise in temperature by 3.5 to 5°C by 2050 (Chiotti and Lavender, 2008).
- A rise in water temperatures will affect the **fish composition** in lakes, favouring conditions for the **expansion** of fish populations with **warm-water** requirements and possibly even resulting in the **disappearance of cool and cold water species** in some lakes (Chiotti and Lavender, 2008).
 - **Non-native species** from warmer climates may find it easier to establish if lake temperatures continue to rise (Chiotti and Lavender, 2008).
- It is predicted that climate change will impact wetlands by **reducing water levels** and causing damage to wetlands that currently maintain shoreline integrity, filter contaminants, provide habitat, absorb excess storm water, reduce erosion, provide wintering and breeding habitat for waterfowl, and breeding and nursery habitat for many fish (Ontario's Expert Panel on Climate Change Adaptation, 2009; Chiotti and Lavender, 2008).

- The reduced water levels may result in the **disappearance of many wetlands** all together.

Ecosystems

Warmer winter temperatures are expected to cause a considerably **shorter ice cover** season on Hudson Bay and James Bay, severe impacts on ecosystems and species dependant on ice, **melting of discontinuous permafrost** along the coast, and loss of methane from the peat of the Lowlands (Ontario's Expert Panel on Climate Change Adaptation, 2009).

- Changes and reduction in permafrost is expected to decrease reproductive success in polar bears as they generally construct maternity dens in permafrost features such as palsen (Chiotti and Lavender, 2008).
- The projected **reduction in snowfall** and **increase in spring rainfall events** are expected to have a negative impact on seal reproductive success in Hudson Bay by impacting suitable birthing lairs (Chiotti and Lavender, 2008).
- Climate change is expected to cause **changes** in **distribution** of individual species and **ecosystem shifts** (Chiotti and Lavender, 2008).
 - Larger wildlife are predicted to be most affected by changes in landscape regimes (Chiotti and Lavender, 2008).
 - White tailed **deer** population are predicted to **expand further north** and **affect moose** populations by **spreading brain worm** and **increasing predation** (Chiotti and Lavender, 2008).

3.4 PRAIRIE REGION (SWAN LAKE CASE STUDY)

The Prairie region in Canada represents 20% of Canada by area, and is generally equally distributed between Alberta, Saskatchewan, and Manitoba. The majority of the region is comprised of boreal forest with the southern portion of the region (25%) representing 80% of Canada's agricultural land. Climate in the region is highly variable but is generally cold and subhumid with extreme differences in seasonal temperatures (Sauchyn and Kulshreshtha, 2008). There is high variation in precipitation from year to year in this region, and it ranges from less than 300mm in the semiarid grassland to more than 1000mm in the Rocky Mountains. Seasonal and prolonged water deficits define the natural environment and influence human activities despite the region having some of Canada's fastest growing cities and economies.

3.4.1 Current Trends

Temperature and Precipitation

- Over the prairies, there has been an **average increase in temperature of 1.6°C** since 1895 with spring showing the greatest amount of warming (Sauchyn and Kulshreshtha, 2008).
 - This increase in temperature has translated as **shorter winters and longer drier summers** (Sauchyn and Lapp, 2008).
- There has been a general **declining trend in precipitation** during the months of **November to February** (Sauchyn and Kulshreshtha, 2008).
- The **amount of days with precipitation has increased** over the Prairies; however, the amount of precipitation was **less than 5mm** on more than half of the days (Sauchyn and Kulshreshtha, 2008).

3.4.2 Climate Projections

Temperature and Precipitation

Precipitation and temperature are the most fundamental determinants of climate stress on the prairies (Swanson et al., 2007). Climate models generally **forecast drier and warmer conditions and increased climate variability** for the prairie region.

- The **mean annual temperature** across the prairies is **expected to increase 2 to 4.5°C** with largest increases occurring in the southern most part of the prairies (Nyirfa and Harron, 2001).
- A slight **increase in annual precipitation** is expected.
- Although an increase in precipitation is predicted, **more arid conditions** are expected because the **increased evapotranspiration**, due to warmer temperatures, will not be offset by the predicted precipitation increase.

Water Resources

For the prairie region, increases in **water scarcity** represent the **most serious climate risk** due to changes in winter precipitation, and increases in temperature and duration (Byrne, 1989).

- These risk include: lower summer stream flows, falling lake levels, retreating glaciers, and increasing soil and surface water deficits (Sauchyn and Kulshreshtha, 2008).
- As a result of **lower water quantities** and consequently **low stream flows, water quality** will be **negatively affected** from increasing concentrations of **contaminants**,

algae, and **pathogens** that cannot be transported out of a stream under low flow conditions (MCEC and IISD, 2001).

- In Manitoba, **water quality** could become a great concern because of potential **increases in water-borne transmission of diseases and bacteria**.

Extreme Weather and Weather-Related Events

Changes in the predictability of weather and an increase in frequency and severity of extreme weather events is predicted for the prairie region, most notable of which are a **greater frequency of local or regional flooding** (flash floods), **tornadoes**, and a **greater frequency and severity of droughts** (Sauchyn and Kulshreshtha, 2008).

- The prairies are historically a drought-sensitive area but with increasing annual and seasonal temperatures drought conditions will be exacerbated meaning **drought** condition will be of a **longer duration**.
- Rising annual and seasonal temperatures will **intensify droughts** (Sauchyn and Kulshreshtha, 2008).
- **Extreme precipitation** events are also more probable with increased temperatures (Sauchyn and Kulshreshtha, 2008).
- Conditions similar to these often result in **local or regional flooding**, as was the case in the South Saskatchewan River basin in 1995 and 2004 (Sauchyn and Kulshreshtha, 2008).

Ecosystems

In the prairies, aquatic and terrestrial ecosystems will be impacted by warming temperatures resulting in shifts in bioclimate, changes in disturbance regimes (e.g. insects and fire), stressed aquatic habitats, changes in animal behaviour, a loss of keystone species, a loss of habitat, changing plant and animal ranges and the invasions of non-native plants and animals (Sauchyn and Kulshreshtha, 2008).

- For example, a warming environment will **impact** species dependant on **seasonal wetlands** (Herrington et al., 1997).
 - The breeding grounds for 50 – 80% of Canadian duck populations are found in the prairies and the prairie pothole region lying in central North America is the most productive waterfowl habitat in the world (Sauchyn and Kulshreshtha, 2008).
 - **Waterfowl populations decline** in response to drought and habitat destruction (Sauchyn and Kulshreshtha, 2008).

- Decreasing water levels in the prairies will likely have negative impacts on waterfowl (Sauchyn and Kulshreshtha, 2008).
- Most of the variation in growth rates in mallards and other duck populations is attributable to weather fluctuations during the breeding period (Sauchyn and Kulshreshtha, 2008)
- For instance, higher temperatures and earlier snow melt resulted in **earlier nesting activity and hatching of geese** in northern regions (Sauchyn and Kulshreshtha, 2008).
- **Delayed ice formation and earlier break up** will also result in changes to aquatic and terrestrial ecosystems due to warming temperatures
- **Changes to wildlife migration patterns and population sizes** have been linked to a changing climate and more changes are anticipated (Sauchyn and Kulshreshtha, 2008).
- Higher temperatures and decreasing water levels will also stress aquatic species at risk (Sauchyn and Kulshreshtha, 2008).
 - Small **changes in temperature, turbidity, salinity or oxygen levels** (all of these are potentially climate change impacts) can **affect** many species of sensitive **fish**.

Forests

The southern extent of the boreal forest is presently vulnerable to **drought conditions** and it is expected to become increasingly vulnerable in the future (Sauchyn and Kulshreshtha, 2008).

- It is not surprising then that the **frequency of forest fires** is expected to **increase** as is the **fire intensity** and the **spatial scale** (Sauchyn and Kulshreshtha, 2008).
- However, the magnitude of these changes is a challenge to predict.
- Large scale disturbances, such as forest fires, **insect outbreaks** and **blowdowns** are strongly influenced by climatic factors, especially droughts which exacerbate forest fires, high temperatures and spruce budworm outbreaks (Sauchyn and Kulshreshtha, 2008).
- These disturbances **affect forest productivity** and **species composition** across the landscape.
- The **frequency and severity of insect outbreaks** is also anticipated to increase (Sauchyn and Kulshreshtha, 2008).

3.5 BRITISH COLUMBIA REGION (T'SOU-KE CASE STUDY)

British Columbia is the most physically and biologically diverse province in Canada. Climate is similarly highly variable and susceptible to changes in the oceanic pressure systems from the Pacific Ocean, which in turn are correlated with changing ocean temperatures and currents (Walker and Sydneysmith, 2008). British Columbia can be divided into a number of zones distinguished by climate, latitude, elevation and distance from the coast.

3.5.1 Current Trends

In British Columbia, as in all of the regions, local variability exists; however, general trends in changing climate have been observed across the province.

- Average annual temperatures have increased by 0.6°C in coastal regions, 1.1°C in central and southern interior regions, and 1.7°C in Northern BC from 1895 to 1995 (Gayton, 2008).
 - The temperature has been greater in the winter months than in summer (Gayton, 2008).
 - **Sea surface temperatures** along the coast of British Columbia **increased by 0.9 to 1.8°C** (Gayton, 2008).
- **Total annual precipitation** has **increased** by **20%** in the region (The Government of British Columbia, 2008).
- The **average annual precipitation increased** in southern BC by **2 to 4 %** per decade between the years 1929 to 1998 (Gayton, 2008).

British Columbia is experiencing several impacts from the changes in temperature and precipitation, such as **increasingly frequent** and **severe water shortages**, risk of land loss from **sea-level rise**, and increasing stress on forests (The Government of British Columbia, 2008).

- There has been a **decrease in snow accumulation** particularly at low elevations due to the temperature increase (Walker and Sydneysmith, 2008).
- An outbreak of **needle blight** on lodgepole pine has already been attributed to increased summer precipitation in northwest BC (Gayton, 2008).
- The wildfire seasons in 2003 and 2009 were the most dangerous and expensive on record (The Government of British Columbia, 2008).

- **Seasonal droughts** occurred in 2003 and 2009 and **threatened water resources** (The Government of British Columbia, 2008).
- BC **glaciers** are **retreating** at a rate **faster** now than in the past 8000 years (Walker and Sydneysmith, 2008).
 - Two large glaciers in southern BC retreated more than one kilometre each from 1895 to 1995 (Gayton, 2008).
 - BC has lost over 50% of its ice pack in the last 50 to 100 years (The Government of British Columbia, 2008).
 - Alpine glaciers are melting rapidly and **affecting regional hydrology** (Walker and Sydneysmith, 2008).
- Temperature increases in BC have resulted in a reduced snowpack, even in snowmelt basins where winter precipitation has increased (Walker and Sydneysmith, 2008).
 - The reduction in snowpack has **changed streamflow volume** and **timing** (Walker and Sydneysmith, 2008).
- **Floods** have resulted from **increased precipitation** and **faster snowmelts** in the Fraser Valley and other parts of the province (The Government of British Columbia, 2008).
 - **Streamflows** have **increased** throughout the year in the northern regions (Gayton, 2008).
 - Many snowmelt dominated river systems in BC are showing patterns of discharging more of their total annual flow earlier in the year; the Fraser River is one example (Gayton, 2008).
 - Many lakes and rivers are experiencing **shorter periods of ice cover** (Walker and Sydneysmith, 2008).
- **Extreme climate events** and **variability** have already had an impact in BC. Climate variability in BC is strongly influenced by two major ocean-atmosphere phenomena: the El Nino-Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO).
 - The frequency and intensity of these two ocean-atmosphere phenomena appear to be changing in response to climate change (Walker and Sydneysmith, 2008).
- Fire suppression along with **warmer winters** and **longer growing seasons** have affected infestations of **mountain pine beetle** which impacted more than 14.5 million hectares of forest in B.C. from 1990 to 2008 (The Government of British Columbia, 2008).
 - The mountain beetle infestations have a profound effect on forest ecosystems.

- The larval stage occurs over winter and the larvae are highly susceptible to cold temperatures in the early stages but not in the late stages (Gayton, 2008).
- When more larvae reach the late larval stage because of longer growing seasons and milder winters, more survive to emerge the following year (Gayton, 2008).
- There have been changes in seasonal patterns throughout the province in the past several decades.
 - On the coast, the **wet season** has become **wetter and shorter**, while the **dry season** has become **drier and longer** (Gayton, 2008).
 - Between 1950 and 2004, the length of the **frost free season increased by 21 days** (Gayton, 2008).
 - **Hydrologic spring** is now **earlier** and **summer** is **extended** in the Southern Interior.
 - The **growing degree days increased by 5 to 16%** across the province from 1888 to 1992 (Gayton, 2008).

3.5.2 Climate Projections

Future climate change projections for the British Columbia region are developed using a set of global climate models and greenhouse gas emission scenarios applied over large areas. Therefore, the scenarios represent a range of possible climate changes and impacts rather than specific projections so there will be local variation and not all parts of British Columbia will experience significant climate change (Gayton, 2008).

Temperature and Precipitation

British Columbia is expected to experience a continued rise in temperatures and changes to precipitation.

- The **average annual temperature** is predicted to **rise by 1 to 4°C** by 2100 (Gayton, 2008).
 - Winter temperatures are predicted to warm faster than summer and northern BC is expected to warm faster than the rest of the province (Gayton, 2008).
- **Average annual precipitation** is expected to **increase** up to **20 %** by 2100 (Gayton, 2008).
 - Winter precipitation is expected to continue to increase and a greater proportion is expected to fall as rain (Gayton, 2008).

Extreme Weather and Weather Related Events

One of the biggest threats of climate change to British Columbia is the effects of extreme weather and weather related events (Walker and Sydneysmith, 2008).

- The frequency and severity of precipitation events are expected to increase (Walker and Sydneysmith, 2008).
- **Higher frequency extreme precipitation** events coupled with **rising sea-level** is expected to **increase** the risk of **flooding** (Walker and Sydneysmith, 2008).

Hydrology

Substantial changes are expected to the hydrology in British Columbia, particularly to glacier-fed systems (Gayton, 2008).

- The disappearance of glaciers in the Columbia River Basin could **reduce flows** of the **river by 20 to 90%** during the July to October flows (Gayton, 2008).
- Many snow-dominated river systems will experience a **decrease in summer streamflows** resulting in **lower water quality** and **warmer water temperatures** (Gayton, 2008).
- A combination of earlier snow melt and reduced snowpack will result in **earlier peak flows in spring** and **reduced flows from April to September** (Walker and Sydneysmith, 2008).
- Smaller glaciers, shifts in timing and amount of precipitation, and a decrease in snowpack are expected (Walker and Sydneysmith, 2008).
 - The changes in temperature and precipitation will continue to reduce snowpack and **increase winter runoff** (Walker and Sydneysmith, 2008).
 - Many alpine glaciers may disappear in the next 100 years (Walker and Sydneysmith, 2008).
- A decrease in groundwater discharge could add to **surface water temperature increase** because groundwater discharge helps to regulate stream temperature (Walker and Sydneysmith, 2008).
 - Changes in temperature and precipitation affect groundwater recharge rates and water table depth (Walker and Sydneysmith, 2008).

Ecosystems

Flora and fauna in British Columbia have been altered significantly in response to climate change and will do so again (Gayton, 2008). Ecosystems will experience **loss of some species, changes** in the **dominance of species**, and **arrival of new species** (Gayton, 2008).

- Ecosystems are expected to adjust to the changing conditions at the species level rather than the community or ecosystem level.
 - There are several species in BC that have shown **abrupt changes in abundance and/or distribution** in response to relatively minor climate changes in the past.
 - These species include: **western red cedar, pacific salmon, sardine, anchovy, and mountain pine beetle** (Walker and Sydneysmith, 2008).
- The greatest impacts of climate change are expected to be **shifts to different dominant species** that are favoured by the new conditions by either subdominant species taking over dominant ones or **species migrating** from other regions (Gayton, 2008).
- Large **shifts in species ranges** are expected to occur with climate change (Walker and Sydneysmith, 2008).
- Many specialized habitats in BC including **alpine ecosystems** and **deserts** are expected to experience a **reduction in extent and/or become fragmented** (Walker and Sydneysmith, 2008).
- The number of infectious human diseases and mammalian wildlife diseases are expected to rise due to climate change (Gayton, 2008).

Forests

Forests may experience a variety of impacts due to climate change, including: extreme weather related **disturbances, ecosystem simplification, species migration, stand age reduction, extinction** and/or **extirpation of local species, increase in invasive species, pests and disease**, and **changes in species dominance** (Gayton, 2008).

- **Forest fires** may already be **more frequent and severe**, a trend which is expected to continue in western Canada (Walker and Sydneysmith, 2008).
- The Mountain Pine Beetle outbreak, linked to climate change and other factors is a massive impact which has transformed the social-ecological dynamics of the interior of the province for decades to come.

Biodiversity

Changes in climate averages, climate variability, and climate extremes affect all aspects of biodiversity. Climate is recognized as a major controlling factor in plant and animal species compositions, global vegetation structure, and productivity (Gayton, 2008).

- The response of species to climate change can be one of four ways: go extinct, evolve, adapt to new conditions, or migrate to more suitable areas (Gayton, 2008).

- It is expected that increases climate and weather extremes such as droughts, severe storms, and cold periods may determine species distribution over changes in climate averages (Gayton, 2008).
- Many **species** will be **forced to migrate** across natural barriers, challenging the capacity of BC's system to maintain biodiversity with protected areas (Walker and Sydneysmith, 2008).
- Climate change is expected to result in loss of ecosystems, ecosystem and species shifts, changes in habitat quality and availability, increase in growing degree days, changes in timing synchronicity between species and predator prey relationships (Gayton, 2008).
- **Wildfires** are expected to **increase in severity and frequency**, posing challenges for ecosystems.
 - Those ecosystems that are fire maintained such as **Garry oak and Ponderosa pine forests may expand** (Walker and Sydneysmith, 2008).
 - Outbreaks of **mountain pine beetle** and **spruce bark beetle** are expected to continue to increase and persist with warming temperatures (Walker and Sydneysmith, 2008).

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APPENDIX C
PRIMARY CASE STUDY REPORT

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1.0 INTRODUCTION

Communities in Canada's Arctic are the subject of intensive efforts to document and understand the processes of climate change and how best to respond and adapt to a new climate, a new environment, and a new economy. Aboriginal communities south of the 60th parallel on the other hand, receive relatively less attention with respect to both the impacts of climate change and the ability of communities to adapt. As a result, relatively little detailed information is available about existing environmental impacts of climate change, especially in some ecoregions. While this is true for virtually all communities south of 60, it is particularly true of Aboriginal communities.

Little is known about the capacity of Aboriginal communities south of 60 to effectively respond to the impacts of climate change in terms of their culture, social relations, economic well-being and traditional and current patterns of governance. While these communities may not currently experience climate change effects to the same magnitude as communities in the north, this lack of research and attention increases the uncertainty about existing and future impacts. This uncertainty may actually put southern communities at greater risk to these impacts.

While climate change impacts everyone, it has a particularly adverse affect on Aboriginal peoples. There are many factors that create unique vulnerabilities for Aboriginal peoples such as location, poor socio-economic conditions, poor health status and inadequate infrastructure. In addition, the fact that the lifestyles of Aboriginal peoples are often more connected economically and culturally linked to the natural environment makes them more affected by climate change impacts. Therefore there is a need for detailed research on climate risks in Aboriginal communities south of 60 and their ability to respond to these risks.

When people think of climate change, they often think of the physical impacts it will have on a community (e.g. loss of lives, damage to infrastructure, etc.). However, the full effects of climate change on communities are not only dependent on environmental elements, such as whether a group of people live in a flood plain or are prone to forest fires; it is just as dependent on other elements such as the way a community makes decisions and works together. The social, economic and political elements of a community are key to understanding a community's 'ability' to adapt to change, in general, as well as specifically to climate change.

Centre for Indigenous Environmental Resources (CIER) and the University of British Columbia (UBC) partnered on a 3-year collaborative project to produce an Aboriginal Climate Risk and Adaptive Capacity Assessment report. The goals of this project were to:

- Increase knowledge about the risks climate change poses to these communities and how these are linked to other challenges and stressors;
- Assess resilience of these communities, in their ability to respond with direct and indirect effects of climate change, including the factors that may lead some Aboriginal communities to be more at risk than others.
- Look specifically at the role of institutions in determining how well or how poorly these communities are able to reduce the negative impacts and take advantage of potential opportunities associated with climate change.

The project team tried to understand these goals through Aboriginal community case studies, that is, by hearing from four First Nation communities¹: Potlotek First Nation (NS), Waskaganish First Nation (QC), Swan Lake First Nation (MB), and T'Sou-ke First Nation (BC). In trying to understand a community's ability to respond to climate change, we explored the local understandings of key social, cultural, economic, ecological and climate changes facing the community, along with the ways that the community has responded to these changes in the past, and things that have helped or hindered this response.

It is our hope that the participating communities will benefit from this research by better understanding the elements (environmental, social, economic, political, cultural) of their community that contribute to their resilience (the ability of a community to cope with, recover from or plan for hazardous conditions) not only to climate change but to change in general. In better understanding these elements, they can take steps to strengthen those elements that contribute to their resilience.

This report provides a summary of the information gathered about each case study community. The community results section provides results for each First Nation separately and is covered in three main sections.

Climate change impacts

¹ We tried to engage Inuit and Métis communities south of 60 to participate in the case study work and were unsuccessful in our attempts

The first section provides information about climate change impacts that are currently taking place and predicted to happen in the various case study regions. An important part of a community's ability to respond to future climate changes is knowing what those changes will be, since every region in Canada is different. The climate change information was provided to document what climate change impacts the communities have experienced and will expect to experience and have to respond to in the future. This information was gathered from current literature.

Interview results and analysis

The project team carried out interviews with members and/or staff of each case study community between January and July 2010. We transcribed and analysed voice recordings of all interviews from the four case study communities, which are summarized together in Section 3.2 of the assessment report. The results and analysis sections of this report provides five key areas from the interviews in each First Nation including: (1) description of community and community change, (2) livelihoods, activities and environmental change, (3) managing and coping with change, (4) governance and community capacity, and (5) environmental and climate changes in context.

Community profile: background information on the community

The community background information provides context to the issues discussed in the interviews by supplying information about the community. It provides information on topics such as a physical description of the community, governance, economy, basic services, education, health etc. This information was gathered from literature and from conversations with First Nation members and/or staff.

This report is concluded with a discussion section for all case study communities combined.

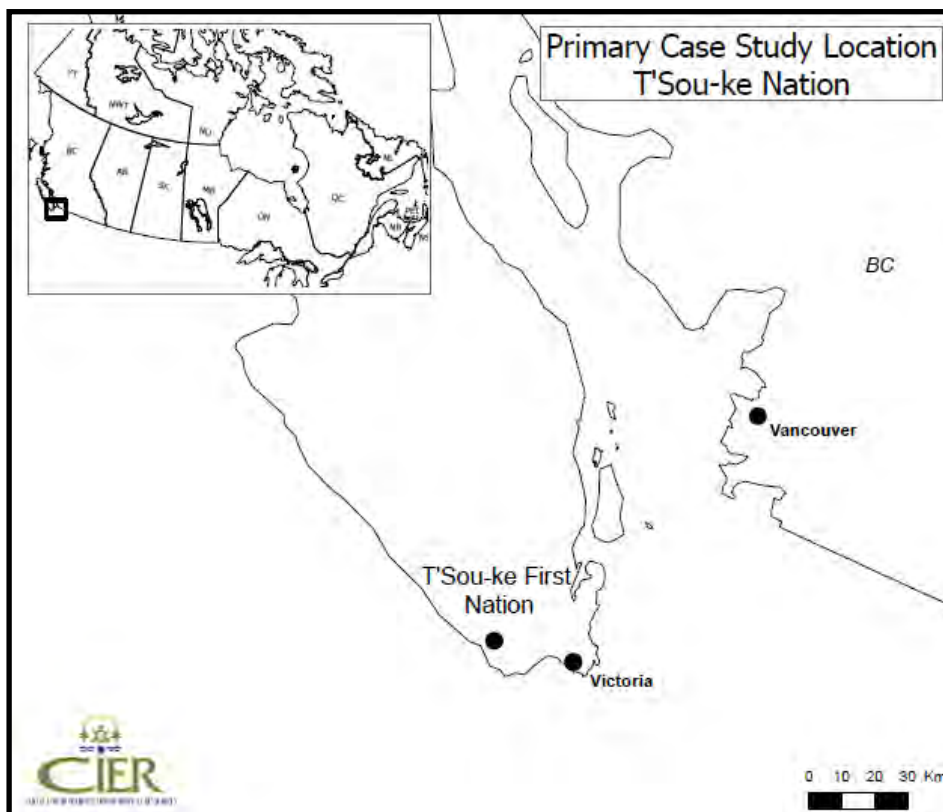
2.0 COMMUNITY RESULTS

2.1 T'SOU-KE FIRST NATION

2.1.1 Climate change impacts

T'Sou-ke Nation is located along the southern end of Vancouver Island in British Columbia (see Figure 1. for location) and lies within the Pacific Maritime ecozone and Eastern Vancouver Island ecological region (ecoregion). The Pacific Maritime ecozone has some of the warmest, wettest and most humid conditions in Canada as determined by its location on the Pacific Ocean and its mountainous terrain; consisting of mild, humid conditions at lower elevations along the coasts and cool, very humid conditions at higher elevations in the mountains (Parks Canada, 2009; Natural Resources Canada, 2007).

Figure 1: Location of T'Sou-ke First Nation



Mean annual temperatures range from 4.5°C to 9°C. Mean winter temperatures range from 0.5°C to 3.5°C and mean summer temperatures from 10°C to 15.5°C (Natural Resources

Canada, 2007). Mean annual precipitation is very high throughout the ecozone varying from 1500 mm to 3000 mm (Natural Resources Canada, 2007). The Eastern Vancouver Island ecoregion can be characterized as having warm, dry summers and wet, very dry mild winters (Ecological Stratification Working Group [ESWG], 1995). The mean annual temperature is approximately 9°C making it the mildest in Canada, with a summer mean of 14°C and a winter mean of 3.5°C. Mean annual precipitation ranges from 800 mm at lower elevations to 2500 mm at higher elevations (ESWG, 1995).

2.1.1.1 Current Impacts

Temperatures have increased 1 to 2°C in the winter and 0 to 1°C in the summer from 1900 to 2004 (Murdock, 2008). Changes in precipitation varied across the island from no change to increases of 5 to 20% in winter and summer from 1900 to 2004 (Murdock, 2008).

2.1.1.2 Predicted Impacts

For Vancouver Island, temperature and precipitation is predicted to continue to increase which will lead to many other secondary climate impacts.

- Temperature is expected to increase by 2 to 4°C and precipitation by 5 to 20% in the winter by 2050 on Vancouver Island (Murdock, 2008).
- In the summer the temperature is expected to increase 2 to 3°C and precipitation is expected to increase 0 to 10% by 2050 (Murdock, 2008).
- Impacts as a result of the changing climate faced on Vancouver Island are potentially drier summers and wetter winters, sea-level rise, and increased extreme weather related events.

2.1.1.3 Sensitivities of T'Sou-ke Nation

A community's sensitivity (high or low) to climate change reflects how climate change will affect the economic, environmental, cultural, and social aspects of a community. Given the current and predicted climate change impacts identified for the area within which T'Sou-ke Nation is located, what does this mean for the community?

For T'Sou-ke Nation climate change could have cultural, social and economic implications. Cultural implications could include: loss of access to land due to coastal flooding, decrease in safety on the land due to increases in unpredictable weather and extreme weather, and a loss

of cultural sites due to sea level rise. Social implications could include: infrastructure impacts (increases in flood damage to buildings, roads, bridges, rail lines, etc.) and health impacts (increase in air pollution, water and food borne pathogens). Economic implications could include an increased risk to forestry operations due to affects on forest fires and insect infestation.

It is difficult to predict the sensitivity for this region because El Nino and PDO (Pacific Decadal Oscillation) highly influence variability in the climate (Walker and Sydneysmith, 2008). The influence of El Nino and PDO could intensify or damper the effects of climate change. However, climate change could have the following environmental implications for T'Sou-ke Nation:

Sea-level Rise

T'Sou-ke Nation is a coastal community and therefore may be highly susceptible to the impacts from sea-level rise.

- Sea-level rise has been slowed by geologic uplift in many areas on the coast, however, there are portions of the southern part of Vancouver Island that are considered highly sensitive to sea level rise (Walker and Sydneysmith, 2008).
- Sea- level rise is expected to cause flooding and erosion resulting in damage to infrastructure and archaeological sites.
- Higher sea levels also increase the threat of damage from tsunamis.

Increasing Extreme Weather Events

Being a coastal community, T'Sou-ke Nation may be highly susceptible to the impacts from increased severe weather.

- Winter storms are common, however, if frequency and severity of extreme weather events increases as predicted, T'Sou-ke Nation will be highly susceptible to the impacts.
 - In December 2006 a wind storm hit southern Vancouver Island and resulted in power outage for a minimum of 18 hours up to 8 days for many residents of Sooke, BC (Sorensen and Lewers, 2006).
 - Many homes and vehicles were destroyed and damaged.
 - The fire station was the only emergency shelter that was able to supply hot meals (Sorensen and Lewers, 2006).

Water

Changes in temperature and precipitation alter hydrology, which in turn impacts water supplies by changing water quality and quantity (Werner, 2007). Changing of water quality and quantity

and extreme events are anticipated to strongly impact the water supply of residents on southern Vancouver Island (Rodenhuis et al., 2009).

- Rising temperature in the future is likely going to draw on surface water reserves because of increasing evaporation rates (Werner, 2007).
- It is possible for conditions in the future to become both wetter and drier by precipitation events increasing in the wet season and decreasing in the dry season (Werner, 2007).
 - This may challenge water supplies if storage is unable to capture the increased magnitude of wet season precipitation and if, in the dry season, there is not enough precipitation coupled with high evaporation rates.
- Increases in water temperatures, increases in suspended solids from more frequent severe weather, and increased bacterial growths are all factors expected to affect water quality (Werner, 2007).

Forests and Fish

Although members of T'Sou-ke Nation are not as involved in forestry and fishing as they once were, forestry activities and commercial fishing remain a part of the community's economic activity.

- The predicted impact to forests and increase in ocean temperature will likely have a negative effect on these activities.

2.1.2 Interview Results

2.1.2.1 Description of community and community change

This section provides a general description of T'Sou-ke Nation and discusses recent changes that have taken place in the community, including:

- Increased unity within community
- Growth in band staff, programs and services
- Move towards more sustainable economies
- Cultural revitalization
- Greater environmental awareness and greater self sustainability

T'Sou-ke is a small close knit community that is 'rich' with friendly and passionate people. It was described as a peaceful, quiet community where people are friendly, outgoing, proud of their community and keen on what's happening in the community. They were also described as a 'rich' community, since there are a lot of people who are passionate about arts and culture and environmental issues. In terms of their location, T'Sou-ke First Nation is along the southern coast of Vancouver Island. There is an abundance of sea life in the area and people are tied to the water in their traditional territory. One interviewee described the community in this way: "I'd say this is one of the most peaceful communities. One of the most peaceful and beautiful settings where people now come together as one. "

Many interviewees talked about the greater unity that now exists between community members. In the past there were conflicts between families that lasted for many years. This made it difficult for people to work together. In the last 10 years, people have now started to work together. Now whole families and the community are more united.

...our community has become quite unique in the way that we work together. We've come a long way and worked hard at meeting each other's half way so I think our community is, is very community minded and I think that's the reason many of our projects have been successful....There was [a time when], our families were separated and weren't willing to work together at that point. And, I used the term "Hatfield and McCoy" because there was much of family feud thing that were going from generation to generation and to the point where I don't think anyone really knew what, why we weren't getting along with one particular family or another. And, I think it became clear that it wasn't getting us anywhere.
(#29)

T'Sou-ke Nation has seen large growth in administrative staff and programs and services. There was a time when all they had were Chief and Councillors and three band staff, and now there are up to 20 people employed by the band. With these new positions, new capacity was developed by Band staff in different areas. For example, the staff have developed their skills that are required to maintain their position (e.g. writing proposals to fund position), and increasing their knowledge to carry out successful projects.

General employment has changed in the community towards more sustainable economies. T'Sou-ke Nation, like the neighbouring Sooke district, experienced massive unemployment due to the collapse of the fishery and forestry industries. Now there are new jobs available, either at

the Band level or in the town of Sooke (e.g. construction). In addition, T'Sou-ke Nation is moving into more sustainable economic ventures such as their solar project and greenhouse project. They see this concept of sustainability as grounded in their culture.

I think another positive impact is that the natural progression from, you know, these failing industries, we need to move from those to more sustainable ways of life. And it's a huge positive. We're in the prime position to be doing that because we were doing it for so many years, so it doesn't take a lot to go back and go, Okay, what did we do, and, let's do it again. (#35)

T'Sou-ke Nation is also undergoing a process of cultural revitalization. They have a member on staff who is committed to implementing cultural programs and holds regular craft nights. The current Chief of T'Sou-ke is also very culturally minded and makes this a priority. They have culture nights every week, which was initiated by the Chief, where people come and eat, sing and play drums. The elders are happy about the renewed interest by the membership in these cultural practises, that it is not being forgotten. There is, however, some disagreements over what T'Sou-kes' culture is. For example, some people say if they have not grown up with it, then it is not part of their culture, but others see it as important to include those practises farther back in their history, even if they didn't grow up with it.

Cultural revitalization, that's been a huge change. It's been a big transformation just in the last few years. We have a chief who is a very culturally minded person and got a lot of wisdom from his parents and grandparents and, regarding hunting and fishing and our traditional territory... and because of that...it shows, it, you know flows down... For me, personally, it's what identified us. It's what we have that makes us who we are. If we didn't have our culture there would be no point to being here. So I think it's an extremely important thing. (#35)

With this cultural revival members have also tied this in with environmental awareness and greater self -sustainability. There has been a general increase in environmental awareness in membership. Some concrete examples are that every house in the community now has a recycle box and people don't burn their garbage anymore. Young people getting more involved in environmental initiatives (e.g. TSEG – a youth environmental group). T'Sou-ke also has staff educating people about what climate change means and how it impacts them.

2.1.2.2 Livelihoods, activities and environmental change

This section discusses the activities T'Sou-ke members do to make a living and/or feed their families, changes in environmental issues in the community and how it has impacted T'Sou-ke members. The areas discussed include: hunting, fishing/harvesting seafood, forestry/gathering plant materials, water, and weather.

People in T'Sou-ke go out hunting and share the meat among community members. The animals most often hunted are deer, moose and elk, and ducks, though duck hunting took place more in the past. T'Sou-ke members hunt deer near the community, in their traditional territory. To hunt moose and elk, they go to the mainland and get permission from First Nations to hunt on their territory. As part of work with the HEAL program (Healthy Eating Active Living), the band asked hunters to go and hunt for the community. They bring back meat for the elders and for consumption at community functions. Wild foods (e.g. meat, fish) are held in community freezers and are shared among community members. Some interviewees said less people are hunting now compared to when they were young but others say there is a renewed interest in hunting and people wanting to exercise their rights to hunt. Interviewees described that there are now more regulations/laws to abide by when out hunting. Previously people just went out and hunted, now people (especially younger people interested in taking up hunting) are required to take gun safety courses, etc.

Hunting by community members has been impacted by changes to the land and decreased animal populations. T'Sou-ke members are essentially getting 'pushed out' of their old hunting areas, due to residential development and park creation in their traditional territory. Deer populations are declining in their usual areas due to loss of habitat (i.e. clear cutting for development), so hunters now have to go farther and farther to find them. The deer are now migrating into residential/urban areas because of issues such as people feeding them, the deer being attracted to peoples' gardens, and the deer seeking protection from cougars.

So we're getting pushed out of all our hunting area.... And you wonder why there's so much deer down below. Because they're getting pushed out of their habitat. It's like us getting pushed out of our habitat, our area to go find deer....I used to duck hunt down here. Years and years before all these houses were here. Now, we can't even do that... So that's all gone. (#40)

Hunting deer is something where it's been passed down generation to generation. In the last few years the deer population has dropped significantly. And, we actually hunt moose and elk and deer in other areas within BC and Alberta...I asked permission through...the bands...we ask permission to hunt in their territory. (#28)

Water is very significant to the people of T'Sou-ke Nation and water resources have been decreasing and subject to pollution in T'Sou-ke territory. Recently (since the 1990's), Sooke district have started to impose water restrictions in the summertime, which limits when people can water their lawns, etc. One interviewee had noticed that at the time of the interviews, water restrictions had come quite early in the summer that year. Water quality in the Sooke Harbour and Sooke Basin has been poor, mainly due to leaky septic tanks. Everyone was on septic systems in the past and they were often not maintained properly. Recently Sooke had a sewer treatment plant built which was thought to improve things.

I think water is one of the main, main, main things that we are dependent on in our traditional territory. Our river is like I say our lake, we call them smokehouse lakes up in the hills and they are the most integral part, because that's the heart of our traditional territory, that is like the veins that keep us alive and we're so dependent on that river for survival. Also for our salmon and we're all connected to these resources and water is integral for our forests, our everything, its everything. And, if that changes, it doesn't change one thing, it doesn't change things for us, it changes things for all of us, and the animals and the environment. So, it's not just us that we're concerned about, it's concerned about everything on mother earth. (#37)

Harvesting fish and seafood plays a big part of the cultural fabric of T'Sou-ke Nation. Even their language is tied to the salmon, as one interviewee said, "Our language follows the salmon". T'Sou-ke members' fish year round for sustenance. Salmon is probably their most important fish (e.g. Chinook/chum, Coho, Sockeye, pink, dog), and has been a staple food for their community. Salmon is always provided at cultural events, and the community is expected to have them when they host events. The members also eat many other fish such as halibut, black cod, lingcod, and rockfish.

It's a part of who we are; we are the salmon people ... it's a main staple of our diet and at one time you were dependant on that almost daily and now how much salmon is out there. It's dwindled down to being able to not have a part of our diet as we like. (#37)

Salmon and other fish populations are declining due to a number of factors. Salmon especially (e.g. Sockeye) are declining. This has been attributed to: overfishing, poor forestry practises (logging, silt in water, affect spawn), warming waters, agricultural activities alongside rivers, and a lack of rain/moisture (creeks drying up).

And fishing is our main, fishing is the main resource here and I have been a fisher-person myself, in the past and I see definitely, the loss of our salmon. Population of the salmon is just remarkably dwindling each year and where we used to have summer and fall smoking our salmon and canning and that, you know, would take all day, because we had lots of salmon. That doesn't happen anymore... we didn't do any smoking last year, at least my family didn't because then you make a choice is there, we only had a few pieces of salmon. So, you either had it right away or canned it or froze it. (#29)

While historically fisheries were critical to the economy in T'Sou-ke Nation, they continue to have importance today. Many members were employed in the commercial fisheries in the past. There used to be a building dedicated to staff and programs related to fish, now there is only a fisheries director and several fishermen employed by the band. Now T'Sou-ke members only fish at certain times of the year for the commercial fishery. Since the collapse of the fishery, everyone now takes a more conservation oriented approach to commercially harvested fish, as one interviewee described, "We need to save the fish before we can fish them."

T'Sou-ke members have also found that local shellfish is also more difficult to harvest. There are fewer areas that can be harvested for shellfish. Some areas that were previously used for harvesting shellfish are no longer accessible due to development. Clams can no longer be harvested from Sooke Harbour (previously a key area for harvesting) because of the pollution in Sooke basin, due to leaky septic tanks and some say also mill effluent. Now, people can only harvest crabs and shrimp in the Sooke harbour. The area around Wiffins Spit is a location that is not polluted, but interviewees said shellfish are more difficult to harvest there; some say this is because of the construction of the Spit, which reduced water flow and had a negative impact on the area.

That's one of the things that a lot of feedback from the community has been local shellfish stocks. They're getting difficult to harvest. I think a lot of it is water quality, pollution, everybody's got a septic field and the big rains come, everything runs downhill, the Sooke

harbour and basin, it's like the bowl effect. When it rains, everything just runs straight down into the saltwater. (#38)

I've heard them talk about, Wiffin Spit. I guess it never used to be there. It was built and put in, and so I guess that stopped some of the natural flow through the basin and harbour. So, that's created some of it as well. (#40)

So every single place of where we used to just go get seafood, you can't do it, because of, ah, the growth in Sooke I guess. Can't get to it. (#33)

The decreased availability of fish and shellfish has impacted people in various ways including health wise, culturally and economically. People can't get enough fish and shellfish (e.g. clams, crabs and fish) that they would normally gather for food. This means they have less of it, since many can't afford to buy seafood as much as they would like to eat it; for example some interviewees used to have it once a week, now they have it once every couple months. Basically, people are missing out on something they've been used to having all their life, which has the greatest impact on the elders. As one interviewee explained, "something that's been a part of your life, all your life is suddenly unavailable." Community members miss out the nutritional benefit they get from the fish and shellfish. In addition to not being able to get enough to eat themselves, they are unable to share their harvest at social/cultural events (e.g. wedding, funerals), which is typically done. Also, by not being able to harvest fish, they lose out on the cultural aspect of harvesting and the teachings associated with it; the youth in their communities will be the ones who will most miss out on this. Economically, the decline in fish had a huge impact on the community when fisheries industry slowed down, since many members were employed in this sector. Also, some families used to make a living digging clams in Sooke Harbour, but they can't afford to do this with the added costs of depuration. Shellfish harvested in Sooke Basin have to be put through a depuration plant to remove any pollution, then be tested and approved to be able to sell or eat.

Well, for us it would be very important, because we've relied on our salmon for a main staple of our diet forever and now that can be compromised, where our whole reason of being as T'Sou-ke people will change forever. And, then you have to adapt to another way of taking different seafoods instead of salmon and that would be really hard. (#37)

You know, for social gatherings...we invite the outside community to ... they come down here they want some smoked salmon and, and we don't always have the ability to provide that anymore. So it's, I guess culturally it's almost a little embarrassing, you know, like we're a band and we can't give you fish, you know. ...so it does impact our cultural practice to not have the salmon. (#35)

It would affect individuals quite significantly, in terms of their standard of living. One time salmon fishing was the backbone of the fishery and everybody back in the '80s was making big money, making lots of money. It wasn't very surprising to see some boats come in with eighty thousand, ninety thousand dollar fishing trips, you know, in like 8-10 days. You know, that'd be gross. You don't see that anymore. (#38)

That's going back to the traditional foods and what we used to eat, and it's just not readily available for us, to be able to just go down onto our beach and grab a bucket of clams to have for dinner...So yeah, I'd say it's definitely impacted the community. . . Well, now you know, then you're starting to get into the health issues of the diabetes and all of that kind of stuff within First Nations communities is, you know, we're eating all of this unhealthy food, because the other stuff is just not available, right. (#39)

Forestry used to be an important part of the economy in T'Sou-ke Nation and surrounding areas. Many people in T'Sou-ke were working in the forestry industry, usually as loggers or in mills. Interviewees attributed the collapse of the forestry industry to a number of issues, one of which was general overharvesting. Ninety five percent of the trees in T'Sou-ke territory have been logged/clear cut; there is no old growth left. Another reason that affected job availability is the change in processing to the export of raw logs instead of processing in local mills. Also, the move to more modern logging methods, which is based on new technology and reduces the need for manpower/human labour, also decreased the job availability. This lack of jobs impacted people's ability to make a living, since for many it was their way of life. All the skills some people had were in forestry and for some, they were at an age where it was difficult to learn new skills. In addition to poverty this led to low morale among the displaced forestry workers, since they weren't able to make money to feed their families. Also, some interviewees commented that there is not as much monitoring now to ensure that environmental standards are met.

I know in the previous generation, there was like two jobs for a man to get and that was mainly logging and fishing. So yeah, most people were employed by the forestry industry, there is nothing left now, especially now that the logging companies are selling off other land to build condos and stuff. (#37)

There is a renewed interest by T'Sou-ke members in berry picking but berries are harder to find now. Picking berries is a 'big thing' in the summer; some members pick blackberries to sell. There is a resurgence of picking native plants in the community that is mainly tied to the greenhouse project. The person running the greenhouse and other staff organize field trips to go pick berries and other plants. Members are finding it more difficult to find berries and traditional plants, especially in walking distance, due to development in the area (e.g. housing, roads). Not having access to berries means members lose out on the nutritional aspects of berry picking and the social aspects as well.

Yeah, I think so. I think it's [not berry picking]...probably not as healthy. But on the community, as a sense of community, probably, well, I guess it had, does have an impact. Because when everybody's out there pickin' berries and talking and having jam-making parties . . . (#34)

Erosion on the banks of the main reserve (IR #1) is a concern for T'Sou-ke members. Erosion was listed as a priority environmental community concern during the Environment Department's environmental scan. Behind the band office, there is an area where kids used to play, which is now eroding due to natural causes; there has already been 10-20 feet lost to erosion. This erosion is an even bigger concern because some of the community's ancestors are buried in this area and bones are starting to be exposed from the erosion. Also, the area that T'Sou-ke Nation has to live on is a relatively small area and erosion is shrinking this.

T'Sou-ke residents have witnessed some changes in the weather, namely milder winters, more variable weather or seasons, drier summers and stronger wind. Many interviewees talked about how the winters are milder, which means they get less freezing of water bodies than they had in the past.

Well, my father, he was born in 1933, and he said when he was a teenager the Sooke River used to freeze right over in the wintertime and he could push his canoe across on the ice. And the last winter that went by, we had a thin layer of ice and it lasted a day or two and it was gone. (#38)

People also talked about 'strange' weather, that is more variable and sporadic, and changes to the seasons they observed. A few interviewees spoke about drier summers.

We've just gone through February, March and April and we didn't have any rain. There was no rain. We shoulda had so much rain that they don't tell us last month that there's a water restriction already, you know... Water's everything. It has such an important impact on everything. (#32)

Other people talked about the increase in strong winds, warmer water temperatures and hotter or stronger sun.

The worst windstorm we ever had was about, I believe it was about, 5 years ago. And, it blew almost 100 miles/hour here. And, that's never happened before. And, you know the power was down for about 5 days or so, maybe more. And, there [were] trees down everywhere. When it does blow down here, in the village, it would blow around 60 miles/hour, and that's fast. But, that's the only time we've ever known it to blow that bad was when it was that storm. So, I don't what contributed to it, but it was something that was unordinary, it was something that doesn't happen. And, as far as I know, has never happened before. And, maybe it happened 100 years ago, I don't know, but it's never happened in my time. (#37)

2.1.2.3 Managing and coping with change

This section discusses how T'Sou-ke Nation responded to the environmental issues and concerns discussed in the previous section. This includes responses at the individual and Band level and partnerships with outside organizations, other First Nations and different levels of government. We discuss how they addressed concerns in three categories about:

- Individual response
 - Inadequate resources to carry out greenhouse program
 - Emergency response following an extreme weather event
- Band Level Response
 - Western Forest Products selling land in their traditional territory to private owners
 - Lack of jobs due to fisheries and forestry collapse
- Working with others
 - Pollution in the Sooke basin
 - Decline in fish populations
 - Inadequate amount of water released from Sooke River dam

- Specific relationships between T'Sou-ke Nation and other First Nations, CRD Parks

Individual response

The manager of the greenhouse teamed up with individuals and organizations in the town of Sooke to get her greenhouse project off the ground. The greenhouse manager started networking with CASA [Sooke Co-operative Association of Service Agencies] and Edward Milne Community School, who have their own gardens and formed a group, which they called the garden network. Through this network they helped support one another in their garden projects and helped to organize events and initiatives. The manager also worked with garden people in the District of Sooke as well.

Well, I had to do something to expand just the garden. We needed help, and we needed help big-time, we needed volunteers, we needed this, we needed that, and I just kept talking to people and got connections and made it happen. (#32)

After the large wind storm hit T'Sou-ke and knocked out the power for a number of days, this prompted individuals in the Health Centre to work on T'Sou-ke's emergency preparedness. Directly after the storm hit, the community relied on a lot of outside help to recover from the impacts (e.g. BC Hydro, highway workers). Following this storm, Health Centre staff began working on emergency preparedness initiatives. They provided guidance on what is needed to assemble survival kits and are working on an emergency plan. Also, they have a generator in the health centre and solar panels in the Band office, which can be used in case of a power outage.

