

Social Vulnerability and Adaptive Capacity to Climate Change Impacts:
Identifying Attributes in Two Remote Coastal Communities on Haida Gwaii,
British Columbia

by

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Abstract

This study investigates the contribution of including local stakeholders in the early stages of identifying local attributes of vulnerability, adaptive capacity and resiliency to climate change impacts. The research is specific to two remote coastal communities on Haida Gwaii (The Queen Charlotte Islands), British Columbia. It includes community feedback on research tools, as well as on local attributes of vulnerability and adaptive capacity. I employ multiple methods and a participatory approach for data collection. Using this approach I discovered that some of the attributes I originally believed contributed to vulnerability were perceived by participants as strengthening their community. Other attributes which I believed to be strengthening, were viewed by participants as contributing to vulnerability. This thesis illustrates how the use of multiple methods and a participatory approach contribute to greater knowledge and understanding, by both the researcher and the community, of local attributes of vulnerability and adaptive capacity to projected climate change impacts.

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1.0 Introduction

Future projections of climate change and accelerated sea-level rise (SLR) are of increasing global concern, especially for coastal communities. Climate change experts project that by the year 2100 there will be an increase in the frequency and magnitude of storm events, and an increase in the average earth surface temperature of 1.4 to 5.8°C accompanied by 9 to 88 cm of relative SLR depending on future emission scenarios (IPCC 2001, Shaw *et al.* 1998). While climate change is a global phenomenon, the extent to which these impacts manifest themselves in the physical environment will vary greatly by scale (e.g., global, national, regional) and region (e.g., coastal, tropical, desert).

Governments are now turning their attention to what these changes may mean for communities. While there is a need to investigate and work toward the mitigation of climate change, there is also a recognized need to prepare for future changes, both short term adaptations and long term adjustments (Smit *et al.* 1999, Smit and Pilifosova 2003, Lemmen and Warren 2004). Most social vulnerability assessments to date have been top down in their approach (e.g., Cutter *et al.* 2000, Wu *et al.* 2001) relying on previously existing aggregate level data or preconceived indicators based on scholarly literature. These approaches, however, do not recognize site-specific elements (e.g., culture) on community vulnerability and adaptive capacity.

This chapter introduces readers to the broader context of global and national initiatives that investigate climate change and accelerated sea-level rise impacts. It illustrates that climate change is a global phenomenon and situates

this research within a Canadian context. Lastly, this chapter highlights the purpose and objectives of this thesis.

1.1 International Action

Increasing concern about climate change has led to the formation of international agencies, organizations, and institutions that aim to better understand and minimize its impacts. At the global scale, the Intergovernmental Panel on Climate Change (IPCC) synthesizes current climate change research and makes recommendations accordingly. The IPCC was established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environmental Programme (UNEP) with a mandate to “assess...the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate changes, its potential impacts and options for adaptation and mitigation” (IPCC 1998: 1). Climate change, as defined by the United Nations Framework Convention on Climate Change (UNFCCC), is, “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods” (UNFCCC 2005, Article 1).

The IPCC has three working groups (WGI, II, and III): WGI focuses on climate change science, WGII focuses on assessing impacts, vulnerabilities and adaptation strategies, and WGIII focuses on mitigation. Together, these three working groups assess the current state of knowledge on climate change and produce technical papers and special reports that encompass science and social

science concerns (Carey and Mieremet 1992, McCarthy *et al.* 2001). To date, the IPCC has generated three major assessment reports published in 1990, 1995, and 2001. A fourth report will be released in 2007. Each report contains an update from the three working groups pertaining to their study area. The focus of this thesis research fits within the realm of WGII, as it is concerned with climate change impacts, adaptation and vulnerability.

The First Assessment Report of the IPCC in 1990 triggered the formation of the International Negotiating Committee (INC). From this committee, the UNFCCC was adopted at the United Nations head quarters in New York, May 9th 1992 (UNFCCC 2005). The UNFCCC was first opened for signing at the UN Conference on the Environment and Development, also known as 'The Earth Summit', in Rio de Janeiro, Brazil in 1992. Other agendas present at this conference were the Rio Declaration on Environment and Development, the Statement of Forest Principles and the United Nations Convention on Biological Diversity. The IPCC acts as an advisory board for assessing and reporting on the current state of knowledge on climate change research. The UNFCCC uses data produced by the IPCC and sets the intergovernmental framework for addressing global climate change issues (e.g., Clean Development Mechanism and the Kyoto Protocol) (UNFCCC 2005).

In 1997, 186 countries signed the Kyoto Protocol Treaty. This treaty was developed by the Conference of the Parties (COP), the highest decision making authority on the UNFCCC. The Kyoto Protocol is positioned as a more legally binding tool to mitigate green house gas emissions (e.g., The Clean Development Mechanism (CDM)) (UNFCCC 2002). While the IPCC and the UNFCCC set the

stage internationally, there are many national organizations that work to respond to IPCC and UNFCCC recommendations.

1.2 National Responses to Climate Change

At the national scale, in response to the work of the IPCC, the Government of Canada instituted the Climate Change Impacts and Adaptation Directorate (CCIAD)¹ in 1998. The CCIAD provides funding for impacts and adaptations research through the Climate Change Impacts and Adaptation Program (CCIAP)² managed by Natural Resources Canada. The goal of CCIAP is to increase knowledge of the risks and impacts of climate change and sea-level rise in Canada and to develop effective strategies for adaptation (Lemmen and Warren 2004). This program and resulting Directorate, CCIAD, emerged from the original Science, Impacts and Adaptation component of the Government of Canada's Climate Change Action Fund (CCAF), a fund originally created to help Canada in meeting their commitments to the Kyoto Protocol agreement in 1998.

The Geological Survey of Canada (GSC), under its 'Global Change Program' has released a series of reports that documented and assessed ongoing impacts of climate change on geological processes in Canada. Under this program, Shaw *et al.* (1998) released a national coastal 'sensitivity' assessment that was based on geophysical attributes, such as coastal geomorphology, shoreline erosion and accretion rates, coastal slope, relative sea

¹ Prior to 2004 the CCIAD was known as the Climate Change Action Fund (CCAF).

² CCIAP aims to understand Canada's vulnerability to climate change better and to build the capacity of Canadians to adapt to future changes by providing funding for research.

level rise, mean tidal range, and mean wave range. This 'sensitivity' assessment identified the coastline of north-eastern Graham Island, British Columbia, to be among the top 3% of most 'sensitive' coastlines in Canada to climate change and sea-level rise impacts (Shaw *et al.* 1998, Walker and Barrie in press). Other areas of Canada identified as 'highly sensitive' include the north shores of Prince Edward Island, New Brunswick and the Mackenzie River Delta region in the Northwest Territories. The coastline of NE Graham Island is identified as particularly sensitive due to a combination of current physical conditions (macro-tidal range, erodible sediments, frequent storm surges and an energetic wave climate), and ongoing rates of sea-level rise (Shaw *et al.* 1998). Currently, relative sea level is rising at a rate of 1.6 mm/yr, and sections of the coastline are eroding at a rate of 1-3 m/yr (Barrie and Conway 2002, Walker and Barrie in press). In addition, there is an observed increase in storminess in the region due to increasing climate variability effects in the NE Pacific (Abeyvirigunawardena and Walker, pers. com 2005).

The United States Geological Survey (USGS) has conducted studies using a similar approach. In a 'National Assessment of Coastal Vulnerability to Sea-Level Rise', Thieler and Hammar-Klose (1999, 2000) investigated six physical variables including geomorphology, coastal slope, rate of relative sea-level rise, shoreline erosion and accretion rates, mean tidal range and mean wave height, to assess coastal vulnerability. Based on the GSC method, this research uses environmental attributes to identify areas of 'vulnerability'. While such environmental studies provide insight as to the areas that may be highly sensitive

or vulnerable, they do not provide insight as to how these climate change impacts may affect the people within these regions or how such people may adapt.

The majority of climate change impact assessment studies to date have focused largely on attributes of the physical or ecological environment (e.g., Shaw *et al.* 1998, White 2001, White 2001, Dorner and Wong 2003). More recently, there has been a shift to a more integrated approach to assessing vulnerability that incorporates other social, economic, health, and political aspects of climate change impacts on communities which arise from the interdependent nature of human relations with the environment (Bell *et al.* 2001, Smit and Pilifosova 2003, Dolan and Walker in press). This integrated approach will be described further in Chapter 2 by reviewing related scholarship and presenting a conceptual framework. The remainder of this Chapter outlines the specific research context and the purpose and objectives of this thesis.

1.3 Research Context

The research for this thesis is part of a larger project funded by the CCIAP Coastal Zone Program (Project A580: Coastal Vulnerability to Climate Change and Sea-Level Rise, Graham Island, Haida Gwaii (The Queen Charlotte Islands) B.C.). This project is led by Dr. Ian J. Walker (University of Victoria Geography) and involves many researchers with experience in geomorphology, climate change, marine geology, and community research. These team members include University of Victoria graduate students and staff, as well as scientists from the Geological Survey of Canada (GSC). Project A580 aims to assess the vulnerability, both biophysical and socio-economic, of NE Graham Island to

climate change and sea-level rise impacts. From this assessment, the project will develop, with local communities, various short-term adjustment responses and longer-term adaptation strategies. This thesis focuses on identifying social elements of vulnerability and adaptive capacity to climate change impacts within the communities of Masset and Old Massett, Haida Gwaii. It does so by integrating community perceptions and experiences in the research, using a participatory approach. While Project A580 aims to assess overall vulnerability (environmental and social) to climate change and sea-level rise impacts on Haida Gwaii, this thesis identifies local attributes of vulnerability and adaptive capacity that will be used in the assessment by the larger research project.

