

**A Comparative Assessment of the Capacity of Canadian Rural
Resource-based Communities to Adapt to Uncertain Futures**

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by

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PREFACE

This report was made possible through co-operation with of our multiple research partners. The opportunity to collaborate with Alert Bay, British Columbia; Montreal Lake, Saskatchewan; Edwardsburgh/Cardinal, Ontario; and Change Islands, Newfoundland and Labrador was both informative and inspiring. It was a privilege to be welcomed into each community and to meet with many of the residents. We also acknowledge and thank our colleagues at Simon Fraser University in Burnaby, B.C. (Kelly Vodden, Dr. John Pierce and Dr. Patricia Gallagher), at the University of Saskatchewan, Saskatoon, Saskatchewan (Dr. Maureen Reed and Mathieu Lebel) and Carleton University (Emily Wilson) for their contributions to community-based research as well as the overall design and execution of the project. And finally, we appreciate the opportunity afforded by the financial support provided by Natural Resources Canada under the Climate Change Impacts and Adaptation Program who are not responsible for the claims presented in this report. We hope this study will be of assistance in the future community planning endeavours. The community background reports as well as the workshop summary reports prepared under the aegis of this project are listed in Appendices 1 and 2 are posted on the following website <http://http-server.carleton.ca/~mbrklac/ruralcommunities.htm>

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1.0 Introduction to the Project

Rural communities across Canada continue to be both substantial contributors to the national economy and important components of Canadian identity. The 2006 Census revealed that 20% of Canadians still reside in rural places. Many rural communities continue to be closely tied to resource activities such as forestry, agriculture and fishery, but they exhibit widespread variation in their social fabric as well as their economic activity. **Canadian Rural Communities (CRCs)** are neither homogeneous nor static, but rather are constantly being exposed to and are responding to multiple stressors including (but not limited to) changes in government policies and priorities at federal and provincial/territorial levels, macro-economic forces which often contribute to economic and demographic restructuring of CRCs, and extreme environmental events which impose considerable pressure on community safety nets. The economic and social vitality of individual CRCs in combination with these multiple stressors will ultimately determine a community's capacity to flourish or perish. Previous research into climatic change and rural communities has not typically taken this holistic perspective into account. Rather, it has been characterized by a focus on:

- Engineering aspects of climate change (e.g. implications of permafrost degradation or sea level rise on transportation infrastructure, for example, McCulloch, et al 2002,)
- On the resource itself (i.e., fish, crops, forests) but not on the coupled resource-human community system, (for example, Violin et al 2002, Montevecchi and Myers 1997)
- Single communities and/or a single region, (for example, Wall and Marzell 2006) and
- Scenarios that depict human-induced climate change but with weaker linkages to other drivers of rural community change, (for example, Parry 2002, Arnell et al 2004)

Research has usually been conducted as isolated case studies with little coordination and hence it is difficult to draw conclusions across different sets of CRCs and regions. In addition, previous research has most often focused on climatic change in isolation while considering CRCs as static. This has permitted assessments of the sensitivity of specific community attributes to climatic change but has failed to place CRCs in their broader historical and dynamic context. As a result there are limitations on our collective ability to assess the vulnerability of CRCs to major stressors including climate change as well as the capacity of CRCs to cope with and if necessary adapt to future changes. Some recent research highlighted the limited capacity of communities to cope with climate change (Davidson et al 2003) and a recent study presented a framework for assessing the adaptive capacity of an agricultural community (Wall and Marzell 2006). The project reported here further expands the examination of rural community capacity to adapt to uncertain futures through a series of comparative assessments in selected rural resource-based aboriginal and non-aboriginal communities across Canada. It provides a consistent framework that allows for the similarities and differences of CRCs to be considered explicitly.

This research employs a vulnerability approach to assessing and addressing climate change (see Brklacich 2006; Wisner et al 2005). Rather than assuming climatic change will be a dominant driver in the future, it examines key environmental, social, economic, cultural and political factors that influence the capacity of CRCs to cope with and adapt to uncertain futures. This approach is in keeping with the contemporary realities of CRCs as multiple stressors are set within a local context.

Four communities were selected for the study. The diversity of the selected CRCs within this study allows for comparisons across regions and sectors. The selected communities include localities on the coasts of Newfoundland and Labrador and British Columbia that continue to rely on various fisheries, in Central Canada set within a rapidly changing agricultural region and in northern Saskatchewan where residents have commercial and subsistence interests in the forest. Changes in the ecosystems supporting these communities have already occurred and climatic change in conjunction with other socio-economic and political factors will continue to affect livelihoods in these CRCs. Our approach involves understanding the different histories and contexts of the selected CRCs, and to use a standardized research framework. This approach provides the basis for a comparative assessment of the ability of CRCs to cope with and adapt to uncertain futures that include a climatic change dimension.

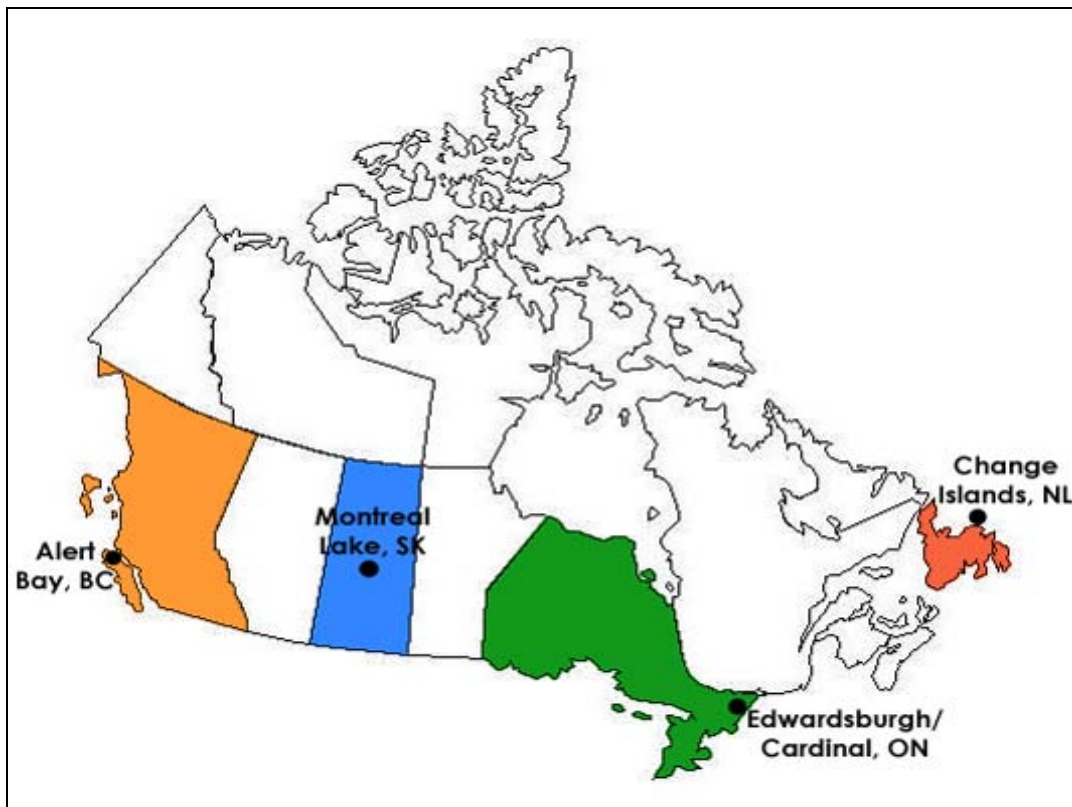
The relationship each community has with its surrounding resource base differs considerably. Nevertheless in each case this relationship extends beyond an economic tie to a single resource sector and most often involves a long-term commitment to resource stewardship as well as social and/or spiritual attachments to local resources. In addition, each of these communities has been subjected to multiple stressors such as variation in demand for the resource, degradation of the resource base, external threats to their livelihoods and traditional life styles, and declining or increasing population. All of these stressors affect local communities and their prospects for future survival. It is in this dynamic, multiple-stressor context that climatic change and its potential impacts on long-term community viability will be assessed.

2.0 Four Rural Communities in Context

Location and access This research was conducted in conjunction with four resource-based communities: Change Islands on the northeast coast of Newfoundland, Edwardsburgh/Cardinal, a set of communities within one township and situated in southeastern Ontario, Montreal Lake in north central Saskatchewan and Alert Bay located on Cormorant Island off the northeast coast of Vancouver Island (see Figure 1). Although all the communities are rural and have some similarities they also exhibit significant differences. For instance, Alert Bay, Montreal Lake and Change Islands are relatively isolated: Montreal Lake is approximately 100 kilometers northwest of Prince Albert and the road is paved except for the last 10 kilometers: Change Islands and Alert Bay are island communities serviced by regularly scheduled government-sponsored ferry services. Improvement in ferry services and roads has meant enhanced accessibility outside the communities but nevertheless in both cases it is more than one hour to the nearest major community. All three communities support commercial services but also rely on nearby communities for banking, shopping and advanced medical services.

In contrast, Edwardsburgh/Cardinal is in close proximity to major urban centres including Ottawa, Cornwall, Prescott and Kingston. A recent four lane north-south highway development through the middle of the township has increased accessibility to the nearby urban centres, but has simultaneously contributed to greater isolation of the community since it is easier for people to bypass the local commercial areas.

Figure 1: Map of Canada Indicating Communities in Study



The four communities in the study are very different representing a range of rural communities in Canada but are far from a representative sample. The selected communities include three resource-based industries and aboriginal as well as non-aboriginal communities. There is no attempt to consider these communities as a statistically representative sample of rural communities across the country. Thus, we will not draw broader conclusions than those related to the four communities that agreed to participate in the study.

In terms of **land ownership and land area** Alert Bay and Montreal Lake are First Nations territory with reserve areas where land and resource ownership are still under negotiation as treaties, legal and policy frameworks related to aboriginal rights and title evolve. Alert Bay, Montreal Lake and Change Islands are relatively distinct communities with smaller land areas in contrast to Edwardsburgh/Cardinal which is a set of communities spread over a larger land base forming the Township.

Alert Bay and Edwardsburgh/Cardinal both have relatively complex/nested local **governance** structures. Cormorant Island is the site of the Village of Alert Bay, a small unincorporated area (Sandyville), three reserves belonging to the 'Namgis First Nation (IR1, IR1A, and IR2 – a burial site) and Whe-La-La-U, a 12 acre parcel of land set aside by the Canadian Department of Indian and Northern Affairs as a home to people from surrounding Kwakwaka'wakw First Nations. The Island also lies within the Mount Waddington Regional District.

Edwardsburgh/Cardinal is one of several Townships and Villages which comprises the United Counties of Leeds and Grenville. The village of Cardinal and the Township of Edwardsburgh were amalgamated in January 2001 as part of a provincial program of municipal restructuring.