When, when we had that huge, ah, I call them hurricane winds, that one year, I think this [reserve] #1 was without, ah, power for five days, somethin' like that. ... but a lot of people lost their, you know, like the freezers, their food supply, so there's been a change there where, ah, now they can, they have a generator where they, people can bring their freezer food so that it doesn't, um, waste. I believe that's one thing they've done. And plus, now, now we have, survival kits, which is a good thing. (#28)

The Health Center is quite involved in keeping up to date with the community of T'Sou-ke on prepared readiness. I, myself, have attended prepared readiness meetings and we have a long way to go, not just T'Sou-ke Nation, but the community of Sooke....I don't know, I think maybe we might be more ahead of the game than other areas. Like, we have

the solar [panels] on these buildings, we have a generator in the Health Center and these are places at least for our residents of #1 reserve would have a place to congregate if it was a serious disaster...I'm not, I think it's still at the stage where we haven't really brought it to the community to say, 'Okay, this is what we know now and this is what you should do.' (#29)

Band level response

T'Sou-ke Nation is currently concerned about Western Forest Products (WFP) selling land in their traditional territory, which they are working with the government to resolve. WFP are planning to sell their lands mainly to private owners who will likely develop it into residential areas. If the land is sold to private owners and developed into residential areas, T'Sou-ke members will no longer be able to hunt and gather in these areas and will lose access to land that they require to practise their rights to hunt and gather. Some of these lands will be turned into parks, but there are additional issues with hunting and other subsistence activities in parks. T'Sou-ke First Nation has reached out to governments to respond to this issue.

In response to the lack of jobs in T'Sou-ke Nation, following the fisheries and forestry collapse, T'Sou-ke Band has created new programs/project where people can learn new skills. A number of interviewees talked about the solar project as an opportunity for T'Sou-ke members to gain new skills. Also, the greenhouse program has also been another source of revenue and opportunity to learn new skills. It is hoped that these initiatives will be more sustainable, that is, they will not suffer from collapse like the forestry and fishery industries did.

The solar project offered a chance to learn a new skill...most of those men that were caught in the forestry and fishing that no longer were able. (#29)

Working with others

The Band worked with multiple levels of government to address their concerns about water pollution in the Sooke Basin. T'Sou-ke has worked with Environment Canada (EC) to do water quality monitoring and has also worked with non-profits to try and address the issue.

Well, I know Chief and Council have always tried to address the issue, but the thing with the water is that all the governments, they just ... have this cycle where they just kind of pass the blame to someone else. But I think a lot of it, when they did build the new sewer, [it was resolved]; it [the problem] was probably because of all the pollution in the basin. And I know that T'Sou-ke was working with some non-profits on the issue. (#31)

At times T'Sou-ke Nation has run into challenges getting federal and provincial bodies to respond to the problems, since they maintain the issue is not within their jurisdiction or responsibility. The fisheries director participated in a multi-stakeholder group called Water Quality Round Table. The municipality eventually developed a sewer system in Sooke, which meant that the houses in reserve #2 are no longer using septic tanks. All houses on the north/south/east/west side of the bridge (including T'Sou-ke's Reserve #1) are not a part of the new wastewater system.

T'Sou-ke Nation worked with a number of non-profit agencies and DFO to respond to the decline in fish populations. T'Sou-ke Nation has worked with a group called the Sooke Salmon Enhancement Society and the Brooks Hatchery in Sooke, in an effort to restore salmon stocks

Yes there is. The Salmon Enhancement Society, there's a few societies. There's the hatcheries in the Sooke River. Community interest groups in the town of Sooke and surrounding areas working with the local First Nations to find ways, together as a collective, to take care of the resource better. Bring back the resource. Be able to work together in a good way to identify things that might come up in the future, that might harm these resources. That kind of thing, that working together, I think is the key. And, it's not the time where it was always separated, it's more that we all come together as one. (#37)

T'Sou-ke Nation has been working with DFO to increase capacity of the members to deal with fisheries issues and respond to declines in fish and seafood populations. DFO and T'Sou-ke have been working together to building capacity in fisheries restoration. There have been some negative relationships between DFO and T'Sou-ke. Some people attribute the decline in fish to mismanagement by DFO, and communities have struggled with allowable quotas for food fisheries, which are set by DFO.

Um, well, probably every Chief and Council in one way or another has fought about the loss of fish and DFO has rules and regulations and they kind of set out our 'quotas' and what we're allowed for food fish, but it was set when the band had probably a membership of 40 people, and now we have a membership of 215, so that allocation just isn't enough. (#39)

T'Sou-ke Nation did a dungeness crab stock assessment, which was initiated by concerned T'Sou-ke members; they brought the issue to the Fisheries Directors attention that there was not enough Dungeness crab around. The DFO stock assessment staff provided the training to

T'Sou-ke members to carry out the assessment. T'Sou-ke has a co-management agreement with DFO within the T'Sou-ke traditional territory, to manage the natural resources, which comes through the Aboriginal Food Strategy agreement. Chief and council renegotiate the terms on a yearly basis, and it includes the costs for the Fisheries Director position. This agreement, as one interviewee explained "...lists a number of management issues, maintaining an Aboriginal Fishing Authority, from our stocks system to our commercial fishing endeavour."

When T'Sou-ke Nation had concerns about water quantity concerning a dam built on Sooke River, they negotiated an agreement with the CRD (Capital Regional District) to have their concerns dealt with it. CRD is the regional government for the 13 municipalities and three electoral areas that are located on the southern tip of Vancouver Island. Sooke Reservoir is a combination of a natural lake basin and reservoir created by flooding portions of the surrounding watershed. The reservoir was created by CRD, constructing a 3.7 m dam on Sooke Lake between 1913 and 1915, which was raised 6 metres in 2003 to increase the capacity of Sooke Lake Reservoir by 78% (CRD, 2009). T'Sou-ke Nation was concerned that there was not enough water being released for fish, and some people thought this was a factor contributing to the decline in salmon. So they negotiated an agreement with the CRD with input from the federal Department of Fisheries and Oceans and the B.C. Ministry of Water, Land and Air Protection. In this agreement the CRD agreed to release enough water from the Sooke Dam to ensure enough goes into the river for a healthy ecosystem, namely salmon populations.

A dam on Sooke Lake there and it provides water for Municipality of Victoria and the District of Sooke. At one time, it was that all the water was for municipal use and they dammed it off and it wasn't enough water for fish. So, the nation in their past negotiated water agreement said there has to be sufficient enough fluids for fish. It's one of the things that really stands out for me. (#38)

T'Sou-ke Nation seems to network with neighbouring First Nations to share resources. For example, people from other communities have asked T'Sou-ke members for fish if they don't have any. First Nations also work together in fisheries through the PICFI (Pacific Integrated Commercial Fisheries Initiative), which is a DFO funded program. It is a program that supports First Nations in their fisheries initiatives and helps them build each other's capacity as well. One interviewee also talked about asking other First Nations at conferences about funding sources or ways to approach problems about programs.

And, then there's a lot of networking too with other First Nations, because they have this program or that program and they got funding from this source or that source and, 'Did you guys try this?' or, 'Have you tried that?' stuff like that. (#39)

T'Sou-ke has worked with CRD to support projects and initiatives. They tried to work with CRD to remove an abandoned boat from Sooke harbour, since they were both being affected by the potential negative effects of the boat. T'Sou-ke had approached the provincial and federal departments for assistance with the issue but both said it wasn't their responsibility. The environment director worked with the CRD on various issues. They had them write letters of support for their proposals, had meetings with them about working together and discussions about park development in the Sooke hills.

2.1.2.4 Environmental and climate changes in context

Interviewees provided a variety of answers when asked what they thought of when they heard the term climate change. Some people thought of general weather and weather patterns. Some answers had to do with changes to winter/northern conditions such as icecaps/glaciers melting, melting snow, and polar bears drifting (on shrinking ice). Other thoughts included some places drying, some places flooding, or forest fires going crazy. One interviewee said that the tearing up of the land that was taking place has an effect on the climate, and another person considered climate change one of the contributing factors for humans 'killing themselves off'.

And, I know it's just the way it is with mother earth, it changes all the time ...So, it's just a cycle, it's the way of life. I think what's happening is that we're going through a cycle now but we're speeding it up. And, so we've got to adapt to that speed. (#37)

Interviewees also discussed climate change as a need to plan for the future and to do this quickly.

I think of weather. Weather patterns change. I think that, you know, that climate change means that we need to start making decisions now about how we're going to function in the future and plan for the future. And hopefully be able to predict, you know... what it's gonna be like ...I think that climate change needs planning. We need to plan for it. (#35)

So, in climate change I could see where we have to adapt. I don't think we're doing it fast enough, I don't think the world's doing it fast enough, and they're not taking it seriously enough. So, you can only go so far and if governments aren't going to change their mandates and the way of investing into this, then that's as fast as we're going to go. So,

it's up to us as Canadians to get together to ask for a change and to ask what's going to be done about change. And, if we can get long term forecasts and to prepare for the future. I would really like to see that, because nobody's saying nothing. You can talk about it but talking's cheap, I think we need action and how can you have action if nobody's bringing in any good information in the way of remedies, trying to fix mother earth, at the same time preparing for that change. (#37)

When asked if the community of T'Sou-ke is prepared to deal with impacts of climate change, people provided a mix of comments. Some interviewees said yes they were ready, others said they were not ready, while others said T'Sou-ke is moving in the right direction, but not there yet.

Not at all. I think in some ways that, you know, we've survived through, like, three documented genocides and, we can adapt to almost anything. But...solar panels... it's a step in the right direction but, I think that a lot would have to be done. (#31)

Some people discussed the issue of climate change as part of the planning and initiatives that are currently taking place in their community. This has led to greater awareness of the issue.

With this whole solar project, I think, it brought changes...that may be little, that aren't as noticeable, but I believe that they're there, and I think it just leads, like only within the T'Sou-ke Nation community, but the world telling us of all of this stuff about global warming and all of that. I think it's just prompted probably some members to start taking about it, which created just a big huge rumble in the community, which kicked off some of these projects, right? (#39)

Although climate change is important to community members, it may not list as a high priority when taken into account with other things people deal with on a day to day basis. For some community members they have much more urgent priorities they need to tend to such as employment, dealing with social issues and health problems and looking after their families.

Climate change is, probably not on the top of the list. Because, looking after our families on a daily basis is a major challenge for many, so being employed, to look after your family and children, is probably top of the list here...Dealing with any, social issues are always a challenge, so looking after folks that maybe need some counselling in all kind of areas, mental health, or alcohol and drug things like that....Educating our children, education is important to both sides, western and culturally. And, looking after our health, you know, we have so many health issues that we suffer, so diabetes, heart, so finding

the means and ways to deal with all those are likely on the desk before someone's going to say, 'I want to find the solutions or make this climate change thing better.' (#29)

In addition to competing priorities, people talked about how climate change is a difficult issue to think about and take action on because it is so big. There is so much information about it, that it can be overwhelming for some people.

Interviewees talked about the individual's responsibility to respond to climate change as well as government. This tied in with the idea that everybody needed to play a part in responding to climate change issues. This means that individuals need to be informed, create awareness amongst themselves and provide direction to their leaders that this is an important issue that needs to be addressed. The government, all levels of government, could do their part by providing funding for planning and building awareness among the public. Interviewees talked about the importance of creating more awareness among people about the risks, vulnerabilities, liabilities, and opportunities associated with climate change.

I think the government needs to start making some major changes in order for it be a huge effect, and not even like local municipalities, those types of governments, like all the way up the ladder kind of thing. I think if our small community could make such a huge change with this solar project, so many more communities and governments out there can do the same thing. You just got to make it happen. (#39)

But I think the best method is going to be like through education. And actually, you know, using environmental education to get out there and teach people about...what we're actually doing to the planet. (#31)

2.1.3 Community background

| Physical Geography | History | Governance | Demographics | Economy |
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| <ul style="list-style-type: none"> T'Sou-ke Nation is one of many Coast Salish tribes along the southern coast of Vancouver Island, British Columbia T'Sou-ke has two reserves (T'Sou-ke 1 is located at 48°23'10.7878"N, 23°41'47.46"W), total area = 67.2 hectares, which are located near the town of Sooke, 40 km west of the city of Victoria All the waters that flow from Sooke Lake (supplies water for much of surrounding area) are part of T'Sou-ke traditional territory - stems from Jordan River, 30 km west of the reserves, includes East Sooke Regional Park, around the Sooke hills, and up towards Goldstream Provincial Park. T'Sou-ke Nation territory is in the coastal western hemlock biogeoclimatic zone, which has a temperate climate, with mild, damp winters and relatively dry and mild summers. Total precipitation is ~140 cm/55 inches/year, most falls Nov-March Like the rest of coastal BC, area is located in an active seismic zone. T'Sou-ke territory has bigleaf maple, cedar and Douglas fir ecosystems (Douglas-fir, western hemlock, western red cedar, grand fir, western white pine, bigleaf maple, balsam fir, Sitka spruce, Garry oak, salal, Oregon-grape, skunk cabbage and wild blackberry bushes as common species. Common animals: elk, deer, s bear, mink, river otters, rabbits, raccoons, bald eagles, herons, cormorants and migrating ducks Common marine life includes: harbour seals, sea lions, and orca whales | <ul style="list-style-type: none"> Traditionally lived in cedar longhouses, which were up to 60 by 100 feet Common traditional foods included fish (salmon, halibut), seafood (clams, crabs, and mussels), seals, wildlife (deer, elk), ducks, and plants such as edible roots (e.g. camas bulbs klitsup and kitsung fern) and berries (huckleberry, blueberry). Cedar tree was used to make a variety of items, such as totem poles, baskets, clothing and canoes (used for fishing/food gathering, trading, communication and warfare) Potlatches (ceremonial feasts) were held regularly and an integral part of the culture In ~1848, the nation was almost destroyed by neighbouring tribes European settlement in the area began around 1850. T'Sou-ke Nation is one of 14 Bands that signed treaties with James Douglas between 1850 and 1854; they cover ~927 km² of land around Victoria, Saanich, Sooke, Nanaimo and Port Hardy T'Sou-ke and other First Nations felt the treaties have never been honoured, so entered the treaty process in July 1995. Te'mexw Treaty Association (TTA) is comprised of T'Sou-ke First Nation, Becher Bay First Nation, Songhees First Nation, Malahat First Nation and Nanoose First Nation, who all signed a Douglas Treaty. Te/Mexw Treaty. Te'Mexw is currently in Stage 4 of the six-stage process where they are negotiating an agreement in principle. | <ul style="list-style-type: none"> T'Sou-ke Nation is governed by an elected chief and 2 councillors, elected on a 2 year cycle. Governance projects/activities outlined in T'Sou-ke's Comprehensive Community Plan (CCP) include: Chief and council governing for 4 years and achieve treaty agreement beneficial to whole community and implement. Communication: Chief and Council meetings happen once a month, are open to band members (notices posted in band hall); A newsletter is sent out to on-reserve/off-reserve members every 2nd Friday by the band Band administration has organization chart, which includes community members, Chief and Council, Band administrator and the various departments (Finance Management, Lands, Youth, Administration, Fisheries, Health, Social Development, Housing, Communications and Special Projects). There is approximately 20 staff working for the band T'Sou-ke went through comprehensive community planning (CCP) process in 2009; they developed a VIP (Vision in Progress) group to lead the planning process and had meetings with focus groups; Vision developed by the community is: "Our vision is for a safe and healthy community, we see us as self-governing, accountable, stewards of our land, generating a respect and understanding for our peoples culture and heritage, united, educated, in sobriety to provide opportunities for all generations to come". T'Sou-ke developed goals, objectives and activities under their key planning areas: governance, land management, resources and environment, education, health, infrastructure development, culture, social, economic development and fisheries. | <p>The current total membership of the T'Sou-ke Nation is approximately 222. The population of T'Sou-ke Nation as of March 2010 for registered members is distributed as follows:</p> <ul style="list-style-type: none"> on Own Reserve - 129 on Other Reserves - 2 Living Off-Reserve – 91 <p>Five status Indians from other Bands, as well as 82 non-status people, also reside on reserve.</p> | <ul style="list-style-type: none"> T'Sou-ke Nation economy used be completely in fishing and forestry There are no economic development staff employed by the band, but have started projects informed by CCP process that resulted in economic opportunities Currently, the main forms of employment are band staff, fisheries, the solar energy project and the ladybug greenhouse Currently unemployment rate is ~20%. In fisheries the band has commercial communal licenses for three vessels (Ocean Sunset, Lady Avril [salmon, halibut, black cod, rock fish], and the Zoe [survey vessel]; 3 Band members employed for commercial fishing Band has plans to obtain crab and prawn commercial licenses, which would employ 3 additional people; and looking into farm clam tenure sites commercially Fishermen are also hired to harvest fish for social/cultural purposes Solar energy project: community has a 75 kW solar energy plant, 2 band members employed currently; 9 band members employed during installation Ladybug green house project: (grows food for members, sells outside the reserve) employs 3 band members Are plans to develop a T'Sou-ke arts and cultural centre, which would contain museum artifacts and also sell arts and crafts made by T'Sou-ke members. Economic development activities identified in the CCP included: a mall, commercial development and a medical centre |

| Basic Services | Health | Education | Recreation/ Social/ Culture | Environment |
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| <ul style="list-style-type: none"> • One maintenance person employed by band (fire hydrants, electricity, water) • Energy source for community is hydroelectricity and now solar as well • Fire department, ambulance and RCMP services for band administered through service agreements with Sooke municipality • All buildings on reserve (fisheries/special projects, health, treaty, band admin, youth centre) and most individual houses have wireless internet services. • Reserves are connected to the drinking water system in Sooke • All houses currently using septic systems and are not hooked up to the Sooke district sewer system, (developed 2005) • Infrastructure activities identified in CCP are: connecting reserves 1 and 2 to the sewage system, new administrative building and additional renewable energy systems • Emergency response coordinated by the Community Health Representative (CHR) , Health Centre designed as an emergency support centre (e.g. emergency provisions, medical equipment, and generator for power outages), also have solar energy in Band hall in case of power outage • One housing staff employed by band • 86 dwellings on reserve - 49 privately owned, 38 are social housing (e.g. band builds house with subsidies from CMHC, is rented to members on rent-to-own basis). • The band has designated areas for future housing through their land use planning process. • Housing waiting list: ~3 waiting for lots (need to be surveyed and have service lines hooked up), ~8-10 waiting for social housing • T'Sou-ke Nation generally does not have overcrowding issues in their houses. • T'Sou-ke Smart Energy Group (TSEG) implemented an energy saving kit (ESK) for members and the Energy Conservation Assistance Program (ECAP), which provides funds for increasing energy efficiency in homes (e.g. insulation) | <ul style="list-style-type: none"> • T'Sou-ke Nation is a member of the Inter Tribal Health Authority (joined in 2006-07) and NIL/TU'O Child and Family Services Agency • The band has a number of service agreements and Memorandum of Understandings (e.g. Sooke municipality, School District #62 , Capital Regional District (CRD)) • T'Sou-ke Nation Health Services calls on necessary referrals from outside agencies (Vancouver Island Health Authority, Pacific Centre, Sooke Physicians, counsellors and resources like CASA (Co-operative Association of Service Agencies). • Health Centre built 2006/07 • The health centre offers services from a Community Health Representative (CHR), home community care, meals on wheels/homemaker, mental health counsellor, drug and alcohol abuse counsellor, baby nurse, traditional spiritual worker, and Aboriginal health dietician. • The Health department runs the following programs: mandatory (immunization, investigation of reportable diseases) and discretionary (mental health, health promotion and preventable activities, injury prevention first aid training, school health, environmental health, Aboriginal infant development program, home and community care program, native drug and alcohol program, and Aboriginal diabetes initiative) • The Centre holds an Elders circle every month, with food and doctor/nurse visits, and all other T'Sou-ke members go to Sooke for medical services • Activities identified in the CCP process under the area of health include: Elders assisted living facility on reserve and a drug and alcohol treatment centre on reserve. | <ul style="list-style-type: none"> • Child care facility on reserve (Sum-SH-thutLellum) offers preschool, after school care, 4/5 kindergarten program and summer camps (ages 5-12). • An early childhood educator (Preschool, after school care, summer camp program supervisor), and kindergarten teacher are employed by the band • A language and culture program is part of the activities at the summer camps. • All T'Sou-ke children attend school off reserve in Sooke, but often have First Nation teaching assistants in the classrooms • Activities in the CCP under the area of education include: K-6 school on reserve, on-line on-reserve further education and develop partnerships with Camosun and University of Victoria. | <ul style="list-style-type: none"> • The youth centre on reserve that employs two members to supervise and run activities with the youth. • Generally many T'Sou-ke members are involved in sports (e.g. softball, baseball, hockey), often joining leagues in Sooke • One person employed by band who runs arts and culture program – brought in mentors from neighbouring Bands to teach members about crafts (e.g. cedar bark basketry, wool weaving). • Some activities identified through the CCP process in the area of social and culture include: generating employment on reserve and learning opportunities, continued life skills development, building a new longhouse, constructing a new heritage building and museum to house artifacts, and hosting Tribal Journeys singing and dancing. • Culture nights take place every Tuesday and involve a dinner, singing and drumming; community lunches are held every Thursday • Wild food gathering events are coordinated by the greenhouse project coordinator, who takes out youth/ members to pick berries, gather seafood, etc. • The HEAL (Health Eating Active Living) worker organized a youth garden club to start this year. • T'Sou-ke Nation participates in Tribal Journeys, a yearly canoe trip organized by Pacific Northwest First Nations. | <ul style="list-style-type: none"> • Fisheries coordinator and land management coordinator employed by the band • Activities identified in the CCP process under the area of land management, resources and environment include: environment, archaeological policing, development of reserve lands, monitoring regulations and enforcing bylaws. Activities under the fisheries area include: purchasing more beach tenures and deperation plant (a facility to reduce the level of bacteria and viruses in live shellfish.), increase involvement in commercial fisheries, and renewing and extending licenses for halibut and black cod. • The environmental department was established in 2006 and ran for three years. The department set up a lab for water quality testing and developed working relationships with the Department of Fisheries and Oceans (DFO), Environmental Canada (EC), Ministry of Environment, and Capital Regional District (CRD). • The T'Sou-ke Nation is a signatory to the Framework Agreement on the First Nation Land Management Initiative administered by Indian and Northern Affairs Canada (INAC); members ratified the T'Souke Nation Land Code (2006) which has established procedures for law making. • The T'Sou-ke Smart Energy Group (T'SEG) was created to “educate the T'Sou-ke community about the importance of low impact sustainable energy, through the use of culture, traditional values and historical means of communication”. The TSEG (T'Sou-ke Smart Energy Group), puts out a newsletters |

Table 1: Reserve description:

| Name | Size (Hectares) | Location |
|------------|-----------------|------------------------------------------------------------------------------------------------|
| T'SOU-KE 1 | 26.30 | Sooke District, Lot 8 on left bank of Sooke River at its mouth at head of Sooke Harbour |
| T'SOU-KE 2 | 40.90 | Sooke District, Lot 16, on Sooke Bay, south end of Vancouver Island, along Juan de Fuca Strait |

<http://pse5-esd5.ainc-inac.gc.ca/fnp/Main/Search/FNReserves.aspx?BANDNUMBER=657&lang=eng>, accessed Oct, 2010.

Table 2: T'Sou-ke Nation Summary Climate Data (see Addendum A for complete Climate Data Methodology)

| T'Sou-ke Nation, BC | | | | | | | | | | | | |
|-------------------------------------------------|-----|-----|-----|-----|------|------|------|------|------|------|-----|-----|
| Weather Station: Victoria Int'l Airport | | | | | | | | | | | | |
| Months (Abbr.) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Mean 2001-2010 (°C) | 4.9 | 5.2 | 6.7 | 8.9 | 12.2 | 15.3 | 17.5 | 17.0 | 14.3 | 10.2 | 6.6 | 4.2 |
| Normal 1971-2000 (°C) | 3.8 | 4.9 | 6.4 | 8.8 | 11.8 | 14.4 | 16.4 | 16.4 | 14 | 9.8 | 6.1 | 4 |
| Difference between 1971-2000 and 2001-2010 (°C) | 1.1 | 0.3 | 0.3 | 0.1 | 0.4 | 0.9 | 1.1 | 0.6 | 0.3 | 0.4 | 0.5 | 0.2 |

Table 3: Population break down by reserve

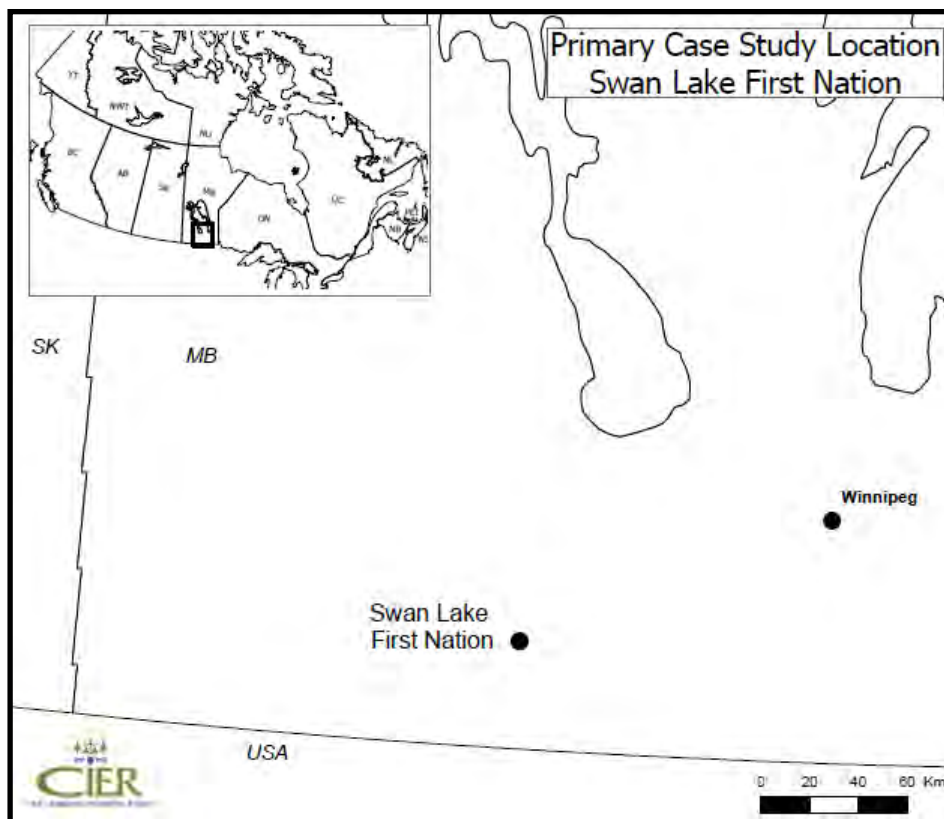
| Reserve # | 2001 residents | 2006 residents | | | | # Homes |
|-----------|----------------|----------------|------|---------------|--------|---------|
| | | TOTAL | < 15 | > 15 < Senior | Senior | |
| IR#1 | 81 | 88 | 18 | 60 | 10 | 39 |
| IR#2 | 76 | 121 | 36 | 8 | 5 | 47 |

2.2 SWAN LAKE FIRST NATION

2.2.1 Climate change impacts

Swan Lake First Nation is located in south central Manitoba (see Figure 2 for location) and lies within the Prairie ecozone and Aspen parkland/Grassland major ecological region (ecoregion). The climate of the Prairie ecozone is determined by its mid-latitude location in the rain shadow of the Rocky Mountains that impede moisture-bearing winds from the Pacific Ocean (Sauchyn and Kulshreshtha, 2008).

Figure 2: Location of Swan Lake First Nation



The result is a continental climate that is sub-humid to semi-arid with short hot summers, long cold winters, low levels of precipitation and high evaporation. Mean annual temperatures range from 1.5°C to 3.5°C. Mean winter temperatures range from -12.5°C to -8°C and mean summer temperatures from 14°C to 16°C (Sauchyn and Kulshreshtha, 2008).

The region is characterized by persistent, and sometimes severe, moisture deficits (Sauchyn and Kulshreshtha, 2008). Mean annual precipitation is extremely variable ranging from 250 mm in southeast Alberta and southwest Saskatchewan to about 700 mm in central Manitoba, the warmest and most humid region in the ecozone (Sauchyn and Kulshreshtha, 2008). The Aspen Parkland/Grassland ecoregion can be described as having a sub-humid low boreal eco-climate and transitional grassland eco-climate characterized by typically short warm summers and long cold winters (Sauchyn and Kulshreshtha, 2008). The mean annual temperature ranges from 0.5°C to 2.5°C; the mean summer temperature ranges from 13°C to 16°C; and the mean winter temperature ranges from 14.5°C to -12.5°C. Mean annual precipitation ranges from 375 mm to about 700 mm.

2.2.1.1 Current Impacts

Temperature records throughout Manitoba show an increase in both annual and seasonal average temperatures.

- Rate of **annual temperature increase** of between **1.1 and 4.0°C** per century. (Manitoba Conservation, 2009)
- Most drastic changes in average temperature in winter (2.1 to 8.1°C per century) and spring (1.3 to 5.4°C per century). (Manitoba Conservation, 2009)
- Increases in temperature are greater than the global average rate of warming at many locations throughout the province (particularly during the period between 1970 and 2007) (Manitoba Conservation, 2009).

2.2.1.2 Predicted Impacts

For south central Manitoba, future climate projections predict that temperature will continue to increase, there will be more frequent drought, and also an increase in precipitation in the form of rain increasing the probability of severe flooding (Sauchyn and Kulshreshtha, 2008), which will lead to many other secondary climate impacts.

- According to the Canadian Centre for Climate Modelling and Analysis, the Canadian model predicts that Manitoba will likely experience **warmer and wetter winters and springs**, and **longer, warmer and drier summers** (MCEC and IISD, 2001).

- **Annual mean temperature** is expected to **increase 4 to 6°C** in Manitoba by the end of the century (MCEC and IISD, 2001).
 - The model predicts a temperature increase between **5°C and 8°C during the winter** and **3 to 4°C in the summer** for Manitoba (MCEC and IISD, 2001).
- **Weather** is expected to become **increasingly unpredictable** and the **frequency** and **severity of extreme weather** is expected to **increase**.

2.2.1.3 Sensitivities of Swan Lake First Nation

A community's sensitivity (high or low) to climate change reflects how climate change will affect the economic, environmental, cultural, and social aspects of a community. Given the current and predicted climate change impacts identified for the area within which Swan Lake First Nation is located, what does this mean for the community?

For Swan Lake First Nation climate change could have cultural, social and economic implications. **Cultural implications** could include: decrease in safety on the land due to increases in unpredictable weather and extreme weather and a loss of traditional foods and medicines due to changing plant and animal ranges, shifting seasons and erratic and/or extreme weather. **Social implications** could include: infrastructure impacts (increases in flood damage to buildings, roads, bridges, rail lines, etc.) and health impacts (limited access to and availability of traditional foods, and increases in air pollution, water and food borne pathogens). **Economic implications** could include more frequent and prolonged drought and flood events affecting agriculture and other economic endeavours.

Climate change could have the following **environmental implications** for Swan Lake First Nation:

Increasing Temperature, Precipitation and Extreme Weather Events

Swan Lake First Nation is highly vulnerable to severe fluctuations in temperature and precipitation, and extreme weather events (tornadoes in particular). Southwest corner of Manitoba (southwest of Brandon), where Swan Lake First Nation is located, has experienced several drastic temperature and moisture changes between 1999 and 2005, including:

- droughts in 2001-2002;
- an unusually cold summer in 2004;

- the worst summer flooding in the province's recorded history during the summer of 2005 (Venema and Myers, 2009).

Water

Extreme water fluctuations due to climate change will have an impact on Swan Lake First Nation.

- **Increasing water scarcity** is considered one of the biggest threats to communities on the prairies (Sauchyn and Kulshreshtha, 2008).
- Swan Lake First Nations water supply is from a groundwater source.
- Future projections of **warmer/drier conditions** and **flooding** in the Prairies will threaten the abundance and quality of surface and ground water (Sauchyn and Kulshreshtha, 2008).
- In southern Manitoba, most water is consumed by evapotranspiration (92%). Runoff consumes the remaining 8% (Venema et al., 2010).
- Very little of Swan Lake First Nation's water is consumed by human activities
 - Makes **integrated watershed management and planning (IWMP)** a **critical** component of climate change adaptation for the community (Venema et al., 2010).
- **Water quality** for SLFN also **negatively affected** because of heavy nutrient loads and low flow in waterways due to extreme precipitation events (Venema et al., 2010).

Agriculture

Agriculture is vulnerable to climatic change due to its strong dependence on climatic conditions (Cloutis, 2001). Since land leases for farming are a source of Swan Lake First Nation's revenue, impacts to agriculture and a fluctuation in crop yields have a major impact on SLFN.

- **Increased flooding, increase in pest, warmer winters, drier conditions and more frequent severe weather** impact agriculture in Manitoba.
- Most direct impacts of climatic change will occur through changing crop yields. (Cloutis, 2001)
- Southwestern Manitoba has already experienced an **increase in heavy rainfall**, resulting in:
 - late or unsown fields;
 - flooding of fields;
 - late or lost harvests;

- decrease in crop quality;
- increase in weeds (Venema and Myers, 2009).
- Area also experienced **drought and dry periods** resulting in
 - lost yields;
 - feed shortages;
 - insect problems (Venema and Myers, 2009).
- These impacts can be exacerbated by other hardships endured by farmers, such as:
 - disease;
 - low commodity prices;
 - high input costs (Venema and Myers, 2009).
- Hardships further increase the vulnerability of their operations to weather events (Venema and Myers, 2009).
- A socio-economic analysis using the nearby Rural Municipality (RM) of Stanley as a case study showed that a **1° C increase in temperature** resulted in an **average decrease in crop yields by 20%**, which translated into a decrease in RM net revenues from agriculture of -10%. (Cloutis, 2001)

Swan Lake First Nation also generates revenues through several bison herds.

- As yet **unknown** what **effect** climate change may have **on bison**
- Scientists speculate that climate change rather than hunting were the main factors in the historic decline of bison on the prairies (Pennisi, 2004).

Wind Energy

Swan Lake First Nation is in the feasibility stage of developing a wind farm.

- Climate change can **increase the risk of wind farm development** because it can decrease the accuracy of wind speed data, thereby making power output and revenue forecasting more difficult.

2.2.2 Interview Results

2.2.2.1 Description of community and community change

This section summarizes the description of the community provided by interviewees and major changes that the community has experienced. People provided the following description of Swan Lake and community changes:

- Strong, progressive community
- Small close knit community
- Improvement in leadership
- Financially stronger and debt-free but still economic challenges
- General increase in people pursuing unhealthy lifestyles
- Improvements to education
- Struggle to hold onto a traditional lifestyle in a modern world

Swan Lake First Nation (SLFN) has been described by its members as a strong, progressive, close knit community that values the land and resources it has. The people have very close relationships with 'no family squabbles' and lots of community events are hosted like lunches and dinners as a way to keep everyone connected. It is described as progressive because SLFN has financial control and capacity now as the community is now debt-free. SLFN is described as being strong as its members have lots of community pride and are traditional minded with strong ties to their cultural ways.

We have very strong ties to our, our cultural ways that were passed down to us over the generations. Some of the beliefs, and some of the ways that we follow are from many generations back and I think that's what keeps our community pretty intact. I think the community vision is far reaching, we don't just look at the generation...that's here, we look at the generation far ahead and try to preserve...what we have in terms of mother earth and all of the resources that we have for those generations that are yet to come. (#23)

The community has noticed an improvement in the leadership, in the past 3 terms or 6 years, compared to leadership prior to this. Chief and council treat Band staff with respect now so the morale in the office is higher and a better place to work. Dishonesty in the workplace is also not

condoned. Leadership strives for and enhances transparency and accountability in everything they do and the decisions they make.

Well, currently it's going to be Chief and Council, but any decision that Chief and Council make, or any discussion they have on any topic for the band that Council deals with, they go into the minutes, the minutes go onto the front counter, which is available to any band member...we've stated all this time there anybody can see what's going on. Minutes are right there. Nothing to hide. (#21)

SLFN is relatively prosperous compared to other First Nations in the region. The economy has improved in Swan Lake with the development of a few small SLFN owned business ventures that have allowed them to become debt-free and therefore financially stronger. This in turn has provided SLFN with the opportunity to embark on new business ventures and invest money into the community to make the community stronger and more independent. SLFN currently has several business developments on the go (a casino, Headingley office complex, wind farm). They have also improved and continue to improve community infrastructure using their own source revenues. For example, SLFN purchased new buses and a new playground structure for the school and also plan to build a basketball court. Those interviewed have attributed their economic success to being a vocal community that takes initiative.

Despite an improving economy, there are still economic challenges within Swan Lake that are apparent and need to be overcome. People noted that it is hard to find long-term positions as many are just casual and/or seasonal jobs. In many cases, SLFN is waiting for their projects to get up and running in order to create employment i.e. wind farm, casino, and chip plant. Many of the senior staff with permanent positions are not from SLFN because the local people lack the specialized skills for these jobs but the community is trying to get their own people educated to fill these positions. The need to create a sustainable economic base was described as money currently does not stay within SLFN and was referred to as a "leaky bucket"

So...all the income that is coming in...could be wages that we earn, GST from the government, family allowance (whatever you call it now), old age pension, everything...all that funding that comes to the reserve...leaves the reserve immediately. So, there is no turn around of the money. So, what we have is a leaky bucket. We have a lot of money coming in, none of it being circulated in terms of even stopping here once, except for our local gas stations and our VLTs and stuff like that... (#16)

The community has seen an improvement in the education system. There have been an increased number of high school graduates in the last few years, which was one of their goals, and they have been maintaining it every year since. The emphasis for SLFN now is on increasing post secondary student enrolment and graduates. An improvement in the education system was also realised with more children participating in school activities and sports. Despite these improvements there still seems to be a sense from parents that the children that attend the local First Nation school do not receive a quality education on reserve and therefore send their children off reserve to get a 'better' education.

But in recent years...the last 10 years, it's steadily increased. But with our own school here it seems like, our kids are not getting the education that they should be and I don't know if that's...a result of being such a big part of the community is our school so that when, something happens in the community the kids are a part of it, so it takes away part of their education day. So...I don't know if we're short-changing them by trying to make them feel a part of their community while, meanwhile we're trying to educate them. (#14)

Swan Lake First Nation members are also noticing an increase in people pursuing unhealthy lifestyles that is leading to an increase in disease and sickness amongst community members. Although the health of the people is getting worse members are not sure if it because more people go to the doctor so find out what is wrong with them or because people's lifestyles are changing to a more sedentary life leading to diabetes and obesity in children and adults. In some cases, interviewees attributed an increase in unhealthy lifestyles to a decrease in the quality of food as people are consuming more processed and hormone filled food and things like pop. Many note that "our food is making us sick". People also noted that they do not have to do as much physical work anymore to survive which is linked to a changing lifestyle.

And I know 50 years ago, the Indian people in this community were very, very, very strong people. I used to see old elders walking around hunting, exercising, being out in the fresh air, cutting wood, working hard, being active. I think modern technology has taken that away in a lot of sense. The longest walk I ever took was from this chair to my truck. I'm not kidding. (#25)

SLFN is facing the struggles of trying to maintain a traditional lifestyle in the midst of people adopting a more modern lifestyle. People tie these struggles to maintain a traditional lifestyle with a loss of language as well. Community members try to teach their kids the traditions but find that they are working against other influences like drugs and alcohol and the societal

change to a modern lifestyle. Interviewees see a new generation of young people that blame everything on everybody else and have no responsibility so have become less involved in community events and traditional practices. Although people see a need to adapt to a modern lifestyle they also see the importance of their culture and traditions, therefore see the urgency to figure out a way to bring their traditional values to the forefront.

In summary, Swan Lake First Nation is a small, progressive close knit community that has witnessed many changes over people's lifetimes. Positive changes center around improving leadership, an increase in financial stability and improvements to the education system. Negative changes include an increase in unhealthy lifestyles and the struggles to maintain a traditional lifestyle in modern times. The next section discusses livelihood activities and environmental changes members of Swan Lake First Nation have witnessed.

2.2.2.2 Livelihoods, activities and environmental change

This section discusses the activities Swan Lake First Nation (SLFN) members do to make a living and/or feed their families, changes in environmental issues in the community and how these issues have impacted Swan Lake members. The livelihood activities discussed and environmental changes associated with them include: hunting, trapping, fishing, picking berries and plants. Other environmental changes discussed include water and weather.

In Swan Lake there are a few people that still hunt for food and share it with others, but hunting in general has declined. Deer is the main game animal hunted but people also hunt elk and moose. Hunting success is dependent on having access to lands to hunt on. Because SLFN is surrounded by privately owned farmland or by municipalities, it is harder for SLFN members to find places to hunt which leads to a loss of interest in hunting. Those people that still hunt have to find areas that are further away (less accessible) which makes it more expensive to hunt. Hunters associate this decline in hunting to not only less accessible areas, but also to the increase in restrictions and regulations that are associated with hunting. Hunters have observed more diseases in the animals, such as deer, which sometimes make the meat inedible. As well, hunters say there has been a decline in the animals to hunt due to the use of agricultural chemicals in the area.

Access to good hunting territory, diminished habitat and degradation of our habitat through, because of the use of chemicals and pesticides, limit the quantity and the quality of the food that we get. As the marginal lands get used up, there is no opportunity to

harvest those wild animals, and the laws are getting stricter. We have to have permission to hunt on property. Now those rules and regulations hamper our ability to have a good sustainable food system. I travel 3 different provinces to harvest my food. Where I used to travel 3 miles to harvest my food, I now travel 1200 miles to harvest my food. (#16)

There has been a loss of interest in trapping in Swan Lake and currently there is only one member who still traps mostly because he enjoys doing it and has trapped his whole life. People attribute the loss of interest in trapping to the decline in the fur market so people get less money for their furs despite the effort they put into it. Trapping is not an activity that has been pursued by the younger people because they have not grown up with trapping as it had already died down so they did not get an opportunity to connect with it. People also expressed that fact that trapping is hard work, requiring commitment, with limited pay offs in the end so does not attract many people.

Fishing is mostly for recreational purposes and takes place in Swan Lake, the southern border of the community, during the spring and fall. People do enjoy eating fish but fish is not always available which has been a noticeable change. Fishing success is dependent on the water levels in the lake so there is less fishing when lake levels are low. The fluctuating lake levels, that are most often low, in Swan Lake affect fish habitat which people attribute to a decline in the number of fish. As well, the other lakes that feed into Swan Lake are dammed up which further lowers lake levels. People note that when the water is low, the water is warmer and therefore has lots of algae in the summer and freezes to the bottom in the winter which impacts the number of fish.

The decline in hunting, trapping, and fishing practises in Swan Lake has had a number of health and cultural impacts on community members. Many Swan Lake members note the importance of traditional foods and understand that the quality of the food eaten plays an important part in the health of the people. Since there is less wild meat and fish available to people, and they often have to buy store bought meat which many cannot afford and is considered less healthy, leading to a poorer diet and resulting in poor health. Elders are the ones who miss the traditional foods in their diet the most since they were raised primarily on a traditional diet. People who still hunt and fish say they share the wild foods with the elders and their families. Another result of a decline in hunting, trapping and fishing is less physical activity, since it often takes work to go out and trap or harvest food.

So that's the biggest, that's the biggest thing about, well especially in the area of hunting, people don't make that effort anymore. The labour to do, go and hunt, they don't do that. And it affects them a lot...lots of ways. (#22)

If you don't have fresh meat, from your local environment, it forces you to buy processed foods like bologna, and salami, and wieners. Macaroni diets, bologna diets, chicken from fast foods, as opposed to having other alternatives of resources. (#16)

Less hunting, trapping and fishing also results in a loss of culture and passing on of traditional knowledge between older and younger community members. It also means that it is hard to get traditional foods for cultural ceremonies and feasts. Many people noted that hunting, trapping and fishing were traditionally family activities and the decline in these practices results in less family time.

There are some people in SLFN that still pick berries but there seems to be a general loss of interest mostly attributed to a decrease in the abundance of berries. The types of berries picked are quite diverse and include chokecherries, saskatoons, raspberries, blueberries, and cranberries. Some reasons for the decrease in the abundance of berries, as offered by interviewees, are: less access to berry picking areas, berries are harder to find, agricultural spraying destroys the plants, habitat destruction as a result of the ploughing of land, changes in climate and weather, and the increased competition for berries so what is available is picked by other people. Lower berry production and declining berry harvests have negative health implications for the community as berries are a good source of nutrition and berry picking is good exercise. Berry picking is also considered a social activity so when fewer people pick, there is less socializing whether with family or friends.

As far as the berries in the bush, I don't know if the people go out as much as they used to either. And as you get more private ownership of some of the land and people concerned about people on their land, some of these areas haven't been available to people to pick berries. (#19)

Climate change is going to have an impact on our berry production. And, everything this year was a month to 6 weeks late in harvesting. Normally, I would have finished my harvesting of my raspberries at the end of July, here I was in September still harvesting my raspberries. And, inviting my neighbours back home, to come and pick as much raspberries as they can off the bush or else they're going to fall on the ground. Normally

we would have done that in July, and here I am doing it September just before the frost comes. (#16)

In general, Swan Lake has had no major issues with regards to their water other than the fluctuating lake levels in Swan Lake, as discussed with respect to fishing. People attribute the fluctuating lake levels, that are most often low, to low snow accumulation and precipitation amounts, and also the dams in the adjacent lakes. The two aquifers on their reserve have good drinking quality despite the majority of the community changing from wells to treated water. For the most part, people from SLFN understand the importance of water and people believe that this understanding has led to and is leading to protection of source water and riparian areas.

Water is vital to our economy and vital to our health. So, our water systems have to be protected. And, our attitude towards water has to change. We have to use our water more efficiently, more economically, and that's why you see in our administration, the change in the type of toilet bowls we use. So, we have to do our part to minimize any further damage to water systems, the water cycle. (#16)

The people of Swan Lake have observed a number of changes in the weather. Many members spoke of the weather and climate as being unpredictable now as if Mother Nature cannot make up her mind. Most interviewees noted an increase in extreme weather events, of which tornadoes, blizzards, and thunderstorms were mentioned the most. Some said that there have been more tornadoes in the last 15 years. People talked about the snow coming late and that there is less snow. Many noticed that the seasons are shifting so they get a longer spring, a shorter winter, and a shorter, hotter summer.

Well definitely, the weathers changed. We're getting tornados and we never used to have tornados. We're getting tornados now. I don't know the weather patterns have changed quite dramatically I think. (#25)

The observed changes in weather have impacted SLFN members in different ways. Some interviewees noted that if it is too hot people just do not go outside which has negative health implications because people become more sedentary. Others attributed changes in weather to less harvesting so people eat less traditional foods which also leads to a more sedentary lifestyle further resulting in negative health implications. Power outages have been attributed to an increase in extreme weather events with people noting the need to be prepared and to think about alternative energies like wind and solar.

This section described the environmental changes that Swan Lake First Nation members have witnessed and how these changes have affected them. These included:

- Decline in hunting practises and loss of access to areas to hunt
- Major decline in trapping and loss of this cultural practice
- Decline in fishing and fish populations due to low lake levels so less fish being eaten
- Decrease in abundance of berries impacting health and cultural transmission
- Concerns about keeping their aquifers clean
- Changes in weather including less predictable weather and increases in extreme weather events, especially tornadoes

The next section will discuss how Swan Lake First Nation responded to these changes to address their concerns.