1.4 Purpose and Objectives

The purpose of this thesis is to investigate, using a participatory approach, the site-specific and locally-relevant attributes of vulnerability and adaptive capacity that exist in the remote coastal communities of Masset and Old Massett, Haida Gwaii (The Queen Charlotte Islands), BC to projected climate change and accelerated sea-level rise impacts.

The thesis:

1. Reviews scholarly literature on hazards, famine, development, and climate change in order to define vulnerability and adaptive capacity as they could be applied to the study of remote coastal communities exposed to climate change and accelerated sea level rise.
2. Develops a participatory research approach using a case study of two communities (Masset and Old Massett, Haida Gwaii, British Columbia) so

as to identify locally-perceived characteristics of adaptive capacity and vulnerability.

3. Examines the role of community-level research to understand better site-specific characteristics of vulnerability and adaptive capacity.
4. Evaluates the utility of the participatory approach in the early stages of vulnerability assessments of coastal communities to climate change impacts.

2.0 Research Context and Literature Review

2.1 Introduction

This chapter has four main objectives. First, it reviews the concepts of vulnerability and adaptive capacity as they pertain to climate change research. Second, it examines the development of vulnerability assessments in various fields including natural hazards, famine, international development, and climate change research. Third, it introduces indicators that have been identified as determinants of vulnerability and adaptive capacity, which will be further discussed in Chapter 4. Fourth, it grounds this research in a participatory approach, offering a framework used in a previous adaptive capacity assessment, to identify local elements of vulnerability and adaptive capacity.

2.2 Defining Social Vulnerability and Adaptive Capacity

Social vulnerability, as defined for this thesis research, is considered to be a measure of human welfare that integrates social, economic, political, environmental and cultural exposures to harmful climate variability and change impacts, over both short- and long-term temporal scales (Handmer *et al.* 1999). Social vulnerability is measured by a community's exposure to risk (i.e., climate change-related events), their adaptive capacity (i.e., a measure of preparedness), and community sensitivity (i.e., the capacity to absorb and adjust to the hazard) (Adger 1999, 2003a).

Adaptive capacity can be defined as the ability of a system to adapt to climate changes (both immediate and long term) and cope with the consequences of climate change impacts (Verheyen 2002, Smit and Pilifosova 2003). Adaptation is a longer-term process of learning from and continually adjusting to changes that occur over time (most commonly associated with projected impacts of sea-level rise and increased temperatures), whereas short-term adjustments refer to the immediate responses to changes (most commonly associated with the increase in the frequency and magnitude of storm events) (Barnett 2001, Smit and Pilifosova 2003). Long-term adaptation requires planning for anticipated impacts by political bodies (e.g., municipalities and governments (Smit and Pilifosova 2003). For instance, increased local knowledge of projected storm events can foster greater community emergency planning (Dolan and Walker in press). Social measures of adaptive capacity include, but are not limited to, social cohesion, education, access to technology, and past experience with hazard events (Adger 1999, Tobin 1999, Kundzewicz 2002, Verheyen 2002, Smit and Pilifosova 2003).

Adaptive capacity can be strengthened through capacity building as manifested in educational programs, access to technology, and increasing communication and planning within a community as it works to reduce vulnerability (Tobin 1999, Smit and Pilifosova 2003). A focus on adaptive capacity is relatively new in climate change impacts assessment research (e.g., Mendis *et al.* 2003) and is increasingly recognized as important by scholars, as “enhancement of adaptive capacity represents a practical means of coping with

changes and uncertainties in climate, including variability and extremes” (Smit and Pilifosova 2003: 11).

Research on vulnerability can be characterized in three distinct ways. First, vulnerability can be determined by the potential exposure to a physical hazard (Handmer 2003). Second, vulnerability can be viewed as a social construct, whereby social, political and economic conditions (e.g., unequal distribution of wealth and power) contribute to vulnerability, rather than environmental conditions (e.g., floods, droughts) (Watts and Bohle 1993). Third, vulnerability can be viewed as an integrated concept that encompasses biophysical exposure to hazards and the social responses, constraints, and impacts of these events (Cutter *et al.* 2000). For example, famine is often the result of both socio-political processes (e.g., distribution of food) as well as physical processes (e.g., drought). This third approach uses elements from the first two in a more integrated way and gives the assessment process a geographical domain (e.g., community), allowing for site-specific assessments.

The first approach to vulnerability assessment characterizes vulnerability as the potential exposure to physical hazard and originates in natural hazards research. This view is based on the premise of ‘environmental determinism’, whereby humans are controlled by and dependent upon the surrounding physical environment (Burton *et al.* 1978). Vulnerability is thus considered to be the result of environmental factors influencing human activities (Handmer 2003). Early hazards research focused on case specific development, paying particular attention to the risks of particular environmental locations (e.g., flood plains, shorelines) and events (e.g., floods, droughts, earthquakes). More modern

natural hazards approaches often adopt a longer-term view of environmental conditions, considering potential adaptations to hazards and sustainable development practices, to avoid hazardous situations, as well as to decrease human impacts on the environment (Handmer 2003). An example of a vulnerability assessment that includes a longer-term view of environmental conditions, as well as adaptation strategies was conducted by McCulloch on Prince Edward Island (Shaw *et al.* 2001, McCulloch *et al.* 2002). This study will be elaborated on further in section 2.3

Another concept common to climate change research is that of 'resilience' (Folke *et al.* 2002, Smit and Pilifosova 2003). First coined by ecologist Holling (1973), resilience is defined as the natural capacity of an ecological system to buffer change (i.e., absorb impacts and recover from some pre-disturbed state) (Folke *et al.* 1996). This term has been adopted by climate change researchers in considering the capacity of an individual, community, state, or nation to buffer climate change impacts (e.g., Adger 1999, Klein and Nicholls 1999, Barnett 2001). This interpretation of vulnerability implies that enhancing human systems to cope with environmental changes will decrease vulnerability (Folke *et al.* 2002). As illustrated by Tobin (1999), sustainable and resilient communities are those that are more prepared to minimize the effects of, and recover quickly from, disaster. Thus, to increase local resiliency, there must be careful planning and organization for both immediate and long-term biophysical impacts, stemming from strong social networks within and between segments of society (Tobin 1999).

The second approach to defining vulnerability examines personal and community-level social attributes that may result in increased susceptibility to external impacts. As such, vulnerability is largely socially-constructed and influenced by factors such as income, education and access to resources (Clark *et al.* 1998, Morrow 1999, Kundzewicz 2002, Yohe and Tol 2002). This approach was pioneered in famine and international development research with the primary goal of identifying underlying processes that create social inequities. This view of social vulnerability generally equates vulnerability with the notion of poverty (Watts and Bohle 1993, Shepherd 2001, Downing 2003). Where international development research often examines underlying global power structures that create poverty, famine research often examines national or regional scale institutions that affect access to resources (Watts and Bohle 1993, Lorenzoni *et al.* 2000b, Holzmann 2001, Hubbard 2001, Shepherd 2001, Downing 2003, Smit and Pilifosova 2003).

In their comparative study of south Asia and sub-Saharan Africa, Watts and Bohle (1993) investigate the causal structure of vulnerability, hunger and famine. Their report identifies vulnerability as a result of lack of entitlement (i.e., economic capability), lack of empowerment (class structure), and unequal distribution of resources. Their example emphasizes the need to consider how socio-political processes contribute to social vulnerability at various scales (i.e., individual, community, region or nation-state), to stressors, both environmental (e.g., drought) and social (e.g., fluctuations in growth in the economy).

Recognizing vulnerability as a social construct emphasizes the importance of social, economic, cultural, and political pressures at the local, regional,

national, and global scales that are not directly and solely linked to biophysical impacts of climate change. However, identifying vulnerability as the sole product of social attributes, while ignoring environmental exposures and processes, overlooks the contributions of physical environmental agents and processes. These environmental factors however, are particularly important in an integrated investigation of climate change and sea-level rise impacts in the coastal zone.

More recently, social and environmental views of vulnerability have been combined into a more integrated definition that encompasses biophysical exposure, as well as social susceptibilities that make individuals and communities more or less vulnerable to climate change impacts. This more integrated third approach is known as the 'vulnerability of place' and has emerged in more recent natural hazards research (e.g., Cutter 1996, Wisner 1998, Cutter *et al.* 2000, Handmer 2003), development literature (e.g., Bond *et al.* 2001, Holzmann 2001, Smit and Pilifosova 2003), famine research (e.g., Watts and Bohle 1993, Downing 2003) and climate change impacts literature (Clark *et al.* 1998, Sutherst 1998, Adger 2001, Barnett 2001, McCarthy *et al.* 2001, Dolan and Walker in press). Integrated assessment models (IAM), integrated impact assessment (IIA), and integrated appraisal (IA) take a similar integrated approach (Bond *et al.* 2001).