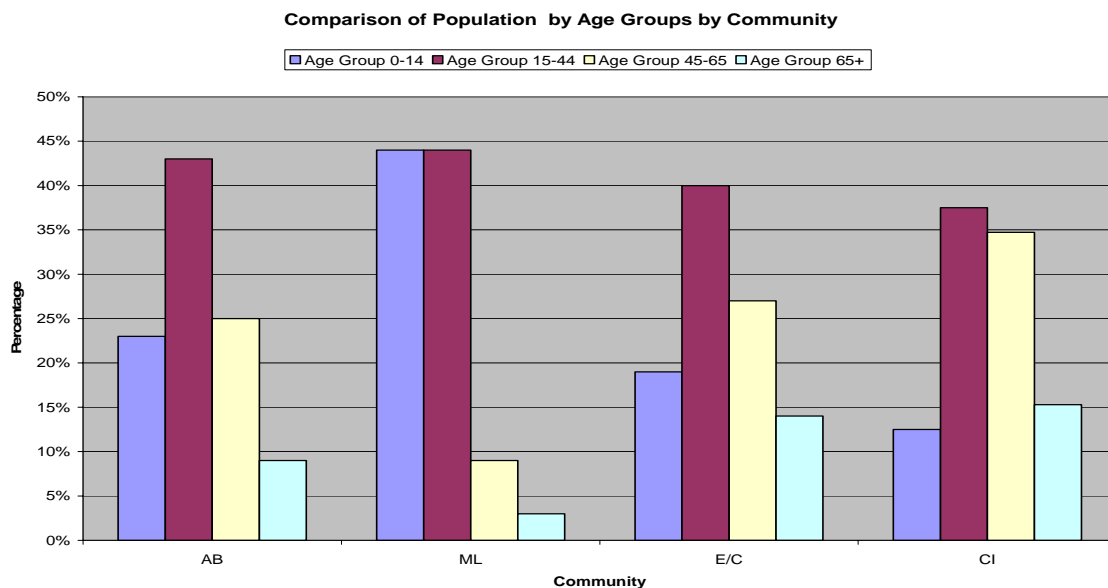
Montreal Lake and Change Islands have less formal regional ties. Local control is increasing in the aboriginal communities of Montreal Lake and Alert Bay. In all communities there is limited municipal funding for infrastructure and services.

Alert Bay and Edwardsburgh/Cardinal both have significant planning processes underway as compared to Change Islands and Montreal Lake. Montreal Lake has an active development corporation. Although there is a development corporation in Alert Bay, it is not active but efforts are underway through a private foundation and local committees to revitalize it. The aboriginal communities in Alert Bay and Montreal Lake are moving towards self reliance. In Change Islands there are several private initiatives underway.

Municipal water and sewer services are not consistent across the communities. Alert Bay is the only community in this study that has complete water and sewer system services within their community. Montreal Lake has water and sewer but homes near the lagoon have bottled water trucked to them. Edwardsburgh/Cardinal has water and sewer but small sections of the township are still on well and septic systems. Change Islands has no municipal water or sewer services.

Demographic characteristics are also highly variable across the communities (Figure 2). Total population ranges from approximately 300 in Change Islands to approximately 6,674 in Edwardsburgh/Cardinal. Also, Change Islands and Edwardsburgh/Cardinal are relatively homogenous Caucasian communities whereas Alert Bay is a mixed First Nations and non First Nations community and Montreal Lake is entirely First Nations. The aboriginal communities of Alert Bay and Montreal Lake have a higher percentage of children under 15 although Montreal Lake has the largest youth population of the four communities. The population of Change Islands has been decreasing for several decades and Edwardsburgh/Cardinal is stable but both communities are aging. Edwardsburgh/Cardinal is attractive to retirees for many reasons including its close proximity to more substantial urban areas. All communities have issues of youth out-migration. Montreal Lake is the only community where there is very little in-migration.

Figure 2 Comparison of Population by Age Groups by Community



Source: Statistics Canada 2001 Census: Community Profiles

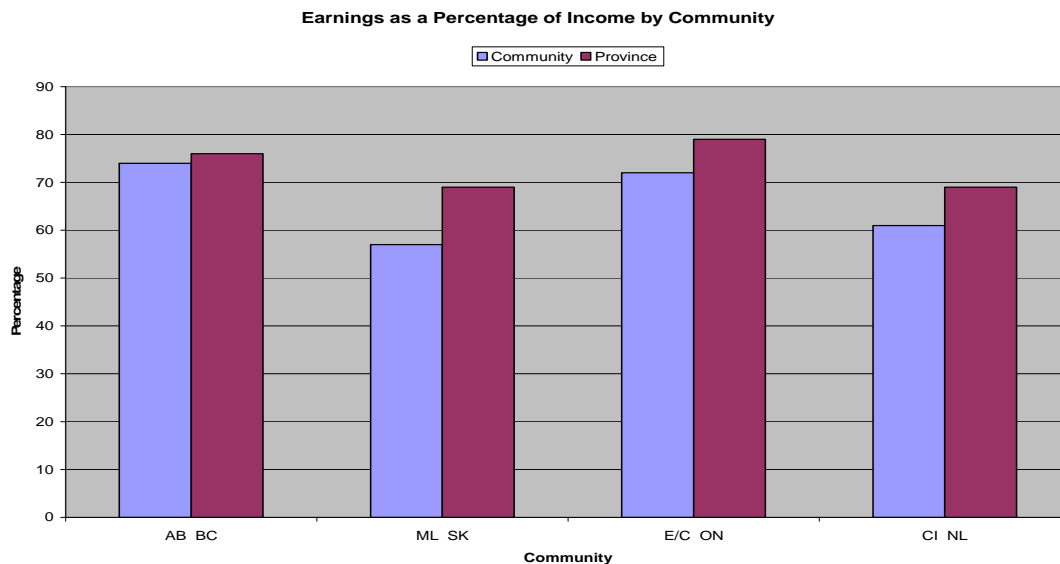
The median age of people living within each of the communities highlights their future position – in Alert Bay the median age is 35 years, in Montreal Lake it is 18 years, in Edwardsburgh/Cardinal it is 39 years of age and in Change Islands it is 45 years. The current (2006) median age for the Canadian population is 38.8 years of age. The recently released 2006 census reported population decreases (Reserve 1 by -47% and Reserve 1A by -27% and the Village by 5%) , a slight increase of 2% in the population of Montreal Lake, Edwardsburgh/Cardinal retained its 2001 population level and Change Islands' population decreased by -17%.

All communities have **education and health** services; however, the high school completion rates and the percentage of the population in each community with university degrees and college diplomas are lower than the provincial averages. Alert Bay and Edwardsburgh/Cardinal have continuing education programs and the health care services

and infrastructure are more developed since there is access to local hospitals. Montreal Lake has a health centre and Change Islands has a clinic with a nurse stationed on the island. All communities except Edwardsburgh/Cardinal are challenged by a lack of access to specialized health services. While the overall health indicators such as mortality rates and teenage pregnancy rates are poor in Alert Bay and Montreal Lake, health indicators in Edwardsburgh/Cardinal and Change Islands are only slightly lower than provincial averages and both have high levels of self-rated health relative to the ratings in their respective provinces. Similar to that of the province as a whole, 69% of Alert Bay residents rate their health as good.

Income and Industry – The isolated communities, of Alert Bay, Montreal Lake and Change Islands have relatively high unemployment rates and work activity is mainly seasonal, often involving travel outside the communities. For all communities government transfer payments as a percentage of total income is above the provincial average and Montreal Lake and Change Islands are considerably more reliant on these transfers than Alert Bay and Edwardsburgh/Cardinal. In addition, the current lack of youth employment opportunities impinges on community well-being assessments. Community income also needs to factor in the informal economy which is particularly important to alert Bay and change Islands and to a lesser extent in Montreal Lake.

Figure 3: Earnings as a Percentage of Income by Community



Source: Statistics Canada 2001 Census: Community Profiles

The resource base of the four communities has shifted as a result of government policies, declining resources, fluctuating commodity prices and many other pressures. In many cases these factors adversely impact young people as they can no longer afford the cost of entering the traditional resource sectors due to increasing licensing fees and high operating costs. Decline in the quality and quantity of natural resources in all communities have in the past decade led to attempts to diversify the economic base away from single sector resource-based activities. All communities identified tourism,

especially heritage-based tourism, as an important current or potential driver of economic development (although less so in Montreal Lake), with this being a more active focus in the two island communities. The role of tourism in each community has been shifting, with an overall decline in tourism in Edwardsburgh/Cardinal since 1993 while the industry has expanded in Alert Bay and Change Islands.

Culture and community – In all four communities there is a link between the land or sea, traditional resource-based activities and local identity. Community culture is derived from history, environment and resource use activities in different ways. The First Nations traditions and culture play a distinct role in Alert Bay and increasingly so in Montreal Lake. Development based on local cultural history is important for Alert Bay, Edwardsburgh/Cardinal and Change Islands. All communities link rural lifestyle with a high quality of life and perceive this as a marketable commodity. In the aboriginal communities of Alert Bay and Montreal Lake, language is an important part of their culture and identity and the erosion of traditional languages is a concern.

All communities identified the importance of **voluntarism** and expressed concern regarding fatigue among current volunteers and the diminishing pool of local volunteers, although the large retiree population in Edwardsburgh/Cardinal is seen as a potential asset. There is a lack of youth engagement in all communities. **Community cohesion** in Alert Bay, Montreal Lake and Change Islands is strong. Edwardsburgh/Cardinal is more fragmented with several communities of interest but in a crisis all communities work together to support one another.