2.2.2.3 Managing and coping with change

This section discusses how Swan Lake First Nation responded to the environmental issues and concerns discussed in the previous section. This includes responses at the Band level, partnerships with outside organizations, other First Nations and different levels of government. We discuss how they addressed issues about:

- Decreased fish availability
- Decreased berry production and concerns about food security
- Environmental issues in general
- Changes in weather especially an increase in extreme weather events
- Protecting water supply
- Fluctuations in lake levels

Band and Community Level Response

Swan Lake First Nation members expressed concerns related to traditional foods and food security. They noted that they enjoy eating fish but have noticed a decline in the numbers of fish so are not always able to eat fish. To address this concern Swan Lake First Nation buys fish for its members because they understand that fish is a healthy food to eat and want their members to be able to continue to eat fish. Additionally, there have concerns expressed about a decrease in the number of berries and concerns related to people eating unhealthy foods. In response, Swan Lake First Nation decided to fund a community garden through the health department to

teach people about growing their own food in hopes of inspiring them to have their own gardens. There was also mention of having a garden for traditional medicines to ensure that they are not all destroyed by agriculture, other development and changes in weather and climate.

Well, one of the things that the Health Department is trying to do and they did last year... with the band, worked up a chunk of ground across the way by the 8-Plex and put a garden in there. And I think there was some real positive things from that. So I think...if we can start with that and get people interested and then have their own gardens because there is a positive thing there with the gardens... but you got to show them what they are. (#26)

As well, the school is in the process of developing a fruit plantation or orchard where local and other types of fruits can be planted as a way to teach students about growing their own fruit.

One of the things they're going to do, I think the school has applied for funding dollars...to put a bit of an orchard behind the school and they're looking at putting things like saskatoons and apples and different fruits in the back... And I think something like that might inspire people to have their own fruit trees. (#26)

As a way to address general environmental concerns in the community, Chief and Council decided to develop its own land code as a way to gain more control over their lands and the use of their lands. SLFN ratified its Land Code in the fall of 2010 and intend to develop a land use plan and have talked about developing their own environmental laws. Many interviewees expressed that “[Indian and Northern Affairs Canada] (INAC) does not move fast enough for us so deal with [environmental issues] ourselves” and therefore view the land code as a way to speed up the process of addressing environmental issues.

Under the land code; we're going to have our own environmental component within the regime..And again, there's going to be some other remedial action taken...once we have the land code in place, whatever over here needs remedial action is going to be government responsibility, Canada's responsibility under the fiduciary obligations. So, that's going to take place, that's happening already. So we have that as a course of action, I guess. (#25)

SLFN has experienced power outages in the past and members have attributed these power outages to an increase in extreme weather events, particularly tornadoes, blizzards and thunderstorms, which have been noted by interviewees as increasing. During one particular prolonged power outage, the community gathered together in a central location, the community

hall, to ensure everyone was safe and unharmed. This event made SLFN realize how unprepared they were which prompted SLFN to create an emergency planning committee in order to develop an emergency plan. Part of the plan involved preparing the community hall to be independent (off the grid and with its own heating source) in order to use it as an emergency shelter.

I guess that's the reason... why you need an emergency plan, to try and adapt to those changes. To try and be prepared for whatever Mother Nature throws at you. You always need a plan. So, that's why I'm saying there, "You never plan to fail, you failed to plan. (#21)

SLFN members did not express any major issues with their water supply. They did not know much about the aquifers from which they get their potable water, and when an opportunity to learn how big the aquifers were through mapping they took it and they also undertook scientific studies on the quality of the water. The mapping and studies were negotiated by Chief and Council with Enbridge as part of the renewal of their agreement to lease part of Swan Lake's land for the gas pipeline.

One of the things we did, they did want to do for years, was to find out about our water supply, like, how far it went and, like the aquifer, so we got that opportunity when Enbridge wanted to renew their contract to bring the pipeline through...we got them to do an aquifer study...it was really, really good because we didn't, have to pay for anything and it was like a quarter of a million dollars and they came...they drilled test sites throughout the community, like within the reserve boundaries and then they did...soil testing, see what types of soil there were, the depths, and how vulnerable our water supply is or how secure it is. (#14)

Protection of the water from contamination was also included in the agreement with Enbridge. Interviewees noted that this has led the community and Chief and Council to be more vocal and advocate for the protection of their water source.

We just got to make sure that, you know, that there's no possible contamination in our aquifers, because that would jeopardize the whole community. So got to do everything in our power to make sure that nothing contaminates our water. And that's why we've put in a bunch of paragraphs in our agreement with Enbridge, to protect the water. (#21)

Working with Others

SLFN understands the importance of reaching out or working with others as a way to respond to environmental issues as not all issues can be addressed at the Band level. Interviewees noted that SLFN is not afraid to look outside the community for help on environmental issues and note the benefits of being able to share resources and get help whether it is the form of technical or financial help.

And that's where...we're not afraid to go out and look for, for help if we need it. We're starting to build a relationship now, I think, with the RMs around us, trying to build a relationship that, it's slowly coming along. (#14)

We have to reach out to our neighbours...bring those environmental issues and do it collectively to deal with those changes. We can't do it in isolation here. (#22)

SLFN has worked with other organisations that include environmental non-government organizations (ENGOs) and municipalities. Interviewees noted that they tend to work with groups that they have developed a good relationship with. An example is the Centre for Indigenous Environmental Resources (CIER) with whom SLFN has worked with on species at risk projects and a wind farm project. CIER developed a good rapport with SLFN through these initial projects and has led to other environmentally related projects and potential partnerships with CIER. One such project addresses SLFN's desire to develop its own renewable energy which is seen as both a way to address changes in weather and climate as well as an economic opportunity.

To have a wind farm is such a major, major thing...like how do you develop a work plan, so you map out the steps on getting there. This is where we are today; this is where we're going to be in 10 years. We asked so many different organizations to help us develop that work plan, because...it's so beyond me. And when we asked CIER...she came up with a work plan, and it was there right in our community hall. You could see it in pictures and also in words. . . (#23)

In response to people's concerns about the fluctuations of lake levels, normally low levels, Swan Lake First Nation and two municipalities have been trying to work together to deal with fluctuating water levels by putting in a control structure to maintain consistent lake levels. This relationship led to the formation of the Tri-Lakes group (SLFN and the RMs of Lorne and Manitou). SLFN has been trying to meet with the Tri-Lakes group to see if a control structure

could be constructed to increase the lake levels when needed and release water when needed as there are dams on the adjacent lakes upstream (Rock Lake, Pelican Lake, Grassy Lake) from Swan Lake.

I know with Rock Lake ... they had to prove how a structure would affect the water flow because one of the problems with the Pembina River, it flows into the states and then it hits the Red River at Pembina, North Dakota which is just south of the border and because it crosses the border, Canada wanted to know how the flow would be affected there... we've had people here, I was on a tour a few years ago with one of the councillors before and people were up from Pembina, North Dakota wanting something done, thinking it would be great if they would do something with these control structures so they could control the water before it got to them. But the government is very slow. And that would really improve the fishing here because [the water levels] would be consistent. (#19)

In keeping with their commitment to stop possible contamination of their aquifers, based on the studies previously done by Enbridge, Swan Lake First Nation worked with some of the rural municipalities (RMs) around them to stop a hog barn from being built nearby. The RMs approached Swan Lake First Nation for assistance.

The water . . . I believe the community did respond to the potential danger of...contamination of our aquifers. They protected that, and as a whole community I believe, rallied around that and they prevented a hog barn from being done. But, they also finally understood how big their aquifer is. They had a scientific study done, which was good, because now they are advocating protection of that water source. It's a good, good way of doing things. Finally, they are understanding their environment. (#16)

This section summarized different ways that Swan Lake First Nation responded to environmental changes and concerns of their members. To address these concerns, Swan Lake First Nation responded through:

- Band level decisions (e.g. developing an emergency plan following an extreme weather event)
- Taking advantage of resources of external organizations (e.g. CIER)
- Participation with others (e.g. working with the neighbouring municipalities)

2.2.2.4 Environmental and climate changes in context

This section discusses people's perceptions of climate change, the importance of climate change to the community and how prepared the community is to respond to climate change. It includes:

- What people think of when they hear the term climate change
- Level of preparedness of Swan Lake First Nation to respond to climate change
- Issue of responding to global climate change at the local level
- Aboriginal perspectives on adaptation
- The need for environmental awareness and education of SLFN members for improved adaptive capacity
- Who is responsible for dealing with climate change

When people from SLFN were asked what they thought of when they heard the term 'climate change', the following were some of the responses:

- Icecaps/glaciers melting
- Ecological disruptions
- Losing our way of life, losing our culture
 - You know, when I think of climate change, I think of our life in total, our health, our language, everything about us and who we are as Indian people, and Ojibway people. It's all impacted. (#23)
- Change in seasons (warm winter with little snow)
- Change in weather patterns, unpredictable
- Weather related disaster/severe weather like tornadoes and big winds
- Natural cycles so not a significant problem (don't believe it)

We were talkin' about that, you know, how climate change is gonna do that and do that. One of the old guys, he's sixty-five years old, he says, "I don't know why these people talk that there's a climate change, there's not climate change," he says, "it's just natural way, the order of things, that's happening" eh? You know, what's happening today, it probably happened a hundred years ago. Just nobody recorded it then. (#17)

When asked if SLFN is prepared to deal with the potential impacts of climate change, the majority of people said that SLFN is not prepared. A few people noted that the community is prepared well enough to adjust and that SLFN needs to update and complete the emergency

plan then will be ready. Others commented that the emergency response plan is outdated and was just reactionary when it was developed.

Virtually not. Simple answer. It's never talked about as a Chief and Council concern, that somebody should do that. It's never really discussed at that level. People talk about it. But in terms of, "okay how are we going to deal with this?" it's never gotten to that level of discussion. (#25)

Despite the general sense that SLFN is not prepared to deal with climate change, climate change was seen as important to those interviewed although it may not list as a high priority when taking into account other things people deal with like life issues, and the global scale and cultural views of climate change. For the majority of community members interviewed, they noted that there are many more urgent priorities they need to tend to on a daily basis such as dealing with social issues and health problems and looking after their families.

...community is minimally prepared. It is not a big concern right now as we have bigger immediate issues at hand like: lifestyle of community, ensuring people are fed, housed, educated, etc. (#18)

Well, currently it's not at the top of the list. I guess it's just like anything else there, people will deal with it if it's a . . . immediate issue? (#21)

There's a deep concern. But I think when people are in a survival mode, the last thing on their mind is climate change...Who's going to worry about the loss of language when you're in survival mode wondering where you're going to get your next can of beans, you know? That gives you an understanding where climate change sits within our mentality. (#25)

For many community members, the issue of climate change seemed so large and intimidating of an issue that they generally did not know how to grasp and respond to it at the local level.

I think there's kind of a quiet fear..And then of course some that aren't totally, I totally accept it...Who am I to argue? Because I ain't going to change nothing. So you know, I just accept things the way they are. At least I try to. And I think a lot of the people do. But I think there's some that are. . .they wonder. Sometimes I wonder myself. I lay there looking up at the sky and say, 'what the heck's going on around here?' (#25)

Another aspect of being prepared for climate change that some interviewees discussed is the notion that adaptation is a part of life for them and they deal with issues as they happen. Some responded to the issue of climate change as just one of the many things they will have to adapt

to. There is this general view that they will deal with things as they come and that it is also tied to their culture.

I think that they could, I think...we adapt good. We might not adapt quickly or the way people want but you adapt in your own way. That's hard to say because there's so many different people here, different personalities it's, but basically, if you have your family, you have, your community or whatever and you have your supports then it shouldn't be that, it shouldn't be that difficult. (#14)

Because one of things we believe is the weather is not going to harm us. That's a strong belief, if you look after mother earth, it won't harm you. And the weather is part of mother earth. (#23)

The importance and need to plan for climate change was also expressed but interviewees noted that planning for climate change has not yet happened due to several reasons. They talked about the fact that it is hard to plan for climate change when you are not sure how it will impact you and are not fully aware of or understand what climate change is. Interviewees talked about the need to work together to know what is going on like having a community meeting to discuss what to do and trying to have a plan in place to deal with climate change.

Our community can just prepare for the next disaster. For a disaster or whatever, if it's a tornado or whatever, a snowstorm, whatever is going to happen. We have to prepare, we have to make our people aware that these things are possible. And it's going to happen more and more. They see it on TV every day of these disasters all over the world. Do you think...that's not going to happen to us...that's not just over there. It's going to happen here. Somewhere here...we have to be ready for those things. (#22)

We usually, if there's major changes that we can foresee then we usually get together with the community and educate all the people on all the possible changes coming down the road and that we have to have a plan in place in order to deal with these changes. So, education is the first thing we have to do. And we have to consult the people on what's the best possible avenue to take to adapt to these changes. (#21)

When asked about who is responsible for dealing with climate change, the general sense was that the community and its leaders should be. Leadership should reach out to people to

increase awareness and inform them about climate change. People as individuals should also be responsible and adjust their lifestyle in their own way in relation to climate change.

Swan Lake's always been...they've always done everything on their own there, and once they rely on an outside group...it's hard to get things done because you got to rely on somebody else. If we do it our own then we don't have to rely on anybody, and it's our own thing, and we take ownership of it and . . . because we are our own government. But the people are the government, not the Council. (#21)

Right at the moment there's just fear, fear and misunderstanding. I think if we're going to get anywhere in understanding these areas, these issues, again it's got to be the...leadership of this community to reach out to the people in the community and teach them, tell them, inform them, you know. And I think everybody should be concerned. (#22)

Interviewees also talked about the responsibility of the federal government in response to climate change and environmental changes in general. The majority of interviewees noted the general lack of interest of federal institutions in assisting First Nations in protecting the environment or planning for climate change.

Indian Affairs have additional responsibility to protect our lands. After all, in the Canadian constitution, in Section 35 of the Canadian constitution, protects our rights. In the division of powers, the Canadian constitution, its the Federal government that is responsible for management of Indian lands and the Indians thereof. So, Canada through Indian Affairs has a fiduciary responsibility to ensure that the environment is protected. But they do so at their least expense and they want to it minimize any liability that they would have, not the liability of the First Nation. So, the very act that is supposed to protect us, is working against us. (#16)

This section summarized people's perceptions of climate change, its urgency, how prepared the community is to respond to climate change and who should be responsible and in what way.

Based on people's responses, the following are the key points:

- Swan Lake First Nation is unprepared to respond to climate change
- Climate change is not a high priority for SLFN because of other high priority items such as social and health issues, its global scale, and cultural views associated with climate and weather.
- Aboriginal perspectives on adaptation may make it harder for long term adaptation planning

- SLFN members require information in order to better respond to future challenges associated with climate change.

2.2.3 Community background

| Physical Geography | History | Governance | Demographics | Economy |
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| <ul style="list-style-type: none"> Swan Lake First Nation (Indian Springs #7), the main community site, is located in south central Manitoba, approximately 135 kilometres southeast of Brandon and 175 kilometres southwest of Winnipeg at 49° 23' 20" N 98° 54' 36" W. The nearest city is Brandon and the nearest service centre is Portage la Prairie. SLFN has an overall land base of about 16,000 acres. The average monthly precipitation ranges from 81 mm in June to 18 mm in February. Rainfall during the growing season is usually not more than 330 mm. The mean effective growing season is about 155 days, with an average frost-free period of about 124 days. SLFN lies in the northeast portion of the Pembina River watershed - characterized by hills and valleys with fertile soils making the area ideal for agricultural. The primary vegetation is aspen parkland with fescue or mixed prairie component that includes trembling aspen, oak groves, mixed tall shrubs and intermittent fescue grasslands (Enbridge 2006). White tailed deer are the most common big game species along with various game bird species. The main surface water body is Swan Lake, located at the southern part of the community site. | <ul style="list-style-type: none"> The people of Swan Lake are Anishinabe and their native language is Saulteaux. In the 1860's, the Hudson's Bay Company appointed Yellow Quill Chief because the former Chief before him left only one relative - his grandson "The Short Bear" - who was too young at the time to take over his hereditary position as Chief. SLFN is a signatory to Treaty No. 1 which was signed in 1871 at Lower Fort Garry. Disputes within the Portage Band eventually broke up the band in 1876 and a revision of Treaty No. 1 was made. Yellow Quill and his followers (Swan Lake First Nation) were to find unoccupied land in southern Manitoba, "The Short Bear" and his followers were assigned land in the Portage area (Long Plains First Nation), and the White Mud Band (now Sandy Bay First Nation) were to locate new land in the White Mud River area. After the survey of Swan Lake Reserve in 1876, Yellow Quill and his following settled there. In the 1900's, the people of SLFN began to farm the land. Many got jobs in the surrounding farms as field hands for local farmers that added to the revenue of the reserve. Many people also did lots of trapping at this time in order to survive. | <ul style="list-style-type: none"> SLFN is a member of the Dakota Ojibway Tribal Council (DOTC) but have limited contact with them. Governed by a chief and 4 councillors, elected on a 2 year cycle. SLFN is in the process of developing a Custom Election Code as the current election cycle is seen as being too short and therefore disruptive. Members of council do not hold portfolios instead are involved in all areas of the organization. Council meetings are held every second Monday and SLFN Enterprise meetings are held on alternate Mondays; all meetings are open to the public, except when in camera items need to be discussed. All council meeting minutes, policies, financials etc. are available at the front desk in the Administration office for people to read. SLFN informs members through community events, meetings, newsletters, information packages, the website, and by phoning and emailing people as well as hand delivering information. VISION – "Swan Lake First Nation Ojibway people are proud and prosperous. We are rich in culture and beliefs and have strong ties to our land." Currently engaged in a governance project to set up a governance model/structure that includes the development of organizational charts and decision-trees, as well as policies and procedures to ensure everyone understands how things are managed and to share the workload. | <p>The current total membership of the SLFN is approximately 1, 252. The distribution of registered members is as follows:</p> <ul style="list-style-type: none"> 700 people on-reserve <ul style="list-style-type: none"> 323 males 380 females 550 people off-reserve <ul style="list-style-type: none"> 266 males 283 females | <p>Economic Development</p> <ul style="list-style-type: none"> The Economic Development Manager is currently responsible for overseeing current ventures and other special projects and proposed ventures. SLFN employs its members whenever possible and the intent of their ventures is to create employment for their members with a goal of having enough jobs for everyone. Land leases to farmers are also a source of revenue for the community. SLFN also owns a bison ranch within the community and a ranch with bison, elk and cattle located near Carberry, Manitoba. <p>SLFN Enterprises</p> <ul style="list-style-type: none"> A division of SLFN and was initially developed for Treaty Land Entitlement purchases and it now includes current and proposed ventures (see Tables 6&7 below) |

| Basic Services | Health | Education | Recreation/ Social/ Culture | Environment |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------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| <ul style="list-style-type: none"> • There is a Public Works manager and a Housing Manager. • SLFN gets their source water from two aquifers. • The community has a water treatment plant that was built in 1994 but the waterline does not extend to all homes so water is hauled. SLFN paid for 4310 metres of the waterline. Prior to this, wells were used with the majority of them decommissioned now. • All homes in SLFN are on a septic system and a company from St. Leon has the contract to empty the tanks. • SLFN has an agreement with the Municipality of Lorne for fire and ambulance services and the Municipality of Headingley for the infrastructure (sewer and water) in that area. • The main energy source for the community is electricity supplied by Manitoba Hydro via the power grid. • SLFN is currently engaged in wind power development and are also investigating 3.5 kWh net metering for homes. • High speed internet service is available in the main buildings, i.e. Administration office, the Health Centre, and the RCMP satellite office. It is also available to residential homes. • SLFN has an agreement with the RCMP for First Nation police with both levels of government and SLFN. The RCMP are based out of Crystal City with a satellite office in the community. • SLFN has an out-dated Emergency Response Plan that was developed by the community as a whole through an ad hoc Emergency Planning Committee. • Currently there are 145 houses in SLFN with 86 Band units, 45 CMHC (rental) units, and 14 home ownership units. There are 67 applicants on the housing waiting list and overcrowding and mould are issues. • SLFN Enterprises has subsidized the housing program for the last three years. | <ul style="list-style-type: none"> • The Health Director oversees the various services and programs offered through • The Health Centre was built in 2008. It has geothermal heating and cooling and also makes use of energy efficient windows and lighting. • Delivers a monthly health centre newsletter to the community. • Programs include: Home and Community Care, Community Health Nurse, Maternal Child Health, Community Health Representative, Drug Utilization Prevention, National Native Alcohol and Drug Addictions program (NNADAP), Brighter Futures Initiative, Fetal Alcohol Spectrum Disorder, Building Healthy Communities (Mental Health and Solvent Abuse), Aboriginal Diabetes Initiative, Water Quality Technician, Medical Transportation, Dental services (a dental therapist comes once a week). • The Health Centre delivers awareness, informational meetings, educational workshops, and support activities to the community i.e. crisis and emergency response, H1N1 vaccinations, annual pow-wow, annual Health Fair, community garden, poultry farming, Winterfest, school activities, awareness walks, sports tournaments, crime prevention. • Dakota Ojibway Child and Family Services (DOCFS) has an office in SLFN from which services and programs such as family support, counselling, child protection, and foster care are delivered. Over the last five years, SLFN has seen an increase in the number of files from 24 open files in 2004 to 63 open files in 2009. The areas that show the most increase are children in care and family service. | <ul style="list-style-type: none"> • Indian Springs School is from K to 8 and was built in 1997. • School staff consists of a principal/director, 6 teachers, 2 teacher aides, a secretary, 2 maintenance, and 3 bus drivers. • Computers, art, Ojibway culture and language are taught within the elementary school. • High school (Grades 9-12) is completed at either Treherne Collegiate Institute (30 minute drive) or Westmount in Swan Lake (10 minute drive) and students are bussed. • The school has geothermal heating and cooling. • Post secondary sponsorship is on a first-come-first serve basis using the following criteria: 1) returning students, 2) grade 12 graduates, then 3) full and complete applications. • There is a post secondary counsellor that visits the students on a monthly basis. • An employment and training coordinator is employed by SLFN to provide training programs and/or sponsors students to enrol in a training programs such as business administration, auto mechanics and heavy equipment operator training. In 2009, 64 clients were assisted. • Youth programs fall within education and training and include the Summer Student program and the Skills Link program. • Also within education and training is the Child Care program (Tiny Tots Lodge daycare) which is at its current capacity of one Daycare Coordinator and five child spots. • Need to secure funding to address the childcare needs of SLFN. | <ul style="list-style-type: none"> • SLFN has a recreation centre located by the school, a school gymnasium, and a community hall located next to the administration office. They also have outdoor rinks, a playground, a boat launch and picnic area by the lake. • SLFN hosts many community celebrations and events as a way to keep connected as a community. They host an annual pow wow, an annual winter festival (organized by the Health Centre), Christmas celebration, and Valentine's dance. • Many events are held for their elders such as monthly Elder dinners, computer classes, meetings to talk about issues and keep them informed. • A weeklong Youth Conference is also hosted at the school and attracts youth from all over. • SLFN has Little Buffalo Youth Camp near Carberry that is utilized by all ages as a means to help connect people to the land, learn about Ojibway culture, arts and crafts, energy conservation and make them more aware of their environment. • The camp has a hybrid wind/solar system and a propane stove and hot water tank and is a permanent summer camp. | <ul style="list-style-type: none"> • SLFN ratified its Land Code in the fall of 2010. • SLGN intends to develop a Land Use Plan and have talked about developing their own environmental laws. • A Traditional Lands Atlas was completed in 2009. • A study was done by to test the water quality and quantity of the two aquifers located in SLFN and the locations of the aquifers were also mapped. This study was done as part of the negotiated agreement with Enbridge. |

Table 4: Reserve description:

| Name | Size (acres) | Location | Established |
|-------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| #7 Indian Springs | 8,982 | <ul style="list-style-type: none"> At the junction of Hwy 23 & 34 near Swan Lake, MB | June 20, 1876 |
| #7A Forest Hills | 6,514 | <ul style="list-style-type: none"> 16 kilometres south of the Trans-Canada Highway near the communities of Carberry and Glenboro, and adjacent to Spruce Woods Provincial Park | May 26, 1996 through TLE |
| #8 Indian Gardens | 640 | Hwy #2, Rathwell, MB | unknown |
| #8A Headingley | 24.86 | <ul style="list-style-type: none"> At Headingley, MB on the Trans-Canada Highway #1, 5 minutes west of Winnipeg's Perimeter Highway | September 16, 2005 through TLE |

Table 5: Swan Lake First Nation Summary Climate Data (see Addendum A for complete Climate Data Methodology)

| SLFN, MB | | | | | | | | | | | | |
|-------------------------------------------------|-------|-------|------|-----|------|------|------|------|------|------|------|-------|
| Weather Station: Pilot Mound | | | | | | | | | | | | |
| Months (Abbr.) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Mean 2001-2010 (°C) | -15.0 | -15.0 | -6.9 | 4.3 | 9.5 | 15.5 | 8.2 | 17.2 | 12.8 | 4.2 | -3.5 | -12.4 |
| Normal 1971-2000 (°C) | -17.6 | -12.8 | -6.5 | 3.5 | 11.3 | 15.8 | 18.7 | 17.9 | 11.6 | 5.1 | -5.4 | -14.4 |
| Difference between 1971-2000 and 2001-2010 (°C) | 2.6 | -2.2 | -0.4 | 0.8 | -1.8 | -0.3 | -0.5 | -0.7 | 1.2 | -0.9 | 1.9 | 2.0 |

Table 6: Swan Lake First Nation Current Economic Ventures

| Business | Location | # of Employees | Years in Service |
|-------------------------------------|--------------|----------------|------------------|
| Gaming centre | Swan Lake FN | 10 | 12 |
| Gaming centre / Smokeshop / Gas Bar | Headingley | 10 | 5 |
| Four Corners Service | Swan Lake FN | 10 | 3 |

| | | | |
|---------------------------|------------|---|---|
| Log Home Building Project | Carberry | 6 | 2 |
| SLFN Band Farm | Carberry | 2 | 7 |
| Office Leases | Headingley | 1 | 6 |

Table 7: Swan Lake First Nation Proposed Economic Ventures

| Business | Location |
|-----------------------------------------------------------|-----------------|
| Stackable Potato Chip Plant | Swan Lake FN |
| 10 MW Wind Farm | Swan Lake FN |
| Dakota Ojibway Child Family Services Head Office Building | Carberry |
| Southwest Casino Project with Assembly of MB Chiefs | Carberry |
| Gas Bar/Convenience Store | Carberry |
| Water Park | Carberry |
| Log Cabin Rentals | Carberry |
| RV Park | Carberry |
| Teepee Rentals | Carberry |
| Golf Course | Carberry |
| Hotel/Conference Centre | Headingley |
| Professional/Office Complex | Headingley |
| Multi-Flex Space Building | Headingley |
| Financial Institution Branch | Headingley |
| Coffee/Fast Foods Outlet | Headingley |

Table 8: Swan Lake First Nation Graduates

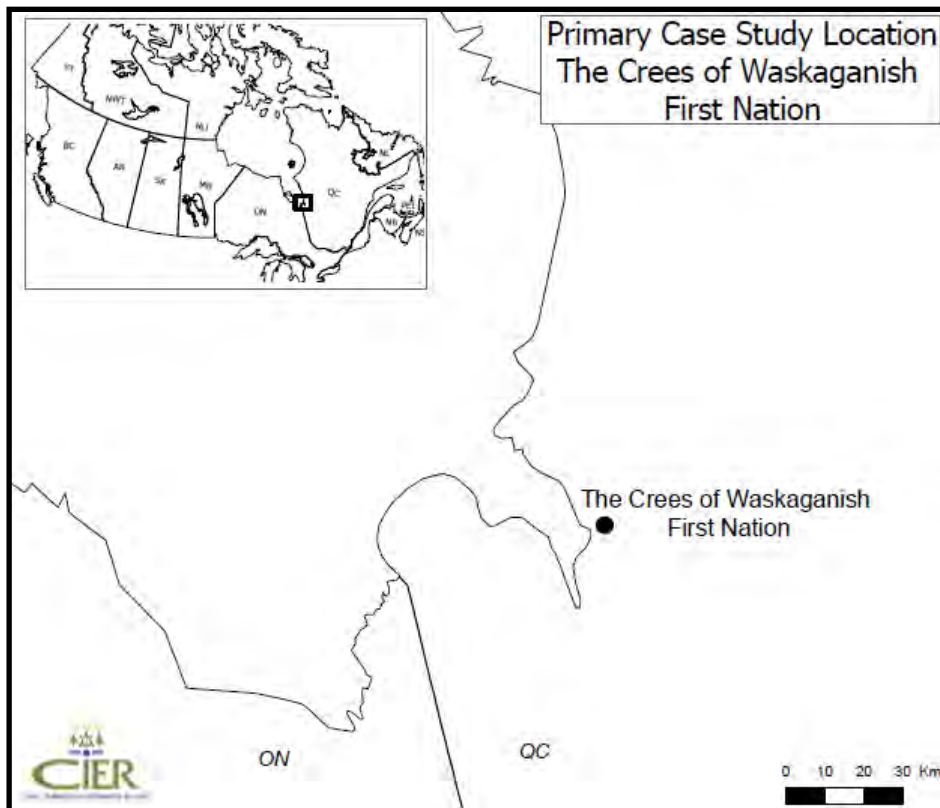
| | Grade 12 and Mature 12 | Post Secondary | Education and Training | Total Graduates |
|-------------------------|-------------------------------|-----------------------|-------------------------------|------------------------|
| 2010 (Potential) | 19 | 11 | 25 | 55 |
| 2009 | 13 | 13 | 100 | 126 |
| 2008 | 24 | 4 | 7 | 35 |
| 2007 | 8 | 3 | 10 | 21 |
| 2006 | 10 | 5 | 1 | 16 |
| 2005 | 9 | 7 | 3 | 19 |

2.3 THE CREES OF WASKAGANISH FIRST NATION

2.3.1 Climate change impacts

The Crees of Waskaganish First Nation (CWFN) is located on the coast of James Bay at the mouth of the Rupert River within the James Bay territory (see Figure 3 for location). The James Bay territory covers more than 350,000 km², approximately one-fifth the size of the Province of Quebec and lies between the 49th and 55th parallels (Meunier, 2007). This territory extends from the James Bay and Hudson Bay in the west to the Otish watershed in the East and is home to nine Cree Nations including CWFN (Meunier, 2007).

Figure 3: Location of Crees of Waskaganish First Nation



CWFN lies on the eastern edge of the Hudson Plains ecozone. The Hudson Plains ecozone is characterized by flat terrain and poor drainage encouraging the creation of the largest continuous wetlands in the world. The climate in this ecozone is generally cold and heavily influenced by the cold and moisture-laden Hudson Bay-low and Polar-high air masses (ESWG,

1995). Mean annual summer temperatures range from 12 to 16°C and the mean winter temperature is -19°C (ESWG, 1995). Precipitation ranges from 400 mm to 800 mm from the northwest to the southeast (ESWG, 1995).

2.3.1.1 Current Impacts

Several changes to the James Bay territory are being attributed to climate change, specifically as a result of increasing temperatures.

- **Temperatures** have shown an **increase by 1 to 1.5°C** in the James Bay Territory from 1970 to 2002 (Meunier, 2007).
- A **decline** in the **fish populations** and **changes** in the **migration routes** of geese have had an effect on the seasonal diet of the Cree people living near James Bay (Meunier, 2007).
- **Changing ice conditions** and **timing of freeze up** has had several impacts in the territory.
- Although CWFN is on the coast of the James Bay, it is not being affected by rising sea-level because it is currently counter acted by isostatic rebound in the region (Meunier, 2007).
- However, **erosion** remains an issue for CWFN because of **increasingly strong winds**.

2.3.1.2 Predicted Impacts

Climate models suggest temperature and precipitation will increase in the James Bay territory.

- **Temperature** will **rise 4°C** by 2050 (Meunier, 2007).
- **Precipitation** is expected to **increase** by up to **30%** a day by 2050 compared with data from 1961 to 1990 (Meunier, 2007).
- Plant and animal **species** are expected to **migrate further north** (Meunier, 2007).
 - The predicted climate changes are expected to force species many forest species to migrate northward and result in **local loss of many species** currently found in the James Bay territory (Meunier, 2007).
- **Increased risk of pest and disease** outbreaks and species migration are expected to have the most detrimental effect on the boreal forest in the James Bay region (Meunier, 2007).

- Climate change is expected to have an impact on wildlife by **changing the timing of life-cycle event**, such as reproduction and possibly causing desynchronization with vegetation (Meunier, 2007).

2.3.1.3 Sensitivities of CWFN

A community's sensitivity (high or low) to climate change reflects how climate change will affect the economic, environmental, cultural, and social aspects of a community. Given the current and predicted climate change impacts identified for the area within which CWFN is located what does this mean for the community?

For the Crees of Waskaganish First Nation climate change could have cultural, social and economic implications. **Cultural implications** could include: loss of access to land due to melting ice, thawing permafrost and flooding in coastal areas, decrease in safety on the land due to increases in unpredictable weather, extreme weather, and a decline in-depth and cover of ice, and a loss of traditional foods and medicines due to changing plant and animal ranges, shifting seasons, and erratic and/or extreme weather. **Social implications** could include: transportation impacts (more dangerous travel due to decline in-depth and cover of ice), infrastructure impacts (roads more expensive to maintain because of damage to permafrost thaw, increased freeze thaw cycle, extreme weather and changing seasons), and health impacts (limited access to and availability of traditional foods, increases in air pollution, water and food borne pathogens, and increase in pests that could carry disease, e.g. mosquitoes/West Nile Virus. **Economic implications** could include a reduced ability to predict seasons having impacts on various informal and formal economic endeavours, i.e. trapping, fishing, cutting wood, etc.

The following information is taken from a 2010 Climate Change Project done in CWFN where community members shared their observations on changes in the community and how these change have already affected the community (CTA et al., 2010).

- It is anticipated that with the future climate changes predictions for the James Bay territory the impacts to the community will continue and may increase and will also be accompanied by new challenges.
- The impacts appear to be especially detrimental to the traditional way of life of the community.

Climate change could have the following **environmental implications** for Waskaganish:

Increasing Temperature and Precipitation

Waskaganish community members have observed several changes in temperature and precipitation that are having an impact on hunting and trapping in the community.

- Cold weather is starting later than it used to.
- **Snow** accumulates later and **melts earlier**, and snow **depth** has **decreased**.
 - Many times there is not enough snow for hunters to make their blinds.
- Snowstorms have decreased in frequency and increased in severity.
- **Freezing rain** has **increased** as well as rain in the winter months.
 - Freezing rain affects the willows leaving less food for moose.
- **Ice** on James Bay is **freezing later** and **thawing earlier** therefore has affected winter travel and transportation.
 - Community members are forced to leave later in the year to access their traplines and hunting grounds and many trails can no longer be accessed.
 - Travel time is reduced because of earlier ice break up and thaw.
- The **water temperature** of the Rupert River is **increasing** and having implications on the bay.
 - Openings in the ice are getting larger and ice is decreasing in thickness every year.
 - **Travel** is considered **dangerous** now especially at the mouth of the river.
 - Some community members have fallen through the ice.

Increasing Extreme Weather Events

- **Thunderstorms** have **decreased** in **frequency** and **increased** in **severity**.
- Strong **winds** are **more frequent** and **intense**.
 - Strong winds blow down trees and blow off the rooftops on houses and buildings in the community.
 - Strong winds also increase the water level in the bay and decrease feeding grounds for geese forcing them to move inland to lakes and wetlands.
 - **Coastal erosion** is occurring as a result of stronger winds and storms putting many archaeological sites and heritage buildings at risk as they are on the coast.

Wildlife

Climate change is having a variety of affects on various species in the area.

- **Animals** are **moving more frequently** and are not showing as much fear.
- Several **new animal species** have appeared or have been **increasing** in the area such as, pelicans, coyotes, raccoons, bald eagles, egrets, vultures, cranes, swans, long neck geese, frogs, porcupines, and belugas.
- **Moose** are showing up on the **shores** of James Bay.
- **Beaver, lynx, marten** and **rabbit** populations have **decreased**.
- There are **more** sightings of **polar bears** on Charlton Island in winter.
 - They have ransacked camps on the island and are a danger to people.
 - When weather is poor it affects the food supply of other bear populations and they come near and in the community to scavenge.
- **Goose hunting** is an important tradition in Waskaganish and it is currently **threatened** by changes to the eagle population, timing and amount of vegetation growth on the shoreline, and ice and snow conditions (Meunier 2007).
 - All of the geese are travelling north later in the summer.
 - Long neck geese are having trouble flying as some of them have already started moulting.
 - There are **less geese** arriving in the **fall** and there are no longer landing areas for them on the bay.
 - **Bald eagles** are thought to be another cause of geese not landing on the shores as they can kill geese and eagle populations have been **increasing**.
 - Hunters are not getting as much geese now and several outfitters have abandoned their camps.

Fish

Climate change is expected to affect an important traditional food for CWFN, fish.

- **Warmer water** is affecting **fish** populations and fishing.
- People are no longer going out into the bay to fish.
- **Sturgeon** are not as large and found in areas where they were never found before.
- **Whitefish** are **smaller** in size and showing up **2 weeks later** than usual.

2.3.2 Interview Results

2.3.2.1 Description of community and community change

This section summarizes the description of the community provided by interviewees and major changes that the community has experienced. Interviewees said the following things about the community and changes they have experienced:

- Cohesive community with beautiful land and water
- Rapidly growing community population and development wise
- Improvements to education
- Construction of an all season road
- Struggle between the modern way of life and the traditional way of life
- Rupert River diversion

CWFN has been described as a friendly, peaceful, safe community where traditional activities still are a valuable aspect of the community. It is a cohesive community where people help each other. It is relatively isolated, despite having road access, so life is slower paced and the people have more freedom, especially when it comes to experiencing the outdoors. Being situated by the Rupert River and James Bay and in the boreal forest, the community has beautiful land and water which makes it easier for people to spend time out on the land with their families.

Waskaganish has seen improvements to their education system in terms of infrastructure and programs and services so people have more education options now. The local high school has been upgraded so students can now complete high school in the community. As well, the school has an adult education component. For post-secondary education, the local government negotiated for increased funding for students to make it easier for students to get fully funded but the issue of having to leave for post secondary schooling remains. Generally, members have attained higher levels of education in past for employment opportunities.

I think people are more educated, this generation, than they were in the past, because families are recognizing that in order for you to get a job, you have to have education and there's no change going on in the traditional way of life to ... the white man's way (#45)

The population of Waskaganish has been growing rapidly (See Table 13, Section 2.3.3) and interviewees talked about the high proportion of young people in the community.

It's a rapidly developing community and a rapidly growing community...It's a young community. Over 60 percent of the population is under 25. (#45)

Many interviewees linked this rapid population growth applying pressure on the First Nation to keep up with the increasing demand for more infrastructure, like housing, and the increasing demand for services.

...the fact that we're unable to keep up with the growth of the community in terms of building new houses is kind of right now put a lot of stress on the housing and overcrowding and stuff like that that we've experienced in maybe the 70's or 80's again. (#45)

Waskaganish has seen some significant upgrades in community infrastructure, both on a small and large scale. The community went from diesel generator to hydro power thus providing people with a more reliable source of power. A water treatment plant was also built. Before the plant was built, people noted that the community was on several boil water advisories. The all season road developed in 2001 was seen as a significant change for the community. Some interviewees see the road as a positive change as it provides, for example, access to the south, access to new areas for hunting and gathering, and improved transport (and lower cost) of goods and services. Others see the road as a negative change as it provides, for example, easier access for people to bring in drugs and alcohol, easier access for poachers, and a constant flux of people in and out of the community.

The issue of drugs and alcohol in Waskaganish has been increasing and has been attributed to the construction of the all season access road. Interviewees noted that bootlegging and drug dealing are a concern in the community with heavy drugs like cocaine becoming a significant problem. This issue concerns community members because they see it being linked to the number of neglected or abandoned kids.

...there's been a huge growth of the number of people in town like a huge growth of people coming in and out of the community, people traveling down south, and I think also like the amount of drugs and alcohol in the community kind of went up... (#45)

Waskaganish experiences various economic challenges, the main one being high unemployment. People expressed concern over the fact that the majority of jobs in the community are in the public sector and many jobs are seasonal as they are tied to the construction industry in order to keep up with the population increases. Some members felt that

there could be more tourism and service industry type employment. Interviewees noted that there are not many local businesses which could be linked to the issue of the availability of start-up funds for entrepreneurs.

In a broader sense, the people of Waskaganish are facing the struggles of trying to maintain a traditional lifestyle in the midst of people adopting a more modern lifestyle which has an effect, to various degrees, on many other changes observed in the community.

You know, in the old days, I had a little story about, when my mother was I guess entertaining suitors who she was going to marry, she had two choices. She had a choice of a young man who was always in school down south and a trapper which is my dad. So, you know, the lady that was raising her said, "You go with the trapper. He's always going to put food on the table." So he's going to have something to eat. Don't live with that schoolboy. He's never going to have, he's never going to have anything to eat. So what happened was she married the hunter and, you know...we've lived a good life as a family who never had any shortage or anything. But the other guy who went on to be a very good I guess worker for the Cree Nation. He's been working for the Crees for like 30 years...he makes a good living. But that's not really the point. The point was her mother I guess recommended that she live with the trapper. Now if the same situation was presented to a parent these days and the girl said, I have these choices. I have this educated guy or this trapper. I think most times they would say go with the educated one, don't live with the trapper because you're never going to have the nice car or whatever. So it's kind of like a social...I don't know, component of why the trapper has declined in importance. (#45)

One of these changes relates to youth becoming less involved in traditional activities attributed to youth being more into technology, like computers, cell phones, and video games, so they do not want to go into the bush and be involved in traditional activities. Youth are losing the value of respect which people say is tied to a traditional lifestyle. Interviewees associated this increase in the use of technology as a change to a modern form of communication from the traditional form of face-to-face communication like sitting around a campfire or visiting. This modern form of communication is viewed as being detrimental to the culture of the community.

To me, it's not a communication within our...our culture. You know, we sat beside each other, we spoke to each other face to face. Now with all the different technology that has arrived in our community, things have changed. The closeness, the family ties, you know, like even one time when we were in the bush, you know, we were living in one bedroom

house ...the family was in one place. Then when we came back from the bush I started to think about it. My kids have their own bedroom...they have their own TV sometimes in their room. So when we get together, everybody goes into their separate rooms. (#48)

A change to a modern lifestyle, especially with respect to technology, is also viewed as weakening the family unit. Family ties are not as close because parents and children do not communicate face-to-face anymore or spend as much time together. Parents have to work now so do not have as much time to teach kids or take them out on the land so there is a lack of family time.

CWFN members are also noticing an increase in the number of people pursuing unhealthy lifestyles that is leading to an increase in disease and obesity amongst community members. Interviewees attribute these unhealthy lifestyles to a change to a modern lifestyle which contributes to a more sedentary life resulting in diabetes and obesity in children and adults. In most cases, interviewees attributed an increase in unhealthy lifestyles to a decrease in the quality of food as people are consuming more store bought foods and making unhealthy food choices. People also noted that they do not have to do as much physical work anymore to survive which is linked to a changing lifestyle. Interviewees talked about the need to promote and bring back their traditional foods and lifestyle.

Well, they turn to other sources of...food...I guess traditional food that was kind of, had a lot of healthy benefits to it. You know, they stay in town and eat other foods which might not be as healthy. That contributes to...diet and health problems. (#45)

In summary, CWFN is a friendly, peaceful community that has witnessed many changes over people's lifetimes. Positive changes center on improvements to the education system, and an increase in infrastructure, especially the all season road. Negative changes include an increase in unhealthy lifestyles, and the struggles to maintain a traditional lifestyle in modern times. Another important change includes a rapidly growing young population. The next section discusses livelihood activities and environmental changes members of CWFN have witnessed.

2.3.2.2 Livelihoods, activities and environmental change

This section discusses the activities CWFN members do to make a living and/or feed their families, the changes in environmental issues in the community and how these issues have impacted Waskaganish members. The livelihood activities discussed and environmental

changes associated with them include: hunting, trapping, fishing, wood harvesting and plant gathering. Other environmental changes discussed include water and weather.

One of the most significant changes affecting livelihoods and activities, with respect to traditional pursuits, in CWFN has been the construction of the Rupert River diversion. The main effect of the diversion has been low water levels in the Rupert River which has significantly affected hunting, fishing, trapping, navigation, camping and is attributed to species decline, especially as related to fish. For example, lower water levels make navigation in the river harder as there are more rocks now and the river channel has changed.

I guess traveling on the river especially the mouth of the river has gotten more challenging. There's what do you call it, the shallow areas that didn't exist before ...we'll go over the same area and your motor is completely broken, and we kind of have to adapt to how to use the river in its new form ... It's going to take us a while to know where the right channels are. (#45)

Impacts on these activities have further impacts on the community and its culture. People have noted that because the diversion is a recent event, the community is just starting to see effects so cannot speak to future effects with any certainty.

The other communities, when they first talked about diverting our river the only thing you heard about was the positive things was what you would get with, you know, the money? But nothing was mentioned about all the negative things that would happen afterwards. But now ... it has happened and we're gonna see ... what affects it's gonna have...the thing it affects most is probably the fish. ...they had a good spot where they can just scoop the fish out the water, ... that's something that went on for so many years, whether you're gonna have it again or not, that's gonna be a big affect on people that really love doing that... we're gonna see a lot more, I think in years to come. (#43)

In Waskaganish, many people still hunt, but hunting and trapping in general has declined. People mostly hunt big game like moose and caribou in the fall, waterfowl like ducks and geese in the spring and fall, as well as ptarmigan, grouse, and rabbits. The majority of people still hunt geese because the work and school calendars are built around the migrations of the geese. Trapping is done mainly by the tallymen as they have access to an area. Interviewees associated the general decline in hunting with a loss of interest in hunting due to the increased costs to hunt and a decrease in the value of a traditional lifestyle. People noted that it is harder and more expensive to go hunting now because hunting requires more effort to be successful

and requires motorized equipment like a boat, snowmobile and in some cases a helicopter. Hunting and trapping has declined, especially amongst the younger generations, because of the change to a modern lifestyle where more people are employed making it harder to get out on the land.

I think it's because people cannot afford all the equipment, you know, what you need now in these days for hunting. Like the boat, motor, the vehicle. And it's not a motive as a means of creating jobs... And even now you're seeing more of our older people, our elders that still practice that. You don't see as much like middle-aged or young people to practice that. (#46)

Interviewees also associated the decline in hunting to changes in the weather, especially in respect to earlier springs. Members noted that changes in the weather have affected the migration timing of geese. Now, the lesser Canada geese arrive before the giant Canada geese whereas they used to arrive at the same time. This translates as less geese to hunt and throws off the work and school calendars. As well, earlier spring means an earlier break-up so people cannot hunt from the ice in mid-April anymore. Hunters have to go by helicopter because it is not safe to cross the ice by snowmobile.

...the giant Canada geese used to arrive with the lesser, smaller species at the same time...what happens now is that the smaller geese arrive first, and maybe a month later the giant Canada geese arrive...and when they were getting here probably in mid-April, there's still a lot of snow and ice, so we can sit on the ice and hunt the geese from sitting on the ice. But now maybe by mid-April it's not safe to trap on the ice anymore. We've actually had to get a helicopter to take families out to their camps in the last say 3, 4 ... 5 years because the spring melt has occurred sooner than it used to, and I think that's had an effect on certain people that aren't able to afford to go out there...they used to go there by skidoo, now you have to use a helicopter and that's much more expensive. (#45)

A decline in hunting was also linked to a decrease in animal populations in the area. People have observed more caribou coming down from the north and more moose moving north. This movement is being attributed to the various hydro projects in the area. There also seems to be less ptarmigan and rabbits in the area. Many interviewees spoke about their observations of fewer snow geese in the area due to the geese changing their migration routes. They noted that since the nineties, the snow geese fly higher and go more inland.