An example of an integrated framework is illustrated by Cutter *et al.* (2000) in their vulnerability mapping of Georgetown County, South Carolina. The authors produce two multi-variate maps; one generated by overlaying risks of flooding, hurricanes, storm surge and wind zone, and earthquakes; the other with social indicators of vulnerability, including age (number of people under age 18

and over age 65), income levels (mean house value and number of mobile homes), gender (number of females), race and ethnicity (number of non-white residents), population distribution and density (number of total house units), and reliance on infrastructure (building quality and public infrastructure)³. These two maps are then overlaid to produce a final vulnerability map that illustrates a scale from low to high. This application of an integrated framework creates a broader view of local vulnerability in Georgetown County than would a purely biophysical or social assessment. Integrated vulnerability assessments of climate change impacts therefore aim to identify the people and places at risk to plan for long-term adaptation strategies. Such vulnerability assessments are often grounded in, or have taken variations on, the integrated assessment framework of the IPCC, known as the 'Common Methodology' (IPCC 1992). This methodology and other frameworks will be explored in the following section to illustrate how this thesis research fits into the broader context of climate change research.

2.3 Methodologies and Frameworks for Integrated Assessments

As stated in the introduction of this thesis, the IPCC is an intergovernmental body that largely sets the stage for climate change research by reviewing current research and scholarship. The Common Methodology provides researchers with flexible guidelines for conducting climate change impacts assessment research in an integrated manner. The seven steps of the methodology specific to coastal areas as outlined by Nicholls (1994) are:

³ These social indicators of vulnerability will be further investigated in Section 2.3 of this chapter.

1. Delineation of case study area and specification of accelerated sea-level rise and climate change
2. Delineation of natural and socio-economic system data
3. Identification of relevant development factors
4. Assessment of physical changes and natural system responses
5. Formulation of response strategies (i.e., for short term impacts)
6. Assessing vulnerability and interpretation of results
7. Identification of needs and actions (i.e., for long term adaptation strategies).

In assessing vulnerability to climate change and accelerated sea-level rise impacts, this methodology encourages proactive consideration of adaptation options. A key contribution of this thesis research is the inclusion of community perspectives (Chapter 5) in identifying the site-specific elements of vulnerability and adaptive capacity of the socio-economic system.

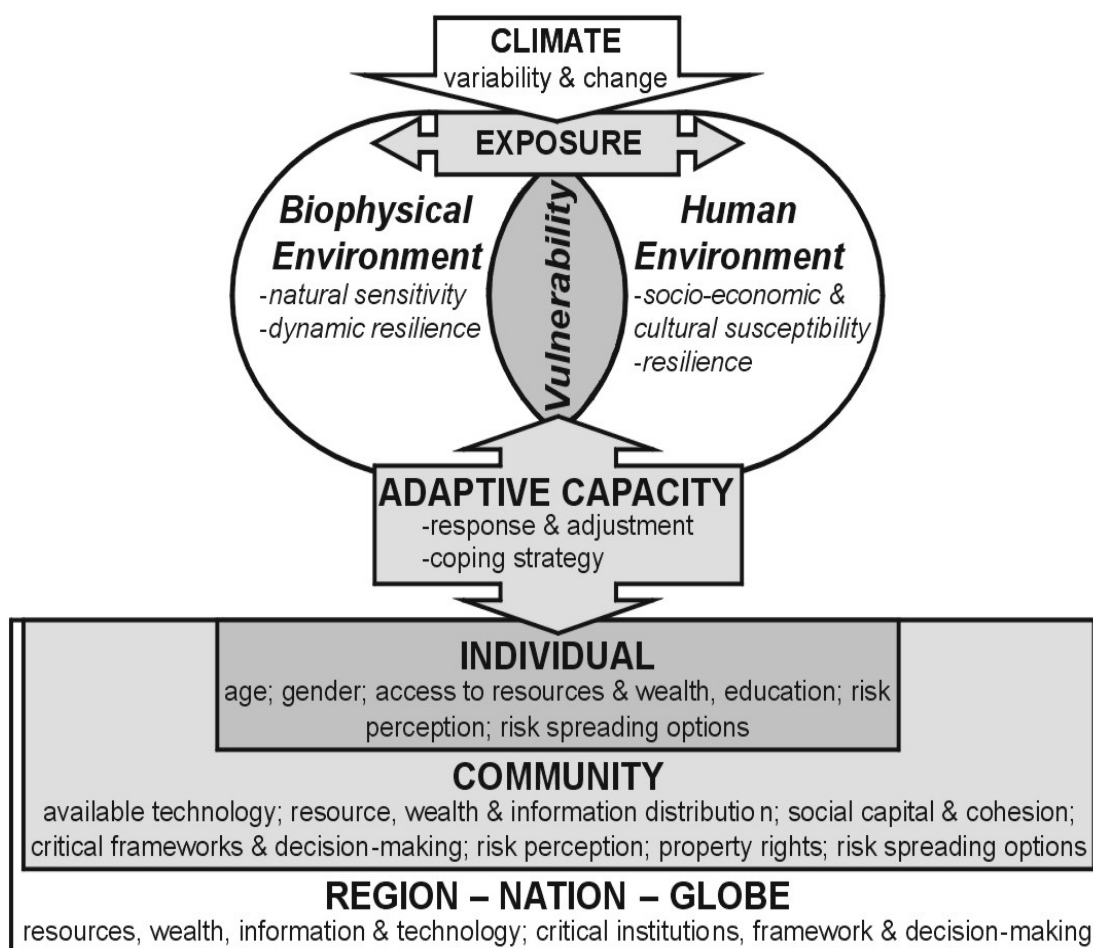
Some climate change researchers argue that the Common Methodology lacks precise definitions and methods for assessments (e.g., Adger 1999, Yamada *et al.* 1995, Dolan and Walker in press). This is due to its broad reach, which makes it difficult to compare results across studies. However, the intent of the methodology is to provide guidelines, rather than a specific framework, to create the potential for high flexibility in its application (Nicholls 1995).

To overcome this, various researchers have generated frameworks that provide greater detail using components of the Common Methodology (e.g., Cutter *et al.* 2000, Dolan and Walker in press). One example of an integrated vulnerability assessment framework is that produced by Dolan and Walker (in

press) (Figure 2.1). This framework acknowledges the various scales (individual, community, regional, national, and global) of an integrated vulnerability assessment. It also illustrates that while exposure to climate variability and change may increase local vulnerability, enhancing social adaptive capacity work to decrease vulnerability. This framework also recognizes the inherent linkages between the human and biophysical environment.

This research study focuses on the community scale as identified in Dolan and Walker's (in press) framework. The issue of scale in climate change assessment research is important in the investigation of projected climate change and sea-level rise impacts. Impacts are forecasted over decades and large spatial scales, whereas adaptations and adjustments are generally in response to short-term climate variability events, rather than longer-term climate change impacts (Smit and Pilifosova 2003). Short-term impacts are most commonly associated with the increase in frequency and magnitude of extreme events (e.g., droughts, floods, storms) and generally call for immediate responses and adjustments (e.g., emergency evacuation, rebuilding of highways), whereas longer-term impacts (e.g., sea-level rise and temperature increases) require planning and adaptation strategies on a longer-time horizon (i.e., decades to centuries) (Smit and Pilifosova 2003).

Figure 2.1. Integrated assessment framework for assessing vulnerability to climate change and accelerated sea-level rise impacts (Dolan and Walker in press).



Dolan and Walker's framework (in press) complements current scholarship as it recognizes the importance of investigating and building adaptive capacity through identifying response and adjustment options (e.g., Basher 1999, Burton *et al.* 2002, Smit and Pilifosova 2004). Both researchers and policy makers recognize that adaptation to climate change and accelerated sea-level rise can be anticipatory or reactive (i.e., planned or autonomous) (Tol *et al.* 1998, Klein *et al.* 1999, Smit *et al.* 1999, Verheyen 2002). To date, the common approach to disaster response has been post-event damage assessment, as opposed to

anticipatory studies designed to identify vulnerabilities to hazards and to develop the means of improving response and community coping mechanisms of communities prior to risk exposure (Jones 2001, Smit and Pilifosova 2003). In light of this, Comfort *et al.* (1999) suggest that policy makers should be more proactive in planning, educating, and informing communities, thereby promoting capacity building, rather than being responsive in providing financial assistance after disaster. This process of prior assessment of damage potential and identification and building of adaptive capacity is increasingly recognized as important (Kelly and Adger 2002, Smit and Pilifosova 2003, Dolan and Walker in press). Vulnerability assessment studies that have been completed prior to climate change impacts are illustrated in this section (e.g., McCulloch *et al.* 2001) and in section 2.3 (e.g., Mendis *et al.* 2003).

In addition to emphasizing adaptive capacity there has been an increased emphasis on the need to conduct site-specific research that identifies and incorporates local elements of vulnerability and adaptive capacity. An example of a site-specific impacts assessment is CCAF Project A041, based in Charlottetown, Prince Edward Island (Shaw *et al.* 2001). This integrated study takes a top-down, quantitative, scenario-based impact assessment approach and compares socio-economic impacts of best- versus worst-case future scenarios of coastal flooding and erosion. The PEI study used three flooding scenarios to assess the physical and socio-economic impacts of climate change and sea-level rise on PEI (McCulloch *et al.* 2002). The indicators used to assess the socioeconomic impacts are discussed in section 2.3 of this chapter. Scenario-based research is commonly used for future predictions of flood risk (e.g., Cutter

et al. 2000, Tapsell *et al.* 2002, and Wu *et al.* 2002). A benefit of scenario-based impact assessment research is that it can compartmentalize the uncertainty of climate change impacts into various scenarios (e.g., best case, worst case), allowing researchers to investigate various potential outcomes.