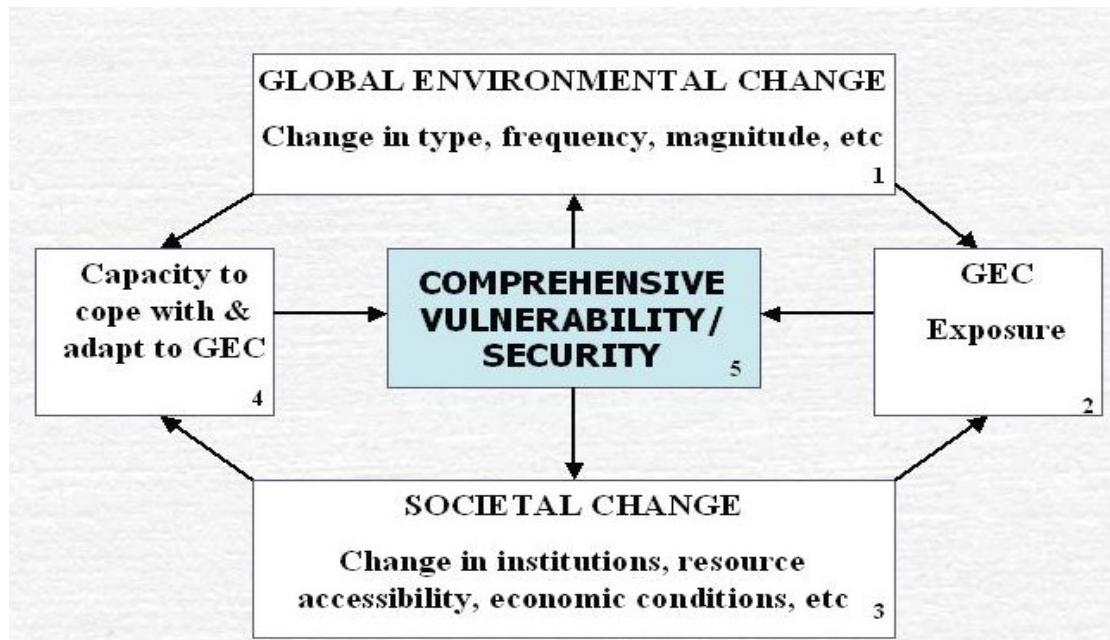
In sum, the four communities participating in this study are very different representing a range of rural communities in Canada. The research design purposefully engaged a wide range of CRCs with varying histories, geographic amenities and capacities to cope with future uncertainties. This diversity facilitates a comparative assessment but it is also important to respect that these communities do not constitute a representative sample of CRCs. This study provides insight into four diverse CRCs but it would not be appropriate to draw conclusions about other CRCs.

3.0 Research Approach and Process

3.1 Community Vulnerability/Security Research Framework

The analytical framework that helps us to assess the vulnerability of CRCs to climatic change is illustrated in Figure 4. It emphasizes that community vulnerability is a function not only of exposure to climatic change and other stressors but also it is mediated by a community's capacity to cope with and if necessary adapt to shocks stemming from environmental and social stresses generally and climatic change specifically. Derived from vulnerability research developed largely in the context of natural hazards (Wisner et al 2004) and famine (Watts & Bohle 1994) these concepts were modified and applied to address human vulnerability to climatic change issues (Brklacich & Bohle 2005). It builds upon more traditional climatic change impacts frameworks which begin with the specification of climatic change within the local context (Fig 4, Box 1) and then consider potential exposures to these changes (Fig 4, Box 2)

Figure 4: A Comprehensive Framework for Assessing Community Vulnerability to Global Environmental Change



(Derived from Brklacich & Bohle, 2005, Ingram et al 2005)

The analytical research framework employed here expands upon this base and considers changes within human systems (Fig 4, Box 3) and how these changes affect a community's capacity to cope with and adapt to change (Fig 4, Box 4). Overall, this approach roots a community's viability in an uncertain future (Fig 4, Box 5) by comparing the severity of future climatic changes to the community's capacity to recognize and respond to the altered climatic regime.

3.2 Initial Engagement of the Communities

The four communities within the study were selected for a variety of reasons. For Change Islands, Montreal Lake, and Alert Bay existing relationships with Carleton University, Simon Fraser University and the University of Saskatchewan provided a platform to advance the research. Edwardsburgh/Cardinal was a slightly different case: the Carleton research team had a prior relationship with a local conservation authority –South Nation Conservation Authority (SNCA) – who suggested working with the township and also provided a conduit to the local community.

Collectively the four communities represent a wide spectrum of resource-based communities in various locations across the country. The variability of these communities (see Section 2) certainly provides insight into the wide range of challenges and opportunities facing CRCs but it is not possible to draw broader conclusions about CRCs from this study.

Once the communities were identified, researchers proceeded to obtain commitments from local collaborators including for example, municipal and First Nations officials, key community organizations, community elders, elected officials and spokespersons that had a thorough knowledge of the community's history, local development issues, current opportunities and future plans for community development. In each case, one of the Co-Principal Investigators and/or the Research Associate facilitated an initial meeting with community collaborators to identify other key actors, and benefits that the community could expect as a result of their participation in the project.

3.3 Preparation of Community Background Reports¹

Following the development of a standardized research protocol and outline for each community report, each researcher proceeded to gather information about recent trends and issues in each location through consultation with community representatives and analysis of existing data (i.e., demographic trends, economic activities, community well-being, etc.). Information on how environmental variability (including climate variability) has shaped each CRC was also acquired. The resulting background studies included reviews of community statistical reports, recent planning documents as well as preliminary interviews with key actors involved in each community. The period over which trends were reviewed and appraised was developed in conjunction with each community (i.e., a time period which is relevant to their community) and was not to be less than 25 years.

¹ The Community background reports prepared for this project are listed in Appendix 1 and available for downloading on the website:

<http://http-server.carleton.ca/~mbrklac/ruralcommunities.htm>

3.4 Community Workshop and Follow-up²

Community background studies and plans for the future compiled in the initial stages of the project were summarized and distributed to participants prior to the initial workshop and explored further in full-day workshops involving about 15 representatives from each community. The intention was to have a second follow-up workshop in each community but this proved to be impossible for Alert Bay and Montreal Lake. We tried to time the workshops to avoid local peak activity periods but this was not always possible and the timing of the workshop in Alert Bay and Montreal Lake were later than originally anticipated due to other commitments by several invited participants and other events in the community which were in conflict with earlier dates. As a result, one-day workshops were held in these two communities to obtain the information required.

The selection of participants from each community was decided in conjunction with key community organizers to ensure fair and equitable representation of various constituencies that comprised the community. Participation in the workshops was voluntary, all participants were advised of the conditions of their participation and informed consent was obtained prior to the workshop.

These workshops explored the current capacity of each community to cope with and adapt to environmental and societal change and then established: a) the extent to which changes will be expected to alter community exposure to environmental stresses such as climatic change (Fig 4, Box 2), b) the community's future capacity to cope and adapt (Fig 4, Box 4) and c) how these changes in exposure and coping-adapting capacity will either increase community vulnerability or community security (Fig 4, Box 5). With some variation in format and content to suit local circumstances the workshops followed the same basic framework. Each workshop was divided into the following three steps:

- *The past as a means to understand the current context* – participants were asked to review background information prepared in the community background paper and then asked to identify major changes in their community over the past 25 years, the perceived reasons for these changes and the extent to which their community's viability has either been enhanced or threatened by these adjustments.
- *Looking to the future of community evolution and development* – discussion continued on factors that participants felt would shape the community over the next 25-50 years and how the community might respond. Climatic change was not introduced at this time as the purpose of this session was to understand major forces that will propel the community into the future and the extent to which these community-identified futures might either represent an opportunity or barrier to future community development. The points from these first two were summarized before moving to a discussion of climate change.

² Summary reports prepared after each workshop are listed in Appendix 2 and available on the website: <http://http-server.carleton.ca/~mbrklac/ruralcommunities.htm>

- *Climate change and how it will impact future community development* – from the more general discussions that characterize the first two steps, we introduced climatic change into the workshop discussion. This approach of initially discussing past changes and future prospects without a direct reference to climate change had the advantage of not creating a “climatic change bias” in the workshop and, thereby, allowed for a more careful placement of climatic change amongst the myriad of environmental and societal changes which have influenced a community’s past and may influence its future. In Step 3, participants were encouraged to discuss the sensitivities of past community and future developments and asked to identify initially if a past change was, or a future initiative is, sensitive to climate and if yes, then to consider how climatic change might affect the implementation of this community development initiative. Overall, this step was to provide initial insight into those aspects of community development that might be impaired by future climatic changes and thereby provide a basis for further assessment.
- *Workshop Synopsis* occurred at the end the day. Following the workshop a written summary of discussions was forwarded to each participant and comments or corrections were solicited before a final draft was sent out.

Each step uses a semi-structured survey approach and posed a set of questions to stimulate discussion. A standardized set of questions were developed to guide the workshop discussions (See Appendix 3 for questions) but these basic questions were refined further in conjunction with the local communities. As is the norm for community-based research workshops, each participating member from the local community was offered a daily participation fee for their contributions to the project.

3.5 Integration of Climate Change in Community Futures.

Presenting climate change at the community level is a difficult task; residents of rural communities live in close connection to the land and the sea that surround them. Changes in weather are often predicted by local knowledge related to the resource by which they make a living. Near the ocean it might be changes in the wind on the water, on the prairies it may be the cloud patterns or changes in animal behaviour. But these predictions are for the near future. How to articulate climate change twenty – forty – eighty years into the future and relate it to the local level is a challenge. We attempted to overcome this in two ways;

- Using two of the IPCC SRES Scenarios (Market first and Sustainability first) representing increased temperature extremes and then downscaling these to regional levels (e.g. central British Columbia coast, northern Saskatchewan, eastern Ontario and Newfoundland). This work was carried out by the Adaptation and Impacts Research Group(AIRG) of Environment Canada based at the University of Toronto
- Presenting an overview of climate change in community workshops, followed by an interpretation of these scenarios for each community and presenting potential climatic changes that might occur in the region as a result of the predicted temperature and precipitation.

For example, the market first or SRES 1A storyline, featuring global population growth over the next 50 years as well as strong economic growth coupled with further globalization may, for the Newfoundland community, translate into more out-migration. This will lead to pressure on local merchants and further decay of local services coupled with increasing reliance on large retail outlets in more distant communities. These comprehensive scenarios incorporated the regional climate change scenarios derived from the IPCC SRES downscaling exercise. Overall, the IPCC SRES scenarios provide a consistent set of global storylines to create a foundation for community-level scenarios and thus a basis for a subsequent comparative assessment across communities.

3.6 Comparative Assessment

Once the workshops were completed the research team met in Ottawa for 2 days to assess the key elements of community well-being in the four communities. Environmental and social 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. In the three smaller communities (Alert Bay, Montreal Lake and Change Islands), the interweaving of the discussions of environmental and social elements together reflected the lack of separation between the way people made their living and the culture of the community. In Edwardsburgh/Cardinal, the community culture had its roots in agriculture but work and community culture were not as integrated as the other three. The comparative assessment commences with an assessment of environmental and social factors and included common indicators reflective of the concerns past and future across the four communities. The indicators applied to the environmental and social conditions in all communities 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)

To assess the level of security-vulnerability we placed each community on a gradient for each indicator ranging from fully secure to fully vulnerable. We are not able to precisely measure vulnerability-security but we were able to assess the current status of each indicator, what are the likely future prospects and how global climate change might impact the communities. The categories were:

- SECURE = No issues, fully supports community well-being
- secure = Minor concerns but not a threat to community well-being
- secure/vulnerable = equally vulnerable and secure
- vulnerable = Minor concerns which could eventually threaten community well-being
- VULNERBLE = Substantial concerns which threaten community well-being

The indicators are a combination of information compiled for the community background reports and the information gathered at the community workshops, including both qualitative and quantitative data. It is important to highlight that the indicators are not mutually exclusive. There are overlaps in several of the indicators such as between the environmental indicator of water quality and societal indicator of infrastructure or the societal indicators of human capital and institutional/political capital.