...they used to kill so much geese there but now today they can't kill anything much over there ... the geese...they're changing their flight patterns and they're changing the level

that they're flying... now it's like they're not really stopping over anymore because they're flying way too high. (#44)

Fishing was and still is a key activity in Waskaganish and fish are a main food staple for the community. People fish mainly for sustenance and to share with family, but some people occasionally sell their catch. There has been a few general changes in how people fish, where people fish and in the number of people that fish. Interviewees noted that less people fish now because there is a loss of interest, people work now so have less time to spend fishing, and it is not as easy anymore to catch fish. It was also noted that more people use fishing rods now as opposed to nets which signifies a change to fishing for recreation versus for survival.

I remember across the river from here I used to see a lot of elders, you know, they would be cleaning their nets during the day, you know, preparing their nets when they were fishing, but now people just go for a couple of hours, just go on the fishing rod. But we still have people that have go set nets ...in the summer there would be probably six to seven to eight families that would go out in the Bay and come back, we'd smoke fish and distribute the fish. (#48)

There has also been a change in where people fish. People are losing important fishing places because of the diversion. An example of this is 'Smokey Hill' that has been an important spot to scoop out whitefish. People also seem to fish less in James Bay because motorized equipment is required which makes it more expensive.

...in terms of fishing there's a lot of changes since the diversion and people are losing their favourite fishing places, you know, fishing sites. And they have to ...go elsewhere...to do ... what they're doing right now...to go fishing. (#58)

Interviewees have observed a decline in numbers of fish which is attributed to the diversion. The diversion has created low water levels resulting in changes to fish habitat so the timing of spawning has changed along with fishing spots. It was also noted that under low levels water can become too warm and lead to massive fish kills.

...I think there's less than before. I used to catch, ah, like in one scoop I used to get forty but now last year...in one scoop I got only a few, like ten. (#57)

The decline in hunting, trapping, and fishing practises in Waskaganish has had a number of health and cultural impacts on community members. Many members note the importance of traditional foods and understand that the quality of the food eaten plays an important part in the health of the people. With less traditional foods eaten, people turn to other sources of food

which are not always the healthiest and often lead to diet and health problems. Another health impact to community members is less physical activity, since it often takes work to go out and trap or harvest food. The use of motorized equipment means people get less exercise where before they used to walk almost everywhere.

I think it affects them because you know you were created to eat certain food ...for different seasons and after the season of spring came and June came we felt like eating fish ... you know that you're going to eat fish and you crave for that...So when fall comes...I'll want to eat moose or wavey. No more fish. You know every season our diet, the food changes, and every season there's different food that we crave, it's so amazing. (#47)

Less hunting, trapping and fishing also results in a loss of culture and passing on of traditional knowledge, especially because fewer youth go out on the land with elders or parents. People were concerned that traditions like the smoking and drying of fish for the winter would be lost. Many people also noted that hunting, trapping and fishing were traditionally a family activity, but also community activities. The decline in these practices results in erosion of the family unit and community closeness as there is less time spent together.

A long time ago ... during the spawning season when the whitefish were very numerous ... Waskaganish would be an empty place because everybody was over there scooping and cleaning and drying the fish, smoking them...then once they were done with that they'd come back to this community with the dried fish and people from the surrounding area would come to this place to get some fish. But today you don't see much of that, just a few people get the fish and everyone runs to them to get the piece of the fish, whereas it was used to be like a community thing in the past, the whole village moved out... (#44)

For community members who only know how to hunt, trap and fish, a decline in hunting, trapping and fishing can really affect them, especially if they do not have the skills required to get a job. With the community changing to a modern lifestyle where a wage economy is dominant, people who have worked in the wage economy will find it easier to switch or adapt to working a regular job.

On a different note or perhaps a more positive note in relation to the decline in hunting and fishing, interviewees also mentioned that with the rapid increase in population (as discussed in 3.1.1), if everyone were to hunt and fish there would be overharvesting. The current animal and fish populations are not large enough to sustain the current population of Waskaganish.

I cannot say that. Well, I can say we can all live off the land, but I think that the population wise. I don't think we can do that in a lot of ways. We're going to overharvest things, so. That's the other thing, you know, like. If everybody would go back to the land, we'd be overharvesting, you know, what's available out there. (#48)

The people in Waskaganish continue to cut firewood to heat homes but the wood resources are stressed because of the greater demand for firewood due to the increased population resulting in more homes to heat coupled by the increased costs of hydro electricity. Although the all season road created new areas to access wood that were previously too far by snowmobile, wood resources still remain stressed.

In terms of...woodcutting, there's 400 houses whereas 20 years ago there might have been less than 200. And I think the needs...put a little bit more stress on the surrounding territory to provide the adequate firewood...people are turning back to...harvesting wood. (#45)

This increased access to firewood, as a result of the all season road, has impacted the tallymen or trapline owners because they now have to ensure wood resources are not overharvested within their territories.

The tallymen or the trap line owners ...they probably experience more people cutting firewood on their territory than before, and in some ways they can actually kind of take advantage of that and they're the ones that cut the firewood and they sell it to the community members. So it's kind of an opportunity on one side or a threat depending on how they react to it I guess. (#45)

Regarding berry picking, the majority of people still enjoy picking blueberries, but people have noticed that there are fewer berries in the area now. Interviewees attribute this decline in the availability of berries to hotter summers as berries do not grow in hot conditions because they dry up. This increase in temperature is also associated with a shorter berry season.

Interviewees also blame the decline in berries on construction in the area that has destroyed good blueberry habitat. The berry decline has some health and cultural implications on community members the most noted of which are the health benefits of berries and berry picking as a family activity. Blueberry picking used to coincide with the scooping of the fish event so with the change in weather, the timing of both events is off.

In Waskaganish, people also talked about the greater difficulty to find the special wood they use to cook geese.

They used to go not too far from the community, my brothers. They usually gather wood for community if they want to cook goose. Cause we use a special kind of wood for a goose. And now they have to go really far to get the wood. Maybe because there is a high demand. (#56)

Waskaganish has had a number of issues and concerns related to water in the area. Many interviewees talked about the low water levels created by the diversion and the impacts this has caused that include difficulty navigating the river when it is low, affects on fish, and the general change in the river. Other water topics discussed were concerns attributed to climate change and the construction of the new water treatment plant as a benefit to the community. With respect to climate change, people noted that the temperature of the water has increased which is exacerbated by low water levels. The construction of the new water treatment plant has provided better potable water to the community. Despite the new system, interviewees noted that people still do not trust the water so many still buy bottled water. Part of this is that people are not used to the chlorine in the treated water. Another advantage of the plant is that it makes it easier to put out fires in the community. However, the plant is also impacted by low water levels because there is less water intake which makes it harder for the plant to run at normal levels.

I mean people still boil their water or buy the water. And they keep telling us, 'No, its okay drink it,' but I don't know, takes time I guess to trust it, because our water used to be so terrible. It was like brown water. (#50)

The people of CWFN have observed a number of changes in the weather. Many members spoke of the weather as being unpredictable now and have noticed an increase in extreme weather events, of which thunderstorms, snowstorms and windstorms were, mentioned. People specifically talked about the increased windstorms and the impacts to infrastructure in the community.

...the wind, I don't know if there's any change...in terms of the global environment, in weather patterns of the wind ... because we've had in the last three years wind storms here, the strongest one actually ripped off the layer of roofing off the school, ripped the roof right off the metal roof right off the aircraft, airport terminal. (#45)

Many also noticed big changes in the seasons, especially shorter winters and earlier springs, but also noted that there are more warm spells during the winter. People talked about getting less snow (about 1 foot deep now versus 5 feet), the snow coming later in the winter and melting earlier with spring starting earlier. Interviewees have also observed more temperature extremes, specifically extreme heat in the summers, which means drier summers and the increased possibility of forest fires.

The observed changes in weather have impacted CWFN members in different ways with the most significant impacts being on traditional activities. Interviewees attributed changes in weather, especially in relation to earlier ice break-up, to greater difficulties harvesting geese in the spring because people have to go hunting by helicopter which increases the costs. As well, the timing of the breaks from school and work that coincide with the spring goose hunt is off as things are earlier now. These impacts negatively impact the health of people because people harvesting fewer geese and therefore eating fewer geese can lead to an increased reliance on store bought foods. People eating less traditional foods can also lead to a more sedentary lifestyle, as the physical activity to harvest food is eliminated further resulting in negative health implications.

I think it's very different. And even in the spring, a lot of the thaw came very quickly and the hunters couldn't go out with their skidoos. They had to use helicopters to get out to their camps because of the mild, and even with our students, we had to let them go almost 2 weeks early in April and usually our goose break is in around the 20th of April and quite a few left two weeks before. But it was warm, very warm and they didn't get a good hunt at all. The numbers were very poor. (#50)

Interviewees also associated changes in weather with changes in animal behaviour. Some noted that they see more polar bears encountering humans now.

This section described the environmental changes that CWFN members have witnessed and how these changes have affected them. These included:

- Decline in hunting and trapping practises impacting cultural transmission, consumption of traditional foods and a traditional way of life
- Decline in fishing and fish populations impacting cultural transmission, consumption of traditional foods and time spent with family
- Stress on wood resources for firewood because of increased demand due to population increase and increased costs for hydro

- Decrease in abundance of berries impacting health and cultural transmission
- Changes in weather including increases in extreme weather events, changes in seasons especially earlier springs, and extreme heat impacting access to traditional foods, human health and a traditional way of life

The next section will discuss how CWFN responded to these changes in order to address their concerns.

2.3.2.3 Managing and coping with change

This section discusses how CWFN responded to the environmental issues and concerns discussed in the previous section. This includes responses by individuals, at the Band level, and partnerships with outside organizations. We discuss how they addressed issues about:

- Changing seasons affecting the timing of land activities
- People eating less traditional foods due to declines in hunting, fishing and berries causing health implications
- Ice safety due to earlier spring melting
- Negative effects to a traditional lifestyle
- Extreme heat events increasing forest fires

Individual Response

In terms of addressing the livelihood and environmental changes noted in the previous section, interviewees talked about the importance of having the 'right' person or 'champion' to lead initiatives related to addressing changes and building community awareness of these changes. In response to changing seasons affecting when people go out on the land, most land users generally rearrange their schedules based on the weather. Hunters respond to earlier springs by planning to leave earlier than they normally do.

I guess they're...rearranging probably their schedule...as long as they're able to go out in the land, they may not be able to accomplish what they want to do. But to go out on the land...it's a priority for them you know. (#55)

Band and Community Level Response

CWFN expressed concerns related to people eating less traditional foods and the implications this has on the health of the people. Less consumption of traditional foods was attributed to declines in hunting, fishing and berries as a result of various factors previously discussed.

CWFN's cultural department runs a program, with funding from agreements with Hydro Quebec, which pays people to catch fish and bring it back for the community. They have one program for fishing out in the Bay and are starting one for 'Smokey Hill' where people scoop net whitefish. Many interviewees noted that CWFN should run more of the above programs for the community but for other types of wild meat like moose, goose and beaver.

...we have people...who do catch the fish, we have people that clean the fish, we have people that smoke the fish, we have people that distribute the fish. So it's a program that can run for 30 or 40 days, it depends on the spawning season. (#55)

To alleviate other health implications from people being less active and eating more unhealthy foods, as a result of a decline in less traditional pursuits, the Health Centre runs various programs. Community health workers run programs that encourage people to exercise like for example, weight loss challenges. The Health Centre also employs a full time dietician who members can see anytime.

In response to issues related to ice safety due to earlier spring melting CWFN hired an individual for public safety. Part of this person's job is to put up markers on the ice showing the safest routes to travel.

Negotiations with Hydro Quebec over the Rupert River diversion provided CWFN with compensation funds in exchange for flooding part of their traditional territory. These funds have enabled Waskaganish to respond to changes affecting their traditional lifestyle. Niskamoon Corporation was developed to administer funds from the Quebec Agreement to fund activities that keep youth connected to traditions and with elders as there are concerns about losing the traditional lifestyle. Examples of some of these activities are the annual canoe brigade in the summer for one month, a snowshoe walk in the winter for a week and 'walking with elders'. Parts of the funds from the Quebec Agreement also pay for people's transportation costs to go to their camps and continue to go hunting, fishing, and trapping, especially in relation to changes to the weather and climate. Funding from the Quebec Agreement is also used to subsidize firewood for people. Young people from CWFN are hired to cut the firewood and then sell it through the program.

Probably, Hydro, being the ones that...provides funds...different things, could be like the water treatment plant, that was at their expense... I have this hope they just continue to, provide the things that, the community needs. So, I think Hydro is one of the key people right now that, is responsible for assisting and providing funding. (#59)

In response to concerns about losing the traditional lifestyle, the local school has different programs to support cultural and traditional activities. The school has a two week break in the spring and the fall so kids can go hunting with their parents. This also supports kids spending time with their families as many traditional activities support the family unit.

Working with Others

CWFN understands the importance of reaching out or working with others as a way to respond to environmental issues as not all issues can be addressed at the Band level. Interviewees noted that CWFN reaches out to others in order to benefit its members by sharing resources and getting help whether it is the form of technical or financial help.

I think for some of these measures or some of these impacts we're facing, I think we seek help wherever it is available, any financial help or technical help and I think that we would access that help for the benefit of our members. Whatever help that's out there whether it be a federal, provincial or regional. (#45)

Issues affecting traditional lifestyle are responded to regionally through the Cree Trappers Association (CTA). The CTA identifies concerns from hunters and trappers and proposes ways to respond to issues around and changes to the traditional lifestyle. For example, the CTA marks the ice and makes announcements about ice conditions as a way to improve the safety of land users. A regional climate change research project was also funded in the area.

In response to concerns about extreme heat events increasing forest fires, there are regional programs that measure the risk of forest fires and broadcast them over the radio. In cases where forests are dry, warnings are put out.

I think if they know the effects of...climate change and all that, I think they would be more, worried or bring them more to their attention, I guess. So I think there has to be an awareness of, the possible risks, or things like that in the community first. (#58)

2.3.2.4 Environmental and climate changes in context

This section discusses people's perceptions of climate change, the importance of climate change to the community and how prepared the community is to respond to climate change. It includes:

- What people think of when they hear the term climate change

- Level of preparedness of CWFN to respond to climate change
- Issues of responding to global climate change at the local level
- Aboriginal perspectives on adaptation
- The need for environmental awareness and education of members for improved adaptive capacity
- Who is responsible for dealing with climate change?

When people from CWFN were asked what they thought of when they heard the term 'climate change', a variety of answers were provided. Some people thought of general changes in weather and weather patterns like no more winters and more bad weather than good weather. Climate change and ecological disruptions were common responses and included: geese not migrating this way anymore, effects on animals, and more traditional foods, like blueberries, disappearing. Other people thought about flooding especially in relation to rising water and coastal communities and icebergs and glaciers melting with concerns over where the water is going to go. Others thought about drought. The term 'climate change' brought on broader thoughts of losing their culture.

When people were asked if CWFN is prepared to deal with the potential impacts of climate change, the majority of people said that CWFN is not prepared. Interviewees noted that the community is limited by financial resources to adapt to climate impacts. Climate impacts that are relatively inexpensive to deal with, like earlier springs are addressed as previously described.

I don't think we're prepared at all....it's hard to say how prepared we are not knowing the exact impacts that we would trace, but I think in terms of what we've seen so far are, and the measures we've taken, I don't think we're really prepared to say in the next 5 years that things...ever get worse than they are now. (#45)

Despite the general sense that CWFN is not prepared to deal with climate change, climate change was seen as important to those interviewed. However, it was not listed as a high priority. For the majority of community members interviewed, they noted that there are many more urgent priorities they need to tend to on a daily basis such as dealing with social issues and health problems and looking after their families.

...now it's because we're becoming more urbanized. You know, like our population is growing. So we have other urgencies like, you know, education first, because of the

Education Act. We need to educate our children...there's other areas that are more important. (#46)

Members talked about the challenge of dealing with the global issue of climate change at a local level. With climate change being such a large and intimidating issue, interviewees expressed that they did not know how to grasp and respond to it. They noted that most of what they hear about, like the various disasters in the world, happens so far away from Waskaganish that people get the general sense that it will not happen around here. Many simply stated that they do not know how they will be affected.

Not very prepared. We're very lacking. Only certain people know, and the climate change is like a new thing for us, right....we only hear in the news. We think it's only happening in their own backyard. it's not going to affect me. Reluctancy is another thing. (#60)

Another aspect of being prepared for climate change that some interviewees discussed is the notion that adaptation is a part of life for them and they deal with issues as they happen. Some responded to the issue of climate change as just one of the many things they will have to adapt to. There is this general view that they will deal with things as they come just as they have always done.

Ah, the only comment I can make is, we've been adaptable. We have to be adaptable to whatever climate change is happening. That's what we've been doing throughout years. (#41)

The importance and need to plan for climate change was also expressed but interviewees noted that community-wide planning for climate change has not yet happened due to several reasons. They talked about the fact that it is hard to plan for climate change when you are not sure how it will impact you and are not fully aware of or understand what climate change is. Interviewees talked about the need for greater awareness and understanding about climate change as well as the possible risks climate change poses to their community. They associated this with needing more information in order to make informed decisions and plan for climate change.

I guess we have to understand first what it's going to cost, what are the real changes going to happen...so first we have to understand what is climate change? Then you give it to the community members for them to understand, too. I know you can read on the internet or listen to the radio what's happening, but as a community, most have to

translate things...because our people know the area, where is that change going to happen, where are we going to see the effects in terms of water or land, like if there's a lot of heat in the summer, which areas is more likely to have a forest fire. (#48)

When asked about who is responsible for dealing with climate change, the general sense was that it should be dealt with as a community and must involve leadership. Leadership should reach out to people to increase awareness and keep them informed about climate change. People noted that leadership should be responsible for developing, distributing and implementing an emergency preparedness plan. People as individuals should also be responsible as it is up to them to change instead of just watching things happen. They noted the importance of starting with little things like getting groups like the tallymen to talk to students about changes they see. People saw the Cree Trappers Association (CTA) and the tallymen as helpful resources to increase the community's awareness of climate change.

I don't think there's any group, I think it has to be done collectively, as a community, as a whole. I think everybody has to pitch in...to see that it works. (#55)

The Cree Regional Authority (CRA) was also named as an important organisation to help the community respond to climate change. People noted that the CRA can help with funding and providing climate change information over the radio or the internet.

But in reality I think the CRA or the CTA that are doing the program now on information about climate change, and they actually had a meeting with the tallymen about their concerns and all the aspects of changes, and there was that for the tallymen, but their local members were left out in a sense. The tallymen of course are the ones that see and breathe in the land on the land. They see animals and everything. But I think the whole community needs to be aware what the community members do. They need to [teach] regular people like us. [Regular people] don't hunt as much but then again the awareness and education would be nice, too. (#60)

Interviewees also talked about the responsibility of the federal government in response to climate change and environmental changes in general. The majority of interviewees noted the general lack of interest of federal institutions in assisting First Nations. Many interviewees had the perception that Indian and Northern Affairs Canada (INAC) just talks about things but does not do anything about it.

This section summarized people's perceptions of climate change, its urgency, how prepared the community is to respond to climate change and who should be responsible and in what way.

Based on people's responses, the following are the key points:

- CWFN is unprepared to respond to climate change.
- Climate change is not a high priority for CWFN because of other high priority items such as social and health issues, and looking after families.
- The global scale of climate change makes it difficult, at the local level, to adapt to it, especially when there is uncertainty about what the local impact will be.
- Aboriginal perspectives on adaptation may make it harder for long term adaptation planning.
- CWFN members need more information and understanding in order to better respond to future challenges associated with climate change.

2.3.3 Community background

| Physical Geography | History | Governance | Education |
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| <ul style="list-style-type: none"> • CWFN located in northern Quebec, at mouth of Rupert River, East shore of James Bay, (Lat: 51° 28' 48" N, Long: 78° 45' 0" W) • All season unpaved road constructed in 2001, connecting CWFN to the James Bay Road, 103 km to the east. • Nearest city is Rouyn, nearest service centre is Val-d'or, 567 km south. • CWFN has total land base of ~12,169.94 acres (Waskaganish #61) (INAC (A), 2010). • Cree is dominant language, but younger generations fluent in English and French • In southern Hudson Bay Taiga Ecoregion characterized by the Coastal Hudson Bay, Hudson Bay and the James Bay Lowlands, underlain by flat-lying limestone bedrock (ESWG, 1995). • Coastal areas dominated by marshes, tidal flats and shallow water (ESWG, 1995). • CWFN territory within the boreal forest. Into interior shrubs including willow, blueberry and Labrador tea, are common, mixed forest, bogs and marshes with white and black spruce, aspen, birch, sedges, lichens, and moss (ESWG, 1995). • Extensive wetlands attract thousands of migratory birds (snow geese, Canada geese, sea ducks, and shorebirds). Mammals include moose, caribou, black bear, caribou, snowshoe hares, arctic fox, beaver, and muskrat (ESWG, 1995). • James Bay Lowlands - short, cool summers and cold winters. Mean annual precipitation range from 500 to 700mm. Mean winter temperatures range from -19°C to 16°C and mean summer temperature range from 10.5°C to 11.5°C (ESWG, 1995). | <ul style="list-style-type: none"> • CWFN is the historic homeland of the nomadic Cree hunters and trappers who made their livelihood from hunting and trapping on the land (AANISCHAAUKAMIKW Cree Cultural Institute (A), n.d.). • 1668 - CWFN was the site of the first Hudson's Bay Company (HBC) trading post Rupert House) and the earliest European settlements in North America (The Columbia Encyclopedia, Sixth Edition, 2008). • In the early 1800's CWFN became the shipping and trading centre of the region (AANISCHAAUKAMIKW Cree Cultural Institute (A), n.d.). • In the late 1930's and early 1940's the federal government established a government structure for each fur trade post and issued rations (which later became social assistance) (Feit, 2004). • In the 1950's and 1960's the federal and provincial governments sought to "open the north" to make the north more accessible to exploit resources for the benefit of southern Canadians (Feit, 2004). • Fur prices declined in the 1950's and many hunters began accepting unreliable jobs with low wages. • In 1971, the government of Quebec announced plans for a hydro mega project (see Table 11) • James Bay Project Part I & the James Bay and Northern Quebec Agreement (JBNQA) 1975 (see Table 11) • James Bay Road Project in 2001 (see Table 11) • James Bay Project Part II (see Table 11) | <ul style="list-style-type: none"> • CWFN is one of the 9 First Nations that are a part of the Cree-Naskapi election system, pursuant to the Cree-Naskapi Act (1984). • An elected Chief, Deputy Chief, and 9 Council members govern CWFN. They are elected on four-year terms and term expiration dates are staggered allowing for continuity between terms. Elections occur every two years in CWFN so within four-year period, one election is for the Chief and five Councillors, the next is for the Deputy Chief and four Councillors (Pers. Comm. Deputy Chief Hester, 2011). • Due to rapid growth, Chief and Council delegate projects and operations to independent departments; each department administered by a director, and all are overseen by the Director General. • Annual general assembly's held in CWFN with community members and Chief and Council – have an open agenda, meant to allow community members to voice their opinions and concerns, and provide suggestions. Due to community members' request, the assemblies are now happening more than once a year (Pers Comm. D. S. Salt, 2010). • CWFN is one of the nine First Nations represented by the Grand Council of the Crees (GCC) and the Cree Regional Authority (CRA). • The GCC, or Eeyou Istchee in Cree, is a political body representing approximately 14,000 Crees in the southern Hudson Bay and eastern James Bay area of Northern Quebec - made up of 20 members: an elected Grand Chief and Deputy Grand Chief, elected Chiefs and one other representative from each of the nine First Nations represented (Grand Council of the Crees, n.d.).The GCC has responsibilities with respect to protection of rights and interests, preservation of Cree way of life, acting as regional or local government to solve problems, and providing regional services (programs and activities). • The CRA is made up of the same members and board of directors as the GCC, however, they are two distinct legal entities (Grand Council of the Crees, n.d.). The CRA has responsibilities with respect to environmental protection, hunting and trapping, economic development, education, social welfare, recreation, technical assistance, and community development in the nine member communities. | <ul style="list-style-type: none"> • With the signing of the JBNQA, Cree people established the Cree School Board that is responsible for administering and funding education at Cree schools and a curriculum that incorporates Cree values and language in the Hudson Bay Cree communities (Mukash, 2008). • The Cree School Board provides several services and resources to the James Bay Cree communities. • Post secondary student services are available to provide financial assistance, counselling and referrals, student centre and facilities, and administrative support to post secondary students (Cree School Board (A), n.d.). Adult education is offered through Sabtuan Adult Education, a division of the Cree School Board. A vocational training centre is located in Waswanipi for those interested in training in a trade (Cree School Board (B), n.d.). The Cree School Board also develops and publishes their own materials on Cree language and culture and makes them available resources. These publications include a Cree online dictionary, Cree oral stories, Cree school board publication catalogue, Cree academic papers, Cree lessons syllabics & read-along exercises, and Cree new words forums (Cree School Board (C), n.d.). • CWFN has two schools; Ecole Annie Whiskeychan Memorial Elementary School (primary) and Ecole Wiinibekuu School (secondary). For primary grade levels, the Cree language and Cree syllabics are the main focus of instruction. The degree in which the students are taught in Cree decreases as they enter into higher grades, however, instruction in Cree as a language is maintained. |

| Basic Services | Health | Economy | Recreation/social/cultural | Environment |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------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| <ul style="list-style-type: none"> • The Director of Public works is responsible for water and sewer plant, garage operations, public building maintenance, roads, walkways, and sanitation operations (Moses, n.d.). • The Director of Community Services administers airport observer communication operations, the post office and the power house operations. • A new water treatment facility was built in 2010 increasing water quality and pressure (Pers Comm. B. Blackned, 2011). • Wastewater from CWFN is treated at 2 stations, directed to 3 lagoons where it is treated and then released back into the Rupert River (Moar, n.d.). • Electricity is supplied to homes by Hydro-Quebec as of 2009 - prior to this was from a diesel generator. • The main facilities in the community are churches, a bank, community radio station, community hall, arena, recreation centre, and an air terminal (INAC (C), 2010). • A courthouse and a new air terminal are currently being built (Pers. Comm. B. Blackned, 2011). • The community is kept informed by public notices in the Band office, on WFNs official website and on the local radio station. • The Director of Public Security oversees the Security Committee, the Police Force, the Fire Department and the Public Safety Department (Moses, n.d.). • A fire department with volunteer firefighters and a police station provided by the Aboriginal police force. • CWFN has an emergency response plan that is currently being updated. • The Director of Capital Works oversees capital works planning and development (Moses, n.d.). • There is currently a shortage of housing and a waiting list of about 400. | <ul style="list-style-type: none"> • The Cree Health Board and Social Services of James Bay have the responsibility for health and social services in the James Bay Cree First Nations. • Health Director oversees department heads that are in charge of clinic staff (Pers Comm B. Blackned, 2011) • Waskaganish Healing Centre built in 2002 • Also a Multi Service Day Centre , built in 2007 (Pers Comm B. Blackned, 2011) - provides day services to elders and community members with disabilities. | <ul style="list-style-type: none"> • Business ventures, tourism, and local cultural activities are overseen by the Economic Development Department under the direction of the Director of Community Development (Moses, n.d.). • Economic activities in CWFN are concentrated mainly in arts and handicrafts, services, trapping, construction, and outfitters. • CWFN currently has several businesses operating within the community, including: a lodge, restaurant, cafe, automobile and heavy equipment repair garage, arts and handicrafts, hardware store, general store, and a taxi service. | <ul style="list-style-type: none"> • A Youth and Recreation Director oversees the youth and recreation department - including the Arena, the Gathering Place, the Youth and the Recreation Departments. • Have recreation centre, members can play basketball, floor hockey, use arcade and fitness centre. • Hockey teams of all ages play in the Sara Memorial Arena. • Have a baseball field where several teams play in the summer. • Every summer a canoe brigade of Cree youth led by elders, travels up the Rupert for 28 days to learn about the land, the Cree way of life, and where they came from. (AANISCHAAUKAMIKW Cree Cultural Institute (B), n.d.). • For generations, members have gathered at Smokey Hill (~20 km from community, contains traditional weir to trap fish and traditional dwellings) in late summer to fish (AANISCHAAUKAMIKW Cree Cultural Institute (B), n.d.). • In winter elders guide youth on a winter snowshoe walk, teach them about winter survival skills and share traditional knowledge and values (AANISCHAAUKAMIKW Cree Cultural Institute (B), n.d.). • The Cree Trappers' Association (CTA) established after signing of the JBNQA –protect, maintain, and support the way of life of the Cree people (CTA, 2010). • CTA runs programs and studies such as: a climate change study, ongoing radio communications, migratory bird studies, local trapper committee assistance, safety courses, trappers training program, and Quebec trapper education (CTA, 2010). • CTA provides tallymen, hunters and trappers with bush radios, assistance in cabin building, and subsidies for airplane /helicopter when necessary for travel. • The Cree Trappers building in CWFN is an office and place for meetings with tallymen, trappers and hunters in the community (Pers. Comm. B. Blackned). | <ul style="list-style-type: none"> • Environment Department responsible for remediation and waste management projects. • Director of Community Development oversees the Local Environment Administrator within the department (Pers. Comm. D. S. Salt, 2011). • Local Environment Administrator is responsible for overseeing projects and contractors who are hired for such things as studies and site assessments (Pers. Comm. D. S. Salt, 2011). • CWFN developed an environmental land use plan called the Environmental Code of Practice (Pers. Comm. D. S. Salt, 2010) - contains information including: how to prepare permits for environmental projects; the responsibility of the First Nation; how to respond to environmental emergencies; water contamination safety; fuel tank inspection and management; and water quality monitoring. • The Niskamoon Agreement was executed by the GCC, the CRA, and the 9 James Bay Cree Nations in 2004, providing the creation for a not-for-profit corporation called the Niskamoon Corporation (Niskamoon Corporation (A), n.d.). Regional coordinators are employed to oversee specific programs and a coordinator in each community. • CWFN employs a Niskamoon Coordinator to oversee projects for the community. There are three environmental program areas designed around ensuring the Rupert Diversion project is sustainable from the point of view of the James Bay Cree (Niskamoon Corporation (B), n.d). <ul style="list-style-type: none"> ○ There is a fisheries and health program that helps enhance Cree fisheries to respond to Cree needs and aspirations (Niskamoon Corporation (B), n.d). ○ In 2010, funded the Waskaganish Aashuumiih Winter Journey project to encourage and challenge youth from the community to pursue traditional culture and way of life (Niskamoon Corporation, 2010). ○ The remedial works program area is for projects that can help alleviate the negative impact of hydro-electric development while enhancing traditional Cree pursuits (Niskamoon Corporation (B), n.d). |

Table 9: Category descriptions for CWFN's traditional territory, determined through the James Bay and Northern Quebec Agreement (1975).

| Land Category | Area designated to CWFN (km ²) | Basic Description |
|---------------|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| 1A | 489.8 | Land set aside for exclusive use and benefit of CWFN. CWFN is able to make bylaws on this land. |
| 1B | 295 | Land owned by James Bay Cree corporations that can only be sold or ceded to Quebec. |
| 2 | 10,222.7 | CWFN members have exclusive rights to hunt, trap and fish on this land in addition to the other James Bay Cree First Nations. |

Table 10: CWFN Summary Climate Data (see Addendum A for complete Climate Data Methodology)

| CWFN, QC | | | | | | | | | | | | |
|-------------------------------------------------|-------|-------|-------|------|-----|------|------|------|------|-----|------|-------|
| Weather Station: Moosonee | | | | | | | | | | | | |
| Months (Abbr.) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Mean 2001-2010 (°C) | -18.0 | -17.3 | -10.7 | -0.7 | 7.1 | 12.9 | 16.6 | 15.9 | 11.9 | 4.7 | -2.8 | -12.8 |
| Normal 1971-2000 (°C) | -20.7 | -18.4 | -11.7 | -2.4 | 6.2 | 11.9 | 15.4 | 14.4 | 9.4 | 3.4 | -4.7 | -16.3 |
| Difference between 1971-2000 and 2001-2010 (°C) | 2.7 | 1.1 | 1.0 | 1.7 | 0.9 | 1.0 | 1.2 | 1.5 | 2.5 | 1.3 | 1.9 | 3.5 |

Table 11: Timeline of major historical events for CWFN

| Year | Event |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1898 | The Parliament of Canada transferred two stretches of Rupert's Land to Quebec in 1898 and extended the borders of Quebec northward to the 52nd parallel. The second transfer occurred 14 years later and extended Quebec's borders further north as far as the 62nd parallel and eastward as far as Labrador. |
| 1912 | Quebec was obligated by the 1912 Quebec Boundaries Extension Act to reach an agreement on land related issues with the Aboriginal inhabitants of the northern lands. However, discussions regarding these matters did not occur until 60 years later. |
| 1971 | The government of Quebec announced plans for a hydro mega project, the James Bay Project Part I . Hydro-Quebec planned to build a series of dams, dikes, reservoirs and power stations and divert rivers in the James Bay area. At the time 5,000 Cree and 3,500 Inuit living in the area feared that Hydro-Québec's plans to divert rivers and flood areas of land would damage the environment and their way of life. |
| 1972 | The Cree and Inuit of James Bay went to court to stop hydro-electric work. The Quebec Superior Court ordered that all work be halted because Quebec did not fulfill their obligations from the 1912 Quebec Boundaries Extension Act (Government of Canada, 2002). |
| 1975 | After several years of intense negotiations, the Cree and Inuit people of Quebec, the |

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|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | governments of Canada and Quebec, Quebec Hydro-Electric Commission, the James Bay Energy Corporation, and the James Bay Development Corporation signed the James Bay and Northern Quebec Agreement (JBNQA) on November 11, 1975 (Government of Canada, 2002). When they signed the JBNQA, the Cree and Inuit of James Bay and Hudson Bay agreed to give up claims in a 410, 000 km ² territory. Some of the land was set aside for Cree and Inuit exclusive use, however, vast portions of the area became available for development in return for \$225 million in compensation from the Quebec government (“James Bay Project and the Cree: Historic Agreement”, 1975). |
| 2001 | James Bay Road Project - Until 2001, CWFN was the only Cree Nation on the Quebec coast of James Bay that was not permanently linked to the province’s highway network and only accessible by boat, winter road, and plane (Canadian Environmental Assessment Agency, 2009). Leaders from CWFN approached Indian and Northern Affairs Canada for assistance in constructing a road despite some community members concerns of potential social impacts and other detrimental effects (Canadian Environmental Assessment Agency, 2009). An unpaved road opened in 2001, approximately 103 km long, linking CWFN with the existing James Bay Highway to the east. |
| 2002 | James Bay Project Part II - An agreement between the Grand Council of Crees and the Quebec government was signed February 2002. The Cree agreed to allow two more hydro-electric projects, on the Eastmain River and the Rupert River, and other development in exchange for \$3.5 billion over the next 50 years and a share in future development. |
| 2009 | The Rupert River, an integral part of the history and traditions in CWFN, was diverted in 2009 as part of the James Bay Project Part II. |

Table 12: Registered Population for CWFN as of October, 2010 (INAC (B), 2010)

| Residency | # of People |
|---------------------------------------------|-------------|
| Registered Males On Own Reserve | 968 |
| Registered Females On Own Reserve | 960 |
| Registered Males On Other Reserves | 99 |
| Registered Females On Other Reserves | 88 |
| Registered Males On Own Crown Land | 0 |
| Registered Females On Own Crown Land | 0 |
| Registered Males On Other Band Crown Land | 0 |
| Registered Females On Other Band Crown Land | 0 |
| Registered Males On No Band Crown Land | 0 |
| Registered Females On No Band Crown Land | 1 |
| Registered Males Off Reserve | 220 |
| Registered Females Off Reserve | 194 |
| Total Registered Population | 2,530 |

Table 13: Census Information for CWFN, 2006 (INAC (B), 2010 and Statistics Canada, 2007)

| | 2001 | | | 2006 | | |
|----------------------------|-------|------|--------|-------|------|--------|
| | Total | Male | Female | Total | Male | Female |
| Total All persons | 1,700 | 835 | 865 | 1,865 | 930 | 935 |
| Age characteristics | | | | | | |
| Age 0-19 | 765 | 370 | 400 | 825 | 420 | 405 |
| Age 20-64 | 860 | 430 | 435 | 980 | 470 | 510 |
| Age 65 and over | 70 | 40 | 30 | 75 | 45 | 30 |
| Median Age | 22.5 | 25.2 | 21.4 | 23.4 | 22.6 | 23.9 |

Table 14: Education Census Information for CWFN (INAC (D), 2010 and Statistics Canada, 2007))

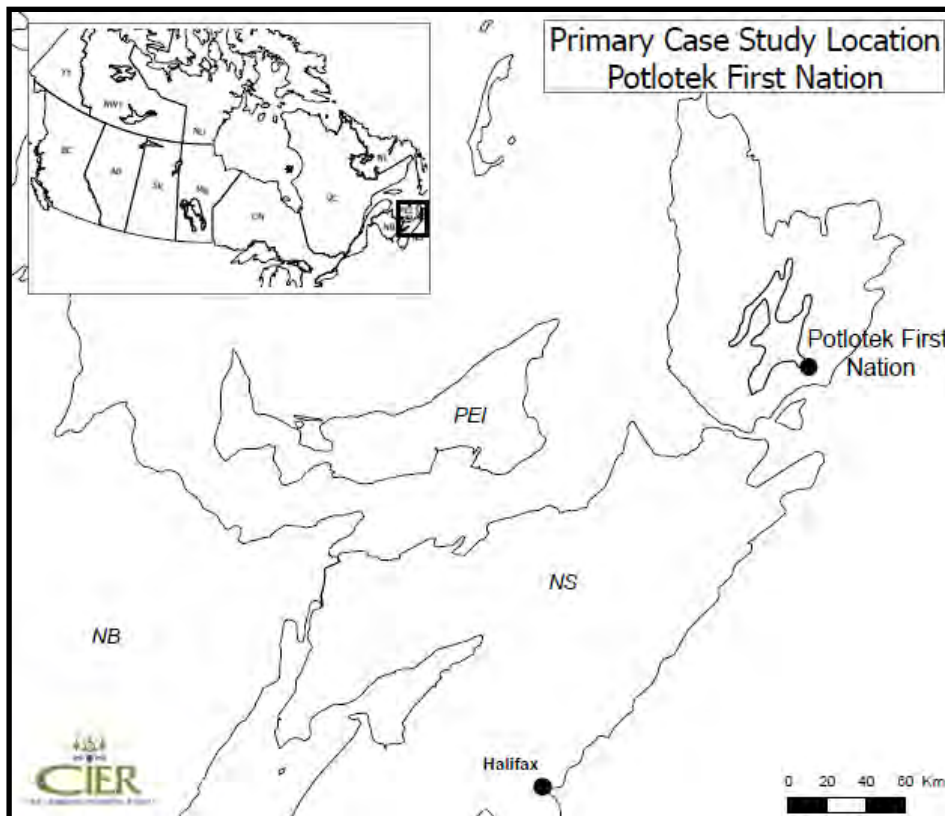
| Education characteristics | 2001 | | | 2006 | | |
|-----------------------------------------------------------------------------------------------|-------|------|--------|-------|------|--------|
| | Total | Male | Female | Total | Male | Female |
| Population 15 years and over | 1,095 | 550 | 545 | 1,230 | 595 | 635 |
| Highest level of Schooling | | | | | | |
| Persons with less than a high school graduation certificate | 650 | 335 | 315 | 730 | 380 | 350 |
| Persons with a high school graduation certificate | 95 | 40 | 60 | 215 | 90 | 125 |
| Persons with some post secondary education | 125 | 50 | 75 | 120 | 45 | 75 |
| Persons with a trades, college or university certificate or diploma (below bachelor's degree) | 170 | 95 | 70 | 95 | 55 | 40 |
| Persons with a university degree at BA level or higher | 55 | 25 | 30 | 65 | 25 | 40 |

2.4 POTLOTEK FIRST NATION

2.4.1 Climate change impacts

Potlotek First Nation is located on southeastern Cape Breton Island in Nova Scotia on the shoreline of the Bras d'Or Lakes (see Figure 4 for location) and lies within the Atlantic Maritime ecozone. The Atlantic Maritime ecozone extends from the mouth of the St. Lawrence River across New Brunswick, Nova Scotia, Prince Edward Island and the Gaspé Region of Quebec where the climate is strongly influenced by the Atlantic Ocean (ESWG, 1995; Vasseur and Catto, 2008).

Figure 4: Location of Potlotek First Nation



The Atlantic Maritime ecozone is the warmest ecozone in Atlantic Canada and is characterized by a cool and humid climate with warmer winters (average temperature range from -8°C to -2°C) and cooler summers (average temperature range from 13°C to 15.5°C) (Vasseur and Catto, 2008). Mean annual precipitation varies from the coast to inland with an average of $\sim 1500\text{mm}$

on the coast and ~900mm inland (ESWG, 1995). This particular region experiences more storms than anywhere else in Canada (ESWG, 1995).

2.4.1.1 Current Impacts

Several changes to the Cape Breton Region are being attributed to climate change, specifically as a result of increasing temperatures.

- The winters are warmer with more rain and there has been a noticeable decrease in ice cover on the lakes over the last 10 years (Collaborative Environmental Planning Initiative [CEPI], 2006).
 - Potlotek First Nation community elders have noticed a dramatic decrease in the ice on Bras d'Or Lake.
 - They have noticed that 40 to 50 years ago there would be 4 to 6 feet of ice on the lake and now parts do not freeze.
 - The lack of ice has affected activities on the lake, such as travel to other communities (CEPI, 2006).
- Warmer winters are resulting in less water in the spring and some brooks and streams have dried up (CEPI, 2006).
- Based on Indigenous Knowledge from the Bras d'Or Lakes Mi'kmaq communities, there is fewer jellyfish and more insects and seals because of warmer temperatures (CEPI, 2006).

2.4.1.2 Predicted impacts

For the Cape Breton region, temperature is predicted to continue to increase which will lead to many other secondary climate impacts.

- Projected increases in temperature range from an increase of 1 to 4°C in the summer and 2 to 5°C in the winter (Vasseur and Catto, 2008).
 - Winter precipitation is expected to increase by as much as 24% while summer precipitation is expected to decrease (Scott and Suffling, 2000).
- A decrease in summer precipitation would decrease flow and velocity of river systems, increasing the risk of salt-water intrusion (Vasseur and Catto, 2008).
 - Changes to the timing of ice freeze up and break up are expected and will affect the life cycles of many fish and plant species

- Sea level is expected to rise 0.5 to 0.88 m in the Cape Breton region over the next century (Shaw et al., 1998).
- Wind speeds are expected to increase by 10% affecting the severity of storms and variability of annual precipitation (Scott and Suffling, 2000).

2.4.1.3 Sensitivities of Potlotek First Nation

A community's sensitivity (high or low) to climate change reflects how climate change will affect the economic, environmental, cultural, and social aspects of a community. Given the current and predicted climate change impacts identified for the area within which Potlotek First Nation is located, what does this mean for the community?

For Potlotek First Nation climate change could have cultural, social and economic implications.

Cultural implications could include: loss of access to land due to flooding, loss of traditional foods and medicines due to changing plant and animal ranges, shifting seasons and extreme weather, and loss of cultural sites due to sea level rise. **Social implications** could include: infrastructure impacts (increases in flood damage to buildings, roads, bridges, rail lines, etc.) and health impacts (limited access to and availability of traditional foods, increases in air pollution, water and food borne pathogens). **Economic implications** could include reduced ability to predict seasons affecting various informal and formal economic endeavours, i.e. fishing, forestry.

Climate change could have the following environmental implications for Potlotek First Nation:

Increasing temperature

- A rise in temperature will decrease the occurrence of cold weather events that inhibit parasites, pests, fungus, and bacteria affecting humans, animals, and plant life (Bizikova and Hatcher, 2010).
- The ranges and occurrence of aquatic and terrestrial species may change due to the rising temperature (Bizikova and Hatcher, 2010).
- Temperature rise will further decrease the amount of ice cover on the Bras d'Or Lakes (CEPI, 2006).

Increasing extreme weather events

- Destruction of infrastructure, loss of near shore habitat, degradation of water quality due to sedimentation, and power outages are some of the risks Potlotek First Nation faces

with the predicted increase in extreme weather related events (Bizikova and Hatcher, 2010).

- Windstorms are an important agent of disturbance in Nova Scotia in particular but the effects of increasing windstorms could be forest blow-down, and damage to infrastructure and buildings (HMJ Consulting, 2007).

Sea-level rise

- Sea-level rise is expected to increase flooding and the threat of storm surges, which would lead to the disappearance of traditional habitats for migratory waterfowl and many settlement structures on the south–end of Chapel Island (Shaw et al., 1998).
 - Potlotek First Nation is located in an area particularly sensitive to sea level rise (CEPI, 2006).
 - The shorelines around the Potlotek area are mainly unconsolidated sediment that is subject to erosion, therefore any archaeological and cultural sites or buildings on the shoreline are at risk (Shaw et al., 1998).
- Several impacts exist for all of the communities in the Bras d’Or ecosystem of Cape Breton Island due to rising sea-levels.
 - Communities are at risk of increased salt water pressure close to the shoreline affecting wells and septic systems (Bizikova and Hatcher, 2010).
 - Flooded homes and roads and loss of coastal land including historically and recreationally significant sites could result from sea-level rise.
 - Sea-level rise is also expected to increase stress on emergency services and maintenance costs (Bizikova and Hatcher, 2010).

Water supply

- Potlotek First Nation’s water supply is a surface water system fed by a small watershed (HMJ Consulting, 2007).
- It is susceptible to shoreline erosion and degradation of water quality.
- Warmer water from higher temperatures and lower precipitation may also result in high nutrient levels and support the growth of bluegreen algae, which produce a human toxin called microcystin (Schindler, 2000).

Wildlife

Climate change is expected to have an impact on all species but some will be more vulnerable than others.

- Residents of Potlotek First Nation hunt throughout the reserve lands and hunting has been identified as an important activity to the community with approximately half of the community members participating.
- Furbearing mammals, birds, amphibians, and reptiles are all important components of the ecosystem in Potlotek First Nation (HMJ Consulting, 2007).
- There has been a decline in wildlife populations in recent years (CEPI, 2006).
 - It is uncertain if climate change is the cause.
 - Elders from the community have said they used to be able to find deer in 15 minutes and now it takes them a whole day (CEPI, 2006).

Fishing

Traditional fishing stocks for Potlotek First Nation and other surrounding First Nations are sensitive to temperature changes and are predicted to decrease as water temperature rises (CEPI, 2006; Vasseur and Catto, 2008).

- Cod, lobster and eels are of particular importance to Potlotek First Nation.
- Potlotek community members have noticed cod are getting smaller and contain more parasites (CEPI, 2006).
- Lobster is an important fishery to Potlotek and the impact of warmer waters on lobster is uncertain, however, it is known that higher temperatures lead to faster growth rates and early maturity at smaller sizes (CEPI, 2006).
- The ability to catch lobsters increases with warmer temperatures, therefore the yield may remain the same.
- Community members have observed that it has become increasingly difficult to catch lobster.

2.4.2 Interview Results

2.4.2.1 Description of community and community change

This section summarizes the description of the community provided by interviewees and major changes that the community has gone through, including:

- Small close knit community in a beautiful and important location
- Growing population of young people
- General increase in infrastructure
- Improvements to education
- Increase in resources and services

Potlotek has been described by interviewees as a small close knit community, in a beautiful location that is important to all Mi'kmaq people. Potlotek is a place where 'everybody knows everybody'; the community is dominated by a few large families. Things like ball games seem to bring people together and people help each other in times of crisis as well. Interviewees described that they lived in a beautiful and historic location, since they are right on the shore of the Bras d'Or Lakes and home to Chapel Island, where Mi'kmaq from the whole region have been gathering for the last 400 years.

Potlotek has a growing population of young people, in contrast to surrounding areas. Interviewees talked about the fact that there is a high proportion of younger people (i.e. under 25 years old) living in community. This was described as a strength as well as a potential weakness. It is a strength because their community is growing and has a number of people who will be able to contribute to the working population, which will be needed to fill in job vacancies in the region, where the numbers of young people are decreasing. It may also be a weakness, because one interviewee described that when people are young they are trying to 'find themselves'. It can sometimes be challenging have a large proportion of your community is in this life phase.