Uncertainty is defined by Barnett (2001: 981) as “imperfect knowledge of an event’s probability, magnitude, timing and location”. This uncertainty is recognized by the IPCC as a major limitation of climate change research because of the following: the broad range of impact projections (e.g., 1.4 to 5.8°C and 9 to 88 cm of sea-level rise by 2100) (IPCC 2001, Shaw *et al.* 1998), the global scale of projected impacts, and the long-term time frame (e.g., 2100) of projected environmental changes. As researchers project numerous impacts of climate change, the extent to which these impacts will be experienced in the socio-economic environment will vary over time and space (Handmer 1999, Barnett 2001, Rotmans and Van Asselt 2001). While future impacts of climate change will vary greatly between regions, there is a need to identify how society may adapt to these projected environmental changes.

2.4 Identifying Social Vulnerability

Many contributions have been made in identifying attributes that can be used to assess social vulnerability to climate change impacts. Some of the indicators and attributes of vulnerability identified through this review that are particularly relevant in this thesis research are illustrated in Table 2.1. While some of these attributes have been applied directly in assessments, others have

Table 2.1. Attributes of vulnerability derived from existing scholarship.

Category	Attribute	Relation to Vulnerability	Source(s)
Geographic	Location	Isolation and remoteness can present challenges of transportation and communication, in emergency situation	Armstrong and Read 2002, Dolan and Walker in press
	Geophysical sensitivity	Can increase rates of erosion and accretion	Shaw <i>et al.</i> 2001
	Exposure	Can increase proneness to flooding, erosion, and storminess	Burton <i>et al.</i> 1978, Barnett 2001, Sidle <i>et al.</i> 2004
Social	Experience	Experience can strengthen preparedness	Dolan and Walker in press
	Population size and stability	Small population may create economic disadvantages; high population density may increase difficulty in evacuation	Townsend <i>et al.</i> 1988, Cutter <i>et al.</i> 2000, Tapsell <i>et al.</i> 2002, Wu <i>et al.</i> 2002
	Education	A determinant of income that can increase the ability to adjust to economic changes; fosters greater awareness of hazards	Tobin 1999, Holman and Nicol 2004
	Health	Limited access to health care facilities; potential impacts to health care centers; current state of health	Wisner 1998, Shaw <i>et al.</i> 2001, Leichenko and O'Brien 2002, Tapsell <i>et al.</i> 2002
	Social relations	Large families may be difficult to track in emergency situations; strong social ties may strengthen community support; the ability of people to work together	Watts and Bohle 1993, Bohle <i>et al.</i> 1994, Clark <i>et al.</i> 1998
	Access to services	Greater distance to emergency services may increase vulnerability	Clark <i>et al.</i> 1998, Wisner 1998
	Culture	Strength of the local culture; human interactions with the environment	Yamada <i>et al.</i> 1995, Magistro and Roncoli 2001
Economic	Employment and income	Greater income allows spending on prevention planning; poverty is directly related to vulnerability	Clark <i>et al.</i> 1998, Wisner 1998, King 2001, Tapsell <i>et al.</i> 2002, Kundzewicz 2002, Yohe and Tol 2002
	Livelihood dependency	Dependence on natural resources can increase vulnerability; supply and demand and the international level	Barnett 2003, Dolan and Walker in press
	Economic development	Economic base for employment increases income levels; growing economic sector can strengthen adaptation options	Lorenzoni <i>et al.</i> 2000a, Barnett 2003, Sidle <i>et al.</i> 2004
Political	Institutions and infrastructure	The level of decision and communication; infrastructure available for decision makers	Yamada <i>et al.</i> 1995, Adger 2003a, Barnett 2003, Smit and Pilifosova 2003,
	Planning	Strong emergency planning can increase adaptive capacity to potential impacts	Tapsell <i>et al.</i> 2002, Sidle <i>et al.</i> 2004

been only proposed as important components of climate change vulnerability assessment frameworks.

Table 2.1 presents attributes of vulnerability that will be explored and elaborated upon in Chapter 4 of this study to illustrate their applicability to the case study communities. There are however, many studies that have previously applied some of the above attributes. These include, but are not limited to, the integrated vulnerability assessments conducted by Cutter *et al.* (2000), Lorenzoni *et al.* (2000a, 2000b), Shaw *et al.* (2001), Wu *et al.* (2002), and Mendis *et al.* (2003).

As indicated in Section 2.1, Cutter *et al.* (2000) conducted a vulnerability assessment study of Georgetown County, South Carolina, to produce a social vulnerability map using numerous indicators of vulnerability from the academic literature. The variables used for assessment and the rationale for their use is illustrated in Table 2.2.

The variables identified in the centre column of Table 2.2 were mapped using U.S. Census block statistics (1990), on a scale of 0 to 1, relative to each other. Results from all variables were then illustrated on one map with the use of Geographic Information Systems (GIS). A similar map of the biophysical attributes was also produced. The two maps were overlaid to illustrate a vulnerability of place map on a scale of 1 to 5. This map provides community members and planners with a tool that identifies vulnerable areas based on these elements.

Table 2.2. Indicators used in an integrated vulnerability assessment of Georgetown County, South Carolina (Cutter *et al.* 2000).

Characteristic	Variables that Contribute to Vulnerability	Use as an Indicator
Population and structure	Total population Total housing units	Higher population density increases difficulty in emergency evacuation
Wealth or Poverty	Mean house value	The poor lack resources, generally live in low quality housing, and are unable to recover quickly
Differential access to resources/greater susceptibility to hazards due to physical weakness	Number of Females Number of Non-white residents Number of people under age 18 Number of people over age 65	Female and Non-whites lack of access to resources and different exposures increase their vulnerability The young and the elderly can increase vulnerability because they can be more difficult (e.g., to move) in emergency evacuation.
Level of physical or structural vulnerability	Number of mobile homes	Poorer quality housing increases vulnerability

In a vulnerability assessment of coastal communities to sea-level rise impacts, Wu *et al.* (2002) take a similar approach to Cutter *et al.* (2002) and examine flood risk in coastal areas with social indicators of vulnerability in Cape May County, New Jersey. Adding to those in Table 2.2, the authors investigate the number of female-headed, single-parent households and the number of renter-occupied housing units, with the assumption that these would also contribute to greater social vulnerability (Wu *et al.* 2002).

These vulnerability assessments by Cutter *et al.* (2002) and Wu *et al.* (2002) are top-down in their approach. Top-down vulnerability assessments such as these often rely on the use of pre-existing, aggregate level data from the national census (e.g., U.S. Census). This can be problematic given issues of scale and data decay. Data decay can occur when using older data as there may have been major changes in the socio-economic situation between the time data

were last collected and the time that data are being used. Other issues that can arise with the use of previously collected data are the relevance and weighting of indicators, and the selection of indicators based on available data (King 2001). For instance, for confidentiality reasons, data available through Statistics Canada or the U.S. Census is aggregated to a point where the data do not allow identification at the individual level (King 2001). The use of aggregate data, although easier and generally less timely and costly, leaves individual vulnerabilities out of community assessments and plans (Adger 1999, Jones 2001, Adger *et al.* 2003, Wood 2003). Identifying linkages at the individual or household level can allow researchers to gain a better understanding of localized vulnerabilities within communities and regions.

The socio-economic assessment portion of the PEI study (mentioned in section 2.2), similar to the flood mapping by Wu *et al.* (2002), mapped projected environmental vulnerability using three flooding scenarios (Shaw *et al.* 2001). Social vulnerability in this study was measured largely in terms of economic losses or damages associated with environmental exposure (e.g., flood impacts). The socioeconomic indicators used for the assessment in the Charlottetown portion of the study are illustrated in Table 2.3.

These indicators were evaluated in terms of the economic costs of each measure associated with projected sea-level rise impacts (e.g., erosion causing property loss, flood damage). A benefit of socio-economic assessments is that researchers and communities gain perspective on the areas that may bear the greatest cost of impacts. Resulting maps provide a meaningful geospatial context for considering adaptation measures, the second goal of their project.

While this study is site-specific, the indicators used for the assessment are commonly used and accepted as indicators in vulnerability assessments. Another benefit of this study was that it is easily replicable in other communities, providing researchers with a common framework to compare multiple communities. While McCulloch *et al.*'s (2002) research included community input on property value, most top-down approaches, like those applied by Cutter *et al.* (2000), and Wu *et al.* (2002), leave community perspectives on local strengths and vulnerabilities (e.g., culture, emergency planning) out of the assessment process.

Table 2.3 Indicators of socio-economic vulnerability used by CCAF Project A041 (McCulloch *et al.* 2002).