4.0 Community Well-being: Environmental Perspectives

4.1 Water Quality and Quantity (Table 1)

Drinking water quality in Alert Bay is excellent. The community water system comprises a deep well, reservoir and distribution system. The future is also secure since the present well is capable of handling an expanded population and village engineers indicate that an additional well could be drilled and pumped to double the output without drawing down the aquifer. There is also a new sewer system. Climate change may pose a minor threat if it reduces aquifers levels but current excess capacity of water should provide a substantial buffer. Overall it is expected that the existing infrastructure will be able to cope with future population expansion and climate change impacts which may result in minor declines in the local water capacity. The major concern regarding water quality is the pollution from fish farms in surrounding marine waters and the potential for the continued operation and expansion of these farms to impacts livelihoods and environmental capital.

In Montreal Lake, the drinking water is drawn from the lake and is treated; however, some residents are concerned that the proximity of the sewage lagoon to the lake is a threat to water quality although water quality tests have confirmed the water is safe. These residents do not drink the water and use bottled water only. Water quantity is not a problem but future increases in water levels due to more precipitation reduce water quality and thereby increase the community vulnerability. The current water and waste water systems are wholly funded by Indian and North Affairs Canada. Any new building for a sewage treatment plant would require external funding from the Department.

In Edwardsburgh/Cardinal water is mainly supplied through centralized systems and water quality is not an issue. There are still a small percentage of people using individual wells and septic systems, mostly in the rural parts of the Township. In general neither water quality nor quantity is a concern now and it is not expected to be a problem in the future, however, it is important to note that the absence of any ground water studies does introduce some difficulty in assessing the situation. There are plans to upgrade the current water treatment plant and this will help to ensure the continuation of an adequate supply of high quality water to local residents. Should the current system not be upgraded, then projected increases in precipitation associated with climate change could be a source of stress on the municipal water services.

There is no municipal water and sewer in Change Islands. All houses are on individual well and septic systems and a few households may be vulnerable even if the community itself is not. The municipality did consider installing a water and sewer system in the mid-1990s as a means of addressing minor water quality issues but costs proved prohibitive. Current water quality and quantity issues are seasonal and the longer drier summers in 2004 /2005 in Change Islands left many households relying on surface wells without water during the month of August. In addition, in most wells, whether surface or drilled, the water is brown due to the levels of trihalomethanes in the soil. A number of adaptation strategies have already been implemented at the household level including the

installation of filtration systems, water sharing with other community members during dry spells and capturing of rain water for household use.

Overall, of the four communities Montreal Lake faces the greatest threat of contaminated water and subsequent health related factors. In Alert Bay and Edwardsburgh Cardinal, there are only minor concerns regarding water and these communities have the capacity to cope with any anticipated concerns. The water supply is considered secure in both Alert Bay and Edwardsburgh Cardinal. The continuation of dry summers in Change Islands is expected but existing coping strategies should be sufficient and the security of the community's water is not expected to change. Climate change may result in additional stress, especially on surface wells, but with sufficient resources this could be offset through drilling wells.

This assessment of each community's vulnerability and security from a water perspective raises two key points. First, vulnerability across communities is highly variable. Montreal Lake's water supply is clearly at risk whereas a threatened water supply does not jeopardize the security of the other three communities considered in this study. Second, history matters. That is, the capacity of each community to cope with and, if necessary, adapt to future uncertainties including climate change is highly conditioned by existing community assets and liabilities. For example, for Montreal Lake, its need to secure external funding for a water treatment facility is an important stressor of the community's water security. In contrast, by taking advantage of the strong social and political capital (See Section 5.1 and 5.2) Alert Bay was able to raise funds for a new system.

Table 1: Environmental Indicator – Water Availability and Quality

Communities	Current	Future Prospects	Global CC Impacts
AB	Overall high quality, minor quality problems in the bay largely addressed, concerns re. pollution in areas near fish farms	No anticipated drinking water or adjacent concerns, trends in aquaculture unknown	Some uncertainty regarding impact on aquifer levels
AB	SECURE	secure	secure
ML	Sewage of concern, water trucked to many residents and stored in cisterns. Minor drinking water concerns, external funding needed to address intake pipe	Contamination threat in cisterns. 56 homes not connected to distribution line. New subdivision will require a treatment plant upgrade, lagoon will continue to be a public concern	Water availability not an issue, increase in precipitation may lead to greater runoff which would adversely impact water quality. ML's water and water system is wholly funded by INAC.
ML	vulnerable	vulnerable	vulnerable
EC	Minor problems with low flow; no ground water studies; some people still on well and septic systems; no significant problems with water quality or availability	Overhaul of waste water treatment plants (for economic reasons will ensure future)	Increase in precipitation could put stress on waste water treatment plant but new facility will minimize potential negative impacts
EC	secure	secure	secure
CI	Well and septic systems, dry summers an issue	Well and septic systems, drier summers will continue to be an issue	Residents with surface wells may require deeper more costly wells
CI	secure	secure	vulnerable

4.2 Land Availability and Quality (Table 2)

Alert Bay is located on Cormorant Island, a small island off the northern coast of Vancouver Island within the Broughton Archipelago. The island covers about 5kms² with about 80% occupied by three reserves and the remaining 20% controlled by the Village of Alert Bay. The current land base is heavily utilized and opportunities to expand are limited. Forestry has degraded the existing land base somewhat but regeneration occurs rather quickly (by Canadian standards) under the temperate climate. The 'Namgis First Nation is currently in negotiation for control of their traditional lands and already have some partnership projects in place on traditional territory lands which will significantly expand the land available for forestry, hunting, trapping and other activities. There is concern, however, that the potential increase in security resulting from land claims will be impacted in some areas by coastal erosion associated with climate change.

Montreal Lake is located in north central Saskatchewan within the Boreal Plain Ecozone. The main town site of the Montreal Lake Cree Nation has an area of 61Km². Band members also live in nearby reserve land. The total land base set aside for the Montreal Lake reserve is 85km². Land availability is currently a key concern for resource development and subsequent revenue generation and employment for the Band. 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. Climate change is expected to significantly increase forest fire risk, adding additional concerns. In summary, the limited land base at Montreal Lake threatens the security of the community and it is expected that land constraints in general, plus climate change will continue as a long term imposition on community well-being.

Edwardsburgh/Cardinal is a mainly rural Township located in southeastern Ontario, with its southernmost boundary bordering the St. Lawrence River Seaway. The Township covers 312 km² and while farmlands, forests, and natural areas are the primary cover, residential and industrial land uses are also important. The township maintains a balance of forested areas, agricultural land, natural pastures and wetlands. Many community organizations in Edwardsburgh/Cardinal and surrounding areas promote land stewardship, and the sustainable use of natural resources remains important for current and future agricultural production, tourism, recreational activity and for maintaining overall quality of life. Urban encroachment currently imposes relatively minor constraints on the availability of land in Edwardsburgh/Cardinal but it is expected to affect community well-being more significantly in the future. Climate change is expected to have only minor impacts on land availability and quality in the Township.

Change Islands, whose residents live on the two islands linked by a bridge, has sufficient land to support its existing population. Future economic developments are therefore, constrained by limits on land availability. The vast majority of uninhabited land in CI is either reserved as crown land or subject to title disputes. Projected sea level rise stemming from climate change could inundate low lying areas on the south island and thereby impact access to the ferry dock on the southern most tip of the south island.

In sum, land availability and quality in each study area varies, and this impacts current and future community well-being. The longer term trends are slightly negative for this indicator in all communities and future climate change could well diminish community well-being by eroding either land availability or quality.

Table 2: Environmental Indicator – Land Availability and Quality

Communities	Current	Future Prospects	Global CC Impacts
AB	Small island but gaining land through treaty (land heavily harvested but high forest growth rates)	Expected access to a significantly increased (although somewhat degraded) land base	Losses anticipated through coastal and bank erosion
AB	vulnerable	secure/ vulnerable	vulnerable
ML	Reserve land base not sufficient to support current human population. Much of the land is of muskeg quality surrounding the current town site.	Population growing rapidly, Band currently in negotiations to control traditional lands	Increase in extreme weather events such as forest fires may place community at risk
ML	VULNERABLE	VULNERABLE	VULNERABLE
E/C	Land bank resource; balanced land use (agriculture, forestry, wetlands); urban encroachment an issue	Possible increase in urban encroachment leading to further conversion of forests, wetlands and agricultural lands	Increase in temperature and precipitation could cause erosion of agricultural lands and stream banks; possible flooding of land bank (already a problem)
E/C	secure	vulnerable	vulnerable
CI	Two islands, small land base, majority of South Islands is crown land, limited land use	Unlikely to change - revision to crown lands use required	Parts of South Island road to the ferry may be impacted by sea level rise
CI	vulnerable	vulnerable	vulnerable

4.3 Climate (Table 3)

Alert Bay's temperate climate is typical for northern Vancouver Island – which brings cool, moist weather for most of the year. Temperature variations are moderate with an average annual temperature of 8 degrees Celsius. The summer months, May through September, are drier than the winter. Temperatures average 17.4 degrees Celsius in July and August, with hot, sunny days and some cooler days as well. Rarely does the temperature fall below 0 degrees Celsius (32 degrees Fahrenheit) in the winter. Residents expressed concern about recent temperature increases in general and warmer summers specifically as well as concern about sea level rise, storm surges and its impacts on community infrastructure such as docks, seawalls, the breakwater and other near shore properties as well as cultural sites/heritage resources and littoral biota. Residents are also concerned about changes in fish stocks and vegetation, and bank erosion resulting from climate change – but saw benefits for increased tourism with a warmer climate. In the future they expect the warming trends will continue but anticipate they will be able cope with or adapt to the threat. Who will undertake the cost of repairs to infrastructure is not clear and the uncertainty appears as much a threat to community well-being as climate change. Alert Bay is the only one of the four communities included in this study that is discussing climate change, including adaptation strategies, within a broader planning

process. Information and the opportunity for dialogue provided via the project contributed to this process.

Montreal Lake has a continental climate with considerable seasonal variation in temperature. The daily normal mean temperature varies from 17.4 C in July to -21C in January with recorded extremes from 39C to -42C. Average precipitation is 405 mm in total with 294 mm of rain and 119 cm of snow. The average humidity is 61%. Its climate is the most extreme of the four communities. Recent trends in climate, including warmer winters, are already noted by the community, and it is expected these changes will heighten community vulnerability in the future. Drought stresses forests making them susceptible to insect damage – and forest fires, the greatest concern in Montreal Lake. A forest fire in 2003 came within a couple of kilometers of the main town site and residents had to be evacuated. Many also mentioned suffering from smoke inhalation. The potential of forest fire may endanger their livelihoods and could also have long term implications on the allowable cuts. Over the long term, changing vegetation may also pose a threat to the traditional way of live of the communities. Warming trends are expected increase the risk of forest fires and potentially threatening the survival of the community itself, but climate change is not part of the planning cycle.