Potlotek has seen a general increase in infrastructure in community. The water treatment system was upgraded to a membrane system in 2002, to deal with issues over sedimentation. The wastewater treatment was in the process of being upgraded during the community interviews (2010), to account for the increase in houses and need for greater wastewater

treatment capacity. The water lines and fire hydrants have been extended to allow for more houses to be built. One hundred and thirty new houses have been built in the last 30 years. They also had a new health center (built 2001) and new school (built 1998) in the community, facilities that did not exist in the community before this time.

Potlotek has seen improvements to their education in terms of infrastructure on the reserve as well as programs and services. The community signed the Mi'kmaq Education Act in 1998, which allowed them to take over full responsibility and jurisdiction over their education. The school on their reserve (for K-6) is Band owned and run. They now have a GED program and BA program for those interested in continuing their education, who now have this opportunity without leaving the community. There has also been an increase in the number of high school graduates as well as the numbers of their members in community colleges and universities.

The community has also seen a general increase in resources and services. They now have a gym that can offer various recreation programs. They also have a gas bar that is owned by the Band and employs some people from the community. They also developed a workfare project to get people off welfare and give them work opportunities they might otherwise not have had. So in the summer, almost everyone is employed in the community. They also now have more resources at hand for crisis intervention in terms of support people they can call on from various fields.

In summary, Potlotek is a small close knit community in which people have witnessed many changes over people's lifetimes. These changes mainly center around an increase in population and young people within the population, and an increase in resources, services and infrastructure. The next section discusses livelihood activities and environmental changes Potlotek members have experienced.

2.4.2.2 Livelihoods, activities and environmental change

This section discusses the activities Potlotek members do to make a living and/or feed their families, changes in environmental issues in the community and how it has impacted Potlotek members. The livelihoods areas discussed and environmental changes associated with them include: hunting, fishing/harvesting seafood, and forestry/gathering plant materials. Other environmental changes discussed include erosion, water, and weather.

Hunting has generally declined over the years, due to declines in animal populations and resources required to hunt. Potlotek members hunt a variety of animals (e.g. rabbit, deer, ruffed grouse, partridge, ducks, and geese), but mainly hunt deer and birds. A relatively recent change is that community members are now able to go moose hunting in the highlands (off reserve), however, people need to have adequate resources to be able to hunt moose. Hunters have noticed that the deer populations have decreased, as they now have to go farther to access them. Some possible explanations for the decline of deer are clear cutting, increased numbers of coyotes, and a harsh winter 7-10 years ago which killed lots of deer. Another change observed by hunters is that hunting is now more regulated than it was in the past.

Fishing is a large part of the community in Potlotek for cultural and subsistence purposes. Many people in the community eat fish, especially elders, although some of the younger members sometimes don't like fish. Potlotek members fish for cod, salmon, eel, oyster, lobster, and crab. Traditional foods like eel are an important part of the midwinter feast and other cultural events. Only First Nations in the region can harvest eel and cod for food/subsistence; non-Aboriginal people cannot harvest these species for any purposes. Eel used to be caught with traps in the past but are now just caught by spear. People jig for cod.

Potlotek First Nation also harvests some fish and seafood for commercial purposes. They have commercial boats that harvest lobster, crab, and groundfish (cod, haddock, pollock). They are the only ones in the Bras d'Or Lakes area with processing and buyer's licence's for oysters. They currently have an oyster processing plant and people to work in the plant in summer, as well as leases (33) for oyster harvest, however, they currently don't have enough people to pick the oysters. Some potential reasons offered by interviewees for why people are not picking oysters are that: 1. people don't want to pick, 2. they are concerned about the disease affecting oysters and 3. they don't have boats to harvest.

Fish and marine species are generally declining in Cape Breton, due to a number of factors: overharvesting, invasive species and pollution. Species such as eel, cod, salmon and lobster have been affected by overharvesting. The community used to fish commercially for eel and cod, but both species are sensitive to overharvesting and commercial fishing is no longer allowed for these species due to their declining numbers. Salmon populations have also decreased due to overharvesting and now Chiefs don't want people harvesting salmon. Some interviewees also said that lobster used to be abundance in the Bras d'Or Lakes, but now only a

few individuals have commercial licences, and there is an attempt to try and stop lobster fishing on the Bras d'Or Lakes altogether, due to low populations.

A number of parasites and invasive species have affected fish and marine species. Oyster populations have been destroyed on the northern side of the Bras d'Or Lakes by a disease (MSX - Multinucleate Sphere X disease or Haplosporidiosis), although currently the colder temperatures in the south Bras d'Or basin (where Chapel Island is located) prevents the oysters in their area from being affected as much. Oysters in Chapel Island test positive for MSX but don't show the disease, which makes members unsure about whether they should harvest oysters for sale or not. There has also been a parasite found in eels. Other invasive species, such as green crab, tunicates, and dead man's fingers are now being found in the Bras d'Or Lakes. Pollution (sewage, cattle manure) has had an impact on the Bras d'Or Lakes and the species that live in them, due to their sensitivity to environmental impacts. A shell fish industry was closed down in the past due to contamination from a nearby cattle farmer and the sewage lagoon in Potlotek.

Potlotek has had some conflicts with neighbouring fishermen over their rights to harvest fish and seafood. In 2006, Potlotek members started to fish on the southern side of the St. Peter's canal through the band's ceremonial food licence, which they had not done previously. Local fishermen were upset that the Mi'kmaq were harvesting 250 traps in the winter (i.e. off season) and were concerned the Mi'kmaq were damaging stocks. Tensions rose when some local fishermen started to cut the traps the Potlotek members had set. The provincial department of natural resources, the department of fisheries and oceans, local fishermen, and Potlotek First Nation all came together to resolve the conflict.

The decline in hunting and fishing practises in Potlotek has had a number of health and cultural impacts to community members. Since there is less wild meat and fish available to people, and they often can't afford to buy seafood in the stores, this leads to a poorer diet and as a result, poor health. Elders are the ones who miss the traditional foods in their diet the most since they were raised on diet of traditional foods. Wild foods that are harvested are still shared with elders today. Another result of eating less traditional foods is less physical activity, since it often takes work to go and harvest their food.

Whereas in order to get your food, you had to work for it, you were burning calories and staying fit at the same time, now you just stroll down the aisle on supermarket days and you know just load up on chips and crap and everything else that's no good for you. (#09)

Not going out to hunt and fish also results in a loss of culture and passing on of traditional knowledge between older and younger community members.

In the Mi'kmaq, language there's so many words that describe the art of hunting, and unfortunately, the language is on a decline in this community. And so the young people are not participating in traditional activities. They're not hunting, they're not fishing, so they're not knowing the language, they're not knowing the ethics of being Mi'kmaq through the language. They're not appreciative... (#09)

Potlotek's involvement in commercial forestry has declined although people are still involved in activities such as gathering wood and picking berries. The Band was involved in commercial forestry (e.g. had equipment, skilled crews, were running for a while), but this is no longer happening. This may be due to the fact that Stora, the local pulp mill, shut down, likely as a result of the forestry industry slowing down as well. Some interviewees talked about the fact that there is a lot of clear cutting in Cape Breton, for example clear cutting to banks of rivers for ATV trails near the reserve, which were concerning to some members. One of the impacts of clear cutting is that there is not enough forest to sustain wildlife (e.g. deer, rabbits) around the community. People harvest wood for their own use on reserve. They used to be able to sell wood harvested from reserve, but this was a pretty limited resource since the reserve is so small; this resulted in clear cutting and had negative effects, such as silt accumulation in lakes and brooks. Now, First Nations are allowed to harvest wood on any Crown land as long as it isn't for commercial purposes. In other related forest activities, while some people used to make a living in Potlotek making baskets, there are now just a few community members that make baskets recreationally. People still continue to pick berries in the summertime for personal consumption.

Erosion is a significant problem in Cape Breton, especially for areas of high cultural significance to the Mi'kmaq people. On Chapel Island (i.e. the location for St. Anne's Mission), some cabins are now at edge of the island due to erosion, and they aren't able to move them back because all cabins all packed together near the edge of the island. As one interviewee explained, "some of the cabins that have been 20, 30, 40 feet from the shore are right on shore now".

Malagawatch, reserve land, which is shared by the other Mi'kmaq bands in Cape Breton, has

an area that is eroding. This is very concerning to Mi'kmaq people living in Cape Breton, because the area is a burial site. One interviewee also described another island where they used to go on that is not there anymore, they presumed this was due to erosion.

Potlotek has had a number of issues and concerns around water in and around their reserve. Many interviewees talked about the pollution of Robertson's Cove. This was attributed mainly to Potlotek's sewage lagoon, which was placed near their source water lake and discharged into Robertson's Cove. People thought that the lagoon was polluting the nearby stream and cove because they saw changes in water quality and as a result, people no longer fished (shellfish) or swam, and people stopped trusting the water quality. The lagoon was then upgraded because it was at its capacity for the population and due to improved water quality conditions people are now swimming there again. Chapel Island Mission was another area of pollution concern. Every year 5,000 people come for a week to the Island for St. Anne's Mission. Since there weren't enough bathroom facilities (e.g. outhouses) on the island, this led to high fecal coliform numbers in the water after Mission when combined with a rain fall, so that people couldn't swim. People were especially concerned about contamination of the island because of its sacred nature. West of reserve, interviewees talked about issues around agricultural runoff (e.g. cattle manure) contaminating the Bras d'Or Lakes.

The community has had some concerns about the quality of their source water lake and other lakes further upstream, such as Lake Uist. There have been some issues around sedimentation in their drinking water, so that sometimes when water came out of the tap, it looked 'dirty'. As a result, even though the community now has a state of the art treatment system, many people still don't trust the water and drink bottled water. Potlotek's source water lake (Indian Lake) is downstream from the major road/highway that goes through their community; some community members are concerned about potential spills coming from any accidents on the road as had happened in a neighbouring community. Additionally, Lake Uist is a lake that may feed Indian Lake. A developer wanted to place a manmade lake near Lake Uist, and install 44 wind turbines, which would clear about 44 acres of forest and require the construction a road leading to that area. The manmade lake was supposed to pump water from Lake Uist, and come down through a hydro turbine back into Lake Uist producing electricity. Some members were concerned about the proposed project because of potential effects on wildlife and fish habitat as well as a lake that may feed their source water lake. The next section discusses how members went about resolving this issue.

The people of Potlotek have observed a number of changes in the weather: namely that there are milder winters. A number of interviewees noted that the Bras d'Or Lakes no longer completely freezes in the winter. There is less ice and much thinner ice on the Bras d'Or. Potlotek members used to go ice fishing (and eeling) in the winter, drive across the Lake to other communities, and drive to islands to collect firewood. Due to the lack of ice, they can't do these activities anymore.

The lake doesn't freeze anymore. I mean the Bras d'Or Lake...which has some salt water...when I was a little girl, back in the '40s I would skate all the way to, French Cove across, from Chapel Island and then skate to St. Peters and then they used to have cars...and horse races. Cars on the Bras d'Or Lakes in St. Peters. Those are the changes on the Bras d'Or Lakes. (#08)

Also because there is no ice cover, the water heats faster and this provides a more suitable environment for invasive species. This change in temperature also could have an effect on the development of native species. Many interviewees said that the winters are generally not as severe; they are warmer and milder. Some saw this as a positive, because people can get out of houses more, another saw this as a negative, since the cold weather is needed to keep invasive species in check. There is also less snow in the winter, which means that kids can't go sledding anymore and people are less able to track animals in the snow.

Other weather-related changes have been witnessed by Potlotek members as well, such as changes in timing of plant and animal development. Some interviewees said there was more variability in the weather. Another said the summers are now more wet and rainy. One interviewee said they think the ozone is depleting, because they have to wear sunscreen year round, when they used to only wear it in the summer. Some talked about the weather changes causing changes in animal timing, for example they saw caterpillars out in February that year (2010), which was not usual. Also, some plants have been blooming fast and trees have been budding faster as well.

This section described the environmental changes that Potlotek members have witnessed and how these changes have affected them. These included:

- Decline in hunting practises and populations of wild game
- Decline in fish and marine species due to overharvesting, invasive species and pollution
- Erosion of shorelines, includes areas of significance to the Mi'kmaq

- Concerns over water quality both in the Bras d'Or Lakes and Indian Lake (their source water)
- Changes in weather including milder winters

The next section will discuss how Potlotek First Nation responded to these changes to address their concerns.

2.4.2.3 Managing and coping with change

This section discusses how Potlotek First Nation responded to the environmental issues and concerns discussed in the previous section. This includes responses at the Band level and partnerships with outside organizations, other First Nations and different levels of government.

We discuss how they addressed issues about:

- Overharvesting of wood on reserve
- Clear cutting in general
- Water quality issues in source water lake (Indian Lake)
- Water quality issues in Bras d'Or Lakes following St. Annes Mission
- Lake Uist project
- Fish and Shellfish populations
- Erosion
- Emergency Preparedness

The Potlotek Chief and Council had concerns about wood overharvesting on reserve, so developed informal rules to respond to this and took steps to improve their water treatment system. Some members were cutting trees near the source water lake, which resulted in silt coming into the lake. To respond to the issue of wood harvesting affecting sediment in the lake, the Band developed an informal band policy to limit cutting activity. The policy was that people were not allowed to harvest wood within two hundred feet of the source water lake unless it was approved by Chief and Council.

...because they were recognizing that some of this harvesting was having an effect on some of the protected areas, like the lake and the watershed, like the shorelines along the Bras d'Or Lake, like the stream that feeds the lake itself... They've put in place bylaws to protect the watershed by no cutting within two hundred feet, no wildlife or so on. And so in that respect, they've made some efforts to protect our watershed. (#07)

In 1999 the band also had a membrane water treatment system installed to deal with existing silt issues in the source water lake.

You know, because that's one thing that I'm...proud of the community is. . . the upgrade on the water system last year that was initiated by us...we didn't wait for it. We did an actual study, we knew we needed water. We put a proposal together and we submitted it to them. (#11)

There were also a few regional groups that have assisted Potlotek First Nation in responding to issues over clear cutting. KMK (Kwilmu'kw Maw-klusuaqn also known as Mi'kmaq Rights Initiative), an organization involved in rights based issues for Mi'kmaq communities did get involved when non-Aboriginal people clear cut along the banks of rivers near the reserve.

...they're looking into doing an investigation...why wasn't the First Nations consulted, like they had the DNR [Department of Natural Resources] there, he should have informed us what was going to happen. ... (#04)

The Confederacy of Mainland Mi'kmaq has also helped out with forestry issues in the past. They had a forestry program and funded an initiative for tree planting in Potlotek in the past.

In response to their concerns about their source water lake, Potlotek First Nation developed a Watershed Committee to respond to the issue. The main highway in the region is located above their source water lake and community members had concerns about water getting contaminated (e.g. vehicle accident, oil spill). There were also several studies had recommended that a watershed plan be developed for Potlotek's drinking water supply. On May 25, 2001, the Chief and Council passed a Band Council Resolution supporting the formation of a watershed protection committee. Potlotek First Nation initially approached the province to assist them with the watershed planning, and while they initially said they would not get involved, they eventually provided a planner that participated in the watershed planning process. The Band received funding from the project from Environment Canada. On the watershed committee they had representatives from Indian and Northern Affairs, Environment Canada, Health Canada, Nova Scotia Department of Environment, Union of Nova Scotia Indians, and a few Band staff. In their watershed/source water protection plan, it was suggested that they install additional guard rails in the bridge area (which is directly over the source water lake). So they have approached the Province to ask for guard rails along the road to prevent spills resulting from an accident.

Through the watershed planning process and other initiatives, Potlotek members see the benefit of working together with outsiders and have observed that other governments, organizations and community members also see the benefits of working together to try and resolve problems.

I know a lot of times it used to be this province wouldn't want to do anything with the reserve....but on some stuff now their opening up and they're realizing it's a benefit to them to help out....I mean if their helping us with our watershed, then ultimately our watershed flows into the Bras d'Or lake and that's off the reserve. So, I think they're realizing now that if they work with the communities they can help protect whatever they need protected...I think all communities around the Bras d'Or realizing they have to protect the Bras d'Or , cause it's where a lot of people do go fishing and whatever, and recreation...So, everybody's starting to realize it's in their interest to work together to keep it going...when I was a kid that kind of cooperation never really occurred...It was always, "What you do in your community is your problem," and it's only in the last 10 or 15 years that their starting to get together to realize it is beneficial to everybody to work together. (#03)

Potlotek has a number of outside organizations that they can turn to for assistance with environmental issues. As one interviewee explained, "They draw on information gathered by the Pitupaq Association, the Eskasoni Fish and Wildlife Commission....UINR. It's a huge contributor."

In order to deal with water contamination concerns from St. Anne's Mission, Potlotek made use of the Unamak'i Institute of Natural Resources (UINR) as well as Pitupaq. Pitupaq is an initiative spearheaded by the five First Nations in Cape Breton that come from concerns over the Bras d'Or Lakes. It brought together First Nations and municipalities to work together collectively to try and respond to waste water issues. The communities concerns about water contamination from St. Anne's Mission were discussed at Pitupaq meetings. Potlotek found it beneficial to work on the issues collectively through this initiative.

As a collective [in Pitupaq], you had the provincial, federal, and First Nations, then you had your technicians working with each other.... I think [Pitupaq needed to be started] because we were all doing the same thing together differently and just tremendous waste of resources and time. So that was one of the good reasons and cooperation and learning about each other's points of view and you know developing relationships and it was a positive thing. (#09)

Through Pitupaq, Potlotek now gets \$5,000 from each Band every year to help with the mission site. This provided a big help to Potlotek as responding to the challenge of wastewater management and cleaning up after the mission put a lot of strain on their band funds and services. There was also a staff member from the Unamak'i Institute of Natural Resources who was dedicated to helping respond to the sewage problems related to St. Anne's Mission.

The Band also undertook steps to improve their wastewater treatment system on the reserve. Through their Source Water Protection Plan, their wastewater treatment system was also identified as a risk to their drinking water system. The Band also recognized that the existing sewage system could no longer service the growing population of Potlotek. So they conducted a study to assess the wastewater treatment system and submitted the report to access funding for a new system.

The sewer work that's going on here, that was again on our own initiative. We've identified that...we're outgrowing our sewage system. We were having to pump it too many times a year and draw it down, and we recognized that it needed to be replaced. And we had a study done, indicating...the population when it was built, the population now, the future population and we submitted that and we got funding for it. (#11)

In response to the proposed Lake Uist hydro and wind turbine project, a local Potlotek member and a UINR staff got involved with the wider community to address their concerns. Concerned community members formed a group called 'Save the Grand River Watershed Association', which the Potlotek member and UINR staff were a part of. They also formed another association, called the Grand River Watershed Association, which was developed to restore the area back to what is was before (e.g. tree planting). Through this organization they had meetings to discuss the issues with community members. One interviewee described the outcome, "...[we] had meetings all over Cape Breton - there was so many concerns from the people, including non-natives that the company president gave up the idea." (#06)

Potlotek talked about other groups that work on issues around fish and shellfish, such as UINR and the Department of Fisheries and Oceans (DFO). UINR is working to try and understand the disease affecting eels, and asking Mi'kmaq eel fishers to participate in a program aimed to monitor the eels. They are also developing a management plan for lobsters, in which they use Mi'kmaq concepts to discuss the best way to manage the lobster populations. DFO and the provincial department of Natural Resources got involved with Potlotek First Nation to resolve

their conflict with local fishermen over the food fishery and lobster harvesting. Potlotek has worked with DFO on a number of issues, some of which have been successful, while sometimes has been challenging.

Sometimes you talk to DFO people and they don't always listen to you,... I was talking to one and she was, "It doesn't exist here", and I [said] "Yes it does" and...I had my camera, and said look, "Here I'll show you some pictures". . . .And she was like all upset and then, "Why didn't you tell us before?", and I said we've been trying to tell you. And the only reason I was got it identified was I, I found another...works independently from them, out of Cape Breton University, and she identified it for me. (#04)

The Unama'ki Institute of Natural Resources has been working on erosion problems around the Bras d'Or, which are a concern to all five Bands in Cape Breton. Through research and communication materials, the Institute is educating Mi'kmaq people about beneficial ways to develop that decrease the likelihood of erosion taking place (e.g. don't cut clear cut right to the shore). They are also taking steps to try and save the burial ground in Malagawatch. The Chief of Eskasoni First Nation (UINR's Senior Advisor) gathered experts to try and deal with erosion problem. They were working with an engineering company to develop protective structures for the remaining area.

The Union of Nova Scotia Indians (UNSI) has been working on emergency preparedness plan processes for the Mi'kmaq bands in Nova Scotia. A Mi'kmaq Chief in Prince Edward Island, after seeing the effects of a strong ice storm on their community, raised concerns with the Atlantic Policy Congress (APC) about the need for emergency preparedness plans in their communities. In 2009, the APC and UNSI began to work with the provinces to develop agreements for how to work together for emergency response. They approached INAC to ratify the agreement but INAC would not sign the agreement because they wanted to develop a national template for emergency preparedness for all First Nations across Canada before allowing them to proceed. In April, 2010, the province and INAC signed a MOU for Emergency Management Services to First Nation bands in Nova Scotia. At the time of writing, they were in the process of developing Service Agreements with KMK.

One interview talked about greater communication at the community level between Potlotek First Nation and surrounding communities and how this better relationship would result in better emergency response.

Probably the biggest change is the interaction now between Chapel Island and the nearby communities. I mean we were isolated... nobody came to the reserve for anything...they drove through. If there had been a gas bar then there probably would have been few people stopped. Now this is probably one of the biggest stops on the way through.... the change is that there just is more interaction between the communities...there's a cooperation I think more so. So like when you say about if there was some sort of environmental disaster or, you know, hurricane or tornado or something, and emergency services, we'd be working together with the local communities, I'm quite positive of that... I think we still have a little ways to go in terms of the municipality and working together, the county. But I was thinking more or less with the residents in the local town. (#11)

This section summarized different ways that Potlotek First Nation responded to environmental changes and concerns of their members. To address their concerns, Potlotek First Nation has responded:

- At the individual level (i.e. Potlotek Band member taking part in Lake Uist group)
- At the band level (initiating Watershed Protection Committee)
- By taking advantage of resources of external organizations (e.g. UINR, UNSI, KMK)
- Through participation with others (e.g. Working with multi-stakeholder groups such as Pitupaq and CEPI)

The next section discusses people's perceptions of climate change and how prepared they feel the community is to respond to it.

2.4.2.4 Environmental and climate changes in context

This section discusses people's perceptions of climate change, the importance of climate change to the community and how prepared the community is to respond to climate change. It includes:

- What people think of when they hear the term climate change
- Issue of responding to global climate change at the local level
- Level of preparedness of Potlotek First Nation to respond to climate change
- Aboriginal perspectives on adaptation
- The need for environmental awareness of Potlotek members for improved adaptive capacity

When we asked people what they thought of when they hear the term climate change, these were some of the responses that were provided:

- New species (rattlesnake)
- contaminated water
- ozone layer
- hotter weather, milder winters,
- change in weather patterns, unstable weather (constantly fluctuating),
- natural disasters
- natural cycles (i.e. don't believe it)
- rising sea levels, ice bergs melting, polar bears

For many community members, the issue of climate change seemed like a very far away, large issue that was hard to grasp and respond to at the local level. One interviewee explained that the community was not a main contributor to climate change, but they noticed the impacts of climate change at the local level. Some saw it as too overwhelming to consider and try to respond to.

Climate change is like, you know, what are you going to do about it? (#04)

But you'd think it's so far away, geographically from what you know and you'd think it wouldn't affect us here but it does you know, we noticed the changes here. (#04)

We need somebody to come along and say "this is important and we want to help you" or whatever, cause it's too overwhelming for community members to do it themselves. The secondary group would be someone like non-profits, like ACAP Cape Breton, coastal communities. Yeah, just seek out partnerships with these people that are out there, that are doing the same things that you are. (#09)

One aspect of Aboriginal communities that some interviewees discussed is that adaptation is a part of life for them and that they deal with issues as they happen. Some talked about responding to climate change one of the many things First Nation communities will have to adapt to, which will be dealt with as people experienced it. As one interviewee explained, "We'll do what we've always done, adapt".

Indians have, Natives have this conception that, 'I'll deal with that bridge when I get to.'
And that's more of mentality with anybody. And that's true, you know. That's part of our

being, I guess...Like, when I was going to university all my professors says, it so happens she's a Native meanwhile, like me, and she said, 'Natives don't give a shit about tomorrow.' She said, 'Light bill comes, Oh, I'll pay that next week, as long as I have money now,' or, 'I'm gonna buy this now, to hell with the bill.' You know? And it's true. That's the way we kind of perceive it, we kind of live for today. Worry about tomorrow when it comes. (#05)

Some interviewees talked about the importance or need for greater environmental awareness generally and specifically about climate change. Some thought that people were not as interested in environmental issues as they need to be, although some said environmental awareness has increased since they were young. Also, in many cases people didn't have the information and awareness about how climate change will impact their lives.

So there's less interest in environmental issues. People need to be educated on these types of issues, environmental issues. What impact they would have in their lives, if they do this and if they don't do that. (#06)

One member talked about the role of climate programs initiated by government to increase that awareness among members. She began thinking about climate change more when she participated in a government funded program on climate change.

What, if, if INAC did not make this project...the climate change project...maybe I would never think the way I was...I woulda still been lookin' at the Chapel Island with no eyes...I wouldn't have been interested in what I'm... thinkin' now. (#12)

Generally Potlotek First Nation members felt unprepared to deal with potential impacts of climate change. There was no knowledge of groups or work being done on climate change at the community level or in region as a whole. One interviewee talked about the lack of lack of long term planning for climate change impacts, and the need to plan and be prepared for these impacts.

But I don't believe there's anybody in this community or anywhere else for that matter, in all of Cape Breton, that's dealing with climate change, except for the global people. (#05)

I don't think, we're ready...I think we should do long-term, long-term planning...what's gonna happen eventually, what could happen. We have to be prepared. (#08)

In summary:

- Potlotek members are aware of climate change but still are 'disconnected' from it partially due to its global scale
- Potlotek First Nation is unprepared to respond to climate change
- Aboriginal perspectives on adaptation may make it harder for long term adaptation planning
- Potlotek members require information in order to better respond to future challenges

2.4.3 Community background

| Physical Geography | History | Governance | Population | Environment |
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| <ul style="list-style-type: none"> Reserve located along Route 4 in SE Cape Breton, Nova Scotia (Lat: 45° 42' 22" Long: -60° 46' 21"), ~12km east of St. Peters Community previously referred to as Chapel Island First Nation Majority of PFN members live on main reserve; Malagawatch shared by all 5 Mi'kmaq bands in Cape Breton located on shoreline of 260-km2 Bras D'or Lakes, which has had issues with invasive species and sewage contamination Indian Lake is source water lake Winter temps average -8 to -2°C, summer temps average 13 to 15.5°C (http://adaptation.nrcan.gc.ca/assessment/2007/ch4/1_e.php) Mean annual precipitation 800mm-1500mm Mixed wood forests primary vegetation type; Common plants include: birch, ironwood, blueberry, sphagnum moss, kalmia heath, and willow Common animals include: whitetail deer, moose, rabbits, and many marine species such as lobster, smelts, Atlantic salmon, cod, American eel Area underlain by bedrock that consists of: The Windsor Group of rocks, crystalline and metamorphic bedrock and Horton Group. | <ul style="list-style-type: none"> Mi'kmaq are an Algonkian-speaking tribe from Nova Scotia, New Brunswick and Prince Edward Island; were part of the Wabanaki Confederacy, which included the Abenaki, Penobscot, Passamaquoddy and the Maliseet. Were nomadic, spent their time hunting (moose, caribou, beaver and bear) and fishing (smelt, herring, salmon, eel, shellfish) using birch bark wigwams for shelter and canoes, snowshoes and toboggans for transportation Mi'kmaq district chiefs gathered regularly to hold Grand Council, traditionally on Chapel Island Grand Council assigned hunting and fishing territories to the Chiefs and their families, and ratified friendship treaties with other tribes, and later with the Colonial government of Nova Scotia Chapel Island is the site of Abbé Maillard's 18th century Catholic ministry, who also built the first church on the island in 1754; island is home of annual St. Anne's Mission, which began the year that Mi'kmaq Grand Chief Membertou was baptized in 1610. The event included a yearly review by the Mi'kmaq Grand Council, combined with a worship service, celebrations and feasting. The mission was held yearly on last weekend of July and continues to this day. In early 1940's, the provincial government developed a Mi'kmaq reserve centralisation program – trying to amalgamate all 23 bands in Nova Scotia into two reserves: Eskasoni and Shubenacadie, program abandoned in 1950's The Marshall decision (1999) affirmed a Mi'kmaq treaty right to hunt, fish and gather in pursuit of a "moderate livelihood" arising out of Peace and Friendship Treaties of 1760 and 1761 | <ul style="list-style-type: none"> Tribal council for Potlotek is Union of Nova Scotia Indians Potlotek governed by a Chief and Council, elected every two years. The Council has the final say on Band matters and regulates Band policies. Council meetings are held once a month; the Band sends out newsletters every week, which are dropped off at every household. In Band Office are the Chief and 6 councillors, public works and housing coordinator, an economic development officer, welfare officer, band administrator/ manager, accountant and secretary. | <ul style="list-style-type: none"> The population of Potlotek First Nation (as of 2009) is 627 and is distributed for registered members as follows: <ul style="list-style-type: none"> On own reserve - 488 On other reserves - 36 Living off-reserve - 103 (http://mikmawey.uccb.ns.ca/nscouncils.html) | <ul style="list-style-type: none"> Fisheries department directed by the Band, employs a fisheries director, secretary, and three fisheries guardians Fisheries guardians are responsible for administering food fishery tags and monitoring One councillor serves as the Chief's proxy for Collaborative Environmental Planning Initiative (CEPI) and Pitupaq meetings CEPI came from Cape Breton First Nations Chiefs in 2003, who requested an overall environmental management plan for the Bras d'Or lakes and watershed lands. Main activities carried out by a steering committee (federal, provincial, municipal, and Mi'kmaq governments, industry, academia, and NGO's) Pitupaq is a group made up of the five First Nations and five municipalities in Cape Breton who came together to address water quality concerns in the Bras d'Or Lakes and their watershed Potlotek also developed a Source Water Projection Plan in 2007, set up a watershed committee in the community, did wider community engagement A woman from Eskasoni First Nation does water sampling regularly in Potlotek as well as Membertou, Wagmatcook, and Waycobah (Cape Breton First Nations) (funded by Health Canada). |

| Basic Services | Health | Education | Recreation | Economy |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------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| <ul style="list-style-type: none"> • One public works and housing staff member, who is also deputy Chief of the fire Department • Internet services in all the major buildings and in many homes • education office has a CAP site (Community Access Program) • Besides Route 4 highway, all roads are dirt roads • recently (1999) upgraded water treatment plant (PCI Tubular Nanofiltration Plant) • A water tower (built in 1999) is located on reserve, has 283,905.89 litres capacity, currently needs to be painted • The sewage lagoon is located within the Indian lake watershed, is currently being upgraded (February 2010) • Most houses rely on electricity, oil and sometimes wood to heat their homes. Older oil storage tanks are removed on an ongoing basis. • Band did a baseline energy audit (2005), are implementing recommended changes as funds become available to do so • Chapel Island Volunteer Fire Dept. has ~14 active members; Fire Hall built 1998, and two fire rescue vehicles - 1990 Ford 1 tonne truck, 800 gallon capacity, and a 2002 GMC Tanker /Pumper, 1200 gallon capacity. • RCMP detachment located on reserve; band has an agreement with RCMP for policing services. • A consultant was contracted out by the Health Centre to develop an emergency response plan, but no meetings between involved parties yet. • ~153 homes on reserve, ~40+ people on waiting list for a house • Majority of houses are band units, most were purchased through CMHC's section 95 Program (On-Reserve Non-Profit Housing Program; 95 houses) and through loans (10 houses), small number of houses (and 2 trailers) are privately owned, some of which were purchased using CMHC's Section 10 Program (Loan Insurance Program On-Reserves; 4 houses). | <ul style="list-style-type: none"> • One band councillor handles health related issues • Health centre on reserve, employs health director, doctor (comes in 2/week), CHR (Community Health Representative), continuing care assistant, NADACA (Native Alcohol and Drug Abuse Counselling Association) worker, and two receptionists • Workplan developed for the first time 2010. The programs offered at the health centre: communicable disease control, environmental public health; primary care: well women/well men, home and community care, children's oral health initiative; chronic disease and injury prevention, children and youth (pre and postnatal, Aboriginal head start program), mental health and addictions. • Have a diabetes clinic once a month, mental health services provided 2/week, residential school councillor 1/week • Have access to two clinical therapists (adult, youth) • Signed Memorandum of Understanding with GASHA (Guysborough Antigonish Strait Health Authority) • Have been able to take advantage of new opportunities through GASHA, e.g., providing member's access to midwife services • Have Telehealth facilities in the health centre - video conferencing communications network that connects healthcare facilities. Able to participate in meetings, have one-on-one counselling, do procedures or examinations remotely (decreases need for members to leave their home for medical attention). • Current health centre is 9 years old, in need of expansion to accommodate existing services | <ul style="list-style-type: none"> • One band councillor that handles education related issues • Within education office is: education director, administration /finance personnel, two adult education teachers, and a language department (Eti Mawa'tasik language department; 5 staff). • Education department is in process of updating their strategic plan, have an organizational chart that is child centered and non-hierarchical. • School on reserve (Mikmawey school) (built 1998) is band controlled, K-8, although some children attend school in St. Peters • Have local programs within schools that emphasis Mi'kmaq language and culture. • Programs offered in the education office: Adult Education/ GED program, Youth with Potential (firewood program), and general Bachelor of Arts program (started 2009) that members can take in the community. • Current collaborations between the education office and economic development officer to provide info to youth on career choices/options • Additional programs for kids: Chapel Island Headstart (4 yr old kids); Chapel Island Daycare (year round) • In language department have graphic artist, animator, writer, translator, and audio recording & video editor. Language department activities include: working on making Mi'kmaq Language CD ROMs, children's books and a prayer book. | <ul style="list-style-type: none"> • Recreation coordinator employed by the band. • Recreational facilities: community hall/church (gatherings held here), baseball diamond (baseball league runs in summer), and school gym that includes a climbing wall and youth center (with a pool table). • Main social events: midwinter feast, powwow, and St. Annes Mission at Chapel Island • Midwinter feast renewed by elder Lillian Marshall. Includes mass, feast of traditional Mi'kmaq food, and entertainment; held on Sunday following the first new moon of January • First powwow in Chapel Island held in 1993; takes place every year in July, organized by powwow committee. Includes: breakfast, evening feasts, and a giveaway • The mission celebrated their 400th anniversary in 2010. • For traditional activities, some members hunt and more members enjoy fishing on a regular basis. | <ul style="list-style-type: none"> • Economic development officer working for the band; his duties: negotiate with government agencies to secure funding for Band projects, direct band members how to start up their own businesses • economic leakage study done in 2000 for Nova Scotia First Nation's – showed that 25% of total revenue was spent in the community; The training interests obtained from community members surveys were fields of entrepreneurship in the resource sectors of fishing, forestry, oil, gas and minerals, environmental, hi tech, management, computers, plumbing electrical and other vocational training. • Businesses include: gas bar & convenience, Johnson's Auto Body (owned by members) and a larger gas bar and convenience (owned by Band) • Approximately 65-75% Potlotek members employed on an annual (seasonal) basis. • The main economic sectors are commercial fisheries, the work program and service delivery (education, health). • Work program employs 90-120 people in various positions within the community • Commercial fisheries brings revenue to the Band, employs ~17 people harvesting lobster/ crab in spring/summer, and 3/4 more in ground fisheries in fall/winter |

Table 15: Reserve description:

| Name | Size (Hectares) | Location | Established |
|------------------|-----------------|----------------------|-----------------|
| Chapel Island #5 | 592.5 | 68.8 km SW of Sydney | 01/07/1792-1834 |
| *Malagawatch #4 | 661.3 | 62.4 km SW of Sydney | 02/08/1833 |

*20% Held by each: Chapel Island, Sydney, Eskasoni, Wagmatcook, Waycobah; 20% = 132.36 each

Table 16: Potlotek First Nation Summary Climate Data (see Addendum A for complete Climate Data Methodology)

| Potlotek First Nation, NS | | | | | | | | | | | | |
|-------------------------------------------------|------|------|------|-----|-----|------|------|------|------|------|-----|------|
| Weather Station: Baddeck | | | | | | | | | | | | |
| Months (Abbr.) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Mean 2001-2010 (°C) | -4.8 | -5.0 | -1.6 | 3.9 | 9.0 | 14.1 | 19.0 | 19.2 | 15.4 | 10.1 | 5.0 | -0.6 |
| Normal 1971-2000 (°C) | -5.3 | -6.1 | -2.2 | 3 | 8.8 | 14 | 18.1 | 18.3 | 14.3 | 8.7 | 3.8 | -1.7 |
| Difference between 1971-2000 and 2001-2010 (°C) | 0.5 | 1.1 | 0.6 | 0.9 | 0.2 | 0.1 | 0.9 | 0.9 | 1.1 | 1.4 | 1.2 | 1.1 |

Table 17: Timeline of various treaties and historical events for the Mi'kmaq (taken from <http://www.mikmaqrights.com/>).

| Year | Event |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1725-26 | One of the first treaties between the Mi'kmaq and the European settlers was negotiated by the Penobscot in Boston in 1725. This treaty, between the British, Mi'kmaq and Maliseet, was then ratified by many of the Mi'kmaq and Maliseet villages at Annapolis Royal in 1726. It was the first of what are now known as treaties of peace and friendship with the British Crown in the Maritime Provinces. |
| 1752 | The Treaty of 1752, signed by Jean Baptiste Cope, described as the Chief Sachem of the Mi'kmaq inhabiting the eastern part of Nova Scotia, and Governor Hopson of Nova Scotia, made peace and promised hunting, fishing and trading rights. |
| 1760 - 61 | Treaties of Peace and Friendship were made by the Governor of Nova Scotia with Mi'kmaq, Maliseet and Passamaquoddy communities in Nova Scotia. These are the same treaties that were upheld and interpreted by the Supreme Court in the Donald Marshall case. They include the right to harvest fish, wildlife, wild fruit and berries to support a moderate livelihood for the treaty beneficiaries. While the Mi'kmaq promised not to molest the British in their settlements, the Mi'kmaq did not cede or give up their land title and other rights. |
| 1976 | The Mi'kmaq Grand Council and the Union of Nova Scotia Indians submitted a |

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|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | comprehensive land claim to Canada and Nova Scotia regarding Aboriginal title in Nova Scotia. The claim was rejected on the basis that it was “super ceded by law”. |
| 1990 | The Nova Scotia Court of Appeal held that the Mi’kmaq of Nova Scotia had Aboriginal rights to fish for food, protected by section 35(1) of the Constitution in the case of Denny, Paul and Sylliboy. |
| 1998 (September) | Canada, Nova Scotia and the Assembly of Chiefs agreed to pursue a “Made-in-Nova Scotia Process” to deal with outstanding treaty, title and Aboriginal rights questions in Nova Scotia. |
| 1999 (September) | The Supreme Court of Canada released the Donald Marshall decision recognizing the Treaties of 1760 and 1761 and the right to hunt, fish and gather for a moderate livelihood. This right is protected by section 35(1) of the Constitution. The Court repeated the need for government and First Nations to negotiate acceptable solutions to detailed implementation of the constitutional rights. |
| 2001 (January) | The Chiefs, Minister Michael Baker (Aboriginal Affairs, Nova Scotia) and Minister Robert Nault (Indian Affairs, Canada) met in Truro and agreed to negotiate an Umbrella Agreement to begin the long-term rights-based process. |
| 2002 (June) | The thirteen First Nations passed BCR’s to support the signing of the Umbrella Agreement, and the document was then completed by the Mi’kmaq of Nova Scotia. Canada, Nova Scotia and the Mi’kmaq of Nova Scotia committed to negotiate the recognition, definition and implementation of Mi’kmaq rights and title in good faith. |
| 2004 | The “Made-in-Nova Scotia Process” became Kwilmuk Maw-klusuaqn (Searching for Consensus). Staff was retained to begin preparing for upcoming discussions. |

Table 18: Potlotek First Nation household and dwelling characteristics

| Household type | 2001 | 1996 |
|--------------------------------|------|------|
| Total - All private households | 120 | 95 |
| Single family households | 90 | 70 |
| Double family households | 55 | 40 |
| Female lone parent households | 25 | 25 |
| Male lone parent households | 10 | 0 |
| Multi-family households | 10 | 0 |
| Non-family households | 25 | 20 |

3.0 DISCUSSION

3.1 WHAT RISKS DOES CLIMATE CHANGE POSE TO FIRST NATION COMMUNITIES SOF60?

3.1.1 Observations and understandings and of climate change

Climate change impacts in the case study communities are often just one of many factors affecting the land and waters and the activities of First Nations in their traditional territories. These other factors include: loss of access to land and therefore land based activities (e.g. development, private land ownership), decline of wild plant and animal species (e.g. overharvesting, pollution and habitat destruction), and declining participation in land based activities (e.g. changing values and historical factors such as residential schools). Due to the complexity of factors causing environmental change and changing the way First Nations use the environment, it is sometimes a challenge to see the true impacts of climate change on First Nations in southern Canada. CWFN, the most northern case study community, identified the most prominent affects from climate change impacts in our study. Although the diversion has had a large impact on the environmental and peoples use of it, climate change impacts (e.g. changes to weather and seasons) was one of the other main factors that had a large impact. This is likely due to a lack of some issues in the north that are faced by southern communities, such as rural/urban development and non point source pollution, their remote location which provides fewer alternatives to land based activities, and the fact that there are greater impacts of climate change being experienced in a more northern climate.

It appears that climate change impacts being felt by our case study communities are currently within their coping range, at least for the three most southern communities. Impacts being felt in Waskaganish, as in many other northern communities, are pushing against the limits of their coping ranges. For example, T'Sou-ke First Nation and Swan Lake First Nation have experienced extreme weather events, but these have not yet occurred in a frequency that would tax their ability to respond and/or recover from these events. In fact, their experiences with extreme weather events have led to the development of emergency plans to be better prepared for these events in the future. In Waskaganish, people have experienced significant safety concerns due to changes in temperature, weather and ice, which have led to people falling through the ice when travelling in the winter. Due to their location, people from Waskaganish often do not have the option to travel by another route. For Potlotek First Nation, while they

have experienced much less ice in the winter in the Bras d'Or lakes, they have access to alternate roads, which, although take longer, still allow them to travel to the areas they need to get to.

The risk of First Nation communities to climate change was supported in their perceptions and understandings of climate change and adaptation. Most of the interviewees said their community was not prepared to deal with the effects of climate change, and some had said there was an urgent need to be more prepared and start planning. However, for those that said they were not prepared, in most cases, there were little proactive measures being taken to respond to future climate change impacts. We also heard that climate change is not a high priority in these communities and that other more pressing concerns require all of their attention. So it is partly lack of information, lack of resources, and competing priorities that prevent communities from preparing for the effects of climate change. Indigenous worldviews on adaptation may prevent communities from developing proactive measures to respond to climate change. Interviewees talked about how indigenous people live more 'day to day' and have 'always adapted' to significant changes they have undergone in their history. This approach to life, by living in the present, and relying on a view that it is almost 'natural' for indigenous people to adapt to change, may be preventing communities to engage in proactive adaptation measures.

3.1.2 Connection to the land and how this relates to risks to communities

First Nation communities south of 60 are more at risk to climate change impacts because of their connection to the land (the connection to the land is also a community strength, which is explored further in section 3.2). This is evident by the way communities have already been impacted by other factors that have compromised their connection to and ability to use the land. The environmental and social changes communities have already witnessed (e.g. loss of access to land, decline of wild plant and animal species, and declining participation in land based activities) have had a negative impact on communities. These changes have served to provide less access to traditional foods and the nutritional benefits these foods provide. Additionally, less time participating in land based activities have led to less physical activity by some community members. Also, by not participating in land based activities, community members miss out on opportunities for families to take part in these activities together and for elders to share and pass on their traditional knowledge. This has resulted in a general decrease in health and wellbeing of community members. Future climate change impacts that further

affect the health of the land and the availability of culturally important species will only increase the current impacts felt by Aboriginal communities from environmental changes.

In many cases, as evidenced by previous environmental and community changes, the environment and First Nation communities' connection to it are already stressed and will only be further stressed by climate change. Population growth, habitat modification (changing land use), and pollution have already put pressure on the plant and animal populations and water resources in many of our case study communities. Climate change is predicted to have a further impact on ecosystems such as plant and animal habitat and water quality, which would put further pressure on already stressed ecosystems. This in turn will put further strain on communities that are struggling to maintain their culture and identity in the face of changing values and lifestyles.

We have already seen the impacts of environmental change on T'Sou-ke members, for example:

- Development around reserve and in T'Sou-ke traditional territory resulting in less access to traditional hunting areas/deer and birds/shellfish populations/berries, nutritional loss from loss of traditional foods, loss of transmission of teachings, and social loss from no longer going out to harvest traditional foods
- Declining salmon populations leading to less salmon as traditional food, nutritional loss of salmon, lack of ability to provide salmon at cultural events; economic losses in fishery)
- Water pollution in Sooke Harbour resulting in loss of clam harvesting sites, loss of traditional food, economic loss for families who harvested to sell
- Declining forestry industry causing economic impacts, loss of jobs, and low morale of forestry workers

These impacts felt by T'Sou-ke members will only be exacerbated by future climate change impacts. The following predicted climate change impacts in this region (detailed in Section 2.1.1) could have negative effects on T'Sou-ke members:

- Sea-level rise (e.g. flooding and erosion, damage to infrastructure and archaeological sites, increased threat of damage from tsunamis)
- Increasing frequency and severity of extreme weather events (e.g. increased taxing of emergency response measures, increased damage to homes and cars)

- Changes to water (e.g. less water availability from rising temperature and changing precipitation over the seasons, decreased water quality from increased bacterial growths (increased water temperature) and suspended solids (more frequent severe weather))
- Changes to fish (e.g. increased water temperature, degraded water quality having negative effects on fish and shellfish)

We have already seen the impacts of environmental change on Swan Lake members, for example:

- Decline in hunting and fishing reducing access to traditional foods resulting in poorer diet, less physical activity, poorer health, loss of culture.
- Major decline in trapping and loss of this cultural practice
- Decrease in abundance of berries impacting health and cultural transmission
- Changes in weather including less predictable weather and increases in extreme weather events, especially tornadoes

These impacts felt by Swan Lake members will only be exacerbated by future climate change impacts. The following predicted climate change impacts in this region (detailed in Section 2.2.1) could have negative effects on Swan Lake First Nation members:

- Increasing temperature (e.g. more pests, changing ranges of animals, more drought)
- Increasing extreme weather events (e.g. destruction of infrastructure, decreased water quality, increased occurrence of power outages, decreased safety)
- Change to water (e.g. higher temperature, high nutrient loads, degraded water quality, increased water scarcity, low flows)
- Fishing (e.g. increased temperature, decreasing fish stocks, less access to fish)

We have already seen the impacts of environmental change on Waskaganish members, for example:

- Decline in hunting, trapping and fishing practises impacting cultural transmission, consumption of traditional foods (e.g. poorer diet, less physical activity), a traditional way of life and time spent with family
- Decrease in abundance of berries impacting health (e.g. poorer diet, less physical activity), cultural transmission, and time spent with family

- Changes in weather including increases in extreme weather events, changes in seasons especially earlier springs, and extreme heat impacting access to traditional foods, human health and a traditional way of life

These impacts felt by Waskaganish members will only be exacerbated by future climate change impacts. The following predicted climate change impacts in this region (detailed in Section 2.3.1) could have negative effects on CWFN members:

- Increasing temperature (e.g. changing seasons, warmer water, less lake and river ice, decreasing)
- Increasing extreme weather events (e.g. destruction of infrastructure, increasing coastal erosion, loss of cultural sites, decreasing safety)
- Change to ice (e.g. later freezing, earlier spring melt, decreasing ice thickness, decreasing safety of ice travel, loss of access to hunting areas)
- Changes to wildlife (e.g. increasing number of new species, decrease in fur-bearers, decreased access to wildlife, changes in animal migrations)
- Fishing (e.g. increased water temperature, decreasing fish stocks, changes in spawning, less access to fish)

We have already seen the impacts of environmental change on Potlotek members, for example:

- Decline in wildlife and sea life reducing access to traditional foods resulting in poorer diet, less physical activity, poorer health, loss of transmission of traditional knowledge
- Erosion on Chapel Island and Malagawatch causing loss of significant cultural and archaeological sites
- Water pollution in Bras d'Or following St. Anne's Mission causing degradation of culturally significant site (Chapel Island), loss of swimming and fishing site
- Decreasing ice on Bras d'Or Lakes resulting in having to travel farther to visit friends/family, loss of ice fishing/eeling, skating and firewood collecting sites in the winter

These impacts felt by Potlotek members will only be exacerbated by future climate change impacts. The following predicted climate change impacts in this region (detailed in Section 2.4.1) could have negative effects on Potlotek First Nation members:

- Increasing temperature (e.g. more pests, changing ranges of animals, less lake ice)
- Increasing extreme weather events (e.g. destruction of infrastructure, loss of shore habitat, decreased water quality, increased occurrence of power outages)

- Sea-level rise (e.g. increased flooding and threat of storm surges, loss of cultural sites, flooding of homes, salt water pressure affecting septic systems, increased stress on emergency services and maintenance)
- Change to water supply (e.g. higher temperature, high nutrient levels, degraded water quality)
- Changes to wildlife (e.g. changing species behaviour, decreased access to wildlife)
- Fishing (e.g. increased temperature, decreasing fish stocks, less access to fish)

3.1.3 How risks are linked to other challenges and stressors

First Nation communities south of 60 are more at risk to climate change because of existing challenges and stressors they are facing in their communities. These existing challenges and stressors take priority for communities and would leave them less able to respond to new challenges produced from climate change impacts. Examples of existing challenges and stressors include poverty, social problems (e.g. substance abuse), and health problems. Many interviewees highlighted a number of economic challenges, including a lack of funding and resources by the Band to address even their current issues, lack of business opportunities in the community, and lack of job opportunities. These issues lead to greater dependence of community members on social assistance and/or the Band and low morale.