Indicator	Socioeconomic Measure (\$ Value of)
Property	Residential properties and structure Commercial properties Publicly owned properties and facilities
Historical and heritage resources	Tourism values Heritage amenities Recreational values
Coastal infrastructure	Municipal infrastructure – storm and sanitary, sewer, water systems Coastal infrastructure – wharves, etc. Other infrastructure amenities
Health, education and employment	Education facilities Health-related facilities Employment costs to society

Overall, integrated approaches have become more common for vulnerability assessments in climate change research (e.g., Tobin 1999, Bond *et al.* 2001, McCulloch *et al.* 2002). However, most vulnerability assessments to date are top-down in their approach (e.g., Clark *et al.* 1998, Harvey *et al.* 1999, Cutter *et al.* 2000, McCulloch *et al.* 2002, Wu *et al.* 2002), whereby outsiders

enter a community with a list of indicators for assessment, without involving communities in the early stages of the process (e.g., project planning, and defining of indicators). What these and other top-down studies lack is the inclusion of local perspectives on attributes of vulnerability and adaptive capacity. Additionally, local experiences with and knowledge of the surrounding environment can offer valuable insight to outside researchers (Pitcher 2001). Increasingly scholars emphasize the importance of investigating how studies identify the indicators used for social vulnerability assessments (Hudson 1980, Folke *et al.* 1996, Wisner 1998, Barker 2001, Dolan and Walker in press). More specifically, local stakeholders need to be part of the process in the identification of indicators and/or attributes to be assessed, as the inclusion of local stakeholders increases the relevance of the research results, potentially aiding adaptation, and improving communications between communities and researchers (e.g., Mendis *et al.* 2003). A true bottom-up, participatory approach to community-based research and planning comes from within the community. However, in practice, more often than not, planning initiatives are driven by outsiders (Smith 1999, Handmer *et al.* 1999).

2.5 Local Participation in Social Vulnerability Assessments

Limitations in social vulnerability assessments have been the focus of discussion at various conferences, workshops, and in scholarly literature on climate change and accelerated sea-level rise impacts. These include, but are not limited to, Oregon's Coastal Natural Hazards Policy Working Group (1994) recommendations, Hughes (2003), "Climate change and Australia: Trends,

Projections and Impacts” paper, and Parlee (2004) CCIARN Coastal Zone Workshop report. Today, one of the tasks for researchers, planners and decision makers is to design and apply a framework for assessment that addresses local concerns and site-specific elements and applies them in practice.

Although the term ‘stakeholder’ is contested in academic literature (e.g., Gubrium and Holstein 2002), it is often applied to experts, prominent community members, and/or any person or group affected by the issue at hand (Mitchell *et al.* 1997, Sixsmith *et al.* 2003). The general view of bottom-up approaches is that greater stakeholder involvement can contribute to more locally-relevant vulnerability assessments that identify local strengths and weaknesses within communities, rather than making assumptions about such attributes. The need for greater stakeholder involvement may be especially important when researching with diverse ethnic groups, as there may be economic disadvantages, cultural isolation, and/or political under-representation that would otherwise exclude these groups (Committee on Native American Child Health and Committee on Community Health Services 2004). Often important site-specific knowledge about the local environment or society may be overlooked if not addressed by incorporating local people into the process (Adger 1999, Adger *et al.* 2003, Kates and Parris 2003, Wood 2003). The terms ‘local ecological knowledge’ (LEK) and ‘traditional ecological knowledge’ (TEK) are often used when local knowledge is used to contribute to a greater understanding of the surrounding environment (e.g., Pitcher 2001); however, the more general term ‘local knowledge’ is common to any research that values local input and knowledge (e.g., Riedlinger and Berkes 2000, Berman and Kofinas 2004,

Committee on Native American Child Health and Committee on Community Health Services 2004).

Through greater participation, not only will the research be strengthened but the sharing of climate change information can also strengthen social capital, adaptive capacity and the resiliency of communities to future climate change impacts (Klein 1999, Magistro and Roncoli 2001, Smit and Pilifosova 2003, Adger 2003a). While definitions of social capital vary, the term is applied here as a measure of the bonding relations within a community, thereby emphasizing issues of trust, reciprocity, and exchange (Adger 2003b). These attributes can positively influence community cohesion and planning, and thus, can work to enhance resiliency. It is argued that participatory planning can yield better information with greater community linkages, input, and support because communities know what local response mechanisms exist and what could be strengthened to increase local adaptive capacity (Klein 1999, Adger 2001, Magistro and Roncoli 2001). Consequently, a community-based approach to research and planning, including contributions from different stakeholders, can strengthen support from local communities and yield qualitatively rich data (Garwick and Auger 2003, Adger 1999).

Some researchers argue that the results of participatory research are not necessarily representative of the greater community because even within communities there are often various perspectives that may or may not be represented (Bradshaw 2003). Additionally, there is an assumption that stakeholder involvement will yield solutions that are more environmentally sustainable for future generations due to their desire to preserve their local area.

Decisions made by local stakeholders, however, may also reflect other values such as economic growth (Bradshaw 2003). Other disadvantages with the inclusion of stakeholders in assessment processes include increased time and costs added to the research. Such barriers of time and cost are evident in the current Land Use Planning Process (LUPP) ongoing in Haida Gwaii. This process involves a diverse group of stakeholders, Haida and non-Haida, from various interest groups such as industry (e.g., loggers and fishers), ecologists, historians, community planners, local government, and medicinal plant users and has taken longer than the original deadline, which aimed for completion in the fall of 2004, as set by the provincial government.

The need and opportunity for greater community participation in climate change and sea-level rise impacts assessment research is not new. In many fields of academia (e.g., economics, geography, sociology, and archeology) researchers have been practicing various degrees of participatory research (Smith 2002). In hazards research, Arnstein's Ladder of Citizen Participation is often used to describe the varying degrees of participation (Mitchell *et al.* 1997) (Table 2.4).

Arnstein's Ladder illustrates various degrees of citizen participation, from non-participation (first rung) to complete control by citizens (eighth rung). As one of the key aims of this thesis is to be participatory, Arnstein's ladder was used to situate the degree of participation in this research. This research aligns closely with the 6th rung on the ladder (Partnership), whereby community participation was sought and taken into consideration throughout this thesis research in identifying site-specific indicators of social vulnerability and adaptive capacity.

While final decisions on the research design and approach remained in the hands of the research team, community feedback was continually incorporated with the research and at times took precedence over the research desires (e.g., omitting potentially sensitive questions from the survey, changing the structure of questions). Stakeholder participation has become a methodological approach that now guides many researchers. The following section (Section 2.5.1) will discuss further the use of participatory methodologies.

Table 2.4. Arnstein’s ladder of citizen participation (Arnstein 1969, in Mitchell *et al.* 1997).

Rungs on the ladder of citizen participation	Nature of involvement	Degree of power sharing
1. Manipulation	Rubberstamp committees	Non-participation
2. Therapy	Power holder educate or Cure citizens	
3. Informing	Citizens' rights and options are identified	Degrees of tokenism
4. Consultation	Citizens are heard but not necessarily heeded	
5. Placation	Advice is received from citizens but not acted upon	
6. Partnership	Trade-offs are negotiated	Degrees of citizen power
7. Delegated power	Citizens are given management power for selected or all parts of programmes	
8. Citizen control		

2.5.1 Methodologies for Greater Local Participation

Participatory Action Research (PAR) or Action Research (AR) is a common methodology for participatory research that involves local community stakeholders. Such research is conducted in a way that respects and

incorporates local knowledge, as it fosters listening to the needs of the community (Garwick and Auger 2003). PAR can be considered a methodology that can be used to guide community-based research. It is a comprehensive and flexible approach, as it can be applied to any community and can encompass diverse research topics. This thesis research borrows many elements and ideas from the PAR methodology (e.g., participatory research tools).

True PAR gives equal emphasis to both research and action (Roberts and Dick 2003). For instance, local stakeholders are involved in the research process and the development of the research questions. The degree to which their ideas and opinions become part of the research, however, depends on the level of participation (Parkes and Panelli 2001, Garwick and Auger 2003, Wiber *et al.* 2004). For example, community members can be considered as research subjects, assistants, or partners (Wiber *et al.* 2004). For this research, stakeholders were consulted on the research methods; however they were not involved in the initial planning of the research questions and methods.

PAR emphasizes building collaborative relationships with the community, designing the research with the community in mind (e.g., funding requirements and culturally specific context), and keeping the community informed throughout the research process (Garwick and Auger 2003). For instance, community members should be included in identifying the research problem, designing the research questions and methods, analyzing research results, and disseminating the results (McGlashan and Williams 2003, Wiber *et al.* 2004, Committee on Native American Child Health and the Committee on Community Health Services 2004).

Frameworks that apply participatory research vary greatly depending on the degree of participation desired and the methods used (e.g., Mendis *et al.* 2003, Metzler *et al.* 2003, and Morford *et al.* 2004). The approach used for this research applies various qualitative methods (Chapter 3) suggested in PAR methodologies that include community perspectives. The following section (Section 2.4.2) will highlight a framework used to increase local participation by Mendis *et al.* (2003). While this thesis research is part of a larger research project, there were inherent limitations that will be discussed in Chapter 6. However, within the bounds of the larger project, this research sought to be as participatory as possible in exploring key themes and attributes that may contribute to local vulnerability and adaptive capacity.

2.5.2 A 'Normative' Framework for Participatory Research

Participatory research makes high demands of both the community and the researchers, as there is more focus on increasing research capacity and empowering participants (Morford *et al.* 2004). The most effective means of participatory research include the involvement of community members from the onset of the research, aiming for a balance between the needs of scientific researchers and those of the community, lengthy partnerships, and shared decision making (Rotmans and Van Asselt 2001, Garwick and Auger 2003, Metzler *et al.* 2003, Morford *et al.* 2004).