Edwardsburgh/Cardinal has a mid-continental climate with average temperatures ranging from a low of about -25C in winter to a high of about 26C in mid summer although temperatures of 30C or higher occur frequently. Winters are characterized by variable snowfall and freezing rain. Winds in winter and relatively high humidity levels in summer are routine. Widespread destructive weather, aside from the 1998 ice storm, is rare, but subsequent droughts and localized weather events have been more frequent in the past ten years. The weather is expected to become milder and area farmers saw this as a benefit in terms of a longer growing season. However, there was some concern expressed about the possibility of further increases in localized storm events and variability in micro climates which could impact local forests and agricultural crops. Although the municipality is not planning for long term climate change it has considerable capacity to address related uncertainties.

The climate in Change Islands is maritime and generally cool by Canadian standards, especially in the spring and summer. In summer the range is from a low of 15C to a high of 25C. Temperatures during the winter range from a low of -12C to a high of 0C; winds from the north Atlantic can cause significant damage to fishing properties on the water's edge. However, residents noted the warming temperatures over the past 25 years and especially during the last 10 years – winters are milder and summers warmer – citing observations such as changes in available fish species, earlier picking season for most of the local berries, longer growing season for gardens. Similar to Alert Bay, Change Islanders saw economic advantages, including potential increases in tourism with a warming climate.

The assessment of community well-being in relation to climate change and its future impacts varies across communities. Both Alert Bay and Change Islands view a warming climate as a potential driver of increased tourism and some farmers in

Edwardsburgh/Cardinal farmers expect their growing season to be longer. Enhanced potential for agriculture/gardening was also mentioned in Alert Bay and Change Islands. In these three communities, the anticipated climate trends are not expected to change community well-being dramatically over the medium to long term. In Montreal Lake however warming temperatures are expected to increase the risk of forest fires and thereby reducing the future security of the community.

Table 3: Environmental Indicator – Climate

Communities	Current	Future Prospects	Global CC Impacts
AB	Getting warmer, more storm surges, higher tides, drier summers	Trends expected to continue	Trends expected to continue perhaps more severe
AB	vulnerable	vulnerable	vulnerable
ML	Warmer in the winter and pest infestations more frequent, impacts on forest unknown, forest fires are frequent	Milder climate, drought forest fire risk continues	Milder climate, forest becoming more drought prone and susceptible to fires
ML	vulnerable	vulnerable	VULNERABLE
E/C	More frequent extreme events; drought	Possible increase in precipitation; milder climate (warmer winters); increased variability in climate; more 'freak' weather events	Increase in precipitation; milder climate; increased variability and 'freak' weather events
E/C	vulnerable	vulnerable	vulnerable
CI	Milder climate	Milder and more variable climate	Milder and more variable climate
CI	vulnerable	vulnerable	vulnerable

4.4 Aquatic Resources (Table 4)

Ocean resources in Alert Bay, especially the salmon and eulachon, are central to the economy, culture and way of life. These resources are currently at risk and thereby impose stresses on community well-being. Aquaculture does provide new opportunities but may pose a threat to indigenous salmon species. Climate change may also change the species available in the area and increase requirements for a technological solution to fishing species which are not indigenous to the area as well as appropriate licensing regimes. Risks to salmon populations from climate change are a significant concern. The 'Namgis First Nation however is actively seeking new economic opportunities and they are planning adaptive measures to respond to climate change. Trends are expected to continue into the future and current vulnerabilities associated with aquatic resources will remain but are not expected to increase substantially with climate change due to the community's adaptive capability (Garibaldi and Turner 2004).

Fish was one of the traditional sources of protein in Montreal Lake but overexploitation led to closure of the commercial fishery on the lake. Traditional and subsistence fishing are still permitted. The closure may help restore stocks but increased precipitation as a

result of global warming could lead to additional runoff into the Britten River which may, in turn, affect the pickerel population. The community remains vulnerable, although other sources of income are replacing the commercial fishery, so while the threat still exists the community is pursuing ways to adapt.

Fishing is a recreational activity in Edwardsburgh/Cardinal rather than a primary economic activity and was not discussed in much detail at the workshops. Warmer climate could increase water temperatures which may adversely affect the cold water fish species and reduce opportunities in recreational fishing.

In Change Islands the fishery is not only a source of revenue but also a way of life. The moratorium of northern cod increased community vulnerability, reinforcing recent out-migration trends. Although conservation measures are in place and the 2006 fishing season was promising, the development of new technologies in the fishery reduces the number of people required. The fishery will continue but it will no longer be the main generator of income for the community. Change Islands will remain vulnerable even if the fish return. Some stock restoration is possible with careful conservation measures but climate change will increase water temperatures and may change the species available in the nearby fishing grounds. It is important to note, however, that climate change is not expected to severely alter the ongoing repositioning of the fishery in Change Islands.

Table 4: Environmental Indicator – Aquatic Resources

Communities	Current	Future Prospects	Global CC Impacts
AB	Threatened, some stocks at risk, restoration possible, impact of aquaculture on salmon stocks, alternative species and tourism resources	No change	Concerns about increased risks to traditional species – salmon and eulachon, possibility of new species
AB	vulnerable	vulnerable	vulnerable
ML	Decline of fishery, especially white fish	Current commercial fishery moratorium may help restore stocks in Montreal Lake but an increase in fishery may impact water supply	Increase in precipitation may lead to greater runoff into Bittern River which may affect pickerel populations
ML	vulnerable	vulnerable	vulnerable
E/C	Stable recreational fishery; some contamination concerns; Zebra mussels have crowded out native fish species and mussels	No anticipate change	Warmer climate and hence warmer water temperatures could affect cold water fish species.
E/C	secure	secure	vulnerable
CI	Threatened cod stocks but restoration possible, fishing alternate species but fishing technology adversely affects ocean conditions	Fishing will continue but at a reduced level. Technological advances will continue.	Species distribution may change as water temperatures increase, could impact fishery either positively or negatively.
CI	VULNERABLE	vulnerable	vulnerable

Overall, the two coastal communities are the most vulnerable to loss of/change in aquatic resources. Alert Bay has more capacity to cope with the effects of a changing climate while Change Islands, on the other hand, has suffered declines in their population and in the ten years following the moratorium this trend has been reinforced. The average age of fishing industry workers is approximately 45 years and recruitment of new employees into the fishery is extremely low. The current state of aquatic resources constitutes a threat to the well-being of Change Islands and only minor improvements are anticipated in the future. It is the most vulnerable of the communities in terms of the future capacity of the community to make a living based on aquatic resources.

4.5 Terrestrial Resources (Table 5)

Alert Bay is an island community with a limited land base; while the treaty settlement on the mainland of Vancouver Island is expected to increase the land base, this area is already heavily harvested. Forest growth rates in the area are, by Canadian standards, high, but nevertheless the limited and degraded land base is expected to adversely impact community well-being into the future. The effect of climate change on terrestrial resources is expected to be varied and include increases in wind throw as well as invasive weeds, pests and fire risks. There is evidence to suggest there will be significant negative impacts on western red cedar, a cultural keystone and economically valuable species. Forest vulnerability is expected to continue but warming temperatures and associated increased growth rates may offset potential negative impacts.

Montreal Lake is part of the Prince Albert Model Forest and this provides a larger framework in which to manage and conserve local forests. There are health concerns however regarding the future impact of spraying for spruce budworm by one of the major logging firms in the region. Some new insects have appeared in the area and there is concern they may increase in the future. The future may bring increased security through a longer growing season or perhaps increase vulnerability if drought occurs thus increasing the forest fire risk in the future. The key point is that climate change in combination with other factors will lead to considerable increases in uncertainty regarding the future of terrestrial resources in Montreal Lake.

Some forested areas within Edwardsburgh/Cardinal are part of the Eastern Ontario Model Forest (EOMF), providing a conservation framework which helps protect the municipality's terrestrial resources. As mentioned previously, the proximity of Edwardsburgh/Cardinal to urban centres and the likelihood of continued urban sprawl into the area is seen a potential future threat for the sustainability of forest, wetlands and agricultural lands in the Township. Climate change could lead to warmer winters and an influx invasive species as well as increase the risk of flooding in low lying areas. Overall future declines in terrestrial resources are expected to offset potential benefits, and without effective adaptation programs vulnerability is expected to increase.

Change Islands has limited wood supply but there is a rich supply of berries. Change Islanders with gardens also observed longer growing seasons and the availability of terrestrial resources are not expected to change markedly in the future. Changes in the

climate were perceived as positive with potential for alternate income sources. A longer growing season with a greater variety of crops may lead to new development opportunities, increasing the adaptive capacity of the community. Terrestrial resources on the island have always been limited and people have learned to adapt and live with what is available.

Table 5: Environmental Indicator – Terrestrial Resources

Communities	Current	Future Prospects	Global CC Impacts
AB	High forest growth rates, changing species mix, reduction of old growth	No change	Negative impacts on some traditional species of vegetation, wind throw, erosion but also increased growth rates for some species expected, no change on balance
AB	vulnerable	vulnerable	vulnerable
ML	Forest stable, part of PAMF, new insects	Continued involvement with PAMF will facilitate effective management	Unclear if warmer temperatures will benefit forest productivity due to longer growing season or render forest more drought prone and susceptible to fires; new species of insects may affect certain tree species
ML	secure	secure	secure/vulnerable
E/C	Regeneration of forests and topsoil; some new insects; part of EOMF; managed woodlots; concerns with landfill site; recent increases in growing season.	Land Bank could be developed as a mixed use recreation/conservation area; continuity in forest and woodlot management programs, some deforestation could occur with increased urban sprawl	Warmer temps could cause shift in tree species; warmer winters could increase invasive species (insects, plants) and diseases (fungi); Flooding in low lying areas; Damage to forest cover (micro-bursts), Agriculture could potentially improve
E/C	secure	secure/vulnerable	vulnerable
CI	Adequate wood and berry supply on Islands and nearby for current population.	No change	May require seasonal adjustments in picking berries but no substantial change
CI	secure	secure	secure

Generally terrestrial resources provide a relatively strong foundation for community well-being in the four communities considered in this study and only minor deviations are expected in the future.