Climate change impacts will make existing challenges and stressors being experienced in First Nation communities worse. For example, any responses to or recoveries from extreme weather events, especially those that happen more frequently and more intensely, will further burden already strained finances in Aboriginal communities, both at the leadership and individual level (e.g. loss of community infrastructure and personal belongings due to flooding). For communities that have high incidences of health problems such as diabetes, these problems maybe be compounded by future impacts such as decreased water quality, and increased damage to homes (e.g. mould) from flooding.

3.1.4 Institutional factors that affect risk in case study communities

In this project, we wanted to understand how First Nation institutions have responded to environmental changes in the past and how they can respond to climate change impacts now and in the future. Institutions are the way the community is organized, aspects of the culture, and how decisions are made. This takes into account the ways decisions are made at the local

level, both formally and informally and the interaction between the First Nation institutions and outside organizations.

In many cases, we found that the formal decision-making processes in First Nation communities are generally not set up to deal with environmental issues. For most of our case study communities, they did not have a staff member employed by the Band to respond to and deal with environmental issues in general. Also, in many cases there was not a Band councillor who had an environment portfolio, although councillors had portfolios for health, education, public works, etc. This could suggest that the concept of the 'environment' is interpreted in a holistic way and is 'mainstreamed' into all aspects of decision-making, or it could be that there are no funds provided by INAC in their transfer payments to have an environment position, so First Nations must look elsewhere to fund this position. In some cases, it means that there isn't someone on staff that can respond to and work on environmental issues; this creates a gap in the decision-making process around environmental issues. Also in some of our interviews, people talked about the importance of both developing and/or enforcing environmental laws. In some cases, enforcement was not happening to the extent that they wanted.

First Nation institutions, when trying to resolve environmental issues in the past, have encountered numerous challenges when working with other (provincial, federal) government institutions. Both federal and provincial institutions, more specifically the bureaucracy associated with these institutions sometimes holds the community back from responding to change. Sometimes First Nations are left waiting on the government institution to respond with the information or provide the resources they need in order to respond to issues in a timely manner. In addition, jurisdictional issues can provide a challenge to First Nation institutions. In some cases where an environmental issue needs to be resolved, both provincial and federal bodies may state that that issue is not within their 'jurisdiction', again stalling a First Nation in being able to resolve any problems. Jurisdictional issues are a challenge since provincial laws do not apply on First Nation reserves, but often do outside reserves in the traditional territory of the First Nation. Interviewees also brought up challenges around high staff turnover in government departments. First Nations place a lot of importance of personal relationships when dealing with outside organizations, and having contacts change on a regular basis makes it difficult to develop and continue those relationships. These challenges experienced when working with outside organizations can put communities more at risk because it stalls their efforts to deal with issues in a proactive and efficient way.

3.2 WHAT FACTORS CONTRIBUTE TO COMMUNITY RESILIENCE?

From our interviews, we gathered themes about what factors contribute a community's resilience. A simple definition of resilience is "that which bends but does not break". Or more precisely, resilience is the ability of a system (e.g. First Nation, community, forest, coastline) to absorb or adjust to change or stress, while keeping basic functions, and maintaining the capacity to adapt, change or learn. We have found that the factors that contribute to community resilience include:

- Effective governance
- Self-sufficiency/motivation (vs. dependency) of leaders and members
- Ability to balance the traditional and the modern
- Maintaining connection to and control over the land
- Healing from the past
- Strengthening community cohesion
- Families – strengthening the positives, overcoming the negatives
- Willingness to accept change
- Education and awareness building
- Reaching out to others

Effective governance

Effective governance is an important factor that contributes to a community's adaptive capacity, and includes elements such as:

- An inclusive, transparent decision-making process,
- Clear communication with the members,
- Making use of traditional systems of decision-making (e.g. elders), and
- Engaging in long term decision-making.

Decision-making processes that included the membership were supported most by our case study communities. This is a process based on consensus as much as possible with major projects/decisions involving the whole community and most daily decisions made by council and/or administration, but each issue is looked at individually to determine who needs to be involved. On the other hand, decision-making processes that did not involve the membership

may have lead to a sense of apathy of community members, which could result in people not being motivated to get involved in community affairs and not trusting their elected leadership.

Inclusive decision-making means that community members were informed about decisions that were made, had opportunity to provide input on important decisions, and that the decisions made at the leadership level reflected their members and were supported by them. Examples of including membership in decision-making was reflected by our case study communities in a number of ways, for example, having open band council meetings that members could attend and that were clearly advertised to the members (with publically available meeting minutes and financials), holding community meetings to discuss important issues and the use of informal ways of providing input. Informal ways of providing input could be members providing input to leaders at community events, or stopping by the Band office to provide their views. Inclusive decision-making also needs to demonstrate to membership how their input was taken into consideration in a meaningful way to build trust and ensure motivated community members.

Being inclusive can also be shown by having the leadership ‘tap’ into sources of information and expertise of members to make decisions about the community. One community described the following qualities of a leader that they supported: listens to staff and members, believes in them and supports them, is open to new ways, shows the positive changes they are making in the community, and is closer in age to others working in the community but is also culturally minded and knowledgeable about living off the land.

There were times when I lived here when I just dreaded going to work. On account of all those things...but nowadays I love coming to work ... we have the sources to do things and our Council really works good together...all our council work is a team...nobody's above anybody else and our Chief is good, you know, he/she listens and everybody else listens. We listen to each other...everything is done as a team. So that's good. (#17)

Part of insuring an inclusive and transparent decision-making process is having clear communication. This includes communication from leadership to the members and vice versa, but also among leadership and other staff/administration. A lack of communication was cited as something that can hold a community back from responding to change. When communication is not effective, people are not informed about decisions or actions by the leadership and other staff. This can lead to a duplication of efforts and inefficiencies and it can also lead to distrust and confusion among members and staff.

The case study communities differed in their success in communication. For one community, they made attempts to communicate with the members, for example through meetings, but it was difficult to get high attendance at the meetings, and some members indicated there was low turnout because people felt they were not listened to.

People don't really attend our meetings, I don't know why and we try many means to get them attend the meetings, by offering them prizes and trips, just to have them attend the meetings... We listened to the people, but they don't attend. (#53)

It's usually the band, they hold everything. They're in control of everything. The Band Council, they make all the decisions. They have assemblies...in the summer time and they have other meetings and usually people don't really show up at the meetings, it's really hard to get a quorum in the meetings and sometimes the meetings just get postponed and people don't show up. Because people know that the Band is gonna make the decision anyway. That's why I say it's hard sometimes to make your point...to ask for projects...to help your community, 'cause you know that's where everything stops is at the Band Council. (#57)

Another community had communication challenges in the past, between members and between leadership and members, but found a number of approaches to help them overcome this. They hired an outside person to improve communication between all members/families and between members and leadership. The Chief at the time asked the communication person to start a comprehensive community planning process with the community, so they could develop a common vision from all of their members.

Effective governance also means taking the beneficial aspects of traditional forms of governance. The benefits of incorporating aspects of traditional forms of governance is that the traditional system of government may still be supported by the membership; members may still informally organise according to traditional systems of government today and may feel more comfortable sharing information through this system. In some cases interviewees talked about traditional decision-making relying on consensus, which again relates to an inclusive decision-making process. In many cases, the wisdom of the elders was an important part of traditional systems of governance and elders continued to be sought for their advice currently.

And elders, they are looked to for their experience and wisdom and if we are needing their assistance in making some decisions in the community then we will call on them ... usually

where something cultural is concerned we want their input. Or, or land ... we look to them for their traditional wisdom. (#35)

In other cases, people were unhappy about the current leadership's lack of use of elders to inform their decision-making.

I find that when the elders talk amongst themselves they like to see it go back to the traditional way, the way it was before where all the decisions were made by the elders. (#13)

Or they were involved but their roles were not clear, which led to confusion and a lack of purpose. Traditional systems of governance also had different ways of selecting leaders or Chiefs, and often a leader was groomed for and prepared for this process throughout their lives. ... the Band Councils. That is the Indian Act government, it's not ours...But in the olden days they made, it was consensus. Now it's a parliamentary system... But it seems like it [Grand Council system]...was from, like from generation to generation, like they were trained, well if you're a leader and your father is a leader you learn all your life to be a leader, you know? They had hereditary leaders in some families. (#13)

Effective governance also involves the ability to engage in long term decision-making and planning. Long term planning ensures that decisions do not only provide short term gain but also consider the needs of future generations. Planning for climate change in particular needs to be long term, since you need to prepare for unknown future effects, and it often takes time to gather the necessary resources and gather the right partners to prepare for climate change impacts.

The leadership can only participate in long term planning if their limited time is not overwhelmed with the day to day needs of community members. One way to ensure this is to have the administration (dealing more with day to day) clearly separated from the political. When this is done, leaders have the time to create policy and focus on long term planning for the community, and the day to day operations are less subject to decisions biased by favouritism, nepotism or corruption.

Chief and council meet once a month, create policy and try to stay away from day to day, administration determines the day to day goings on based on the policy and if there's anything over and above policy then he/she would bring that to Chief and Council, community gives direction to chief and council, administration get direction from chief and community. (#35)

That's one thing over the years...I know in a lot of communities there's a high staff turnover when there's new elections and a new local government. In this community, it doesn't impact. ...there's nothing to worry about, because our Chief and Council don't work that way. No matter who it's been, they don't impact the staff in a negative way.

(#23)

Also, since administration jobs are not affected by the leadership, this allows for a more stable decision-making processes, where there is more likely to be the continuation of existing policies and bylaws (vs. creating new ones). In order for this to happen, the administrative staff has to have the skills, the mandate and the capacity to carry out their roles, and have guidelines and policies in place that allow them to carry out the day to day decisions.

One example of long term planning is comprehensive community planning or land use planning. Through these processes, the leadership and members create a vision for the future and determine how they will reach that vision collectively through the development of goals, priorities and actions. It ensures that all future decisions take into account all areas of importance to the community, i.e. environment, economy, social and culture. It also provides methods for inclusive decision-making and communication because planning processes encourage and rely on input from all of its members in order to be successful.

... when the...comprehensive community planning...came to our reserve ...it was another step in getting our community to work together and ... that the community itself be the ones that make the decisions and direct Chief and Council. (#29)

Emergency planning is also an example of long term planning, since it provides options for any future crisis or emergency and allows the community to be better prepared for them. In a few of our case study communities, it was an extreme weather event that led to the development of emergency plans and in some cases, increased self sufficiency such as wind and solar energy development. While the community members would likely be involved in long term planning processes, it is up to the leadership to set these processes as a priority and support their implementation in the community.

One thing that many interviewees described as hampering the ability to think and plan long term is the two year election cycle that exists in many communities. Having new leadership every two years was seen as very disruptive to community decisions and operations. This election cycle

does not allow for long term planning or policy initiatives because leadership is distracted by regularly trying to get re-elected.

There's not enough time to establish anything or do anything and that kind of holds people back when they're...can only really do something in one year and then the other year you try to get re-elected. (#02)

Well they came in with the 2-year, Band Council government, how can anybody do anything in 2 years? If you're not elected back, how can you make long-term plans...? (#13)

The administrative staff can sometimes find it difficult to keep momentum with projects or initiatives with changing leadership. Although this negative effect can be somewhat alleviated if the changes in leadership does not result in an upheaval in administrative staff and policies and bylaws.

In some cases, the elections can have a hard social toll on the community because campaigns can cause conflict in the community; so members just begin to heal from the election process and then they are in another election 2 years later. These conflicts can be especially hard on the community because the high degree of relatedness between many community members. And this short turnaround time in elections can sometimes lead to increased cases of corruption as people try to win votes, which again spreads disharmony in the community.

Self-sufficiency/motivation (vs. dependency) of leaders and members

Another factor contributing to community adaptive capacity is self –sufficiency or motivation of both leaders and the membership. The community appreciates leadership that is motivated and is not dependent solely on outsiders to solve their problems (although reaching out to others is another aspect of adaptive capacity, discussed further in this section). Leaders need to show their members that they are proactively trying to respond to issues and challenges. Leadership can show their motivation by allowing members to 'see' the positive changes they are making and encouraging and attending community events.

Also needed are members who are willing to, on their own accord, embrace those traditional values of self-sufficiency, so they aren't depending on the leadership for their day to day needs. Some interviewees talked about the issues around dependency in their communities that

prevented them from being able to respond to change. In some cases, people spoke about the welfare system contributing to dependency of community members. They also spoke of traditional values of a hard work ethic and not having a sense of entitlement that helped them survive. This was tied to the ability to take ownership of things, take responsibility for them and take pride in things. It is these values that prevent dependency of individuals.

It's better for your health, you're outdoors, you're, self-sufficient...you can depend on yourself...if you go through tough times you know you can make it through a tough year or something. ...I've had to that where it's like, 'Oh my god, I'm sick of deer meat and I'm sick of fish and I'm sick of whatever,'but, you know, it helps you through the tough times. (#33)

There's another thing...their ancestors, they weren't given things on silver platters, they weren't, Say here, here have a tipi, no, no...they had to go out and cut the poles down and peel 'em and everything and build their house..they just didn't get it given to them. (#32)

So what people had to make a go of it on their own without waitin' for the welfare cheques. It's only when the welfare cheques were introduced that they stopped doin' the things that made 'em independent to begin with years ago. (#10)

There was discussion about the importance of finding balance between creating opportunities for the members but also getting them to take responsibility and take initiative when it comes to holding down a job and developing a good work ethic.

If you give it away, there's no sense of ownership, there's no sense of value, there's no sense of taking care of it...on one hand you want to help people and you do, on the other hand you get them so dependent on it that they won't do anything else without having that assistance. (#09)

Some interviewees talked about the importance of having champions in the community, individuals who take on specific issues and make sure they are successful in the community. These champions in turn, need to be supported by the leadership. Champions have motivation to keep an initiative going and provide the momentum needed to move something forward and keep it moving.

...You need champions, that's a huge thing in the community, you gotta have champions for all these different things. (#35)

Ability to balance the traditional and the modern

The ability to balance traditional and modern lifestyles/worldviews, as determined by the community itself, is a key component of adaptive capacity in Aboriginal communities. Many interviewees spoke about the challenges two competing worldviews had on their community, the traditional lifestyle and the modern lifestyle. For some communities, they saw finding this balance as important for their cultural survival, for environmental stewardship, and for their identity. Even though, in some cases, the value of a modern lifestyle (e.g. technology, formal education) increased at the expense of traditional lifestyles (e.g. subsistence land based activities, traditional teachings), ideally, both worldviews should be valued for their beneficial qualities and used by the leadership and membership.

Not forgetting who they are...we have our Sundance, we have our powwow, we have our elders, we have our pipe carriers, we have so many resources that we maintain who we are...we remember who we are, and understand and accept and realize that, that won't change. We are who we are and you can walk in both worlds and find the balance. (#20)

In some cases, this struggle between modern and traditional lifestyles is splitting generations apart, particularly the elders and youth, which is contributing to a loss of culture and identity.

So, there's kind of a bridge, I guess, that needs to catch hold, to be built. The people from my generation, like I'm in my 50s, we learned by working hands on. The generation that's here is learning by pushing buttons. So there needs to be some kind of a bridge that's built there. So that we can adapt to their lifestyle and they can bring some of our values to the forefront. (#23)

This includes the incorporation of traditional governance systems into the modern decision-making process discussed previously. In some cases, leadership was respected more if they were competent in the modern system but still had traditional teachings that guided their decisions.

Part of balancing the modern and traditional worldviews is to make positive use of technology and deal with any potential negative effects. Some people found the use of technology, especially among the young people, to separate community members from their families and their culture.

Technology has come a long ways in the way of involving our young people. They get caught up in their video games and all these other things that will keep them occupied, where...you get away from real life. They've all got headphones on, they all have these

pocket devices, where it's so easy to shut other people out and when we go on cultural travels or tribal journeys we don't allow those things to come with us...to be able to ground our youth in a cultural way...I think that technology plays a part in separating our youths from the family unit. And, that definitely has to be addressed in the future, because there is something wrong there. (#37)

But some interviewees realize that the modern lifestyle also makes it more difficult for parents to spend time with their kids. While there are many beneficial uses of technology (e.g. increased efficiency), this needs to be balanced so it does not sever ties between community members, the land and their culture. As a way to get away from this one interviewee talked about the importance of adults leading by example to get them outside.

I'm re-educating myself as a Cree, who I am today as a First Nation and I want to stop with the technology, but I want to go further with...the contemporary Cree now. In the old way, the new way, trying to find a path that's a common denominator for me, the same here for the other people, some others lost in their own world, but then there's so few people like us who can do that. (#60)

Interviewees saw their culture as being pivotal to the strength and resilience of their community. Many interviewees talked about the importance of their culture in terms of helping community members know 'who they are', helping people respond to change, strengthening families and communities as a whole, even providing valuable survival skills on the land. Many were concerned about the community losing their culture and expressed that losing their culture held the community back from being able to respond to change. Others saw the traditional teachings reflecting a more sustainable lifestyle that they and others in society should be pursuing. These values associated with traditional cultures, such as sustainability and self-sufficiency, can easily be applied in a modern context.

Our culture! Our traditional way of doing things! A simple way of doing things, a simple life, try to get away from the material world, very difficult. Be able to use the teaching of our elders and our ancestors to make us better people. To be able to get everyone to get together with one voice to take care of the resources that are all around us... (#37)

Some people found that communicating modern concepts (e.g. environmental terms) to the membership using cultural context (e.g. language, art) were better received by the members as well.

Definitely our culture. 'Cause that I found when I was doing environmental education programs, when I started...incorporating artwork into the whole education part, a lot more

people responded... So that's the main thing, when we show people...that the way we are living right now isn't really aligned with our traditional culture. We need to, seek out a lifestyle that is more aligned with it. (#31)

Maintaining connection to and control over the land

While the connection of people to the land puts First Nations more at risk to climate change impacts, many saw this connection to the land as contributing to their resilience.

I think the best thing...about this community is our real sense of ownership of our land... and that closeness we have in this community. I think those are the two best things we have going for us right now... I think one of the good things about this community is, we're dealing with a land code where the band...would be responsible for, its our own land now. Although we still won't own it, we'll at least have the ability to make the laws to govern it. (#22)

Just as culture is seen as a strength of the community, it is this cultural connection to the land and use of the land that is also seen as a strength as it provides practical skills to survive on the land that increases self- sufficiency. Land is also provides a spiritual connection for many people.

As a way to strengthen this connection, communities can increase their adaptive capacity by increasing their control over decisions about their land. This is important because a First Nation does not have to wait on others to make decisions about their land, and has some flexibility in those decisions. Also, this control of the land would allow the First Nation to ensure their members have continued access to the land to carry out traditional activities.

One First Nation is working towards regaining as much control as possible over their lands through the development of their own land code. This will increase their ability to keep the land healthy and maintain their cultural connection to the land. Another First Nation saw their First Nation Land Management Initiative in moving their community forward, as something that will provide them with more independence and opportunity. By implementing this agreement they will have more flexibility to make their own decisions, will therefore not have to wait on INAC to get things done and can make decisions faster. They are approaching this framework agreement the same way they approached their comprehensive community planning, being inclusive and getting support from the whole community. They have set up a lands committee with individuals from different families. They also have regular communication with the

members about decisions regarding the agreement. Whenever decisions need to be made, a mailing is sent to every household and a community meeting is held so members can provide input.

How I see and when I think economic development...it's giving the band more opportunity to do the things that they want rather than what they're being told to do, right? To make their own decisions and you know, not relying on funding for this and funding for that...I think more community members would be working and they would take pride in that. Knowing that it's yours (#30)

Healing from the past

A critical part of Aboriginal communities moving forward in a positive way is to heal from the past. All of our case study communities talked about the negative effects from the Indian Act and residential school on their communities. Many interviewees identified these historical policies as a barrier for the community being able to respond to change. In many cases, these issues stemming from the Indian Act and residential schools have not been fully resolved or healed by community members. It will be difficult for communities to address certain elements of their community if they have not invested in healing from these events in the past.

The specific issues raised about the Indian Act were that it imposed a system of governance on First Nations that was not their own, and it defined who was First Nation and who was not. This led to conflict within communities.

Also how INAC, the legacy of the Indian Act, how it played a role in separating families and making it so we argue amongst ourselves when we shouldn't be doing that... the INAC system of government for most tribes in BC or Canada, it's not our style of government. And, it's changed since hereditary chieftain-ship was taken away. When the hereditary Chief died, then INAC came in and enrolled an election system, which wasn't a part of our people. And, that made us weaker, because we were so strong government-wise before that and now with the election system sometimes it hurts us because it splits families up. And, you know, it's at a time when we're all together as one, you could have separation because of the legacy of the Indian Act, and residential schools and also technology. (#37)

One part of the Indian Act that had a particular impact on one case study community was the part that stated First Nations women lost their status from marrying a non-First Nations male.

This caused a lot of conflict between families since within the same immediate family there were people who had status (e.g. First Nations men and women who were single or married another First Nations person, non-First Nations women who married First Nation males) and those who did not (e.g. women who married non-First Nation males). Bill C-31 was supposed to 'right' the wrongs of this part of the Indian Act, giving status back to First Nations women who had married a non-First Nations man. When this Bill was enacted, there were many people who were previously denied status coming back to the community, who grew up differently than those living on reserve. The population quadrupled over a matter of a decade when people regained their status.

Well, Bill C-31 was 1985 so I'd say like '90 on. ... it had a big impact. And, that brings to mind some of the reasons we weren't getting along. Cause, the government made it so that we would argue with each other as far as I'm concerned. With the enactment of Bill C-31 and it was supposed to fix things, but it didn't.... it's still something that still needs to be sorted out today. And so people keep an eye on them, like the new Mclvor case and things like that. Still trying to fix that. (#29)

The impacts of residential schools have been felt for multiple generations in the case study communities. People described how many issues in their communities, such as conflict, substance abuse, sexual abuse, poor parenting, loss of culture, language and traditions, are linked to the impacts of residential schools.

Well, in my lifetime I know the residential school played a big role in decimating our culture, it actually really hurt us. I know it hurt all tribes, but in a time where you weren't allowed to practice your culture, or you got in trouble if you did. (#37)

'Cause I am one of the...residential school people... it was very hard. Like you always felt like, nobody, you're second class, all those awful things, that nobody really cared, you know, the white community. I think we are always looked down on.... I think there is a time in our lives when you're kind of up against, there was time when, I felt that, it was like a huge void in my life and I kept wondering why is it there? (#28)

I guess the other problem is also the participation of young people. Like, let's say for my age, you know, we've gone through the residential school issue, problems and the effects. We still haven't been able to solve all these issues, all the trauma we've been through... (#41)

I think the major issues that we have to overcome are...something that we brought from the past...I didn't go to a residential school, but I heard here about it almost on a daily basis, the effects of like parenting skills, or I guess the trauma of families being ripped apart from each other, and the lack of meaning to even show affection to your family members because you kind of grow up apart from them. (#45)

I think where other folks may have had that problem behind them and they just were ashamed of who they were or are or made to believe that. ...we were only a small band and now we're pretty large and I think we have a chance with our new youth and children that are proud of who they are and want to learn more. (#29)

Interviewees in another community spoke about another historical event that had a negative impact on their community – the federal governments centralisation policy in Nova Scotia. This is where the government tried to amalgamate all bands in Nova Scotia onto two reserves. As one interviewee put it.... “our biggest problem, and we're still, we're, we are still rebuildin' our reserve from the 1940s.” It split families and their community apart (as other communities in Nova Scotia). For those who left the community, the promises of houses and jobs were not fulfilled, and they suffered because they had no food gathered and stored for winter. For those who stayed, they lost key members of their communities (e.g. leaders, trades people) and had to stay and fight for their right to stay on their reserve. This led to a decline in quality of life both for those who moved and those who stayed and led to increased dependence on government. Although one interviewee described that it was the people who stayed behind who showed their strength by resisting the government attempt to move them.

So, these people who are here are very, very strong Chapel Islanders.... we lost all of our leaders during the centralisation period which began in 1942...people stopped moving about 1948-49...the group that didn't move to Eskasoni...they organized themselves and fought the government and they, allied themselves with other reserves like, the people who didn't want to move...we shall always teach our children ...to love Chapel Island like they did and...to take care of it ...all the men...who weren't fooled... that's the generation that's here now... they have these fighting genes in them. (#13)

It may have also resulted in more connections between different bands in Cape Breton, since many of the families moved from their reserves to Eskasoni First Nation and those who remained on their reserves allied together to resist the centralisation policy. There seems to be

more of a collective identity by Mi'kmaq people living in Cape Breton. This may be because of the way the Bands were traditionally organized, including the yearly gathering by all Mi'kmaq at Chapel Island as well as the effects from the centralisation policy.

People talked about different ways that healing has been started in their communities.

I think they have to heal the people who went through residential school, it's gotta start from there. Which are the elders. Then you work your way down to, the children. It's gotta start there because that's where it started. They don't, they have to focus on healing the people within the community. It's hard to face your issues but, you know, I think nothing will ever change until that healing starts. (#27)

In some cases this involved developing networks of people to support people who are struggling with various issues, having leadership speak up about these issues and the importance of traditional values and approaches to healing. There was emphasis on the youth, who experience the multigenerational effects of these historical events, and the importance of developing youth programs and providing positive role models for young people. One way to overcome conflict between community members is to engage in comprehensive community planning, since everyone participates (especially different families and groups in the community) and everyone can see themselves in the vision for the community. Gatherings around education (e.g. graduation for young people), or activities (e.g. talking circle, healing circle) were ways that people saw culture and education being helpful in bringing people together and starting the healing process.

So it's healing in that sense...you have people that wouldn't have normally talked to each other, sharing classrooms and now they have to interact and so they realize that they do have a lot in common and its best not demonize people and that's what the end result was. (#09)

Strengthening community cohesion

The general strengthening of community cohesion is important for a community's resilience. Community cohesion describes the relationships between people, for example, how well people work together and help one another. Interviewees spoke about the importance of cooperation among the community, being there for each other, supporting each other and working together as a community. Negative attitudes, gossip and distrust can hold a community back from being able to respond to change. As one interviewee put it "the biggest threat is ourselves".

In some cases, people said their community members still came together in times of crisis, though not as much in day to day activities.

A good case in point here, we had somebody lost last year and everybody was out doing what they can to help find this man...for that brief moment, it was no real tension between, any of the groups. Everybody was just focused on, 'Let's find that person'...when ... everybody has to come together, they come together really. But in other little things or that, I guess, where they don't need to be, where they don't really need to be together on everything...it tends to be, well, they're still be going to be the way they were. (#03)

While it is important that communities support each other during times of greatest need, working together on a day to day basis is critically important for resilience as well. It is in the day to day cooperation where planning for the future can take place (vs. reacting to an immediate issue), which means the community as a whole is better prepared for what might come in the future.

...what if everyone was on the same level playing field and they had common interest and they common vision and they had a sense of community rather than a sense of person, I mean the individual has pushed his limits as much as he can, at the cost of the community. ... That's not the tribal way. That's not the way of our people, you know, where one person or people consider themselves as individual first before they consider themselves part of a family or a group or a tribe or a nation....So, if only they could see... how much stronger we would be as a people. How much better off we would be and how much healthier and longer living happy people. (#09)

...I think the more heads to get together to...try and find ways to the change that it would be a lot easier. I think that's one of the things that I would say hold us back a bit more is that we're not working together as much as we should be, and I think if were able to do that we'd be even more successful in coping with whatever change... (#45)

Families – strengthening the positives, overcoming the negatives

Families play a large role in Aboriginal communities, and come with both positives and negatives.

...In the past when I met a lot of the government people, cause a lot of the things to do with our issues on reserve or to do with Native people is just a number to them...when a Chief and Council or administration is governing their band, they're governing people they live with. They're governing their families...so it's not just a number. And, I think that it's a blessing and yet it's also really hard (#29)

It is important to both strengthen the positive aspects of governing relatives but take steps to overcome the negatives aspects. A positive aspect of governing your families is that since so many people are related in First Nations, this supports decisions to be made for future generations. When you are governing your families, you are likely more accountable to your relatives than you would complete strangers. Also, in a community made up of families, this can provide more community support and action to assist the leadership in their work. Families are there to support and help one another, teach the values to their young people, and come together in a crisis.

Families are everything, 'cause that's what keeps you together. Um, it's your parents that teach you, well . . . They teach you values. What's important. (#32)

...families are, families are the strength in this community. Families need to work together, they need to support each other, families...need to... pass on their knowledge to the little ones... (#32)

I think they're critical. Meaning we support each other, families, a good example is when we lose a relative, all the families rally around each other. You see that support, moral support, spiritual support, physical support, financial support, it's all there when one family needs it. When it's required, it's there. Everybody has a role to play. (#25)

I would say families are very important. You know, they're very close-knit families and even the extended family, like if something happens the whole extended family supports the family that's having a problem or whatever. So you know you have, they're very large families, and everybody takes part in some way or another. (#50)

Whenever there's an emergency or a crisis the family always pulls together. It doesn't matter, who the family is that's in trouble, the whole Nation pulls together. Sometimes there's some families that...they have conflicts but they put that aside and they gather together in emergencies or deaths or things like that. Tragedies. And good things...Sometimes they all sit in their corners but they're still there. (#32)

Some negative aspects associated with families in First Nations is nepotism in leadership, family feuds which can carry on for multiple generations, people defending their family members even if they have done something wrong, and families acting more as a unit which prevents

people acting as a community. As one interviewee described it, "... some of them they're so big that they don't need anybody else from the reserve. They just stick to their family." While it is a community strength that families are relied on and seen as so important to members, it would make the community stronger if they were also able to identify as a community, in which all members work together and support one another. Some of these negatives are tied in with historical events that have damaged the values and relationships within and between families.

Some interviewees talked about the importance of strengthening the family unit, which requires reconnecting parents with their children as modern conveniences have lead to parents spending less time together and also involves overcoming the many social issues affecting families and the community. Healing from the past is also involved in strengthening the family unit. Traditionally, in Waskaganish, people had roles and responsibilities within a family (e.g. women taking care of the children, kids carrying water and firewood, etc.) that ensured a strong family unit and taught important values like respect and cooperation, but many people noted that these roles are no longer required by modern convenience. Many noted that this change has eroded the family unit by families spending less time together and working together less as their survival does not depend on everyone helping out anymore. People also attributed this erosion of the family unit to a lack of parental involvement in children's lives nowadays.

You know, when we were still living off the land, everybody had a responsibility within the family. As a little boy, if I didn't carry any water there wouldn't be no water in the home, there would be no tea, no water to cook with or if I didn't bring in the firewood there would be no heat in the home. I had that responsibility, but my father was the one that was telling me you got to do this, and that's where the family units are very important, but the change has taken place...sometimes without even realizing. When we see the facilities, when we receive the houses with running water in the house...all the different things that we used to do as a family in years back. Carrying water, cutting wood, all of those different things do a part of teaching within the family unit in terms of respecting, honouring one another. You had a part within the family. (#48)

Ways to ensure the positives are strengthened and the negatives are overcome at the governance level is to have clear decision-making policies in the leadership that are not influenced by family and having decision-making structures that have representation from each family in the community (e.g. on committees).

Willingness to accept change

Many interviewees talked about the importance of being open to change. Some said that fear or aversion to change is what holds the community back from responding to change.

I think it's true for, probably, everybody, not just communities but, it's, the unknown...fear of the unknown, you don't know what to expect and I think it makes people kinda apprehensive about stepping forward. They kinda do it very hesitantly, and, I think it's, just not knowing what is gonna happen. (#20)

By being open to change and flexible, the community is better able to respond to any future challenges. Part of this is understanding what is involved with the change, how it will affect the community, and what aspects of the community are important to retain during potential changes.

Education and awareness building

Many interviewees spoke about the importance of education and awareness building for their communities. Many people see awareness or keeping people informed about what is going on as paramount to easing the fear of change and making informed decisions. In many cases, a lack of information or awareness was seen as preventing the community from best being able to respond to changes they were facing. This applied to the leadership as well as the members. This includes having leaders and staff who possess the skills and education to carry out their roles/positions. Others talked about the need for staff within leadership and administration to be educated, so that they can carry out their roles and responsibilities, keep community members informed, and make informed decisions. Having educated leaders decreases the community's reliance on outsiders to some degree. Interviewees talked about the fact that people need to motivate themselves to get educated and become independent.

An important aspect of education that was expressed was a community's ability to take control of the education of their youth and having it locally available. This enables communities to keep children in the community and provide the children with cultural teachings as part of their formal education. This also provides them with the flexibility to modify the schedules to allow youth to take part in traditional activities and maintaining the connection with the land, families and culture (e.g. the two week spring break in Waskaganish for goose hunting).

But I think that, the thing that the school has done over the years is the, goose break is a very good and I hope it does continue....They take two weeks off from school and pretty, about close to 90% of the community does go out and practice that and...I think through

there they find that the time they need to spend with their families and also with their who they are as First Nations people, as Cree out in the land where they learn, their culture, their language and way of living. So I think there is a strong family connection through, through the cultural way of living. (#59)

Potlotek First Nation have tried to incorporate a “two-eyed seeing” approach into their programs, a concept coined by Elder Albert Marshall that is about using the strengths of both Mi'kmaq and Western ways of knowing.

Another aspect is the need for skills and capacity building in community members, and trying to ensure jobs are available for people who do pursue different forms of education.

But, what is the reason why we want our people educated, if there's no economy and no jobs? We have grade 12 graduates standing in a welfare line, and said, "Look what that education did for them." So education has to be appropriate to the community you live in. We have a lot of young people, who are, know how to do certain things like carpentry, electric and stuff like that. But, if there's no job there to sustain them, why get educated? What is the ultimate end result? (#16)

Reaching out to others

Reaching out to others outside the community (i.e. organisations, municipalities, government departments, etc.) can increase a community's resilience. Working on environmental issues with other groups makes sense because environmental issues are interconnected, they do not adhere to the artificial political boundaries we have created (e.g. reserve lines, provincial boundaries, etc). If you are working on similar issues as other groups, you could both be wasting limited resources and time that could be used elsewhere if you combined resources. By working with others you can reach common goals, sometimes with more access to information and resources than you would have alone. By taking the time to build relationships with outside groups, you learn about each other's problems and perspectives, and this could lead to other ways of collaborating.

However, there can be drawbacks from working with others, in that you might be waiting on others in order to achieve things. But when working on large issues, especially environmental ones, the benefits often outweigh the negatives for working with others.

We have to reach out to our neighbours...bring those environmental issues and do it collectively to deal with those changes. We can't do it in isolation ... And we have to get

our neighbours to understand our views and the importance, of our environment as a native group and then as a whole community. And I think that's going to be our responsibility to do that. Because the municipalities or provincial government or any of those other agencies are not going to come in here and do that. They won't. So it's us that has to reach out. It's our people here that have to reach out. (#22)

From our research we made the following conclusions:

- Climate change impacts in the case study communities are often just one of many factors affecting the land and waters and the activities of First Nations in their traditional territories.
- It appears that climate change impacts being felt by our case study communities are currently within their coping range, at least for the three most southern communities.
- Their risk of First Nation communities to climate change was supported in their perceptions and understandings of climate change and adaptation. This approach to life, by living in the present, and relying on an view that it is almost 'natural' for indigenous people to adapt to change, may be preventing communities to engage in proactive adaptation measures.
- First Nation communities south of 60 are more at risk to climate change impacts because of their connection to the land
- In many cases, as evidenced by previous environmental and community changes, the environment and First Nation communities' connection to it are already stressed and will only be further stressed by climate change.
- First Nation communities south of 60 are more at risk to climate change because of existing challenges and stressors they are facing in their communities.
- Climate change impacts will make existing challenges and stressors being experienced in First Nation communities worse.
- In many cases, we found that the formal decision-making processes in First Nation communities are generally not set up to deal with environmental issues.
- First Nation institutions, when trying to resolve environmental issues in the past, have encountered numerous challenges when working with other (provincial, federal) government institutions.
- From our interviews, we gathered themes about what factors contribute a community's resilience. We have found that the factors that contribute to community resilience include:

- Effective governance
- Self-sufficiency/motivation (vs. dependency) of leaders and members
- Ability to balance the traditional and the modern
- Maintaining connection to and control over the land
- Healing from the past
- Strengthening community cohesion
- Families – strengthening the positives, overcoming the negatives
- Willingness to accept change
- Education and awareness building
- Reaching out to others

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5.0 ADDENDUM

Primary Case Study Climate Data Collection Methodology

The objective of the climate data collection for the four primary case studies in the INAC south of 60 degrees final report is to show the degree of climate change that each of the four locations has experienced since 1971. The chosen methodology to do this was to compare the temperatures available through Environment Canada (EC)'s **Canadian Climate Normals or Averages 1971-2000**² with that of EC's **Climate Data Online** from 2001-2010.

Weather Station Selection

The first step in this comparison was to determine the appropriate weather stations for each of the four communities. These were not always the closest weather stations, because data quality and availability for both 1971-2000 and 2001-2010 had to be factored in.

| Community | Weather Station (1971-2000) | Weather Station (2001-2010) |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Swan Lake First Nation, MB | Pilot Mound Latitude: 49°11'27.700" N Longitude: 98°54'17.500" W Elevation: 470.30 m | Same |
| Potlotek First Nation, NS | Baddeck Latitude: 46°06'00.000" N Longitude: 60°45'00.000" W Elevation: 07.60 m | Baddeck Bell Latitude: 46°06'00.000" N Longitude: 60°45'00.000" W Elevation: 16.60 m |
| T'Souke Nation, BC | Victoria International Airport Latitude: 48°38'50.000" N Longitude: 123°25'33.000" W Elevation: 19.50 m | Same |
| The Crees of Waskaganish First Nation, QC | Moosonee UA Latitude: 51°16'00.000" N Longitude: 80°39'00.000" W Elevation: 10.00 m | Same for 2001-2006, 2009-2010 Moosonee RCS (2007- 2008) Latitude: 51°17'30.000" N Longitude: 80°37'05.000" W Elevation: 09.10 m |

² *Climate normals* or averages are used to summarize or describe the average climatic conditions of a particular location. At the completion of each decade, Environment Canada updates its climate normals for as many locations and as many climatic characteristics as possible. The climate normals and extremes offered here are based on Canadian climate stations with at least 15 years of data between 1971 to 2000. (EC website)

Climate Data Availability

The next step in the comparison was to find the monthly averages for each weather station and for each timeframe. In some cases the monthly averages were provided by EC, and in some cases they had to be calculated manually.

| Community | Data Availability (1971-2000) | Data Availability (2001-2010) |
|-------------------------------------------|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Swan Lake First Nation, MB | Monthly average provided for entire period | Monthly average provided through 2007 Daily averages provided from 2008-2010, monthly average calculated manually based on daily averages |
| Potlotek First Nation, NS | Monthly average provided for entire period | Monthly average available from 2000-2006 Daily average provided from 2007-2010, monthly average calculated manually based on daily averages |
| T'Souke Nation, BC | Monthly average provided for entire period | Monthly average provided for entire period |
| The Crees of Waskaganish First Nation, QC | Monthly average provided for entire period | Monthly average available from Moosonee UA from 2000-2006 Daily average provided from 2009-2010 from Moosonee UA, monthly average calculated manually based on daily averages Daily average provided from 2007 and 2008 from Moosonee RCS, monthly average calculated manually based on daily averages |

March 31, 2011

**APPENDIX D:
SECONDARY CASE STUDIES**

March 31, 2011

**ATTACHMENT 1:
HOPEDALE CASE STUDY**

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1.0 CASE STUDY OVERVIEW

Author: Laura Fleming

1.1 RESEARCH CONTEXT / STUDY RATIONALE

The case study in Hopedale, Nunatsiavut came about as a follow up to a vulnerability assessment in the year prior. The results of that assessment (DeSantis, 2008) indicated that the community was already experiencing notable change, including environmental, social, cultural political and economic change. How the community might manage that change, what the role of government and other institutions which span across multiple scales of governance might be, spawned this case study. The intention to follow up on next steps, beyond a community vulnerability assessment was also a component of the rationale for this particular case study. The main research question was to identify and describe what the role of governance, institutions and knowledge systems, specifically Labrador Inuit Knowledge was in undertaking adaptation to climate change in Hopedale, Nunatsiavut.

1.1.1 Researchers

Researchers involved in this project included Laura Fleming, lead researcher, MA student at University of Guelph, Supervised by Barry Smit, University of Guelph. Local researchers included Tiffany Flowers, Hopedale resident and student at Memorial University, Krista Lane and Selma Boase, residents of Hopedale. Funding for this research came from several sources including ArcticNet, International Polar Year, Social Sciences and Humanities Research Council, Canada Research Chairs Program, and the Indian and Northern Affairs' Northern Scientific Training Program.

Main publication from this research:

Fleming, Laura. (2009). *The Role of Governance, Institutions and Knowledge Systems in Adaptation to Climate Change in Hopedale, Nunatsiavut*: University of Guelph.

1.2 COMMUNITY PROFILE

Hopedale is located in northern coastal Labrador, in the region of Nunatsiavut. It is on the Labrador Sea, and the landscape is made up of a rugged, rocky terrain with sporadic permafrost

in the surrounding area. Hopedale is prone to excessive snow fall, high winds, fog, and extreme cold during winter. The community is a population of approximately 600 people, with many people traveling in and out of the community for work in Voisey's Bay, Goose Bay or St. John's. Hopedale is an Inuit community and is one of the five communities in the newly established Inuit self-government, Nunatsiavut.

2.0 RESEARCH

2.1 APPROACH/ METHODOLOGY/RESEARCH DESIGN

The methods employed in this study included 40 community-based interviews with local residents, experienced hunters, fishers, trappers and gatherers. It also involved 15 key-informant interviews with institutional representatives from the local, regional, and federal level. One survey was also completed in the community by 15 Hopedale residents. Secondary sources were also analyzed including the Nunatsiavut Government's website and departmental documents, the Labrador Inuit Land Claims Agreement, the Constitution, and other available written materials. For the community-based interviews, the aim was threefold (1) Understand what natural resources are important to Hopedale residents and the types of changes that were being experienced and observed in the region by local residents (with respect to those resources, and any others). (2) Identify which management/governing organizations, institutions, representatives, or individuals were accessible to the community (in general, and those pertaining to natural resource management) and (3) Understand the nature of those interactions, including the opportunities or constraints to interacting with those institutions/individuals, to determine how adaptive capacity might be enhanced in light of these institutional interactions, and a changing environment.

2.2 FINDINGS

2.2.1 Current exposure-sensitivities and adaptive strategies

Hopedale is a natural resource-based community. Community members' regular engagement in hunting, fishing and gathering of resources for household food sources as well as activity/leisure, culture reaffirmation and recreation mean that they are particularly exposed to/ sensitive to changes in those resources, or more importantly, changes in environmental and climatic conditions. In addition to the natural-resource based nature of Hopedale, it is also a

community that depends on the land and sea for a means of transportation. Sea ice and land ice (freezing of lakes and rivers) in the colder months increase the ease of accessibility to surrounding lands via snowmobile. Using frozen lakes and rivers shortens the distances to travel in many cases, reducing the costs of travel. With less reliable sea ice and river ice conditions, there is increased risk with travel, and also a need to take alternative, less ideal (longer distance) routes across the land. This is often the case with the annual caribou hunt, which requires hunters in Hopedale to travel some distance to access the caribou grounds for each given year. Many hunters note that it has become increasingly costly to participate in the hunt, and some are even opting to not participate as a result. The cost of the trip includes gas, equipment and food. Likewise in summer, the open sea acts as the means to travel to nearby fishing hot spots as well as family cabins (where much hunting for geese, ptarmigan and gathering of berries and wood takes place). When conditions are less than favourable, (i.e. winds are high), travel on the sea in motor boats is risky. Without other means of accessing these areas (minimal infrastructure, roads), the ability to access these areas and participate in these important activities can be limited. The community is therefore very sensitive to changes and inconsistencies in weather.

Hopedale is exposed to non-climate conditions as well. Housing and infrastructure conditions are inadequate for a number of residents in the community. Due to the location and high costs associated with shipping items to the community, costs of repairs are high and some residents continue to live in housing conditions that are in need of repair, and in some cases, overcrowded. In addition, income levels in the community are below the average of the province of Newfoundland and Labrador. Hopedale residents are therefore sensitive to the high costs of living on the coast.

In addition, considerable social and cultural change has taken place in Hopedale over the past fifty years. Many residents of Hopedale come from a generation that traveled along the coasts in sync with the changing seasons to hunt, fish and gather wildlife and other resources. The settlement of the community and closure of Hebron in 1959, for example, led to considerable emotional and social change for those people who endured the resettlement to Hopedale, Nain and other communities in the (now) Nunatsiavut region. These residents in particular are exposed to the challenge of a new place and having to let go of their former hunting and harvesting locations and rituals, and adopting new ones within the Hopedale area, many of which were already claimed by families living in the area prior to their arrival.

In addition, residents of Hopedale are exposed to high rates of suicide as well as drug and alcohol abuse. Some residents are concerned that youth are less engaged in land-based activities, and traditional and cultural practices and this is causing them to be more exposed to the use of drugs or alcohol, as well as suicide.