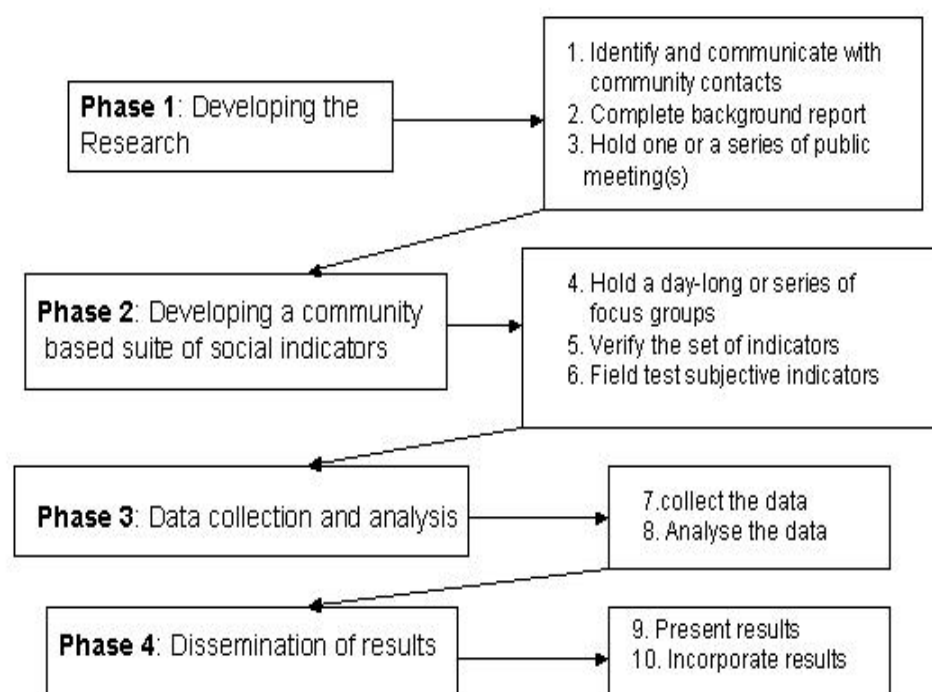
There is no single framework for conducting participatory research, its use as a methodology has been widely accepted and applied (e.g., Clark and Stein

2001, Parkes and Panelli 2001). Mendis *et al.* (2003) provide excellent and feasible guidelines for conducting a community-based adaptive capacity assessment of forestry-based communities to climate change impacts (Figure 2.2). This framework focuses on identifying adaptive capacity rather than vulnerability and emphasizes the need to focus on capacity building similar to the views of Basher (1999), Burton *et al.* (2002), and Smit and Pilifosova (2004).

Mendis *et al.* (2003) recommend that the research process begin with public meeting(s) as an opportunity for community members to obtain information and provide feedback on the research goals, shape the research definitions, identify potential stakeholders, and discuss data collection (Mendis *et al.* 2003). While the authors suggest a public meeting for gathering this information, other means identified by scholars are: information leafleting, use of media, displays, exhibitions, telephone hotlines, open houses, personal contact, group presentations and public inquiries (Wood 2003). While my research borrows ideas from Mendis *et al.* (2003), it does not follow their exact format (section 6.4.2.1)

Mendis *et al.* (2003) suggest hosting a day-long workshop or series of focus groups to develop a community-based suite of social indicators. The authors then suggest that these indicators be field tested. Means of identifying and evaluating these indicators may include: questionnaires, surveys, interviews, meeting with community liaison staff or community advisory committees and workshops (Wood 2003).

Figure 2.2. A framework for adaptive capacity assessment (adapted from Mendis *et al.* (2003)).



This framework also recommends that adaptive capacity or vulnerability assessment studies incorporate a follow-up phase that would involve presenting the results of the participatory research to the community, to elicit their feedback and incorporating such results into future planning for adaptation strategies. For adaptive capacity or vulnerability assessment studies, it is this phase of the research where the true value and importance of the study may generate positive

impacts on communities through fostering greater awareness and increased understanding of the impacts (Cornwall and Jewkes 1995, Parkes and Panelli 2001, Mendis *et al.* 2003). Ideally, increasing awareness and understanding may serve to increase adaptive capacity as community members learn more about potential consequences and may choose to take actions that would help them better prepare for future changes, such as climate change.

2.6 Identification of Research Opportunity

This review of literature has illustrated that vulnerability and adaptive capacity assessments have undergone an evolution towards greater integration by incorporating both environmental and social considerations into the assessment process in the context of climate change. From this, an increased awareness is emerging that, while climate change is a global phenomenon, its impacts will be experienced at the local scale, both on the landscape and in the lived experiences of people. Thus, the movement in recent research is toward increased involvement of communities in the research process, so as to incorporate local knowledge and develop locally-relevant adjustment and adaptation strategies to short-term variability and longer-term environmental changes. While other research areas such as resource geography have recognized the contribution of stakeholders to research (e.g., Bradshaw and Stratford 2000), it is more recently that climate change researchers are acknowledging the potential contributions that can be made by local stakeholders (e.g., Smit *et al.* 1999 and Mendis *et al.* 2003).

The purpose of an impacts assessment is to assess the state of something (e.g., community vulnerability) according to a set of established criteria (i.e., indicators). Research, on the other hand, implies synthesizing available knowledge to support decisions (Parson *et al.* 2003). This thesis research does not intend to produce a vulnerability or adaptive capacity assessment, rather, it aims to advance the knowledge base regarding site-specific attributes used for the larger study of climate change and sea-level rise impacts assessment in Masset and Old Massett, Haida Gwaii. Identifying the site-specific attributes presented in this thesis was done by including community feedback and perspectives on the research methods and identified attributes.

Chapters 1 and 2 have provided information that situates this research in academic literature and the broader context of climate change and sea-level rise vulnerability assessment research. In the following four chapters, the research methods, results, and discussion of this thesis research are presented. For the remainder of this thesis, the first person 'I' will be utilized, as it is more effective in sharing my research experiences, insights, and observations. The third person 'we' is used when the research involved members of the larger research team CCIAP Project A580.

3.0 Methods

3.1 Introduction

In this chapter I review scholarship on qualitative research methods and identify the methods of data collection used in this thesis research. I also provide information on the sampling methods used and a rationale for the questions asked in the key informant interviews and the door-to-door surveys.

In this research, both qualitative and quantitative data were gathered in order to compare characteristics of vulnerability and adaptive capacity as initially viewed following my preliminary field season (Chapter 4) with those identified by the community (Chapter 5) with the use of a participatory approach.

3.2 Rationale for Qualitative Approach

Qualitative methods often use inductive reasoning to “explore human values, meaning, and experiences” (Winchester 2000). In this thesis, qualitative methods were employed to understand how local community members of Masset and Old Massett perceive their vulnerability and adaptive capacity to future climate change and accelerated sea-level rise impacts.

In qualitative research, one means of ensuring rigour involves “establishing trustworthiness” in the research results (Bradshaw and Stratford 2000). Rigour enhances the quality of qualitative research by ensuring that results are valid and reliable (Baxter and Eyles 1997). Baxter and Eyles (1997) provided a review of guidelines for establishing rigour in qualitative research. They identified eleven main principles (Table 3.1) used by qualitative

geographers to enhance or improve rigour. Of the eleven principles identified by Baxter and Eyles (1997), I applied nine in my research.

Table 3.1. Evaluation of rigour in qualitative research (Baxter and Eyles 1997).

Principle used to Ensure Rigour	Used	Not Used
1. Rationale for using a qualitative approach	√	
2. The use of multiple methods	√	
3. Information on the selection of respondents	√	
4. Quotations from interviews with interpretive explanations	√	
5. Details of interview practices	√	
6. Discussion of the procedures for analysis	√	
7. Immersion/lengthy fieldwork	√	
8. Revisits to respondents		√
9. Verification by respondents		√
10. Appeals to interpretive communities	√	
11. The provision of a rationale for verification (validity) of the findings	√	

I did not conduct revisits to, or verification by, respondents. While I had originally intended to revisit interview respondents and verify their answers and my interpretations prior to submitting my thesis, it was later decided, along with my committee that this was not very time effective. The larger research project, however, intends to take these results to the community in the spring of 2006 (Walker, pers.com 2005).

An underlying assumption of my research is that if a community is prepared for any change (social or environmental), they will be inherently better prepared for climate change impacts. My research questions therefore, address changes and responses more generally, and draw parallels to climate change and sea-level rise, rather than using climate change impacts as a starting point. However, working as part of a larger research team under the umbrella of climate change was an influence on data collected, as community members tended to

associate general research questions with climate change specifically. Riessman (2002: 812) refers to this influence on data as “contamination”.

Methods of data collection used in qualitative research vary depending on the nature of the research questions asked. For instance, research may be top-down or bottom-up, participatory or hands-off. As a result, the data gathered may take various forms including: i) verbal communications, involving face-to-face interaction with respondents (e.g., interviews and informal conversations and observations), ii) written text, either by the respondents (e.g., mail surveys and workshop feedback sheets), or existing literature on the subject (e.g., historic documents or past research) and, iii) reflection, involving iterative consideration of our own thoughts and biases on the research topic (i.e., personal observation) (Babbie and Benaquisto 2002, Gubrium and Holstein 2002).