5.0 Community Well-being: Societal Perspectives

5.1 Social and Cultural Capital (Table 6)

Alert Bay is the most socially and culturally cohesive of the four communities. There has been a partial reclaiming of language and culture by the 'Namgis and the community is world renowned for Kwakwaka'wakw song, dance and carvings. Several programs to retain Kwakwaka'wakw culture are in place by the U'mista Cultural Centre. The sense of community, history and shared identity are very strong and reflect positive relationships between aboriginal and non-aboriginal communities in Alert Bay. Residents of both communities routinely attend each others cultural events. In addition, community well-being is supported by many civic societies, recreational associations and a volunteer community. While some stresses, such as loss of language are observed, this is unlikely to change significantly in the future or be impacted by climate change.

The cohesiveness of Montreal Lake is founded on common language and culture and there have been recent revivals of some of the traditional festivals. Strong personal relations and formal organizations add to the cohesiveness but informal volunteer associations are not well represented in this community. An arena was recently built with working members of the band contributing to its operation and maintenance. The community well-being is currently threatened by high unemployment and related problems of delinquency and drugs, especially among the rapidly growing young adult and youth population. In addition, isolation contributes to community vulnerability. It appears this will not change dramatically over the near to medium term and that climate change will not alter cultural capital. Residents expressed dissatisfaction with the current state of the reserve. This community is vulnerable and its isolation increases its vulnerability.

The amalgamation of the village of Cardinal and the township of Edwardsburgh was part of a larger initiative in 2001 by the province of Ontario and in many ways this legal amalgamation has left the community fragmented. Traditionally the identity of the area (especially Edwardsburgh) was founded on its strongly rural character however two four-lane highways provide links to major urban centres drawing and contributing to an increasing commuter population who tend not to engage to the same extent in local activities. On the plus side, the improved highways also makes it easier for long-time residents to take advantage of services in nearby urban areas and similarly these transportation routes also provide opportunities for nearby urban population to participate in Edwardsburgh/Cardinal activities. Many local volunteer groups focus on promotion of the heritage of the township, such as the Spencerville Mill and the Battle of Windmill site. There are also more efforts being made within the township to unite the diverse communities of interest and build community cohesion. There is some concern however that the coupling of these broader trends towards urban sprawl with a milder climate could make the area more attractive for area commuters and weaken the community cohesion. Vulnerability will increase in the township especially if it is impacted by urban sprawl.

Table 6: Societal Indicator – Social/Cultural Capital (cohesion, networks, culture)

Communities	Current	Future Prospects	Global CC Impacts
AB	High social cohesion, high level of networking, rich but threatened culture	No anticipated change, although volunteer resources are strained and language loss will be difficult to reverse	Not climate change sensitive
AB	secure	secure	secure
ML	Cohesive community, cultural events are coming back, youth problems persist	Community members coming together to address issues, main priority is to attend to youth problems	Must provide opportunities for the youth population, Milder climate may benefit tourism potential
ML	vulnerable	vulnerable	vulnerable
E/C	Fragmented population (urban-rural) adversely affects cohesion; shifting sense of rural identity	Continued influx of urban population could cause increased social fragmentation but efforts underway to unite various communities of interest	Milder climate could lead to increase in land values and more incoming 'rurbanities' and retirees, which could shift demographics
E/C	secure/ vulnerable	secure/ vulnerable	secure/ vulnerable
CI	Socially cohesive , decreasing capacity some issues with newcomers	Socially cohesive but decreasing population will continue to be a challenge	May lead to expansion in tourism opportunities and more seasonal residents
CI	vulnerable	vulnerable	vulnerable

Change Islands is a very cohesive community despite the cod moratorium but coping capacity has been decreasing. Community members are supportive of one another but are hesitant in their acceptance of the newcomers who are mainly seasonal residents. Some fear these newcomers will not respect local values and traditions and change the nature of the community. An aging population and out migration has increased community vulnerability over the past four decades and these trends will continue. Climate change may enhance tourism, contributing to an increase in seasonal residents and thereby adversely impact community cohesion.

5.2 Economic Capital (Table 7)

Alert Bay is actively seeking economic alternatives to the threatened fishery. The Namgis have the capacity and expertise to search out new opportunities and the band now employs a professional planner to assist the band council in its search for new economic activities. The decline in the fishery coupled with variable international market for forest products has increased the vulnerability of the community. Tourism has buffered these economic declines and cultural attractions such as the U'mista Cultural Centre already draw a significant numbers of tourists. However, tourism is seasonal and does not replace year round employment. The adaptive capacity of the community should be sufficient to temper negative impacts stemming from climate change.

Economic opportunities in Montreal Lake are limited and impose constraints on community well-being. In 1999 the Band joined forces with a major forest company in the region and three other First Nations to create jobs in the forestry sector, but in late 2005, declining international demand for paper led to layoff notices to fifty people and closure of the Prince Albert pulp mill. Forestry related activities such as tree planting and

fighting forest fires continue to be a key source of seasonal activity for residents. South Beach prefabricated homes; a company controlled by the band, and based in Prince Albert, is one of the largest employers for the community. Montreal Lake residents also work in the uranium mines in northern Saskatchewan. Limits on economic opportunities are expected to be a major driver of community vulnerability, especially for the rapidly growing youth population. Higher than average temperatures are expected to increase the threat of forest fires that will further aggravate community uncertainties in Montreal Lake.

Edwardsburg/Cardinal has the highest employment and income rates of the four communities, and relies on government transfers to a lesser extent for its economic well-being. The township has a stable and experienced workforce that enhances overall community well-being. The already diverse economy is expected to further diversify in the future, thereby continuing to provide a stable foundation for community well-being. The effects of climate change on future economic security in Edwardsburg/Cardinal is difficult to access, as it is expected to provide new opportunities within some sectors as well as create additional pressures others, (i.e., on municipal budgets). Overall it is estimated climate change may result in slight declines in economic security.

Table 7: Societal Indicator – Economic Capital (jobs, industry, poverty, globalization)

Communities	Current	Future Prospects	Global CC Impacts
AB	Relatively strong but threatened informal economy, higher than average unemployment, new opportunities arising	'Namgis plan for economic renewal but many challenges are faced	Strong ability to adapt demonstrated but capacity and policy-related barriers exist
AB	vulnerable	vulnerable	vulnerable
ML	High Unemployment, lack of opportunities on reserve, South Beach Homes growing, pressure of global markets (pulp mill closures) adversely affecting economic opportunities	Opportunities will continue to be limited, many residents will be required to look outside the community for employment, continued growth of South Beach Homes, development of the Reserve's tourism potential,	Opportunities will continue to be limited, warmer temperatures may benefit tourism potential, severe weather events such as forest fires could negatively impact forestry operations
ML	VULNERABLE	VULNERABLE	VULNERABLE
E/C	Strong economic networks and diverse base; job losses offset by nearby economic opportunities; main concerns are limited youth employment, decrease in tourism, threats to agriculture and retail.	Continued diversification of local economy and economic opportunities. Continued pressures on agricultural and retail sector.	Warmer temps could benefit agricultural industry but extreme weather could adversely affect forestry and feed stocks to local industry. Warmer temps have positive and negative impacts on tourism.
E/C	SECURE	secure	vulnerable
CI	Limited opportunities, failure to diversify, some tourism potential	Opportunities will continue to be limited. Tourism/agriculture show potential	Opportunities will continue to be limited. Tourism/agriculture show potential with warmer temperatures but unlikely to offset larger trends
CI	VULNERABLE	VULNERABLE	VULNERABLE

Change Islands' primary employment remains the fishery and the processing of fish. An attempt to diversifying the economy was unsuccessful due to poor management and lack of marketing experience. There has been a surge of activity related to tourism in the past ten years and while this has provided some economic relief it has not replaced the economic losses from the downturn in the fishery. Constraints on economic opportunities are expected to adversely impact community well-being and relatively minor improvements stemming from climate change are unlikely to alter larger economic trends. The community is expected to remain vulnerable but residents feel climate change may lead to positive prospects for tourism and small agricultural operations such as berry picking.

The overwhelming trend across these four communities is that current economic trends are expected to persist into the future and that climate change will not significantly alter these trends. Overall climatic change appears to be less of a driver on community well-being than current and future trends in local and regional economies.

5.3 Institutional and Political (Table 8)

The aboriginal and non-aboriginal communities of Alert Bay have separate administrative and political systems within the municipality, yet they have forged a strong relationship. On-going treaty negotiations regarding aboriginal rights to water and land resources will continue to define relationships between 'Namgis First Nation and the Village of Alert Bay Council. The good will and institutional relationships, along with strong leadership within the respective Councils, provides political stability. It is anticipated these institutional assets will continue and allow the councils to cope with future uncertainties. In addition, both Councils have already begun to investigate climate change impacts and are in the early stages of factoring climate change into long-term planning.

Montreal Lake Cree Nation is governed by their elected Council and it is a member of the Woodland Cree as well as the Prince Albert Grand Council (PAGC): a union of twelve First Nations bands. The new Montreal Lake Chief is an active and vocal promoter of community needs and the band and the community has begun to exert more control over local government. The resurgence in local government provides a firmer base for better stewardship of the Montreal Lake resources over the short and medium-term. It is anticipated that in institutional capacity Montreal Lake will continue to grow and thereby enhance the prospects for coping with and, if necessary, adapting to climate change.

The Edwardsburgh/Cardinal is governed by an elected municipal council and the current municipality is part of the larger United Counties of Leeds and Grenville (UCLG), whose decision-making is informed by several standing committees. Despite the community's long history of strong governance, the recent amalgamation of the two municipal governments plus the downloading of responsibilities by the Provincial government onto municipal agencies has begun to erode institutional capacity. It appears that securing economic resources to deliver municipal programs will continue to be a major challenge,

and climate change will add significantly to this challenge, imposing new constraints on community well-being.

The decrease in human capital (see section 5.4) has adversely impacted governance in Change Islands. The community is represented by an elected council but at the moment the position of Mayor is being filled by the Deputy Mayor. The prolonged economic decline impedes Change Islands' capacity to participate fully in broader regional programs such as Kittiwake Economic Development Corporation. Overall, constraints on institutional capacity adversely impact Change Islands' well-being and this trend is expected to continue for some time. Furthermore, there is concern that climate change will make it more difficult for Change Islands to re-establish the institutional capacity required to cope with and adapt to uncertain futures.