2.2.2 Future exposure-sensitivities and adaptive capacity

Hopedale is a community which is intimately connected and supportive. Informally, within households, families and the community, there exists a common willingness to assist each other, share resources, including harvested country foods on the part of hunters and fishers. Those without access to a snowmobile or boat for example tend to have a relative or neighbour who will share their haul with them. Most residents indicate that they do not go without country food for example, even when conditions are not ideal. The burden on hunters and fishers however, appears to have increased, with many noting the costs of fuel going up, and conditions being more challenging to traverse (less reliable ice conditions, higher winds blowing), also increasing the cost of hunting and fishing. In addition, some hunters note the changes in the locations and abundance of some species, which may continue in future in light of increasing climate change. The ability of the community to respond to these and other challenges is enhanced by the supportive, networked and sharing-oriented nature of the community, but constrained by the limited income levels, limited relevant employment opportunities (based on the skill sets in the community), instances of inadequate infrastructure, roads, high costs of living, social change and loss of some cultural practises.

The Nunatsiavut Government, is keenly aware of the need for enhanced capacity, and have developed a number of departments, programs and policies which either directly or indirectly address the challenges to adapting to future change. Employment opportunities have opened up, committees have been developed to curtail drug and alcohol abuse, language forums have been developed that focus on maintaining the local Inuit language of Inuktitut, programs are in place in the local school which teach youth land skills. There is consideration for the creation of a food bank, or more formalized food sharing systems, as well as hunter support programs to lessen the costs of hunting and ensure the availability of country foods in the community. Above all else, with the Nunatsiavut Government now in place, the emphasis on interests, values and concerns of importance to Labrador Inuit is central to government decision-making. One clear example of this is the moratorium that has been placed on uranium mining in the area due to the potential danger it might present to the region. Despite the potential economic benefits of the

resource, the unknown risks of extracting the resource on local resources and ecosystems, and subsequently the country food supply of Nunatsiavut residents, there is an emphasis on the interests of the community.

In future, improved collaboration and use of knowledge types between the Nunatsiavut Government and Provincial and Federal government agencies and department will benefit Hopedale residents. Operating from unique worldviews and institutional processes, there are some resources and services which are jointly managed by the Nunatsiavut and Provincial governments. Enhancing the capacity of Hopedale residents in these respects is a joint effort between these and collaborating on decisions of interest to Hopedale residents will be necessary. Currently, there are some differences in priority setting and values which may pose a challenge to future decision-making regarding enhancing adaptive capacity.

2.2.3 Institutional context

As mentioned in section 2.2.2, the institutional context in Hopedale largely fosters adaptive capacity in the community. Formally, the Hopedale Inuit Community Government which, along with the Mayor or AngajukKâk, is the main formal institutional body to which Hopedale residents are acquainted with and have access to. Council meetings are open to the public and announced in town, although attendance is generally low. Opportunities to voice concerns or have legislation changed are encouraged by the Nunatsiavut Government. Notices regarding changes are generally communicated to the community in the form of radio announcements (Okalakatiget Society), notices on the Nunatsiavut Government Website and physical notices in mailboxes or posted in town.

Some institutional challenges that exist at a community level deal with the avenues for raising concerns. The institutional system of the Nunatsiavut Government is for some, intimidating and too formal. The suggestion was made during interviews, to have representatives meet with people in their homes, privately so that they may express their interests or concerns without having to do so in front of a large group, at a council meeting for example. In addition, some residents indicate that they are not aware of the purpose of the meetings that are held in town (as Hopedale is the legislative capital of Nunatsiavut). In addition, some feel that there are decisions that are made without the community's input, however, there is significant effort made by the Nunatsiavut Government to identify what the concerns of the community are including

doing research, providing opportunities for community members to provide traditional knowledge in for example the Torngat Joint and Co-Management boards.

Decisions regarding the community are made mainly by the Inuit Community Government, and the mayor, and also by the Nunatsiavut Government. The Labrador Inuit Constitution in and of itself places significant emphasis on the rights and interest of Labrador Inuit and promotes the best interest of Labrador Inuit. Mechanism for doing so, may require fine tuning in future to be in sync with community level communication styles and ways of doing.

2.2.4 Climate change impacts

As discussed in section 2.2.1., observations of change are entirely based on local and traditional knowledge. This knowledge comes from current observations compared to past experiences and knowledge passed down from prior generations. Residents are using traditional and local knowledge to both observe changes, and inform themselves and each other of ways to adapt. One example includes the volume of snow pack. Many elders and adult hunters indicated that a certain thickness of snow pack is necessary to travel over land to access certain hunting grounds, in particular for the caribou hunt. Local and traditional knowledge informs them of this particular condition that is necessary for safe travel, avoiding damage to snow machines. Local and traditional knowledge of the area, also informs them of ways to adapt, including creating new routes by taking chainsaws and other means of removing trees/shrubs from new routes which have adequate snow pack amounts.

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March 31, 2011

**ATTACHMENT 2:
SHOAL LAKE AND JAMES SMITH FIRST NATION CASE STUDY**

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1.0 CASE STUDY OVERVIEW

Author: Jeremy Pittman

1.1 RESEARCH CONTEXT / STUDY RATIONALE

Climate change is expected to pose challenges to communities throughout the globe. The exposure-sensitivity and adaptive capacity of communities is dependent not only upon the magnitude and severity of climate impacts to which they are exposed, but also upon the social and political processes and institutional arrangements affecting communities. Basically, context matters, meaning indigenous communities in Canada will experience and cope with climate and climate change distinctly. Research into exposure-sensitivity and adaptive capacity within indigenous Canadian communities to date has largely been focused in the Arctic, warranting an exploration into the many facets of climate change vulnerability undertaken in partnership with First Nations communities south of 60° latitude. This particular research project was completed with the James Smith and Shoal Lake First Nations located in north-central Saskatchewan. The objectives of the research were to understand how these communities are exposed to and how they currently manage climate risks simultaneously with much broader risks in order to understand how they might be impacted by and able to cope with climate change.

1.1.1 Researchers

This research was conducted by Jeremy Pittman in collaboration with the communities of Shoal Lake and James Smith. Edgar Cook (Shoal Lake) and Lyle Ooponechow (James Smith) acted as community liaisons. Many elders, hunters, band councillors and other community members participated in this study. This project was a part of two other initiatives, the Nikan Oti (the Future): Understanding adaptive capacity in two First Nations (http://www.parc.ca/nikan_oti/) and the Institutional Adaptation to Climate Change (IACC - <http://www.parc.ca/mcri/>) projects; these projects received funding from Natural Resources Canada and the Social Sciences and Humanities Research Council respectively.

Some publications stemming from this research:

Pittman, J. (2009). The Vulnerability of the James Smith and Shoal Lake First Nations to Climate Change (M.Sc.), University of Regina, Saskatchewan.

- Pittman, J., Cook, E., Diaz, P. and Sauchyn, D. (2009). Coping with Change - Family Camp at the Shoal Lake Cree Nation. In J. Oakes, R. Riewe, and A. Cogswell (Eds.), *Sacred Landscapes* (pp. 30-41). University of Manitoba, Winnipeg, MB: Aboriginal Issues Press.
- Pittman, J. (2010). Nêhiyawak (Cree) and climate change in Saskatchewan: insights from the James Smith and Shoal Lake First Nations. *Geographic Research Forum*, 30, 88-104.

1.2 COMMUNITY PROFILE

Shoal Lake and James Smith are located in central Saskatchewan close to the transitional boundary between the grasslands and the boreal forest. James Smith is just east of the North and South Saskatchewan River forks on the southern edge of the Fort-a-la-Corne island forest. Shoal Lake is located north of the Wachik Hills on the shores of Pakwaw (a.k.a. Shoal) Lake in the Saskatchewan River Delta. Spatially, James Smith is much larger than Shoal Lake, encompassing approximately 162 km² while Shoal Lake encompasses only about 15 km². James Smith was a part of Treaty 6 negotiations while Shoal Lake was a part of Treaty 5.

In 2006 there were 1,093 people in James Smith and 545 in Shoal Lake. There are three main groups of people on James Smith – the James Smith, Chakastaypasin, and Peter Chapman band members. James Smith and Chakastaypasin people are related to the Plains Cree peoples, while Peter Chapman people are related to the Swampy Cree peoples from near Cumberland House. Shoal Lake people are also related to the Swampy Cree. On James Smith reserve, the “th” dialect of Cree is spoken and on Shoal Lake reserve the “n” dialect is spoken. Shoal Lake people have maintained their language extremely well, even though many contemporary scholars are unaware that the “n” dialect is used in Saskatchewan.

There is still some degree of subsistence hunting in each community, although reliance on store-bought foods is continuously increasing. Elk and ‘jumper’ (white-tailed deer) are major country-food sources for people in James Smith, while mainly moose, ducks and fish (northern pike) supplement the diet of Shoal Lake people. Traditionally, there were many more animals used for food than those listed above, but these animals have become unpalatable to the younger members of the community.

James Smith is dependent on groundwater for its potable water. Its water system consists of five interconnected wells that are pumped through a supply line to a reservoir capable of holding 636.44 kilolitres. Four separate cells, two with 204.57 kilolitres and two with 113.65

kilolitre capacities, constitute the reservoir. Water is chlorinated here and then pumped to 87 houses in the town site and trucked to 145 households outside the town site. Shoal Lake relies on surface water from the McVee Creek. A water treatment center is used to chlorinate the water, which is then pumped to 95 homes.

2.0 RESEARCH

2.1 APPROACH/ METHODOLOGY/RESEARCH DESIGN

The vulnerability framework was applied to two rural indigenous communities in Saskatchewan – the community of James Smith and the community of Shoal Lake. Vulnerability was conceptualized as a function of exposure and adaptive capacity. Climate-related vulnerabilities were not explored in isolation from broader conditions shaping vulnerability, such as institutional arrangements, social contexts, environmental issues and politics, but rather analyzed in the context of all stresses and conditions that affect the community. Participatory methods were employed to assess vulnerability from the bottom-up and to more accurately portray the processes operating at the local scale that contribute to vulnerability.

Multiple data sources and collection techniques were used in this study. Snowball and purposive sampling strategies were used to seek participants from a wide range of backgrounds, including elders, hunters, band councillors, females, males, younger individuals, and other community members. Data was collected through the use of semi-structured interviewing, elders circles and participant observation. Transcriptions and field notes were analyzed using content analysis and coded for themes relating to exposure, adaptive capacity and vulnerability. Data from the two communities was analyzed separately.

2.2 FINDINGS

2.2.1 Current exposure-sensitivities and adaptive strategies

2.2.1.1 James Smith

Major concerns for the people of James Smith reserve include social problems, poverty, limited employment opportunities, poor housing conditions, dependence on external sources of funding, poor health, ineffective institutional arrangements, and threats to traditional values. These conditions can serve to increase exposure and constrain adaptation within the

community, although a high level of adaptive capacity is exhibited in some cases. Examples follow.

1. The community's dependence on social assistance programs to secure livelihoods presents a vulnerability to climate. The presence of such programs relieves some exposure to climate, as community members are no longer dependent on the climate for securing their livelihood. On the other hand, the capacities developed over the generations to cope with climate have become at risk of being lost and forgotten. In an elders circle held in conjunction with the Nikan oti project, the example provided was how community members no longer chop wood, a once necessary task in the struggle to keep warm in the harsh winters because it is no longer necessary. Traditionally, the 'old people' relied on their work ethic and spirituality to make it through their many struggles (Ermine et al., 2008). Work ethic refers to the will of individuals to work hard to earn a living and was used to proactively cope with stressors (Ermine et al., 2008). Spirituality refers to a set of morals that define respectful relationships with the environment and between individuals (Ermine et al., 2008). Spirituality was the source of strength during difficult times and often gave individuals the will to persevere (Ermine et al., 2008). The community has developed an existence based on dependency, as opposed to capacity, by relying on social assistance. Social assistance programs do not produce an abundance of wealth within the community and poverty is simply a fact of life for those who wish to stay on the reserve.
2. The community has shown great adaptive capacity with respects to the delivery of potable water to its residents. Contamination problems sometimes arise, but they are promptly and efficiently dealt with. Concerns with water availability rarely occur, and if they do, they are related to the function of infrastructure. The system is designed to accommodate the inoperability of certain parts through redundancy. For example, the operation of two pumps for transporting water from the treatment centre to the reservoir avoided problems with water availability in 2007 when one pump was damaged and needed repair. The other pump was capable of supplying adequate water for the community's needs.

2.2.1.2 Shoal Lake

Major concerns for the people of Shoal Lake include poor quality drinking water, flooding, poverty, dependence on external sources of funding, lack of employment opportunities, loss of traditional culture, poor health, housing conditions and social problems. Examples follow.

1. Flooding can be problematic for Shoal Lake, degrading housing and health conditions as certain areas of homes become unsuitable for habitation due to moisture infiltration and mold growth. Inadequate construction practices can exacerbate the problem, as wooden basements are more penetrable. The community is, however, currently coping with flooding despite the constraints. They have partnered with Dalhousie University to complete a community planning project. Areas less prone to flooding were identified and housing development in these areas was pursued with loans from the Canadian Mortgage and Housing Corporation (CMHC). The community was able to obtain loans from CMHC as band governments had maintained trusting relationships and a good standing with this institution. This exhibits the ability of Shoal Lake to foster networks and linkages with external institutions in order to cope with climate-related stressors.
2. Poor quality drinking water often plagues the reserve. Spring run-off causes high turbidity in the McVee Creek, the surface water supply on which the community is dependent, demanding more of the water treatment plant. Often, the plant cannot keep up, and a boil water advisory is put in place. Residents are notified by any means possible, including posters, flyers, door to door engagement, and radio announcement. The community lacks the resources to improve the water treatment system and is dependent on outside funding sources to address the problem. In an effort to create synergy with Indian and Northern Affairs Canada (INAC), a water protocol committee was formed. According to interviewees, water protocol committee meetings with INAC have proven insufficient to properly address this issue.

2.2.2 Future exposure-sensitivities and adaptive capacity

2.2.2.1 James Smith

There are other likely changes in the area aside from climate. A diamond mine proposed in the Fort-à-la-Corne forest will have many impacts on the community. The destruction of large tracts of forest is imminent, but so is job creation. There will likely be an increase in economic wealth

of the community at the cost of its forest. The mine will be located in traditional lands that were used for hunting and gathering. Many respondents already note the negative effects of existing diamond mine developments on these activities. These will likely only be exacerbated as development continues.

Economic capital could become more abundant for the community if the diamond mine generates as many jobs and other opportunities as is projected. Definite increases in average annual earnings of community members would occur and bring monetary prosperity to the community. There is, however another side to these developments. Elders discussed the potential negative effects of the projected 'economic prosperity' showing the darker side of diamond mine developments. The elders fear that the capacities of individuals to responsibly deal with an increase in economic wealth have not been properly developed. Increases in economic wealth could potentially exacerbate current negative conditions within the community, such as drinking, drug abuse, unstable families and violence, causing the destruction of the community. Elders wish economic affluence for their descendents, but hope that wealth does not spell out disaster for their community.

The community is striving to construct a hydroelectric dam on the Saskatchewan River to provide the mine with electricity. The mine will require a projected 50MV of power at a time when SaskPower will be trying to replace a predicted 2000MV worth of power production (Economic Development Strategy-JS, 2005). With or without the mine, the hydro dam would give James Smith a market advantage. There is also a projected 500 to 800 human-years of work involved in the dam's construction and possibly more positions available for the dam's maintenance and operation once constructed (Economic Development Strategy-JS, 2005). This is a joint venture between the three local band governments, which could forge the way for co-operation among them.

Changes and variability in flows down the Saskatchewan River will have implications for the hydroelectric dam. Future stream flows are difficult to predict, and as such, their precise effects on electricity production cannot be precisely modeled. Water storage may compensate for losses, however. There is little discussion on the water holding capacities of the dam project, but the resulting reservoir may also provide opportunities for the community, given the uncertainty surrounding water availability in the future.

On other matters concerning drinking water, the community has shown much foresight. There are plans in place to either treat river water or buy water from SaskWater in the event that the current supply of groundwater becomes unsustainable. If these strategies are feasible, they increase the ability of the community to cope with such water shortages.

Individuals are desperately trying to revive the traditions lost due to residential schooling and cultural exile. It is difficult to say whether or not they will be successful, but climate change in light of other changes could restrict their efforts. Forest disturbance in the area by insects, drought, fire and development will potentially have severe implications, resulting in the loss of forest cover (Johnston, 2008). Culture and traditional practices are partially dependent on the forest. Future generations may not have the opportunity to see the forest as their grandparents did. Hunters could be replaced by miners, if current economic and climate projections come true. This does not necessarily mean culture will be lost, however. Recent efforts to train new pipe bearers and sweat keepers can keep traditions alive in a modern world. Passing traditional values and spiritual beliefs down from the elders will be crucial.

2.2.2.2 Shoal Lake

The community of Shoal Lake is attempting to position itself to take advantage of opportunities as they are presented and build its capacities to cope with negative impacts. Their strengths lie in their ability to preserve language and culture within the community. Although some of the spirituality has been lost, there are demonstrations of the will to increase traditional capacities, such as Family Camp, that maintained the people in the past. Family Camp is a weeklong excursion into the forest for the whole community where elders are given the opportunity to demonstrate and lecture on the 'old ways'. Duck soup, bannock and many hours of stories are among the delicacies passed around the fire. Events such as Family Camp provide an avenue for the communication of traditional values and beliefs away from video games, cell phones and other technologies that elders must often compete with for their grandchildren's time.

The ability of the community to utilize its social capital to confront problems, as demonstrated in the flooding example in section 2.2.1.2, will aid them in the future. The community has increased its ability to deal with a wide range of exposures using its social capital and could potentially apply similar techniques when dealing with climate change.

Economic opportunities for Shoal Lake are fewer than for James Smith, and it will require great creativity to develop industry. There is potential for oil shale and peat development in the area, but little is known about benefits/impacts to the community. The community is prepared and poised to take advantage of opportunities in ecotourism and forestry. They have attempted to build human capital for these industries by encouraging participation in various training initiatives. Decreases in forest cover and productivity, as projected by climate change, may impact the forestry industry in the area. Shoal Lake may be prepared for an industry that could become unviable in the future. Ecotourism could have a similar fate. Reduction in forest and wetlands in the area will impact the wildlife upon which ecotourism, which is largely centered on vacation hunting, is dependent. Climate change could undermine some of the efforts at economic viability already taken by the community.

Water quality is one of the most significant issues related to climate variability and change that must be dealt with in order to increase coping capacities for future change. With an increase in extreme precipitation events and a decrease in forest cover, the McVee Creek could become more prone to periods of high turbidity. Similarly, there are great uncertainties regarding the impacts of future drought on water availability from the McVee Creek. Securing adequate and sustainable drinking water supplies and treatment/delivery systems now and into the future will be a major challenge for the community.

2.2.3 Institutional context

There are three band governments operating on James Smith – James Smith, Peter Chapman, and Chakastaypasin – but only one is formally recognized and funded by Indian and Northern Affairs Canada (INAC). The band is also under what is known as third party management, which means an external financial administrator has been appointed by INAC to manage band funds due to previous mismanagement by the band themselves. Shoal Lake has a much different institutional context, having only one band government operating on reserve and not being subject to third party management. Decision-making in both communities is largely completed by the Chief and Council. Elders' advice is often taken into account, although perhaps more so in Shoal Lake. The local band offices and health centers are at the heart of communication between decision-makers and community members, providing information on programming and other issues. Shoal Lake band office even houses a community radio station that serves various roles in terms of communication.

There are family ties and other informal networks with many other bands in the area. As well as having connections with each other, community members from James Smith and Shoal Lake reported ties with many other communities in the area, including Red Earth, The Pas, One Arrow, Muskoday (formerly known as John Smith – originally named after James Smith’s brother), and Cumberland House. Especially interesting are the family ties between Red Earth and Shoal Lake. In times of flooding and other distress community members from Red Earth and Shoal Lake have worked together to ensure adequate food and lodging for those impacted. Since these reserves were created, they have developed a strong support network between them, despite coming from different Cree populations – Red Earth from the Plains Cree and Shoal Lake from the Swampy – and speaking different Cree dialects – Red Earth people speak “th” dialect while Shoal Lake people speak “n”.

On James Smith, there is some degree of community fragmentation based on traditional family lines and band associations (i.e. James Smith, Peter Chapman, and Chakastaypasin). As these divisions have been replicated in local band governments, some community members expressed concerns over nepotism and unfairness in the distribution of resources, not to mention daily stresses caused by othering. Achieving community cohesion is a struggle for James Smith reserve.

Both communities have completed collaborative projects and are part of larger external institutions. Local band governments have successfully partnered with outside agencies and institutions to complete various projects related to community planning and health, Shoal Lake especially so during the course of this research. The communities are also a part of the Prince Albert Grand Council, which is allied with other tribal councils in the Federation of Saskatchewan Indian Nations. The Federation of Saskatchewan Indian Nations is a part of the national Assembly of First Nations.

2.2.4 Climate change impacts

2.2.4.1 Climate change and the forest

The forest is important to both communities, traditionally and contemporarily. Changes in the forest will cause changes in the communities, and climate change is projected to drastically affect forest in these areas. Forest cover could be lost or significantly changed in much of the

area surrounding the communities due to drought, pests and an increase in forest fires (Kulshreshtha et al., 2001; Johnston et al., 2001; Johnston, 2008).

There are many weather- and climate-related factors that affect forest fires. The frequency, size, intensity, seasonality, type and severity of forest fires are largely dependent on climate and weather (Wheaton, 2001). Weather has been identified as one of the most important factors determining the occurrence of forest fire in western Canada (Van Wagner, 1988; Hély et al., 2001). Various climatic characteristics have also been proven to affect fires, including temperature, precipitation, humidity and wind speed and direction (Flannigan et al., 1998). As climate changes, so then will forest fires. Fire occurrence and severity are both expected to increase due to climate change (Bergeron and Flannigan, 1995). Fire is important in determining the vegetation composition of the forest (Suffling, 1995; Johnston, 2008) and there are the obvious risks to human communities.

Forest insect and pest outbreaks are also affected by climate change (Kurz et al., 1995). The poikilothermic (having body temperatures that vary with ambient temperature) properties of insects make them sensitive to temperature (Fleming, 2000). Warmer temperatures increase the reproduction rate of insects (Kingsolver, 1989). Cold winter temperatures limit populations. Winter warming will reduce the effects of this natural mechanism and insect populations will increase (Williams et al., 2000) under climate change (Kingsolver, 1989; Williams et al., 2000; Johnston et al., 2001).

Moisture stress will also produce change in the forest as higher temperatures increase evapotranspiration (Johnston et al., 2001). Moisture availability determines the current spatial limits of forests in Saskatchewan (Hogg, 1994; Hogg and Hurdle, 1995). The boreal transition is expected to experience moisture deficits in the future (Johnston et al., 2001), reducing productivity of species and thus forest cover (Johnston, 2008).

2.2.4.2 Climate change and water

Climate change is projected to impact water availability throughout the Prairie Provinces (Sauchyn and Kulshreshtha, 2008). The flow of the Saskatchewan River will be affected by climate change as glaciers melt (Pietroniro et al., 2006). Decreases in stream flow are likely under future climates, but difficult to quantify based on the complicated nature of their determinants (Pietroniro et al., 2006; Sauchyn et al., 2006). Shortages are likely in years with

limited snowfall, but increases in spring precipitation may compensate (Sauchyn et al., 2006). Communities are more sensitive to decreases in stream flow, as the rivers are used for transportation during hunting expeditions.

Despite the increase in precipitation, droughts are likely to increase in intensity and duration under climate change (Herrington et al. 1997). It is important to note the reported resilience to drought demonstrated by the communities in the 1930s. Drought was not mentioned by any respondents as currently impacting the communities with any significance.

2.2.4.3 Climate change and human health

First Nations peoples are expected to bear the brunt of negative health impacts due to climate change (Sauchyn and Kulshreshtha, 2008). They are not more physically susceptible to illnesses associated with climate change, but will likely be hit harder due to a lack of access to medical treatment, poorer infrastructure, lower socio-economic status and the fact that they are also faced with the deterioration of traditional lifestyles that has already produced many health problems in First Nations communities (Sauchyn and Kulshreshtha, 2008).

There are numerous projected impacts of climate change on human health in the prairies. Increases in length and severity of droughts and number of forest fires increase the occurrence of respiratory problems as they increase concentrations of dust and smoke in the air (do Pico, 1986; Rylander, 1986; do Pico, 1992; Lang, 1996; Simpson et al., 1998; Bowman and Johnston, 2005). Drought can also serve to increase concentrations of pathogens and other contaminants in drinking water supplies, as reduced surface water amounts are available to dilute supplies (Charron et al., 2003; World Health Organization, 2003). Following floods, there may also be increased occurrences of diseases, such as Hantavirus and West Nile virus, as mosquito and rodent populations related to the spread of these viruses often increase (Sauchyn and Kulshreshtha, 2008).

Most of the aforementioned health issues are more likely to harm elderly people due to their higher susceptibility, lower incomes, social isolation and higher likelihood that they are already suffering from other health conditions (Sauchyn and Kulshreshtha, 2008). Elderly residents are the backbone of First Nations culture. Elders in James Smith and Shoal Lake were already reported to be dying before their knowledge could be passed on. The projected impacts of

climate change on health would further stress the transfer of cultural knowledge. Traditional teachings are at risk of being lost before elders can pass them on.

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**ATTACHMENT 3:
MONTREAL LAKE CREE NATION CASE STUDY**

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1.0 CASE STUDY OVERVIEW

Author: Mathieu Lebel

1.1 RESEARCH CONTEXT / STUDY RATIONALE

Rural communities in Canada are constantly being exposed to and are responding to multiple stressors including environmental, social, economic, and political factors. The Comparative Assessment of the Capacity of Canadian Rural Communities to Adapt to Uncertain Futures project (hereafter referred to as the Comparative Assessment Project) examined the combination of these stressors and the economic and social vitality of four rural communities across Canada (Alert Bay, British Columbia, Montreal Lake, Saskatchewan, Edwardsburgh/Cardinal, Ontario, and Change Islands, Newfoundland) to determine their capacity to adapt to uncertain futures (Brklacich et al., 2007). The key objectives of the Comparative Assessment Project were to further expand the examination of rural capacity through a series of comparative assessments in selected First Nations and non-First Nations communities, and to provide a consistent framework that allows for the similarities and differences of rural communities in Canada to be considered explicitly. Although climate change was the underlying focus of the Comparative Assessment Project, it did not assume that it had the most significant influence in the capacity of rural communities to cope with and adapt to uncertain futures.

The following paragraphs describe the adaptive capacity of the First Nations community of Montreal Lake, SK. Although the current and potential future exposure and response to multiple stressors was examined in four rural communities across Canada, including the largely First Nations community of Alert Bay, only the Montreal Lake component of the Comparative Assessment Project will be discussed here. The capacity of Montreal Lake to adapt to an uncertain future based on the findings of the Comparative Assessment Project was also previously described in Johnston et al. (2008).

1.1.1 Researchers

The Comparative Assessment Project was a joint initiative between researchers from Carleton University, Simon Fraser University, and the University of Saskatchewan. Key investigators in this project were Mike Brklacich (Professor and Chair, Department of Geography and

Environmental Studies, Carleton University), Maureen Woodrow (Research Project Manager, Carleton University) who also acted as the project manager, Maureen Reed (Professor, Department of Geography, University of Saskatchewan), Patricia Gallagher (Director, Centre for Coastal Studies and Program Director, Continuing Studies in Science, Simon Fraser University), and John Pierce (Professor, Department of Geography, Simon Fraser University). Community researchers were graduate students based at each university including Kelly Vodden (Simon Fraser University), Emily Wilson (Carleton University) and Mathieu Lebel (University of Saskatchewan). Monirul Miza of the Impacts and Adaptations Research Group of Environment Canada based at the University of Toronto developed climate change scenarios in the regions where the case study communities are located. Financial support for the Comparative Assessment Project was provided by Natural Resources Canada under the Climate Change Impacts and Adaptation Program.

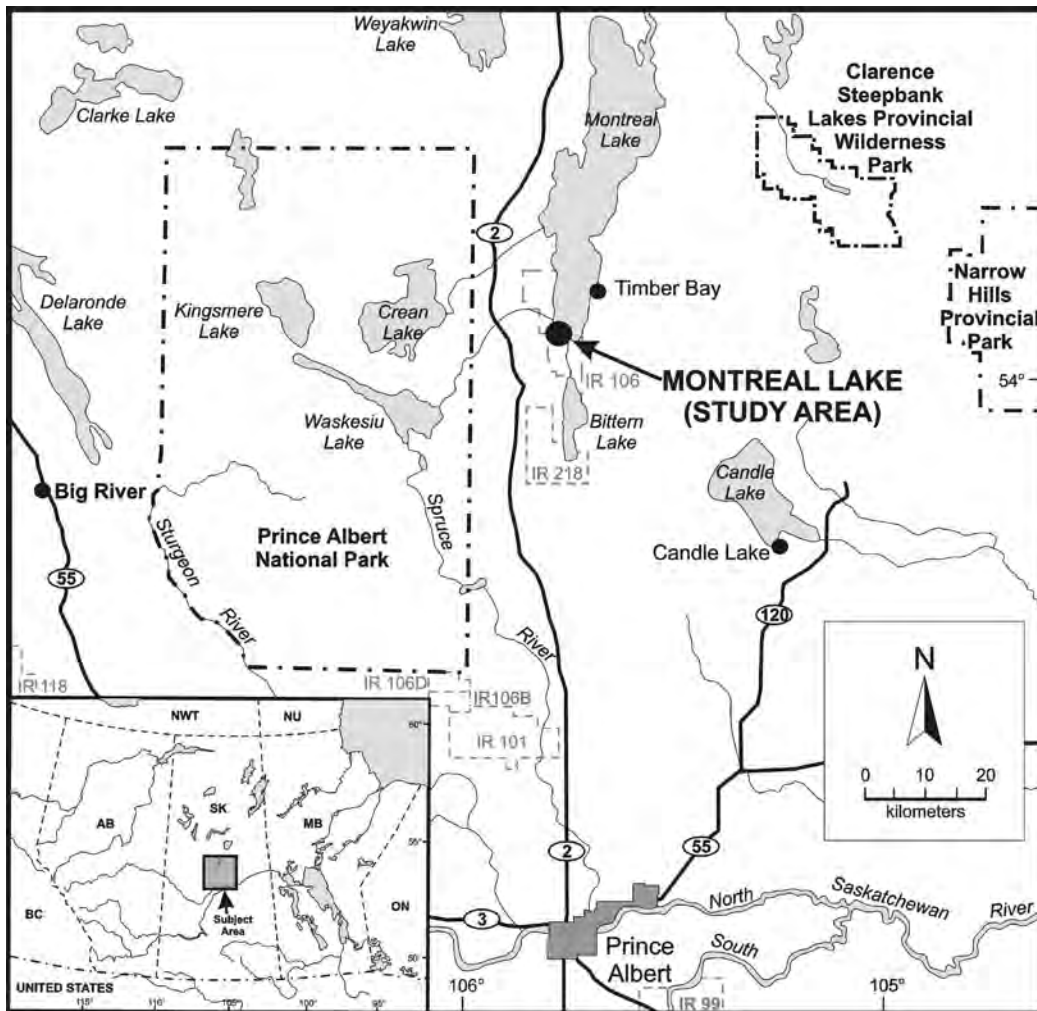
Community research in Montreal Lake, SK was conducted by Mathieu Lebel and Maureen Woodrow. However, the other investigators and researchers all contributed significantly to the analysis and assessment of the community's adaptive capacity.

1.2 COMMUNITY PROFILE

Montreal Lake is a First Nations community located in north-central Saskatchewan (54° 4'59" N 105° 49'0" W) within the southern boreal forest (Figure 1). The community's main town site is situated on the southwest end of Montreal Lake on Indian Reserve #106, the main reserve set aside for members of the Montreal Lake Cree Nation. Montreal Lake is situated within the Prince Albert Model Forest area, just outside the eastern boundary of Prince Albert National Park. The community can be accessed year-round by a gravel road that branches off a major provincial highway and is approximately 235 km north of Saskatoon. It should be noted that there are two reserves set aside for members of the Montreal Lake Cree Nation, who also reside in various other communities throughout the region. The second reserve, officially Montreal Lake Indian Reserve #106B but known as the Little Red Reserve, is located approximately 40 km south. This study pertained only to the community of Montreal Lake situated on Indian Reserve #106.

The community of Montreal Lake had a population of 880 residents in 2006, an increase of 2.2% from 2001 (Statistics Canada, 2007). However, from 1996 to 2001 the community experienced a growth rate of 30.7% (Statistics Canada, 2002). Like many First Nations

communities across Canada, Montreal Lake's population is growing rapidly and can be described as young, with a high percentage not yet of working age. The community is considered to be cohesive barring a few isolated events with high priorities centered on the availability of basic services (Parkins et al., 2001).



¹ Figure 1: Montreal Lake Region developed by Chris Evans of the Focus Corporation

Montreal Lake has been described as a non-traditional forest dependent community, in the sense that the majority of jobs are found in other sectors (Parkins et al., 2001). Forestry related employment has continued to decline in recent years with layoffs at the nearby Wapawekka sawmill in 2005 and the closure of the Prince Albert Pulp Mill in 2006. However, the community remains strongly tied to the forest for lifestyle and non-industrial uses. Employment opportunities are limited and have been especially impacted in recent years by the aforementioned declining forestry operations and the closure of the commercial fishery on

Montreal Lake in 2006. As a result, many residents are forced to search for work elsewhere in the province and beyond. The most recent data reveal that the community's unemployment rate rose to 36% in 2006 from 31% in 2001 (Statistics Canada, 2007). On the other hand, some Band-based initiatives, notably in the manufacturing of ready-to-move homes, have been very successful and are continuing to grow and expand their labour force.

Montreal Lake's climate is influenced strongly by the mid-continental position resulting in temperatures and total annual precipitation ranging from -40°C to 32°C and 400 to 500 mm respectively (NFC, 1996). Forest fires are very common in the region, with a major fire coming within a few kilometres of the main town site in 2003. Although there is little direct stress from human activity, Montreal Lake is subject to acid deposition like the rest of the Churchill River Basin (SWA, 2007). The amount of acid deposition in the Churchill River Basin and its potential impacts on aquatic ecosystems led the SWA (2007) to the conclusion that the watershed is currently in an impaired state of health.

2.0 RESEARCH

2.1 APPROACH/ METHODOLOGY/RESEARCH DESIGN

The Comparative Assessment Project employed a three-phased research approach which included initial engagement of the community and preparation of background material in the spring and summer of 2006, a community workshop in October 2006, and analysis and synthesis of data from November 2006 to March 2007. Existing relationships between the University of Saskatchewan and the community of Montreal Lake provided a platform to proceed with the research.

Initial engagement of Montreal Lake involved first obtaining commitment from a community official who also acted as the project's key informant, contributing thorough knowledge of the community's history, local development issues, current opportunities, future plans for development, and identifying participants for the workshop. Information was then gathered about recent trends and issues in Montreal Lake through consultation with other community representatives, analysis of existing data (i.e., demographic trends, economic activities, community wellbeing, etc.), and a literature review. This information was then used to develop a

Montreal Lake background paper which was distributed to the identified workshop participants prior to the community workshop to initiate discussion.

Following the review of the background paper, the community workshop followed a four step framework and was loosely guided by a standardized set of questions (see Appendix 1). Discussion in Montreal Lake focused on four main themes: (1) past changes in the community, including the evolution of both the socio-economic and environmental situations, (2) current community wellbeing (3) observations of climate change in the past and today and its impacts on the community, and (4) the community's future, including prospects, opportunities and issues that need to be addressed. The main objective of the workshop was to obtain information that could be used to determine the ability of Montreal Lake to adapt to both socio-economic and environmental pressures in the future

The workshop lasted approximately four hours and was attended by sixteen participants including representatives from the Elders Council, Band Council, Resource and Environment Office, Montreal Lake School, William Charles Health Centre, Montreal Lake Child and Family Agency, Youth Council, and members of the general public. As mentioned earlier, participants were selected with the assistance of the study's key informants in order to ensure the most fair and equitable representation of the community's groups as possible. The workshop approach was similar to that of Parkins et al. (2001) who previously examined sustainability within the community of Montreal Lake.

Midway through the workshop, an overview of climate change was presented. This was then followed by an interpretation of two Intergovernmental Panel on Climate Change (IPCC) Special Report on Emissions Scenarios (SRES) Scenarios (Market first and Sustainability first). These IPCC SRES Scenarios were downscaled to the northern Saskatchewan regional level by the Adaptation and Impacts Research Group of Environment Canada based at the University of Toronto. The interpretation of these scenarios included potential climatic changes that might occur in the Montreal Lake region as a result of the predicted temperature and precipitation. These presentations integrated climate change into the discussion on the community's future.

During the workshop, the participants were asked to answer and discuss each question; having the opportunity to do so uninterrupted. Before the next question was introduced, participants were invited to comment on the previous responses. The workshop dialogue was independently

chronicled by both Montreal Lake community researchers from the Comparative Assessment Project and a rapporteur to ensure that the forum's key points were captured. All participants were advised of the conditions of their voluntary participation and informed consent was obtained prior to the workshop's commencement. At the workshop's conclusion, an honorarium was offered to all participants for their contributions to the project.

Once the workshops for all communities participating in the Comparative Assessment Project were completed, the key investigators and community researchers met for two days to assess the capacity of all four communities to adapt to uncertain futures. Environmental and socio-economic factors were discussed in all communities in the context of changes and adaptations in the past that may impact each community's ability to adapt to the future. Results from the analysis were presented in a synthesized format. Prior to the Brklacich et al. (2007) final report being made public, a preliminary draft was sent to each participant in Montreal Lake and the other communities for verification.

2.2 FINDINGS

2.2.1 Current exposures and sensitivities and adaptive strategies

The most prominent challenge faced by the community of Montreal Lake is to assist and provide for the needs of its rapidly growing population. Economic opportunities have always been limited in Montreal Lake, but were further impacted by the decline in regional forestry activities and the closure of the commercial fishery on Montreal Lake. Seasonal forestry activities such as tree planting and fighting forest fires continue to be a key source of income for residents, but there are few permanent employment opportunities. Unemployment is high within the community and as a result the economy is reliant upon government transfers. The limited employment opportunities for many successive years have resulted in the departure of many community members, especially the youth, in search of jobs. South Beach Homes, a band owned company specializing in the fabrication of ready-to-move homes based in nearby Spruce Home, SK, is one of the largest employers of community residents. Uranium mines in northern Saskatchewan also provide employment for Montreal Lake residents.

Montreal Lake's poor economic condition is a reflection of the reality that the reserve land base is no longer capable of supporting the community's population. Participants in the Comparative

Assessment Project workshop indicated that the inadequacy of the reserve land base was true not only for providing jobs, but also for supporting wildlife populations that are valuable for subsistence and traditional activities. The current limitation on land supply is compounded by a rapidly growing population and it is expected that the future land base will become further extenuated in the medium to long term.

The key social challenge in Montreal Lake is to address the addictions, vandalism, and gangs associated with its youth population. These issues are common to many communities, but their presence in Montreal Lake is a recent occurrence. Workshop participants agreed that guiding youth in the right direction was one of the community's utmost priorities. Furthermore, participants also suggested that it was necessary to prepare the youth for the opportunities that exist outside the community.

Lastly, community residents have also observed an overall decline in natural resources on the reserve land base and in the surrounding region. In particular, the closure of the commercial fishery on Montreal Lake was in response to declining stocks of whitefish, and wildlife populations are no longer found in abundance on the reserve land base. Workshop participants indicated that the decreasing fish and wildlife populations in turn reduce the opportunity for residents to partake in subsistence or traditional activities.

In recent years, residents of Montreal Lake have begun to address the socio-economic pressures facing their community. Two of the most positive changes in the community have been the development of community-funded infrastructure and an increase in control of services to band members. Specifically, through a self-government taxing system (3% payroll deduction of all salaried band officials and staff members), the local arena, church, and recreational facilities have been built without federal funding. These structures have built a sense of community within Montreal Lake and are a starting point to healthier options and lifestyles for the youth. For example, the arena has become the community's hub during the winter months and is considered by residents to be vital to the future wellbeing of Montreal Lake. The community has also taken control over education, health, social assistance, and policing which has allowed Montreal Lake's leaders to directly address concerns of residents. For example, the community recently acquired its own Royal Canadian Mounted Police detachment and established a police management board. However, it should be noted that workshop participants also indicated that despite taking control of certain programs, as First Nations

people, Montreal Lake residents have always been marginalized by other levels of government. Participants suggested that this discrimination has limited their growth and wellbeing, and has been a major barrier to community development.

2.2.2 Future exposure-sensitivities and adaptive capacity

The community of Montreal Lake is currently faced with strong socio-economic pressures and some environmental issues. Participants in the Comparative Assessment Project identified a mix of positive and negative changes that have occurred in the community, and agreed that overall wellbeing is increasing. However, strong cohesion among, and a commitment from, residents to develop strategies to alleviate these pressures is required as many issues remain unresolved. Montreal Lake's top priorities are to address the immediate issues facing community residents, with potential future stressors estimated to be relatively minor factors in comparison. Therefore, the capacity of Montreal Lake to adapt to an uncertain future was considered to be low.

The capacity of Montreal Lake to adapt to an uncertain future was assessed using environmental and social indicators reflective of past and future and concerns. Discussions in each community workshop of the Comparative Assessment Project touched upon each individual indicator, but often in an interwoven manner. This highlighted the connection and lack of separation between environmental and social factors within the communities. The indicators applied in the Comparative Assessment Project were:

Environmental Indicators

- Water availability and quality
- Land availability and quality
- Climate
- Aquatic resources
- Terrestrial resources

Societal Indicators

- Social/Cultural Capital (cohesion, networks cultural richness)
- Economic Capital (jobs, industry poverty globalization)
- Institutional/Political Capital (informal and formal modes of governance)

- Human Capital (demographics, health, education, knowledge, skills)
- Infrastructure (transportation, communication, water and sewer)

In order to assess the level of security-vulnerability in each community, indicators were rated on a gradient ranging from fully secure to fully vulnerable. It was recognized that a precise measure of security-vulnerability may not be achievable, but it was possible to assess the current status and probable future prospects of each indicator, and consider global climate change impacts. The security-vulnerability gradient categories were:

SECURE (S) = No issues, fully supports community wellbeing
 Secure (s) = Minor concerns but not a threat to community wellbeing
 secure/vulnerable (s/v) = equally vulnerable and secure
 vulnerable (v) = Minor concerns which could eventually threaten community wellbeing
 VULNERBLE (V) = Substantial concerns which threaten community wellbeing

The indicator ratings for each community were based on a combination of information compiled for the community background reports and the information gathered at the community workshops, including both qualitative and quantitative data. As indicated above, it is important to emphasize that the indicators are not mutually exclusive, and that there may be overlaps in several of the indicators. For example, the environmental indicator of water quality is intertwined such with the societal indicators of infrastructure, human capital, and institutional/political capital. The indicators and associated ratings provide an assessment of how individual factors shape the capacity to adapt to an uncertain future with and without climate change. The ratings for Montreal Lake's environmental and societal indicators are presented in Table 1.

Table 1: Montreal Lake Environmental and Societal Indicator Ratings

| Environmental Indicators | | | | Societal Indicators | | | |
|--------------------------|---------|------------------|------------------------|---------------------|---------|------------------|------------------------|
| | Current | Future Prospects | Climate Change Impacts | | Current | Future Prospects | Climate Change Impacts |
| Water | v | v | v | Social/Cultural | v | v | v |
| Land | V | V | V | Economic | V | V | V |

| | | | | | | | |
|-------------|---|---|-----|-----------------------|---|---|---|
| Climate | v | v | V | Institution/political | s | s | s |
| Aquatic | v | v | v | Human | v | v | v |
| Terrestrial | S | s | s/v | Infrastructure | v | v | v |

It is evident from Table 1 that during the Comparative Assessment Project study period, the community of Montreal Lake exhibited considerable environmental and societal vulnerability. When climate change impacts are considered, Montreal Lake’s environmental stresses also become more prominent. Lastly, the community’s current vulnerabilities also suggest that capacity may be limited to anticipate and offset future pressures.

This research emphasized the strong socio-economic pressures that some First Nations communities in Canada are currently facing. Montreal Lake’s top priorities are to address these immediate issues, with climate change estimated to be a relatively minor factor in comparison. Consequentially, it was determined that the capacity of Montreal Lake to adapt to an uncertain future is low. Until the community is able to address the more pressing socio-economic stressors, it will be difficult to develop the capacity to anticipate and offset future stresses including climate change.

2.2.3 Institutional context

The Montreal Lake Cree Nation is governed by their elected chief, two vice-chiefs, and twelve councillors. The people of the Montreal Lake Cree Nation are also members of the Woodland Cree and the Prince Albert Grand Council (PAGC): a union of twelve First Nations bands. Montreal Lake’s leaders have a long history of being active and vocal in an effort to improve their community’s socio-economic situation (Goode et al., 1996), which was also evident during the Comparative Assessment Project study period. The community of Montreal Lake also has an active Elders Council and a Youth Council. In recent years the Montreal Lake Cree Nation has begun to exert more control over local government, which better addresses the needs of residents and provides a firmer base for stewardship of Montreal Lake resources over the short and medium-term. The strong and growing institutional capacity of Montreal Lake, as reflected in its indicator ratings in the previous section, is expected to enhance its prospects of adapting to an uncertain future.

2.2.4 Climate change impacts

The boreal forest surrounding Montreal Lake has been strongly influenced by natural fires which have been observed in the region on an annual basis since the establishment of permanent settlement (Goode et al., 1996). The community is also located in a predicted future area of drought-stressed forests (Hogg and Bernier, 2005; SERM, 1995). The presence and persistence of drought-stressed forests are particularly of concern as they are further susceptible to forest fires. The potential for an increase in forest fire activity poses a direct threat to the health and livelihoods of residents. For instance, a major fire came within a few kilometres of the community in 2003, which led to the evacuation of several residents and some suffered from smoke inhalation. An increase in forest fire activity and a reduction in moisture may also have long-term implications for forestry activities in the region.

In terms of observations of climate change, participants in the Comparative Assessment Project workshop indicated that they had noticed a general warming trend over the past 50 years. Other specific observations relate to changes the timing and duration of seasons (particularly the later onset of and shorter winter). Some participants also noted that it was becoming increasingly more difficult to predict the weather and that weather events were now of a greater magnitude than they had been in the past. Despite these noticeable changes in climate, participants did not indicate that there had been any significant impact on the community up to this point.

Following the presentation of climate projections, which suggest, among other things, the region will experience hotter and drier summers, workshop participants carefully reflected upon the significance of and the impact the changes, particularly on the frequency of forest fires. However, it was evident that addressing the impacts of climate change on future development is a low priority for the community. Montreal Lake is facing many more pressing socio-economic issues at the moment which must be resolved before climate change will figure into long-term community planning

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March 31, 2011

**ATTACHMENT 4:
BLOOD TRIBE CASE STUDY**

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1.0 CASE STUDY OVERVIEW

Author: Lorenzo Magzul

1.1 RESEARCH CONTEXT / STUDY RATIONALE

A five-year project called Institutional Adaptations to Climate change (IACC) took place 2004-2008. The goal of the IACC project was to develop a systematic, integrated and comprehensive understanding of the capacities of governmental institutions to formulate and implement adaptations strategies to climate change impacts, with a particular focus on water resources, in dryland environments. The dryland environments looked at were the South Saskatchewan River Basin (SSRB), in Canada, and the Equi River Basin (ERB), in Chile. To achieve the goal of the IACC project several research streams were undertaken. One of these streams was the community vulnerability assessment of a select group of rural communities in the two basins: 6 communities in the SSRB and 6 in the ERB. One of the communities selected in Canada was the Blood Tribe.

Therefore, the goal of the Community Vulnerability Assessment to Climate Change Impacts of the Blood Tribe was to assess the vulnerabilities and adaptive capacities of the Blood Tribe community to impacts of climate change by focusing on its exposures and adaptations related to water use and the roles of institutions in its current and future adaptive capacities.