To meet the second objective of my thesis (to develop a participatory approach to identify locally perceived characteristics of adaptive capacity and vulnerability), I reviewed academic literature and participated in a preliminary field season, which together, helped to shape my initial views of adaptive capacity and vulnerability to climate change and sea-level rise impacts in the remote coastal communities of Masset and Old Massett (Chapter 4). To meet the third objective of my thesis (to better understand site-specific characteristics of vulnerability and adaptive capacity), I employed several qualitative methods (section 3.3) to examine the experience, perceptions, and opinions of people within Masset and Old Massett regarding local attributes of vulnerability and adaptive capacity to future changes. Because Old Massett is an Aboriginal community, the politics and processes within this community are socially and culturally different relative

to working with non-Aboriginal communities (Smith 1999). For example, permission to conduct the research in Old Massett (e.g. door-to-door surveys) must be granted by the Hereditary Chief. As mentioned above, my research sought community input during the preliminary field season (section 3.3.2) using a focus group (section 3.3.3) to discuss the survey methods and questions. Many of the community members consulted were Haida, or had worked closely with the Haida communities on Haida Gwaii.

3.3 Methods of Data Collection

With the use of a multiple methods strategy, greater rigour can be achieved as multiple methods increase the strength of reliability of research results (Baxter and Eyles 1997). The use of multiple methods is often referred to as 'triangulation', implying the use of three or more methods. The variation in ideas and opinions expressed via the use of multiple methods can increase the scope and magnitude of understanding of a phenomenon (Eyles and Smith 1988, Denzin and Lincoln 1998). This helps to reduce bias in sampling of a community as mentioned by Bradshaw (2003). My thesis research involved three main phases. Phase I (July 2003-December 2003) involved a preliminary field season (July 2003) (section 3.3.2) to gather data, both qualitative and quantitative on the communities. I also reviewed current scholarship on vulnerability and adaptive capacity (July 2003-December 2003). I used these two data sources to create a community profile for Masset and Old Massett (Chapter 4). Phase II (February 2004) involved a second visit to the case study communities to conduct a community pilot study (section 3.3.3) of proposed survey questions and collection

of data for the research project. Phase III, preceded by the ethics review, was the main field season for data collection (May 2004-July 2004) and included a community workshop (section 3.3.4.1), key informant interviews (section 3.3.4.2) and a door-to-door survey (section 3.3.4.3). Throughout all three phases, I used participant observation (section 3.1) as a supplementary data collection tool.

Prior to Phase III, the University of Victoria Human Research Ethics Board approved this research, to ensure confidentiality and consent of research participants, sharing of results, and complete openness of the research purpose and objectives. The surveyed population was not asked to provide any personally identifying information (e.g., name, address). Workshop participants provided the research team with contact information, but were not identified in my research. To ensure consent, interviewees were required to sign a participation form. Consent of those surveyed was assumed by their agreeing to participate and the workshop participants were voluntary and were required to sign-in the day of the workshop. While research results have not yet been disseminated to community members, the larger project intends to do so once more of the data analysis from the project has been completed.

3.3.1 Participant Observation

Observation is the practice of gathering information from one's surroundings through observations of human actions and interactions (Denzin and Lincoln 1998). Observation involves both silent observations and personal interactions with the community. For participatory research, observation forms

the basis for being reflective and for developing understanding. Observations such as body language, tone, facial expression, emotions, and setting not obtained from other sources of data, help with gaining greater understanding (Denzin and Lincoln 1998). For example, an interviewer may wish to reflect on the demeanour of the respondent or the interviewer's personal thoughts following the interview, as these data will not be evident in the interview transcriptions. Recordings could also include obstacles in the interview setting (e.g., others within earshot) or current events that may affect the responses. These observations and recordings, however, are highly subjective as they reflect the views of the observer.

Participant observation varies along a spectrum of participation types that range from pure observer to pure participant (Denzin and Lincoln 1998). A pure observer is a researcher, who has no contact with those being observed, but rather, watches and collects data from what they perceive remotely. A pure participant is a researcher who is concealed from those being researched and/or is a part of, or accepted by, the community being observed (Walker 1985, Eyles and Smith 1988, Denzin and Lincoln 1998).

Qualitative research also acknowledges that the researcher plays a role in data collection and interpretation (Gubrium and Sankar 1994). The presence of the research team within the community may play a role in the type of data collected (e.g., answers related to biophysical impacts such as erosion and sea-level rise). When a researcher is actively engaged in the case study communities there may be a bias in how they interpret and present the results, out of concern

for being politically and culturally sensitive. Chapter 6 will further explore these biases and discuss how they impacted this research.

My role within the communities combined attributes from what Adler and Adler (1998: 84) refer to as “observer-as-participant” and what Cotterill and Letherby (1994: 120) refer to as “the friendly stranger”. The “observer-as-participant” approach was established from the beginning of my research with the communities as all research participants were informed of the research verbally when participating in the workshop, interviews or surveys. The community was informed of the research by public talks by the project leader, the local newspaper (The Observer), the Scroll (a community information television station), and interactions with the research team.

While my approach was similar to an “observer-as-participant”, as I was observing while participating in the community, Adler and Adler (1998: 84) state that this role “does not cross into the friendship domain”. For this reason, I believe my research approach and interactions within these communities was more in line with what Cotterill and Letherby (1994) call “the friendly stranger”. During the interviews, door-to-door surveys, and workshop, my interaction with respondents remained that of the friendly stranger who “does not exercise social control over respondents” (Cotterill and Letherby 1994: 120), but maintains a casual presence. During my stay in Masset and Old Massett, I also participated in local events and made many friendships and acquaintances in the communities, beyond the participants. Within the context of my thesis research, I believe that these acquaintances had a positive impact on the responses to my questions because they built greater rapport and helped me keep the interview

tone more informal than formal. However, the presence of a researcher within a community may have an impact on the data provided by community members due to increased awareness of the research topic, as stated in section 3.2.

Personal journal writing or field notes can be an effective method of collecting observational data. Field notes may include observations that may not otherwise be transparent in the results through dialogue (Babbie and Benaquisto 2002). That being said, by reflecting on interviews and observations captured in my field journal throughout the research, a researcher may recall in more detail important components of the research.

Field notes played an important role in all steps of my research. I made memos on the details of the location, timing, flow and other information that could not be captured through audio recordings. Surveyors also took notes and meetings were held on a regular basis to discuss thoughts that emerged during the door-to-door surveying. For example, the surveys in Old Massett commenced the morning following an announcement by the Old Massett Village Council that there would be significant job losses (80%) in the next few weeks, thus resulting in many responses reflecting on this. This will be further elaborated upon in section 3.3.4.3. While such community events may affect data collected, research bias may impact the questions asked, as well as the interpretation of results.

3.3.1.1 Researcher Bias

It is difficult, if not impossible, to enter a research endeavour completely bias free (Winchester 2000). One of the greatest strengths of qualitative

research is perhaps our ability to empathize with respondents. However, our knowledge and perceptions can, and often do, affect our results. In the social sciences, as researchers we are often the research instruments, conducting interviews and collecting data through our personal lenses. As humans, we are not purely objective, but rather seek meaning and purpose in our work (Walker 1985). For this reason, as researchers, it is important to be aware of what Kirby and McKenna (1989: 32) call “conceptual baggage”. Conceptual baggage implies that our own experiences and perceptions may affect the questions we ask, as well as our interpretation of the results. Part of validating research is acknowledging our personal biases and experiences as they often provide important information on how researchers shape their approach and questions (Kirby and McKenna 1989). As a researcher, I acknowledge that I placed greater emphasis on adaptive capacity over vulnerability, as I believe it to be more empowering to local communities. Additionally, in my results and discussion, I tend to avoid elaboration on topics I believe may be of a sensitive nature (e.g., generational impacts of residential schools). This is due to my lack of comfort with, and limited understanding of, these topics and also because of the lack of community participation in the analysis phase of this research. As a researcher it is impossible to present the data completely bias free, especially when the researcher is actively engaged with the case study communities (Riessman 2002). This bias in my presentation of the data is emphasized in section 6.4.2.

3.3.2 Phase I: Preliminary Field Season

My preliminary field season took place in July of 2004. During this time period, the research team lived in Old Massett, a Haida Community. This preliminary field season helped me satisfy three important issues for my research. First, I was able to gather community information and statistics data (e.g., Statistics Canada and Skeena Native Development Society) for community profiles of Masset and Old Massett. This information will be presented in Chapter 4. Second, I became oriented to the study area and the research project through observations. Ideas generated during this preliminary field season helped me form the purpose and objectives of my thesis. Third, and most importantly, these preliminary community interactions, made it clear to me that there was a general distrust and dislike of outside researchers due to past experiences of the community. For example, community members felt as though there had been a lot of research done on them in the past, from which they received very few results or benefits. For this reason, a qualitative participatory approach was best suited to the research goals and to build trust and communication with community members.

As 'outsiders', often researchers must request access to the research setting, whether this is a community, an institution, or a group of people. By 'outsider' I mean any researcher that is not a resident of the community they are working within. This requires not only gaining trust of community members, but often obtaining permission by a local authority figure or political body. These are known as 'gatekeepers' within a community (Burgess 1994). The degree to

which the community accepts the researcher also strongly influences the depth and quality of data collected. Therefore, researchers should work to build good community relationships. For permission to conduct research in the case study communities I contacted many of these local 'gatekeepers' during my preliminary field season, including: The Village of Masset (VOM), the Council of the Haida Nation (CHN), the Old Massett Village Council (OMVC), and the Hereditary Chief of Old Massett. Local community members informed me of the importance of requesting permission from the Hereditary Chief, as it is a cultural custom. These governing bodies and community leaders will be further described in Chapter 4. While The CHN required a written contribution agreement from the project, the VOM, OMVC, and Hereditary Chief all required a brief explanation of the project and granted oral permission on the grounds that the research results are released to the communities first. The larger research project has a contribution agreement with Natural Resources Canada (NRCan).