Table 8: Societal Indicator – Institutional/Political (informal and formal)

Communities	Current	Future Prospects	Global CC Impacts
AB	Strong leaders and governments, provincial downloading of responsibilities, effective working relationship between village and reserve, strong stewardship ethic	Expected increases in self-governance through treaty but with pressures of implementation and municipal governance	Already beginning to factor climate change into future planning, expect to be able to adapt.
AB	secure	secure	secure
ML	Vocal and active leaders taking control of programs, beginning to be heard by higher levels of government, good stewardship ethic (stream and elk restoration)	Continued activity by community leaders, greater consideration from higher levels of government, increased control over programs and traditional lands	As leaders continue to gain influence, they should be able to address demands imposed on institutions by including more road maintenance due to increased precipitation, and fighting forest fires (already underway)
ML	secure	secure	secure
E/C	Strong leadership and planning; amalgamation pressure due to downloading of services with no additional funding; strong stewardship	Continued strong leadership, planning, stewardship; Getting adequate funding for municipal services will continue to be an issue	Trends expected to continue but adverse cc impacts could lead to inability to continue services at current level
E/C	secure	secure	secure/vulnerable
CI	Decreasing capacity, limited municipal funding, difficulty with attracting people to serve, environmental concern but no programs	Current trends expected to continue	CC may exacerbate vulnerabilities
CI	VULNERABLE	VULNERABLE	VULNERABLE

The institutional and political capacities of the four communities is variable and their respective prospects to cope with future uncertainties such as climate change is impacted by current institutional and political capacities as well as by the magnitude of future climate changes. In all cases, recent trend changes in institutional capacity appears to be at least, and most often more, important than climatic change itself.

5.4 Human Capital (Table 9)

Alert Bay residents have good access to basic health services and education but the need to go off island for specialized care plus high school and post secondary education adversely affects community well-being. On numerous health indicators (e.g., diabetes, infant mortality, suicide rates) and education indicators (high school completion rates), Alert Bay is below provincial averages. Recent modest improvements in health and education are expected to continue. The benefits of enhanced native governance on human well-being may be offset by more environmental threats in the future and without effective adaptation measures; climate change is expected to reduce human health.

There have been recent human capital improvements in Montreal Lake, most noticeably being an increasing number of young people completing high school and the addition of a relatively new health care facility. Nevertheless, most health and education indicators are below provincial averages and a rapidly growing young population continues to have difficulty finding suitable employment. These trends are expected to continue and in the future it is likely many Montreal Lake residents will be forced to leave the community due to lack of suitable employment locally. Further vulnerability is expected to increase and climate change has potential to deepen these vulnerabilities if increased forest fires contribute to declines in air quality and respiratory illness for Montreal Lake residents.

Edwardsburgh/Cardinal is sustained by a relatively stable, well-educated but aging work force. The community's proximity to large urban centres, and hence access to a wide array of health and education services, enhances the well-being of the long-time rural residents as well as the more recent community members who have purposely sought out a rural lifestyle with access to urban activities and services. Concerns over declines in the youth population have arisen recently and if left unchecked could adversely impact community well-being over the long-term. Climate change is also viewed as a substantive threat to future well-being. The possibility of icier winters and substantially warmer temperatures, coupled with an aging population and declines in provincial health care services could translate into more falls and increases in heat exhaustion respectively among seniors and thereby impose more stress on already overtaxed health care services.

Change Islands vulnerability can to a large extent be traced back to more than 50 years of out-migration which not only resulted in severe population declines but also to a decline in young to middle aged adults that are a vital component of a healthy and secure economy. Basic health services have recently improved on the island but more specialized health care and post secondary education require residents to leave the island and in many cases the immediate region. Climate change is not expected to adversely alter these deeply entrenched forces which adversely impact human capital.

Overall, the role of human capital in establishing the current well-being in each community is quite variable. In Alert Bay and Edwardsburgh/Cardinal current human capital provides a foundation for overall community well-being whereas stresses on human capital in Montreal Lake and Change Islands currently reduce well-being. The

future is also variable and uncertain. For Montreal Lake and Change Islands, the current vulnerability generated by demographic shifts is expected to continue well into the future. For Alert Bay and Edwardsburgh/Cardinal, minor declines in human capital are anticipated in the future and while climate change is expected to accelerate that potential trend, human capital is expected to continue to support overall community well-being.

Table 9: Societal Indicator – Human Capital (demographics, health, education, knowledge, skills)

Communities	Current	Future Prospects	Global CC Impacts
AB	Population growing, poor health indicators, good access to regular health services, long distances for specialized services, education indicators lower than average but improving, rich traditional knowledge	Health and education indicators may continue to improve, particularly with plans for self-governance and development yet ecological threats increase vulnerability	Ecological threats may increase human capital vulnerability without effective adaptation
AB	secure/ vulnerable	secure/ vulnerable	vulnerable
ML	Rapidly growing young population, education indicators much lower than average but improving, excellent access to health services but low health indicators, education/skills/knowledge improving	Population increase slowing, educating and preparing youth for opportunities, many residents will be forced to leave the community in search of employment, continued improvement of health and awareness in the community	Increase in fires in the region may affect air quality and produce respiratory issues but importance of education and skills increasing
ML	vulnerable	vulnerable	Vvulnerable
E/C	Stable but aging population; overall good health indicators and services; relatively well educated workforce	Continued increase in retirement population and continued youth out-migration; continued accessibility to health and educational services/ resources (linked to broader investment and trends in these sectors)	Increase in precipitation (ice) could cause more health problems for elderly population (broken hips) and put pressure on local health service providers; warmer temps could cause increase in respiratory issues, heat stroke, infectious disease, skin cancer, pandemic
E/C	SECURE	secure	secure/vulnerable
CI	Decreasing and aging population, reasonable access to health services, education is lower than average	Demographic change is the major challenge. Maintenance of an education and health services depend on capacity to retain population.	Continued demographic, education and health trends. Seasonal/new residents attracted by an altered climate may increase capacity but only minor shifts expected. .
CI	VULNERABLE	VULNERABLE	VULNERABLE

5.5 Infrastructure (Table 10)

Recent improvements in sewer and water facilities as well as frequent daily ferry service to Vancouver Island and high-speed internet augment community well-being in Alert Bay. Marine infrastructure needs upgrading and there are plans to improve these

facilities in the future. It is expected that extreme weather associated with climate change will create new infrastructure problems for Alert Bay and moderately reduce community well-being. The primary concern is related to sea level rise, storm surges and periods of heavy rainfall which would increase erosion and damage to coastal infrastructure.

The proximity to the sewage lagoon is the major infrastructure concern in Montreal Lake and this poses a threat to water quality and community well-being. Water is trucked to the outlying homes of residents who are located too far away from the water treatment facility for underground piping to be economically sensible. Most homes near the lagoon are part of the subdivision and have piped water and sewage. Recent and continued population increases have and will continue to impose stress on infrastructure. A self-government taxing system has also been adopted to assist with minor and major capital projects in the community but this will not address all infrastructure needs and the community's continued reliance on external funding to support infrastructure maintenance and the building of new facilities remains a threat to community well-being. There are concerns that climate change will adversely impact infrastructure and cause overflow of the lagoon into the nearby lake and endanger community health. Also, the gravel road from the highway to the community, a distance of approximately 12 km, may be negatively impacted by heavier rains. To alleviate housing shortages, the construction of the new subdivision for the community will begin in the summer of 2007.

The recent establishment of Highway 416 through Edwardsburgh/Cardinal provides easy access to nearby urban centres. Communications are excellent with high speed internet available in the area. The main concern is the limited water and sewer facilities in the industrial park and these will need to be upgraded if a proposed new ethanol plant goes ahead. Recent off loading of services traditionally provided by the provincial government has made infrastructure maintenance and development more challenging for the municipality and this is not expected to change. Increased precipitation due to climate change could cause some damage to roads which would put additional pressure on municipal infrastructure budgets.

Change Islands has reliable ferry service providing regular daily access to nearby larger centres on the mainland such as Gander, Lewisporte and Grand Falls. A limited range of services are offered by the municipality and they are expected to maintain these services into the future but continued out-migration will limit the community's tax base. The 12km road to the ferry is a provincial responsibility and climate change may result in minor flooding along this important roadway.

The assessment of infrastructure development on community security illustrates the need once again to consider current local capacities. In Montreal Lake, recent trends in infrastructure development adversely impact community well-being. Change Islands' decision not to install municipal water and sewer is perhaps in retrospect a good one since the community does not have the capacity to manage such a system. In Edwardsburgh/Cardinal and Alert Bay the current status of infrastructure is more favourable and this provides a stronger foundation for coping with future uncertainties

including but not limited to climate change and yet concerns exist about protecting investments from climate change impacts.

Table 10: Societal Indicator 5 – Infrastructure (Transportation, Communication and Water and Sewer)

Communities	Current	Future Prospects	Global CC Impacts
Alert Bay	Good sewer and water, new facilities, high speed internet, degraded marine infrastructure	Plans for infrastructure enhancement	Anticipated expenses associated with extreme weather, erosion but also commitment to plan for reinvestment
Alert Bay	secure	secure	secure/vulnerable
Montreal Lake	New arena, water trucked in to many houses, high speed Internet, good access to main highways. Gravel roads often in poor conditions after heavy rains	New subdivision will require either an upgrade to the water treatment plant or a new booster station, community gaining control of highway maintenance contracts, dependence on external funding sources for capital projects	Increased precipitation may negatively affect gravel roads and therefore access to the community
Montreal Lake	vulnerable	vulnerable	vulnerable
Edwardsburgh/ Cardinal	New highway (416), easy access to urban areas, good communication (high-speed internet), limited water and sewer services in industrial park	Will continue much the same; Industrial park may get hooked up to full services if ethanol plant goes ahead	Increase in precipitation could cause more damage to roads but people can work more from home (with improved telecommunications)
Edwardsburgh/ Cardinal	SECURE	SECURE	secure
Change Islands	Roads and ferry service is good; no water and sewer, external funding dependency, diminishing tax base, no high-speed Internet	Trends continue but capacity to retain population will affect level of services	Small sections of road to the ferry may be impacted by sea level rise.
Change Islands	secure	vulnerable	vulnerable

6.0 Tracking Community Well-being: An Integrated Perspective

Sections 4 and 5 of this paper provided an assessment of how individual environmental and societal factors shape community vulnerability-security under current and future conditions with and without global climate change. This approach has provided detailed comparative assessments across the four communities at the level of individual indicators. This section builds on this analysis but it explicitly provides a comparative assessment at the community level³. That is, it employs the detailed information presented in Sections 4 and 5 and aggregates this information in order to highlight the overall vulnerability – security of the four communities. There is a clear separation among the four communities – Montreal Lake and Change Islands, in aggregate, are considerably more vulnerable than the other two communities. Edwardsburgh/Cardinal is the most secure and Alert Bay borders on being secure.

This community level comparative assessment is based upon addressing three questions:

1. To what extent are the four communities either vulnerable or secure?
2. To what extent are societal versus environmental factors supporting or contributing to the community's vulnerability-security?
3. To what extent might global climate change alter the future security of each community?

In Change Islands societal factors are clearly heightening vulnerability to a greater extent than environmental factors under current and future conditions (Table 11, Figure 5). In Montreal Lake the overall vulnerability is very similar to Change Islands but in this case the overall stress on the community is more evenly distributed across societal and environmental factors under current and future conditions but when climate change is factored in, environmental stresses become more prominent whereas in Change Islands climate change does not substantially alter the future situation.