The key research questions were:

- What are the past and current exposures and adaptive capacities of the Blood Tribe?
- What are the future exposures and adaptive capacities of the Blood Tribe?

1.2 RESEARCHERS

The IACC project was conducted by a multidisciplinary team of researchers from various Canadian and Chilean universities and partner organizations (Please refer to the IACC website for a more details regarding the research team). Members of the Prairie Adaptation Research Collaborative (PARC) were involved in this study. The Community Vulnerability Assessment to Climate Change Impacts of the Blood Tribe was conducted by Lorenzo Magzul (2007). Lorenzo Magzul is a PhD candidate in the Faculty of Land and Food Systems at the University of British Columbia. The project was funded by the Major Collaborative Research Initiative (MCRI) program, Social Sciences and Humanities Research Council of Canada (SSHRC).

Additional publications stemming from this research:

Wittrock, V., S. Kulshreshtha, L. Magzul and Wheaton, E. (2008). Adapting to Impacts of Climatic Extremes: Case Study of the Kainai Blood Indian Reserve, Alberta. IACC Project: An assessment of vulnerabilities of rural communities and households to water related climate conditions (Chile and Canada).

1.3 COMMUNITY PROFILE

The Blood Tribe community is located in southern Alberta, with a territory of 547.5 square miles; it is the largest reserve in Canada. According to Statistics Canada, the population of the Blood Tribe in 2001 was 3,850, while in 1996 the population was 4,326. According to the communities own estimates however, the population in 2005 was about 9,000 to 10,000 people, with 6,000 to 7,000 people living on reserve. The latest estimated of the Blood Tribe population is 12,400 people (based on information provided by the Blood Tribe Department of Works (Personal Communication, July 2008).

The Belly, St. Mary's and Oldman Rivers border the Blood Tribe reserve. Of the 349,295 acres of the reserve's land base, approximately 200,000 acres are currently under cultivation, of which about 20,000 acres are irrigated and 180,000 under dry land cultivation. The Blood Tribe Irrigation Project (BTAP) manages the 20,000 irrigated acres, and it is one of the largest irrigation projects in Canada.

For this study, Statistics Canada 2005 figures showed that the unemployment rate for the Blood Tribe was estimated at 36.2%, which was considerably higher than the unemployment rate of 4% for the province of Alberta.

2.0 RESEARCH

2.1 APPROACH/ METHODOLOGY/RESEARCH DESIGN

This was an ethnographic study and the data collection methods used were participant observation, in-depth interviews and focus groups. About 35 members of the community participated in the study and they included men and women from the general public and band employees (from several departments and band organizations). Information collected included past, present and future vulnerabilities and adaptive capacities.

The conceptual model that guided the study was a Vulnerability Model, which is conceptualized as the function of the exposure-sensitivity and adaptive capacity of the community. The exposure-sensitivity of the community refers to the manner in which it experiences conditions to which it is sensitive. The adaptive capacity, on the other hand, refers to the community's ability to employ actions that avoid and minimize risks associated with, or take advantage of, changing climatic conditions. The vulnerability model emphasizes the need to assess community's vulnerability in the context of past, current and future climate conditions.

2.2 FINDINGS

2.2.1 Current Exposure-Sensitivities and Adaptive Strategies

Through the project a number of current exposures and sensitivities of Blood Tribe First Nation were identified.

| |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environment |
| <ul style="list-style-type: none"> • Climate <ul style="list-style-type: none"> ○ Temperature ○ Droughts ○ Floods (1995, 2002, 2005: housing costs \$8 million (2002); 2005, 397 homes affected, estimated costs \$ 6.5 million • BSE (mad cow disease) • Water quality |
| Economic: |
| <ul style="list-style-type: none"> • Lack of access to capital • Lack of infrastructure • Lack of economic activity • High unemployment • Poverty • Shortage of housing |
| Social: |
| <ul style="list-style-type: none"> • Drug and alcohol abuse • Addictions • Community and family violence |

| |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • Problems in town sites |
| <ul style="list-style-type: none"> • Gangs |
| <ul style="list-style-type: none"> • Lack of recreation programs |
| <ul style="list-style-type: none"> • Lack of parenting skills |
| <ul style="list-style-type: none"> • Diabetes and cancer |
| Institution |
| <ul style="list-style-type: none"> • Institutional policies <ul style="list-style-type: none"> ○ Indian Act ○ Residential schools ○ Social Welfare |
| <ul style="list-style-type: none"> • Federal and provincial agreements |
| <ul style="list-style-type: none"> • Elective system |
| <ul style="list-style-type: none"> • Perceived weak leadership of Chief and council, managers and directors of the various Blood Tribe agencies. |

Blood Tribe First Nation has taken a number of steps to adapt to different challenges they face.

| |
|-------------------------------------------------------------------------------------------------------------------------------|
| Water management |
| <ul style="list-style-type: none"> • Water conservation |
| <ul style="list-style-type: none"> • Boil water, buy bottle water, use of water filters |
| <ul style="list-style-type: none"> • Buy water for cisterns from private supplier |
| <ul style="list-style-type: none"> • Cattle and horse ranchers fill dugouts in the spring |
| <ul style="list-style-type: none"> • Flood mitigation measures: improve drainage around homes |
| Financial |
| <ul style="list-style-type: none"> • Move off reserve for employment, education and training opportunities |
| <ul style="list-style-type: none"> • Move back to reserve for family support and no taxes on income |
| <ul style="list-style-type: none"> • Engage in informal economy |
| <ul style="list-style-type: none"> • Lease land to non-native farmers |
| <ul style="list-style-type: none"> • Engage in small businesses |
| Institution Internal |
| <ul style="list-style-type: none"> • Water quality testing |
| <ul style="list-style-type: none"> • Negotiating with Indian Affairs about moving homes away from flood plains |
| <ul style="list-style-type: none"> • Housing assesses drainage capacity of lands for building new homes |

| |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • Housing coordinates with Public Works when building a new home, making sure the home will have enough water supply |
| <ul style="list-style-type: none"> • Housing, Public Works, Emergency Services better prepared for 2005 floods |
| <ul style="list-style-type: none"> • Development of a the “Blood Tribe Community Five Year Master Plan, 2005-2009: Building Safe and Healthy Communities” to reduce violence in the community and ensuring a safe and healthy environment |
| <ul style="list-style-type: none"> • Task Force to implement initiatives towards the fulfillment of the of Community Master Plan, as well as other initiatives to promote community and individual healing |
| <ul style="list-style-type: none"> • Start up loans for small businesses |
| Institutions External |
| <ul style="list-style-type: none"> • Disaster relief help for 2002 and 2005 flood damage (help for: home repairs, water pumps, oil and gas industry losses) |
| <ul style="list-style-type: none"> • Alberta Environment communicates dam conditions with the Band during flood emergencies; “better” regulation of water flow may have lessened 2005 flood impacts |
| <ul style="list-style-type: none"> • Programs and campaigns by the Health department about prevention of diabetes |
| Technology |
| <ul style="list-style-type: none"> • The Housing Department is negotiating with Indian Affairs of moving homes away from flood plains, but also exploring the possibility of lifting homes on to stilts, as some of the homeowners have requested |
| <ul style="list-style-type: none"> • When building a new home the Housing department conducts soil drainage capacity of the land to determine future risks of flooding |
| <ul style="list-style-type: none"> • BTAP’s irrigation pivots are all computerized for greater control and monitoring of water use |
| <ul style="list-style-type: none"> • Public Works uses chlorination and sand filtration to ensure good water quality |

In assessing the vulnerability of the six communities selected in the SSRB for the IACC project, it was determined that, with the exception of the Blood Tribe, their main economic income comes from agriculture. The Blood Tribe’s lands are agricultural lands, but most of these lands are leased out to non-native neighbouring farmers. Although the Blood Tribe community is exposed to and is sensitive to climate variability events such as heat waves, late and early frosts, high winds and wind erosion, the community is most exposed and most sensitive to floods. Homes build in river valleys and homes built with poor design and materials have been flooded by extreme rain events.

2.2.2 Future Exposure-Sensitivities and Adaptive Capacity

| Future exposures – constraints |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • More frequent floods and droughts |
| <ul style="list-style-type: none"> • Lack of economic activity |
| <ul style="list-style-type: none"> • Band's limited financial resources |
| <ul style="list-style-type: none"> • Legitimacy of Chief and Council and other Band entities |
| <ul style="list-style-type: none"> • Lack of vision and planning; need for an environmental department |
| <ul style="list-style-type: none"> • Lack of awareness between the connection of floods, drought, scarcity of water and climate change impacts |

The IACC project generated climate changed scenarios for the SSRB which suggest that the expected climatic changes in the basin are increase in temperatures, changes in precipitation patterns, reductions in annual river flows, increases in the intensity and severity of droughts and floods and an expansion of moisture deficit areas. All of these changes are outside the range of natural variability in the SSRB.

The ability of local institutions to cope with these expected changing conditions are limited by the many other social, economic and institutional challenges in the community (see current exposures). At the time of the initial fieldwork for this study, 2005, community members' awareness of climate change and its potential impacts in the community was limited. However, perhaps due to the increase profile of climate change issues over the last few years the awareness in the community appears to also have increases. During a visit to the community in the fall of 2008, when findings from the study was shared with Chief and Council and other members of the community, it appeared that the interest in climate change and its potential impacts in the community was greater. Chief and Council were very receptive of the findings shared with them.

However, according to some people in the community, and particularly according to a council member, Chief and council need to develop a vision and long term planning to address environmental challenges, including climate change. The community does not have a department (or agency) that is focused on environmental issues.

Among some community members there is lingering feeling of mistrust toward Chief and Council and other band employees, which hampers their ability to develop and implement adaptation strategies to climate change.

| Future adaptive capacities -- opportunities |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • Integrate issues of climate change and environment in school curriculum |
| <ul style="list-style-type: none"> • Women's group eager to use a participatory action research approach for initiatives on to education and programs related to climate change |
| <ul style="list-style-type: none"> • Wetter conditions—no need for irrigation |
| <ul style="list-style-type: none"> • Diversify crops |
| <ul style="list-style-type: none"> • Diversify markets |
| <ul style="list-style-type: none"> • Investment in wind mills |
| <ul style="list-style-type: none"> • Tourism, bed and breakfasts, interpretive centre |

Although the current and future challenges for the community are many, there are positive signs and evidence of genuine efforts in the community that are beginning to address some of the challenges. The Community Development Five Year Master Plan and a recent Task Force to implement some of the strategies developed in the Master Plan are indeed very positive signs. These are concrete efforts that show the importance of addressing the major socio-economic issues in the community.

There are opportunities for diversifying the current economic base of the community. The Band is exploring the possibility of investing in a windmill project, which is becoming a major economic activity in southern Alberta; also, there are discussions on the potential establishment of a pasta plant on the reserve, which will provide employment opportunities for community members. BTAP and KABC are also contemplating opportunities to diversify their agricultural production including the production of organic beef and potato farming.

Other community members spoke of the potential of developing economic activities based on tourism: the construction of an interpretive centre and bed and breakfasts. An employee of Kainai Resources, the oil and gas corporation, believes that the corporation does not have to restrict its operations to the reserve's boundaries, or Alberta or even Canada, in fact, he

believes that in the next ten years the operations of the company will certainly be expanding beyond the Blood Tribe

2.2.3 Institutional context

The decision-making process in the Blood Tribe is top down and hierarchical. The government of Canada makes transfer payments that fund the delivery of programs and services in the Blood Tribe. Chief and Council deliver the programs and services.

Chief and Council make major decisions in the community, but there are traditional societies such as the Horn Society, Crazy Dogs, and others that help some people deal with alcohol and drug abuse. There are also efforts to revive traditional societies that have been forgotten. For example, there is a society which translated from its Blackfoot name means “the ones that have water,” and this society has a “beaver” bundle. It seems that the beaver is a very important component of the bundle because of its strong association with water. According to one respondent, the re-emergence of these societies is important for the Blood Tribe people because it reminds them how as indigenous people they have been so closely “connected to the land, that the land has been such an integral part of their social fabric and that it affects their social interactions.”

There a sense that social cohesiveness in the community is eroding. Some issues that appear to contribute to divisions in the community are: unequal access to land not all people in the community have occupancy rights to the land--; according to the Lands department only about 12% of the population has occupancy rights to lands. Only those who have occupancy rights to lands obtain benefits: they can build a home on the land, cultivate the lands or lease them out. The majority of those who have occupancy rights to lands lease these lands out, mostly to non-native farmers, and they obtain an income from the leases.

Some community members feel a sense of injustice in the sense that they don't have equal opportunities to jobs and other benefits. They feel that only those community members that have some “connections” with members of Chief and Council have better opportunities for jobs, educational opportunities, etc.

There is a feeling that Chief and Council, the decision-makers, do not communicate efficiently with the community. Some people feel that their neighbourhood, or areas, are neglected

because they do not have a council member that represents their interests -the reserve is large and the community is fairly spread out.

There is a sense of disempowerment in the community. A significant number of people commented on the fact that they feel dependent on government assistance for their survival. There is a significant number of people who live in rented housing (housing owned by the Blood Tribe), and according to the Housing department people who rent homes often let the homes deteriorate as they do not feel responsible for their upkeep.

Family support is strong in the community. Most people interviewed highlighted their families as a source of support in times of hardship. For example, community members whose homes were flooded often sought refuge with family members.

Most people feel that their families are their fallback support network, and as a result there are few examples of people working or doing things collectively. Most collective activities undertaken by groups of people involve cultural gatherings such as pow-wows and sun dances. There are also Christian religions that provide social support in the community. According to some respondents, supposedly there is a coop in the community that runs a couple of gas stations (unfortunately, no coop member was identified and interviewed), however at the time when the fieldwork was conducted, the gas stations were closed and they seemed to have been shut down.

The Blood Tribe has a number of relationships with outside bodies. The Blood Tribe has oil and gas and the extraction of these resources is done in partnership with businesses from outside of the community. Most of the land is leased out to non-native farmers from neighbouring towns. The Blood Tribe has established a partnership with Corporations in Japan to develop a hay processing plant on the reserve. The Blood Tribe Forage Plant was built in 1997, and now has a capacity of producing 35,000 tonnes of compressed (or densified) hay for exports. The University of Lethbridge works in partnership with the local Red Crow college in delivering some courses and conducting research. According to a member of a women's group in the community, the University of Lethbridge provides the group with support by providing them with the space for holding meetings, conferences, etc.

2.2.4 Climate change impacts

Most respondents mentioned that they have observed a decrease in snow fall over the last 20-30 years; also warmer winters and heat waves in the summer time.

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March 31, 2011

**ATTACHMENT 5:
HAIDA GWAII CASE STUDY**

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1.0 CASE STUDY OVERVIEW

Author: Robin Sydneysmith

1.1 RESEARCH CONTEXT / STUDY RATIONALE

Project Title: Coastal Vulnerability to Climate Change and Sea-level Rise, Northeastern Graham Island, Haida Gwaii (Queen Charlotte Islands), British Columbia

The project was undertaken due to the noted sensitivity and exposure of the region to sea-level rise, storm surge and related coastal impacts including flooding, salt water intrusion of coastal aquifers, and various infrastructure and ecological impacts (Shaw et al., 1998; Walker et al., 2007). Northeast Graham Island, which includes Rose Spit and other culturally significant areas is highly sensitive to the related climate change impacts of sea level rise and storm surge and ranked in the top 3% of Canada's three coasts by the Geological Survey of Canada. Coastal vulnerability to climate change has received considerable attention around the world, however, according to Dolan and Walker (2006) there are considerable gaps in our understanding of the uneven, scale dependent, distribution of coastal vulnerability, especially in the context of Canada's remote coastal and island communities. This study was undertaken to carry out an integrated assessment of exposure to the physical risks of climate change and local adaptive capacity.

The project exemplifies a case study approach that fills extensive knowledge gaps of both physical and social vulnerability. It generates baseline data on the assessment of physical (primarily coastal) impacts of climate change and is a relatively early attempt to explore community perceptions and understandings of climate risk, vulnerability and capacity. Project objectives range from detailed description and analysis of contemporary, historical and pre-historical trends in climate variability and change to assessment of the potential future impacts of sea level rise and coastal erosion, to description of local social-ecological values and perceptions and understandings of risks and adaptive capacity.

1.1.1 Researchers

The project was lead by Dr. Ian J Walker of Dept. of Geography at the University of Victoria in affiliation with researchers from other academic institutions and the Geological Survey of

Canada. The project was funded by the Canadian Climate Impacts and Adaptation Programme (CCIAP) of Natural Resources Canada.

Project team members included:

- Ian J Walker, PhD, Associate Professor, Dept. of Geography, University of Victoria, BC (Principal Investigator)
- J. Vaughn Barrie, PhD, Research Scientist, Natural Resources Canada - Geological Survey of Canada, Pacific Geosciences Centre, Sidney BC
- Holly Dolan, PhD, Research Analyst, Agriculture & AgriFood Canada - Rural Secretariat, Burnaby BC
- Ze'ev Gedalof, PhD, Associate Professor, Dept. of Geography, University of Guelph, Guelph ON
- Gavin Manson, MSc, Coastal Geoscientist, Natural Resources Canada - Geological Survey of Canada, Bedford Institute of Oceanography, Dartmouth, NS
- Dan Smith, PhD, Professor, Dept. of Geography, University of Victoria, Victoria BC
- Stephen Wolfe, PhD, Research Scientist, Natural Resources Canada - Geological Survey of Canada, Ottawa ON

1.2 COMMUNITY PROFILE

The study region for the project comprised the northeast region of Graham Island, the largest and northernmost of Haida Gwaii Archipelago. Old Massett Village (OMV) is one of four communities engaged in the study which also included the Village of Masset and the unincorporated communities of Tlell and Tow Hill. The Village of Masset is the largest, incorporated municipality on the islands and distinct from, although adjacent to, the Haida community of Old Massett Village.

Old Massett occupies a narrow strip of relatively low land along the foreshore near the mouth of Masset Inlet. Due to recent growth in the Band and on-reserve population the reserve was expanded and developed with new housing on land across the causeway from the Village of Masset in 2004. The islands are separated from the main land by a notoriously rough stretch of water, the Hecate Strait, and weather is highly variable and often inclement. Reaching the islands by boat or plane is difficult and it is not uncommon for regularly scheduled transportation services to be disrupted. Both ferry and plane service terminals are located in the central part of the Archipelago at the communities of Sandspit and Queen Charlotte City. OMV is

approximately a two hour drive north along Highway 16 which for much of the route hugs the coast, only a few metres above sea level. The road way has been washed out several times during winter storms.

Walker et al. (2007) reports recent demographic trends between 1994 and 2003. These show an increase in both the total membership of the Old Massett Band, up almost 28% from 2181 to 2512, and the on reserve population, up over 15% from 626 to 799. In addition to natural population growth the increase is attributed to declining out migration from Haida Gwaii itself augmented by amendments to the Indian Act which restored status rights to Aboriginal women married to non-Aboriginal men. It is not known how many of the off-reserve members of the Old Massett Band live in the neighbouring community of Masset.

Unemployment is high in the community as compared to Masset Village although citing Skeena Native Development Society statistics (SNDS, 2004) employment levels in Old Massett improved from the mid-nineties when three quarters of the community was un- or underemployed through 2003 when it was down to almost 53% of the labour force, although according to SNDS (2007) by 2006 this had crept back up to almost 65%. The Old Massett Village Council (OMVC) is the largest employer in the community, followed by forestry and fisheries which combined continue to employ about a third of the population despite declines province wide in both sectors in recent decades. On Haida Gwaii employment statistics reflect levels of employment in the formal job market which misses an important element of work time dedicated to informal activities and subsistence oriented hunting and fishing. Such informal activities play into local understandings of adaptive capacity.

2.0 RESEARCH

2.1 APPROACH/ METHODOLOGY/RESEARCH DESIGN

The researchers developed an integrated approach to this project in an effort to combine biophysical knowledge of key processes of environmental change, including climatic impacts and social science understandings of community exposure, sensitivity and adaptive capacity. The biophysical research included a review and regional assessment of recent past, historical and prehistoric climate trends and extensive field analysis of coastal geomorphology, especially coastal accretion/erosion and flooding assessments around the NE quadrant of Graham Is.

The social research, a community-based case study of four communities in the study region, sought to explore dimensions of climate risks and adaptive capacity deploying multiple methodological elements that included: (1) A focus group used to garner direct community involvement and guidance with respect to development of a household survey, interviews and a community workshop exercise. In effect the focus group was used as local advisory committee. (2) A door to door household survey (n=204) gathered quantitative data on several dimensions of community demographics, perceptions and awareness of environmental change and risks and attributes of adaptive capacity including past and future climatic changes and levels of response and preparedness. The survey was carried out after the workshop and key informant interviews. (3) A series of key informant interviews (n=14) were carried out to augment and elaborate knowledge of community issues relating to climate risks and response that emerged from the household survey and other aspects of the research. (4) A one day workshop held in June 2004 attracted 22 participants, primarily from Masset and Old Massett and, according to Walker et al (2004) was reasonably representative of social and cultural diversity of four communities included in the project. The workshop hinged on a progressive community mapping exercise which through a series of stages and activities identified and located on maps; (i) key areas and activities of importance to people in the communities, (ii) perceptions and observations of change, especially with respect to environmental change (iii) accounts of types of responses to noted changes (iv) explorations of key issues that challenged individual and community responses to change and consideration of how such responses might be improved or other approaches be adopted. The workshop identified a dozen key areas or themes about areas and activities valued by the community which were explored through the course of the workshop and eventually “mapped” in such a way as to provide a fairly rich spatial representation of community values, vulnerabilities and adaptive capacity.

2.2 FINDINGS

2.2.1 Current Exposure-Sensitivities and Adaptive Strategies

The biophysical work of the project identified key environmental impacts and hazards primarily around the study area’s relatively high exposure and sensitivity to climate related coastal erosion and flooding associated with sea level rise and storm surge. Many areas around the NE coast of Graham Island are low lying and dynamic, comprised of loose sediments, dunes and beaches. Many of the cultural, economic and ecological values identified in the mapping

workshop are linked to these coastal areas including important food gathering areas, coastal infrastructure, sites with special cultural importance, and recreation areas.

Recent changes that have impacted community life and the local environment are summarized in the table below (Note; in this table responses are an aggregate of findings from both Masset and Old Massett).

Table 18: Examples of community changes experienced by workshop participants.

| Theme | Aspects |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Social | <ul style="list-style-type: none"> • Increase in gas and food prices • Increase in number of post-secondary education students • Increase in rates of depression • Increase in unemployment rates • Change in children's activities: staying inside more, more TV • Electricity and plumbing upgrades in the 50s/60s |
| Cultural | <ul style="list-style-type: none"> • Haida traditional programs (e.g., carving, singing, dance) • Haida repatriation ceremonies • Movement away from traditional Haida culture • Increased interest in use of traditional medicine |
| Political | <ul style="list-style-type: none"> • Haida Governance (formation of CHN) • Haida women gaining voting status • Creation of the Gwaii Trust endowment funding program • Implementation of the Indian Act • Closure of CFB Masset base • GMDC formation to handle downloaded military infrastructure • Lyle Island logging protests |
| Environmental | <ul style="list-style-type: none"> • Weather/Climate changes (more storms, less snowfall) • El Niño (warmer weather and oceans, effects on fishing) • Seismic renovations to infrastructure • Less cedar for ceremonial purposes • Beach changes (North Beach growing, East Beach eroding) • Increased bear hunting and related tourism • Introduced species (e.g., deer) • More sport fishing and related tourism, with negative effects on commercial fisheries |

In addition to the social, economic and demographic data collected in the household survey respondents were asked to identify community strengths and weaknesses as a means to measure or at least identify locally perceived vulnerabilities and adaptive capacity. The table (Table 21) below indicates what respondents (n=50+/-) to the survey in Old Massett identified as key weaknesses or 'vulnerabilities' that limit the effectiveness of individual and community responses to change. The key strengths of the community identified in the research lie in the relationships between people and with the natural environment. The remoteness of the community and the challenges this brings means that people rely on each other for support; the way to tackle problems is collectively. The strong reliance and intimate connection with the

environment creates a susceptibility to environmental change but also means there is experience and willingness to work with existing and changing environmental conditions. In Old Massett people expect the environmental conditions upon which they depend to be relatively challenging and to change; adaptation seen in this way is simply a way of life. On the other hand, the implication is that adaptive strategies remain largely reactive, and perhaps inadequate under conditions of significant and apparently increasing hazards and risks related to coastal erosion, storm surge and flooding. Although residents of Old Massett exhibited high levels of risk awareness with respect to storm surge, flood hazards and extreme weather in general, and perceived such conditions as changing for the worse in recent years, Walker et al. (2007) note with some surprise that emergency preparedness and preparation was not wide spread at the community or household level. In fact, the data from the household survey indicates that risk/hazard awareness and concern is highest in Old Massett and yet levels of emergency preparedness and planning are the lowest at both household and community scales. Instead, the dominant adaptive strategy that was reported was to rely on household resilience and the support and help of neighbours to repair damages and deal with environmental risks when and as they arise.

Table 21: Reported community vulnerabilities for Masset and Old Massett.

| Community | Masset (%) | Old Massett (%) |
|---------------------------------------------------|-------------------|------------------------|
| Negative attitudes within the community | 35 | 37 |
| Limited resources | 26 | 8 |
| Social problems (economic/education/health) | 21 | 8 |
| Dependency (transportation/government/technology) | 20 | 3 |
| Location | 19 | 3 |
| Lack of emergency preparedness | 9 | 33 |
| Poor Leadership | 7 | 11 |
| Lack of control | 5 | 6 |
| Divides in the Community | 2 | 3 |
| Lack of government support | 2 | 3 |
| Nothing/other/don't know | 11 | 19 |

Source: Walker et al., 2007

2.2.2 Future Exposure-Sensitivities and Adaptive Capacity

Issues around the access and control of natural resources, inadequate funding for health and education, rising costs and declining quality and reliability of transportation services and infrastructure, economic revitalization (i.e. in the wake of the closing of the Canadian Forces Base – Masset, and recent declines in forestry and fishing jobs), and declining social cohesion are all areas of real and potential vulnerability in the future. Responding effectively to these challenges in the future hinges at the outset on recognizing that they exist. The interviews,

workshop and community survey carried out by this study reveal that the awareness of these issues is certainly there and that there are many ideas in the community of various means by which the capacity of the community to respond to these challenges can be enhanced.

Table 20, in Walker et al. (2007, p. 98), provides a summary of these ideas and understandings for both Masset and Old Massett. The reader is cautioned that some of these approaches, or the specific vulnerability issues to which they refer, may be specific to the non-Aboriginal community of Masset. Others are exclusive to the Reserve community in the Village of Old Massett, and still others will be broadly applicable in both communities. The comparison between the two communities is revealing for the ABSOS project as it underscores those attributes of developing adaptive capacity which are unique or important to focus on in Aboriginal settings. Most notably, in Old Massett the principal source of adaptive capacity lies within community attributes related to social cohesion (see below), community relationships, historical sense of place and attachment to the environment, the strengthening of Haida culture and language and so on. Whereas it appears implicit in the report that Masset is more concerned with economic diversification and improved measures for emergency preparedness as the most important avenues for enhancing adaptive capacity.

Table 20: Key challenges and means to improve responses to environmental and social changes based on session 4 workshop results.

| Challenges | Improved Responses |
|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Haida culture and language | <ul style="list-style-type: none"> • increase cultural teachings and classes • advertise, make a CD of music and language • canoe and totem pole making |
| Social issues (e.g., drug and alcohol abuse) | <ul style="list-style-type: none"> • improve communication, • improve education and youth programs • use other media (e.g., hip hop for youth) • strengthen family and friend networks • more community events, training, and jobs |
| Government control of fishing licences | <ul style="list-style-type: none"> • lobby for increased commercial fishing licenses on cultural/traditional grounds, involve CHN • Increase local education, media exposure, funding programs • protest aquaculture development |
| Resource management and development policy and practice | <ul style="list-style-type: none"> • ongoing Haida Land Use Vision (HLUV) • CHN alternative management plans and programs: Forest Guardians, Haida Fisheries • Building protocols among island communities • Encourage more value added work on the island • Gwaii Trust |
| Tourism | <ul style="list-style-type: none"> • develop community plan for tourism development • develop more locally-based businesses • seek development funding |
| Food shortages | <ul style="list-style-type: none"> • develop neighbourhood units to discuss issues and assist each other during shortages • create outreach and skill sharing programs for hunting, gathering and food preserving • build a community garden • encourage stores to stock local products • education on benefits of buying locally gathered & processed food |
| Health care services and specialists | <ul style="list-style-type: none"> • local control of resources: money to offer doctors and invest in infrastructure • new hospital • lobby government for incentives for doctors • UNBC northern medical school • Teach traditional medicine to youth (via elders) |
| Reliance on outside experts for solving community problems | <ul style="list-style-type: none"> • train locals: local expertise and solutions • increase local opportunities to increase community capacity (e.g., college facilities, programs) • turn volunteering into jobs |
| Education and community programs | <ul style="list-style-type: none"> • short term program funding to compensate declining education and social services as population declines • requirement for tourism and natural resource industries to invest in local programs/facilities |
| Socio-economic restructuring (e.g., military withdrawal, resource declines) | <ul style="list-style-type: none"> • start new businesses to fill the gaps • social programs must be community-driven and supported, not just volunteer-based • economic diversification (e.g., tourism) |

In both cases there is no specific mention of climate change as the main driver of future vulnerability or as focus for building adaptive capacity (i.e. as something for which response capacity is urgently needed). On the other hand the summary of community strengths and weaknesses provided in the report and the attributes of adaptive capacity that were identified reveal much about the ability of Old Massett to adapt to changes in general, including natural hazards that may change in frequency and/or magnitude with climate change and sea-level rise.

2.2.3 Institutional context

The study did not include a specific focus on institutional processes per se and questions related to decision-making, problem solving etc. However, as noted above, there was considerable emphasis and analysis of various attributes and factors that contribute to social cohesion in the community. The concept of social cohesion as used by Walker et al. (2007) is defined as an important element of social capital and refers to aspects of interpersonal relationships and interaction such as mutual respect and trust, social networks and support, family and friends, and social ties. Whereas Old Massett may be found wanting in many traditional socio-economic measures of adaptive capacity – employment, per capita income, levels of formal education and so on – the researchers find social cohesion and related community attributes, for example, traditional knowledge, attachment to place and pride in ‘being Haida’ as especially important elements of adaptive capacity in the community.

The researchers attempted to measure social cohesion in several ways including, levels of trust in formal and informal leaders, levels of satisfaction with community services, and perceptions and attitudes towards emergency response. Social cohesion was especially high around social ties and trust in family, friends and social networks especially with respect to crisis response and dealing with emergencies or disasters. There were also high levels of trust in elders and other ‘informal’ leaders. Social cohesion indicators were much lower in regard to satisfaction with community services and local leadership.

At the time of the research the Village of Old Massett was in the midst of a quasi-crisis with its community leadership stemming largely from allegations of corruption and mismanagement of reserve finances. Clearly this sort of ‘crisis’ situation is likely to undermine the function of certain critical institutional processes in the community and, at least temporarily, have a negative effect on adaptive capacity.

Table 32 of the report (Walker et al., 2007, p. 142) provides an informative summary of locally defined attributes of vulnerability and adaptive capacity.

2.2.4 Climate change impacts

The study did not consider in specific detail aspects of local knowledge, understandings or observations of climate change. However, everyone was keenly aware of the winter storms of 2003 that washed out large portions of Highway 16, the main road link between Masset/Old Massett and southern transportation links (both the ferry to the mainland and the airport are located in central Haida Gwaii hub of Skidegate/Queen Charlotte City and Sand Spit). The key physical/environmental hazards associated with climate change impacts identified in the study are related primarily to coastal exposure-sensitivities exemplified by the so called Christmas Eve Storm of 2003. They are summarized in the Walker et al (2007, p. 132) as follows:

1. Rates of gradual sea-level rise (1.6 mm yr⁻¹) and extreme annual water levels (3.4 mm yr (see 2.6.4). Specific rates for Masset Inlet are not known, given very limited water level monitoring in the area, and are complicated by strong tidal currents.
2. Coastal erosion rates and hotspots (see sections 2.7 and 2.8), including identification of critical infrastructure that is, or could be, impacted (e.g., highways/roads, airports, buildings, properties, sewer networks, communications and power lines, etc.). Given the high energy of wave and storm systems in Haida Gwaii, such areas are not necessarily limited to areas of sandy substrate but also may include areas with exposed coarse materials or weathered bedrock (e.g., Wiggins Road and Hwy. 16).
3. Coastal and estuarine flooding hazard extent and probabilities due to extreme events (e.g., storm surges and wave runup) and future sea-level rise inundation (see sections 2.6 and 2.8) including identification of critical infrastructure that is or could be impacted (e.g., highways/roads, airports, buildings, properties, sewer networks, communications and power lines, etc.). Though flood hazards are typically limited to low-lying areas, high storm surges of 0.5 to 1.0 m above predicted tides are possible (see 2.6.4) as are higher tsunami waves. Tsunami zone mapping could be coupled with this. It should also be noted that flood events may increase in frequency and are superimposed on a gradually rising sea-level.
4. Other geomorphic risks and hazards affecting coastal regions and community services/infrastructure including: earthquake amplification and liquefaction, mass wasting and slope failure, wind storms, etc.

5. Other climate variability related risks (e.g., drought occurrence and potential, fire hazard risks, pest outbreaks, ocean current and nutrient changes) that may change with future climate changes.

Climate trends and predicted changes that are expected to have an increasing impact on Haida Gwaii in the future (Walker et al., 2007, p. 138) include:

1. National average temperature rise of +1.3°C since 1948, with 2006 the 2nd warmest year on record, next to 1998 (+2.5°C) which was a strong El Niño year.
2. In BC, the coast region has warmed +1.2°C and the northern BC-Yukon region +2.0°C since 1950. These are among the fastest rates of warming in Canada.
3. Temperatures in Haida Gwaii show warming of +0.5 to 1.1°C since 1950. Both daily minimum and maximum temperatures have also risen by 0.9°C and 1.1°C respectively. These increases are most pronounced in winter and summer. Additionally, the number of 'frost free' and 'growing degree' days has increased, which has implications for agriculture and forestry.
4. Future scenarios for the BC coast region (see 2.9.3) show possible temperature increases of 0-2°C for 2020-2050s to as much as 5.5° C by 2080. In Haida Gwaii, this may be more pronounced in winter.
5. Precipitation has increased by ~20% on the BC coast over the 20th century (see 2.2.3). In Haida Gwaii, distinct increases since 1950 range from ~+13% at Cape St. James and Sandspit to +36.5% at Langara. The general trend since 1950 has been for wetter springs for the Northern BC-Yukon region and wetter summers for the Pacific coast region. Precipitation may increase by 10-20% with more occurring in the fall and early winter as rain.
6. Sea surface temperatures have increased in Queen Charlotte Sound by +1.6oC over the 20th century, which is 2-4 times greater than the global average (+0.4 to 0.8oC).
7. Warmer and stormier waters around Haida Gwaii have caused annual sea levels to rise at 1.6 cm century-1, while superimposed on this are extreme annual water levels rising at 3.4 cm century-1. Future sea levels could be up to 30 cm higher by 2050, with more storm surges superimposed on this. These events pose immediate and increasing risks of coastal erosion and flooding.

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APPENDIX E

TOOL NEEDS ASSESSMENT

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1.0 INTRODUCTION

At the outset of our project we envisioned the potential for a self-assessment tool that would allow Aboriginal communities to evaluate their own adaptive capacity or ability to address climate change impacts. This would also allow us to incorporate the project findings from the primary and secondary case study research, and literature reviews. However prior to doing this it was necessary to determine the need for such a tool, the feasibility of it, and determine the potential elements of a self-assessment tool for Aboriginal communities. The project team aimed to identify the key elements of a tool/resource to assist Aboriginal communities south of 60 in better understanding their vulnerability and adaptive capacity in relation to climate change. We sought to identify elements that communities could use to help them identify: (1) key exposure/sensitivities to climate change and other stressors and (2) self-assess local capacity and resources that support adaptation. Therefore, we evaluated existing tools around vulnerability, risk and capacity and assessed their relevance to an Aboriginal context in Canada as a means to understand and assess a community's adaptive capacity.

Existing tools or resources for vulnerability, risk and adaptive capacity assessments were compiled and reviewed in Year 1 and 2 to determine their relevance for Aboriginal communities in Canada. We investigated existing tools/resources currently in use or under development including risk management, emergency preparedness, vulnerability assessment, capacity assessment, adaptation planning, resilience etc. In Year 3, we compared and contrasted the various tools/resources compiled using a matrix. The matrix assisted us in reviewing the feasibility, focus, and content of each tool/resource in relation to its specific use by Aboriginal communities and each tool's ability to assess adaptive capacity which will ultimately inform our recommendations for tools that might be the most relevant, useful, and accessible to assist Aboriginal communities south of 60 in better understanding their vulnerability and adaptive capacity in relation to climate change.

2.0 SURVEY OF EXISTING RESOURCES/TOOLS

Approximately thirty (30) different tools and related assessment resources were reviewed and summarised with the help of a matrix using the following broad element categories: number of pages, region covered, document type, scale (local, regional, national), intended audience, usefulness, specific focus, components, and methods used (refer to Attachment 1).

Additionally, the tools/resources were categorized into nine (9) types based on their focus area:

1. Risk management
2. Adaptation and livelihoods
3. Hazard, risk and vulnerability analysis
4. Vulnerability and capacity assessment
5. Resilience and vulnerability assessment
6. Adaptation
7. Social capital
8. Sustainability assessment
9. Resilience

Many resources that focus on the topics of environmental hazards, disasters, risk and vulnerability are readily available with some developed specifically for climate change impacts. These various resources come in the form of risk management guides (Bruce et al., 2006; Bruce et al., 2010; Heljmans and Victoria, n.d.; Snover et al., 2004), hazard, risk and vulnerability assessments (Government of British Columbia, 2004; Actionaid, 2003), and vulnerability and capacity assessments (Kuban et al., 2001; Dazé et al., 2009; Red Cross, 2008). These resources outline the general planning process involved in carrying out a vulnerability and/or risk assessment which is to (1) gather information about predicted or potential biophysical hazards in a particular area, (2) gather information about the risks the hazards pose, and (3) analyse the information to determine the level of vulnerability of a population (e.g. community, city) to these hazards. Within these resources, the risks posed to the population tend to cover the social, biophysical, economic, and infrastructure components of a community.

Resilience was also an area of focus where many resources were found ranging from resilience and vulnerability assessments (Buckle et al., 2001), to sustainability assessments (Global Ecovillage Network, 2000), to resilience assessments (Hegney et al., 2008; Centre for Community Enterprise, 2000; US Indian Ocean Tsunami Warning System Program, 2007). Additionally, there were resources where the area of resilience was combined with other areas such as adaptation (Bizikova et al., 2008; ICLEI Canada, 2010; Regmi et al., 2010) and adaptive capacity in the form of social capital (Mignone, 2003; Krishna and Shrader, 1999). The resilience assessment resources covered all the components of vulnerability i.e. the social,

biophysical, cultural, economic, institutional and infrastructure components, therefore were the most holistic in assessing adaptive capacity. These resources use participatory methods at a local scale with both developing and developed communities.

The majority of the resources available are intended for practitioners working with aid organizations, such as Red Cross, Actionaid, or others, in developing countries at the community level. Many of these resources also follow a community-based approach in which community members are solicited directly for their input through a number of participatory methods. A few assessment tools are geared towards leaders and decision-makers at the municipal or state/provincial level in which the key stakeholders are involved to determine the potential people, property, infrastructure, industry, resources or environments that may be vulnerable to specific predicted climate change impacts (Bruce et al., 2006; Government of British Columbia, 2004; Snover et al., 2004). One resource outlined steps involved in incorporating scenarios in vulnerability and risk assessments at the community level (Malone et al., 2004).

With assessing adaptive capacity being one of the main focuses of our research, it was notable that not many tools or resources were found that related specifically to assessing adaptive capacity. There were however those that touched on aspects of adaptive capacity such as social capital assessments, livelihood assessments, and resilience assessments. Some social capital assessments (Mignone, 2003, Krishna and Shrader, 1999, provided specific qualitative tools (e.g. mapping, questionnaire, interview questions) in order to assess social capital at the community level. The tools related to assessing resilience tended to have the most linkage to assessing adaptive capacity.

The tools that were most useful in the context of our project are those that are implemented at the local (community-level) scale and incorporate all components of vulnerability (i.e. social elements, livelihoods, institutions, motivation, infrastructure, biophysical elements, and economic elements) using participatory approaches. The assessments that provide examples of qualitative and quantitative techniques (e.g. transect walk, social mapping, Venn diagrams, hazard mapping, livelihoods seasonal calendar, and key informant interviews) that can be used to gather information and engage community members are also useful in the context of our project (ActionAid, 2003; Albarquez and Murshed, 2004; Enarson et al., 2003; Frankenberger et al., 2002; Heljmans and Victoria, n.d.; Red Cross, 1996; Government of Bangladesh, 2006).

Also, of relevance to our project and in assessing adaptive capacity are those resources that incorporate the institutional component of vulnerability, namely resources relating to social capital (Krishna and Shrader, 1999), livelihood security assessment (Frankenberger et al., 2002) and resilience (Hegney et al., 2008; Centre for Community Enterprise, 2000; US Indian Ocean Tsunami Warning System Program, 2007). One social capital tool's audience was specifically First Nations communities (Mignone, 2003) and one risk management guide was developed specifically for all types of communities in northern Canada (Bruce et al., 2010).

3.0 FEASIBILITY ASSESSMENT FOR TOOLS FOR ABORIGINAL COMMUNITIES

As a result of reviewing the existing tools and continuing with the primary research in our case study communities we decided not to pursue the development of an in-depth tool. Rather, we felt it would be more beneficial to provide a resource based on our research that will provide communities and Indian and Northern Affairs Canada (INAC) with a comprehensive review of current tools, including recommendations on which tools might be the most relevant, useful, and accessible to assist Aboriginal communities south of 60 in better understanding their vulnerability and adaptive capacity in relation to climate change.

As a way to assist us in recommending tools that might be the most relevant, useful, and accessible, we felt it necessary to first identify and list a number of key conclusions based on our feasibility assessment concerning: (1) the availability of existing tools, (2) additional considerations when looking at the need for and usefulness of a tool to address adaptive capacity in Aboriginal communities south of 60, (3) the key elements of a relevant tool for Aboriginal communities south of 60, and (4) existing tools we feel would be the best fit for Aboriginal communities south of 60. Our feasibility assessment included a review of tools/resources and the development and use of a matrix to highlight key elements of existing tools (refer to Attachment 1).

3.1 AVAILABILITY OF EXISTING TOOLS

From our review of relevant tools, we determined that there are many tools currently in existence or under development (by academics, the government, and aid agencies) that there is no need to duplicate efforts. This abundance of tools was the basis for deciding not to pursue the development of an in-depth self-assessment tool that would allow Aboriginal communities to evaluate their own adaptive capacity or ability to address climate change impacts.

3.2 ADDITIONAL CONSIDERATIONS

Although there are no specific tools that relate to directly assessing adaptive capacity in Aboriginal communities, we do not suggest developing a tool that fills this gap because, aside from many tools already being in existence, there are several additional considerations and challenges that need to be weighed first. We would suggest giving the following points careful consideration during the planning and development of such a tool, should there be interest in doing so:

- *Communities are unique:* Aboriginal communities south of 60 are extremely diverse and any tool that is used by the community will have to be adapted to their specific context.
- *Assessing adaptive capacity from an institutional perspective is challenging:* While many of the tools address issues of vulnerability and risk, even resilience, very few address the issues of adaptive capacity specifically from an institutional perspective. Any other tools that have tried to address adaptive capacity have done so through the use of indicators, which we have determined miss out on some key elements of adaptive capacity (see Year 1 report). Assessing adaptive capacity from an institutional perspective is challenging because it encompasses decision-making at the local level, informal processes in the community, interactions with outside institutions, and policies that operate at a much broader scale than the local level.
- *Extension and outreach workers are pivotal in using tools:* Rather than investing additional efforts in developing another tool, we feel an important task would be to provide assistance for communities to make use of existing tools. Many Aboriginal communities do not have the resources or capacity to implement the tools we have reviewed. Therefore, there may be a greater need for certain types of extension and outreach to assist communities with accessing, adapting and implementing tools, i.e. extension workers or people on the ground (vs. technology and tools) who understand

the tools and can make use of them as well as adapting tools to fit individual community contexts.

3.3 KEY ELEMENTS

From our perspective the most relevant tools from the existing list to help Aboriginal communities assess their adaptive capacity would be those that:

- Take a holistic perspective and incorporate all components of vulnerability - social, livelihoods/culture, institutions, motivation, infrastructure, biophysical, and economic. Specifically, they need to consider the social and institutional elements of adaptive capacity, as in many cases the biophysical elements are the main focus
- Are implemented at the local scale (community) using participatory methods with qualitative and quantitative techniques that involve local and/or traditional knowledge
- Are adapted to the context of Aboriginal communities in Canada – considers their historical experiences and governance/institutional realities.

3.4 RECOMMENDED TOOLS

Based on the list of key elements developed above, we think the following tools would be the most useful:

Adaptation and Livelihoods Tool

Frankenberger, Timothy R., Luther, Kristina, Becht, James and McCaston, M. Katherine. (2002). *Household Livelihood Security Assessments: A Toolkit for Practitioners*. Atlanta, GA: CARE USA.

- Incorporates all aspects of vulnerability, including social, biophysical, cultural, economic, institutional and infrastructure elements.
- It is implemented at a local scale using participatory techniques but in developing countries so would have to be adapted to an Aboriginal Canadian context.

Vulnerability and Capacity Assessment Tool

Dazé, Angie, Ambrose, Kaia, and Ehrhardt, Charles. (2009). *Climate Vulnerability and Capacity Analysis Handbook*. CARE International.

- Incorporates all aspects of vulnerability, except cultural elements, with a focus on climate change, resilience, adaptation, adaptive capacity, vulnerability and risk.

- It is made more for a local scale for governments, non-elected decision-makers and practitioners in developing countries so would have to be adapted to an Aboriginal Canadian context.

Social Capital Tool

Mignone, Javier. (2003). *Measuring Social Capital: A Guide for First Nations Communities*. Ottawa, ON: Canadian Institute for Health Information.

- Although focused solely on social capital this IS a critical element of institutional adaptive capacity, AND has been developed for and tested in First Nation communities in Canada.
- It could be used in conjunction with another more broad assessment.

Sustainability Assessment Tool

Global Ecovillage Network. (2000). *Community Sustainability Assessment*. Moffat, Colorado: Ecovillage Network of the Americas.

- Incorporates all aspects of vulnerability, except the institutional elements, with a strong focus on resilience.
- Is made for a general audience anywhere in the world working at a local scale so would be easy to adapt to an Aboriginal Canadian context.

Resilience Tool

U.S. Indian Ocean Tsunami Warning System Program. (2007). *How Resilient is Your Coastal Community? A Guide for Evaluating Coastal Community Resilience to Tsunamis and Other Coastal Hazards*. U.S. Indian Ocean Tsunami Warning System Program supported by the United States Agency for International Development and partners, Bangkok, Thailand.

- Incorporates all aspects of vulnerability and factors in the institutional element of governance more so than any other tool.
- It is implemented at the local scale using various participatory techniques.
- Focused specifically on coastal communities so would need to be adapted to non-coastal areas and to an Aboriginal Canadian context.

Risk Management Tool

Bruce, James, Egener, I.D. Mark, Black, Robert, and Centre for Indigenous Environmental Resources (CIER). (2010). Managing the Risks of Climate Change: A Guide for Arctic and Northern Communities. Volumes 1 and 2.

- The tool does not incorporate the social aspects of adaptive capacity and has a specific focus on climate change, risk and adaptation.
- It has been adapted to an Aboriginal context specifically in northern Canada.

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**ATTACHMENT 1:
EXISTING TOOL MATRIX**