Alert Bay's overall assessment reflects relatively more vulnerabilities across several environmental factors but these stresses are offset by the community's capacity to cope with and adapt to environmental stress. In the future, under scenarios where global climate change is and is not factored in the assessment, only minor declines in community well-being are anticipated.

Edwardsburgh/Cardinal presents a substantially different profile to the other three communities under current and future conditions. It is currently very secure which reflects both its high quality environmental resources and considerable human capacity to cope and adapt. Its future trajectory remains healthy but a decline in overall community

³ This comparative assessment of each community's overall vulnerability is based on assigning values ranging from -2 for substantially vulnerable (i.e., VULNERABLE) to +2 for fully secure (i.e., SECURE) for each environmental and societal indicator and then summing values across all ten indicators.

security is anticipated. This decline in overall well-being is related principally to anticipated societal changes including urban sprawl and conversion of forest, wetlands and agricultural lands. When global climate change is factored into an assessment of its future, the community's overall security is further eroded. This decline reflects further estimated increases in environmental stresses which could in turn place additional stress on the community's coping capacity.

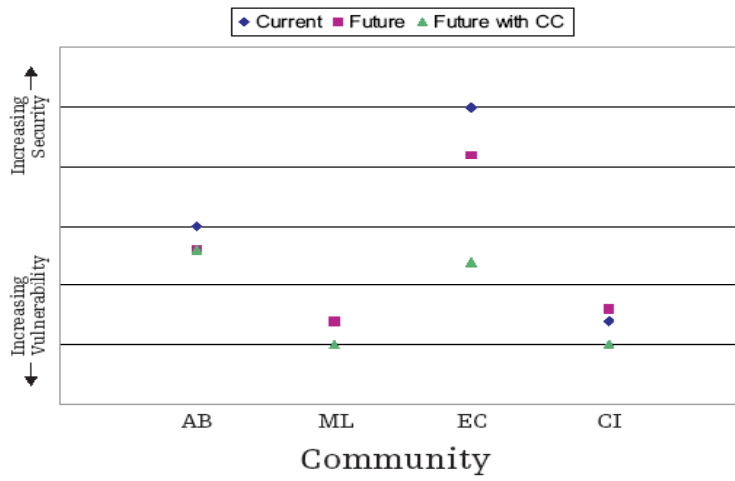
This assessment is careful to factor in climate change as one of several environmental and societal changes which might alter the future well-being of these four communities. For three of the communities (Alert Bay, Montreal Lake and Change Islands) global climate change is estimated to be a relatively minor factor when compared to other expected trend changes in environmental and societal factors. Only in Edwardsburgh/Cardinal is global climate change expected to substantially alter the future well-being of the community. For Change Islands and Montreal Lake, this reflects the relatively extreme environmental and societal stresses which currently heighten vulnerabilities and it is estimated these communities will not be able to reverse these trends in the future. For Alert Bay, it is expected that existing coping capacities are nearly sufficient to meet the challenges of global climate change. For Edwardsburgh/Cardinal, it appears global climate change when coupled with other trend changes will be to surpass their coping and adaptation capacity. Nevertheless, it is important to note that global climate change by itself is not expected to undermine overall security in Edwardsburgh/Cardinal.

Table 11: Overall Environmental and Societal Indicators

INDICATOR	AB			ML			E/C			CI		
	C	F	GC	C	F	GC	C	F	GC	C	F	GC
Environmental												
Water	S	s	s	v	v	v	s	s	s	s	s	v
Land	v	s/v	v	V	V	V	s	s	v	v	v	v
Climate	v	v	v	v	v	V	v	v	v	v	v	v
Aquatic	v	v	v	v	v	v	s	v	v	V	v	v
Terrestrial	v	v	v	s	s	s/v	s	s/v	v	s	s	s
Societal												
Social/cultural	s	s	s	v	v	v	s/v	s/v	s/v	v	v	v
Economic	v	v	v	V	V	V	S	s	v	V	V	V
Institution/political	s	s	s	s	s	s	s	s	s/v	V	V	V
Human	s/v	s/v	s/v	v	v	v	S	S	s/v	V	V	V
Infrastructure	s	v	s/v	v	v	v	S	S	s	s	s	s/v

In sum, Montreal Lake and Change Islands communities are more vulnerable to future changes than either Alert Bay or Edwardsburgh/Cardinal. Current stresses in Montreal Lake and Change Islands are such that it will be difficult to develop the human capacity to anticipate and offset future stresses including climate change. Alert Bay and Edwardsburgh/Cardinal, although vulnerable to future change, these communities seem to have the capacity to cope with change and potentially include adaptation measures in their planning processes.

Figure 5: Overall Community Vulnerability-Security Assessment



7. Advancing Our Understanding: Summary and Opportunities

This project successfully engaged four diverse communities from across Canada in a dialogue on their capacity to adapt to uncertain futures. The diversity amongst these communities made it difficult to draw generalizations but the project did generate several key findings.

1. A community's overall vulnerability or security is determined by its exposure to environmental and societal stresses and its capacity to cope and/or adapt.

This project reinforced that it is not feasible to determine key vulnerabilities by examining a single stress in isolation. Communities are constantly being exposed to multiple stresses and furthermore, communities are also constantly adjusting to these stresses. Assessments of overall community well-being must be found upon a thorough understanding of exposure to stresses and capacity to cope with and/or adapt to these stresses.

2. The overall vulnerability of Canadian Rural Communities is highly variable.

Of the four communities considered in this study, Montreal Lake and Change Islands clearly have the least capacity to cope with and if necessary adapt to future challenges, including climate change. The current and future security of these communities is significantly influenced by the recent decline in several environmental and societal factors. This is in contrast to Alert Bay where strong leadership allows the community to better cope with and adjust to environmental stress. Edwardsburgh/Cardinal is currently the most secure of the four communities, reflecting a high quality environment and the township's capacity to adjust to a wide array of environmental and societal stresses.

3. The past has significant impact on the future well-being of rural communities.

The legacy of previous stresses on community leadership is difficult to eradicate and can impair community capacity to address future stresses and uncertainties. The recent reshaping of community demographics in Montreal Lake and Change Islands has reduced the capacity of these communities to cope with stress and to adapt when necessary. Reducing future vulnerability in these two communities hinges upon rebuilding human capacities as much as reducing environmental stresses. For Alert Bay and Edwardsburgh/Cardinal, there is substantial human capacity to respond to environmental stress and this provides a significant buffer against environmental and societal uncertainties over the short and medium term but there is a need to continually re-invest in human capacity.

4. Future climate change most often decreases community security but the magnitude of these impacts varies considerably.

Change Islands and Montreal Lake are already in a vulnerable state and climate change effectively reinforces conditions and this adds to existing challenges which impair potential for new development. For Edwardsburgh/Cardinal, the current coping capacity will be challenged by climate change and this preliminary assessment suggests Edwardsburgh/Cardinal may not have sufficient capacity to fully adjust to climate change. This highlights the need to reinvest in human capacity as well as reducing future environmental stresses.

5. Active participation of communities in climatic change research enhances community adaptive capacity

All four communities considered in this project were active partners in the development of the community background reports and subsequent workshops. This process does extend research timelines but the benefits are substantial. The background reports not only contributed to this project but also consolidated disparate information sources and thereby provided a context for the communities to explore future options and challenges. However, it is important to recognize that routine scientific products such as emission and climate change scenarios must be translated into information that resonates with the rural community, otherwise it becomes difficult to initiate and sustain dialogue. During this project, it became apparent that the four communities did not treat climate change separately from other stressors. This suggests that it is important to rethink the introduction of climate change scenarios when engaging communities in this type of project. In some cases the communities are continuing the dialogue stemming from this project and are actively seeking solutions to address future stresses and uncertainties. The exposure to recent climatic change information broadened the context for discussing future developments and, most importantly, to begin discussion of adaptation challenges within a broader development context.

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APPENDICES

Appendix 1

Community Background Reports – A Comparative Assessment of the Capacity of Canadian Rural Resource-based Communities to Adapt to Uncertain Futures

Vodden, Kelly (2006) Alert Bay Community Background Report, Ph.D. Candidate
Simon Fraser University and Assistant Professor of Geography Memorial University
(Fall 2007)

Lebel, Mathieu (2006) Montreal Lake Community Background Report, Master's
Candidate University of Saskatchewan

Wilson, Emily (2006) Edwardsburgh/Cardinal Community Background Report, M.A.
Carleton University

Woodrow, Maureen (2007) Change Islands Community Background Report, Project
Coordinator, Carleton University

Appendix 2

Community Workshop Reports – A Comparative Assessment of the Capacity of Canadian Rural Resource-based Communities to Adapt to Uncertain Futures

Vodden, Kelly (2006) Summary Report Community Workshop Alert Bay – 3 Oct., 2006

Lebel, Mathieu (2006) Summary Report Community Workshop Montreal Lake – 18 Oct., 2006

Wilson, Emily (2006) Integrated Summary Report Community Workshops
Edwardsburgh/Cardinal – 26 April and 25 September 2006

Woodrow, Maureen (2007) Integrated Summary Community Workshops Change Islands
Report – 13 July and 30 August 2006

Appendix 3

Guiding Questions for Community Workshops

A. The Past as a Means to Understand the Current Context

1. What major changes have occurred within your community over the past 25-50 years and what prompted these changes?
2. How have these changes affected your community, especially overall community well-being?
3. How has your community coped with and if necessary adapted to these changes?
4. What strategies worked best in your community to deal with the changes and move ahead?

B. Looking to the Future

1. What are the prospects for your community over the next 25-50 years?
2. What are the long-term prospects for community well-being over the next 25-50 years?
3. How do you think your community will look in 25-50 years from now?
4. What are the barriers to the future development of your community?
5. What are the major planning initiatives and policies (local, provincial & federal) that will effect and influence the development of your community over the next 25-50 years

C. Community Development and Climate Sensitivities

1. Do you feel that climate has changed in your region over the past 25-50 years? If so, how?
2. Have these past climate changes impacted your community and how?
3. What aspects of your community's future development plans are/are not sensitive to future climate changes?

D. Future Scenarios and Community Development

Communities are dynamic and have been responding to multiple stressors, this is not new. We do not know future conditions with certainty so we will ask you to consider 3 possible futures. Please consider the following 4 scenarios for future development and climate change in your region and for each scenario, consider:

1. Would the scenario alter expected developments and overall community well-being in your community and how?
2. What aspects of the scenario would trigger the need to alter future development plans?
3. What barriers might hinder your community's capacity to adapt under this scenario?
4. What strategies would you employ to adapt to the future (either to reduce negative effects or capitalize on emerging opportunities?)