During the preliminary field season, and since, regular community presentations and information sessions on the larger project objectives and findings were given by the primary investigator. These presentations were done in Masset, Old Massett, and Queen Charlotte City. There was also a presentation at one of the Hereditary Chiefs meetings and to the CHN.

To inform my background case study on Masset and Old Massett (Chapter 4) I researched local documents (e.g., Masset Business Directory 2003), and previous reports (e.g., Holman and Nicol 2004), and collected information through personal communications with community members of Masset and Old Massett. For instance, by reading the local newspaper (The Observer) I learned about

current issues faced by these communities. Also, I gained greater insight into the communities through secondary data (i.e., Statistics Canada community profiles and the 'Labour Market Census' by the Skeena Native Development Society). The 'Haida Gwaii-Queen Charlotte Islands Land Use Plan, Socio-Economic Base Case' (Holman and Nicol 2004) and the base case report produced by Land Use Plan Process Management Team (LUPPMT) (2005) assisted me by providing both relevant background information, and in defining the clusters of 'communities' for this study. I used these documents to capture a current picture of the communities of Masset and Old Massett given that government data sources were limited. For example, Statistics Canada does not have any new data on Old Massett since 1996 due to insufficient response rates in 2001.

3.3.3 Phase II: Focus Group

During a two week stay in Masset (February 2004), seven island residents provided feedback on a draft of the questionnaire, giving advice on how to refine and best administer it. This group of people included three members of the Council of the Haida Nation from Old Massett and Skidegate, two members from the Village of Masset, a community social worker, and a Masset resident who had conducted previous surveys in Masset and Old Massett.

From this early focus group, we decided that a door-to-door survey would be the best option for our household survey. Although more costly and timely (Gubrium and Holstein 2002), this was recommended by community members to accommodate potential literacy and education issues, as well as to increase the

personal element of the research and the response rate. As a research team, we were fortunate in receiving lots of constructive feedback from our focus group participants.

Respondents provided extensive feedback on the initial questions. Gender and ethnicity questions were omitted due to the recommendation from the focus group. Additionally, it was suggested that we restructure the question on education to include 'informal' educational skills. This focus group also gave us a broader perspective of local perspectives on education and how we could better structure this question (Appendix III Question 29).

3.3.4 Phase III: Workshop, Key Informant Interviews, Door-to-door Survey

3.3.4.1 Workshop

Workshops are a useful tool as they provide an open forum in which community members are encouraged to participate in an informal setting (Mendis *et al.* 2003, Parlee 2004). We designed a one day community workshop - "Living with Climate and Community Change in Northern Haida Gwaii: Planning for Today and the Future"⁴ held on June 5, 2004 - to be highly participatory. The workshop was six weeks in planning and involved general information sessions, breakout groups, and group presentations/idea sharing. This allowed local residents to participate in, and contribute to, the research by being informed, involved and by contributing their knowledge.

⁴ Information regarding workshop participant demographics and representation, as well as results will be made available on the project website <http://www.geog.uvic.ca/blast/>

To recruit participants for the workshop we advertised by posters in local stores, restaurants, the post office, the recreation center and the town offices, as well as extending an open invitation in the local newspaper. Advertising can be an effective means of gathering participants; however, it is cautioned that this heightened awareness of the research project can also have impacts on results (Sixsmith *et al.* 2003). The workshop successfully brought together a diverse group of 22 participants from the communities of Masset, Old Massett and Tow Hill Road (a study community of the larger project, located on the north coast of Haida Gwaii). There was a broad and diverse representation of participants by gender, ethnicity, age and occupation present at the workshop.

Many objectives of the workshop were beyond the scope of my research and thus were part of the larger project. However, the workshop facilitated discussion that helped develop some of the interview and survey questions for my research. Sections of the workshop aimed to elicit community response as to how community residents had dealt with past changes (social and environmental), the challenges associated with responding, and some ways to improve responses.

The workshop consisted of four main sessions. The first session involved a mapping exercise of 'significant' areas and activities. In the second and third sessions, participants identified past changes they had experienced and how they dealt with them. In the fourth session, participants brainstormed ways that the community could better prepare for future changes.

While I had originally intended to produce a detailed qualitative analysis of the second and third sessions of the workshop, it was later decided along with

one of my co-supervisors that there was sufficient information in the key informant interviews and door-to-door surveys to validate the communities' perspectives on issues examined in this thesis. Insight gathered from the workshop that was further investigated in the interviews included ideas around changing populations, local political control, changes in tourism and forestry, increased social cohesion, the land title case and increasing local education.

Some of the key interview and survey questions that resulted from the workshop were:

- What do you feel makes people in your community healthy or unhealthy?
- What are some of the strengths and problems with education in this area?
- How would you assess the status of employment in this community?
- How would you assess the level of community support in this area?
- If an emergency were to occur, do you think that members of your community would pitch in to help?

The workshop also introduced the summer 2004 research team to the communities, and provided contact information to facilitate greater interaction.

3.3.4.2 Key Informant Interviews

I designed the key informant interviews to meet the second objective of my thesis: to gain insight into what local community members perceive to be their strengths and weaknesses for coping with future changes, both social and environmental.

Interviews vary greatly in structure, length, and content. A structured interview consists of an assigned set of questions, a defined timeline, and varies

little from the questions at hand (Eyles and Smith 1988). This approach may limit the depth and richness of information from the interviewees/informants, but focuses directly on the research questions. On the other hand, open-ended/depth interviews involve little structure. For example, the researcher enters the interview with few, if any, set questions in mind. The interview format varied from interview to interview and the key informants essentially guided the interview via their responses (Walker 1985).

Between the two extremes are various formats of interviews (e.g., semi-structured, depth, and non-directive) (Lofland and Lofland 1984, Walker 1985, Denzin and Lincoln 1998). The use of semi-structured interviewing is beneficial in that the interviewer is guided by a set purpose and objectives, allowing for greater flexibility than structured interviews, while still maintaining focus. Although there may be a set of questions to work through in the interview, these questions do not have a designated order. Thus, the interviewer and interviewee have the flexibility to stray from the questions during the interview. For these benefits, I used research questions (Appendix I) as a guideline, leaving room for interviewee interpretation. The timing and location of these interviews depended on the comfort level and location of those involved (e.g., homes, restaurants, business offices). When possible, with the permission of key informants, audio-recordings accompanied the interviews, allowing me to focus more on the informant's responses rather than be engaged with extensive and distracting note taking. Having audio recordings of the interviews was also useful in enhancing rigour and ensuring reliability of my interview results and interpretation, as these

notes were used to crosscheck my initial coding of interview memos (section 3.3.2).

I selected key informants based on contacts made during my preliminary field season in the community of Old Massett, and the focus group period (February 2004), and through continued contact during the year with local community members. The workshop, interviews and surveys all occurred between May 1st and July 31st, 2004. In total, 14 individuals were interviewed.

I selected some key informants based on my initial beliefs about people who represented diversity in the community. Others I selected via snowball sampling (Babbie and Benaquisto 2002). Snowball sampling refers to selecting informants based on the recommendation of other informants. In this case, the others were both key informants and community members I encountered in my day-to-day interactions, thus reflecting a bias of others within the community. Interview selection was also shaped by the availability of key informants. Key informants included a variety of local community members over 18 years of age, in accordance with our ethics agreement, and had equal gender and ethnic (Haida and non-Haida) representation. Key informants were representative of different occupational backgrounds, including: local policy makers, volunteers, community council members, seasonal workers, and community leaders. Furthermore, key informants represented both short and long-term residents. Table 3.2 provides a brief description of all interviewees. To ensure confidentiality (because of small population size) and to meet our ethics agreement, the descriptions of key informants are limited and pseudonyms are used.

Table 3.2. Descriptions of key informants.

Pseudonym	Gender	Haida	Location	Role
Aaron	Male	No	Masset	Newer resident, small business owner.
Adrian	Male	Yes	Old Massett	Council of the Haida Nation (CHN) member, island born.
Adam	Male	No	Masset	Works island wide fostering and supporting new business and educational opportunities.
Dakota	Male	No	Tlell	Large landowner and entrepreneur, island born.
Fiona	Female	No	Masset	Highly involved in emergency planning, long term resident.
Isabelle	Female	Yes	Other	CHN member, involved in education and repatriation.
Jenny	Female	No	Other	Has worked on Haida Gwaii for between 15 and 20 years.
Kira	Female	No	Masset	Village of Massett employee, involved in emergency planning
Lana	Female	No	Other	Newer resident, actively involved in the land use planning process (LUPP).
Larissa	Female	No	Masset	High school teacher.
Megan	Female	Yes	Old Massett	Small business owner, Old Massett Village Council (OMVC) member
Riley	Male	Yes	Old Massett	Haida Elder
Tyler	Male	Yes	Old Massett	Local clam digger
Victor	Male	Yes	Old Massett	Island born, involved in the LUP and CHN.

Key informant interviews were designed to solicit local perceptions of resiliency and adaptive capacity, as well as elements of vulnerability. Specific to adaptive capacity I asked:

- What makes this community strong in the face of changes?

Specific to vulnerability I asked:

- Are there things you could recommend that would make your community stronger in the face of potential future changes? And,
- Do you feel the location of your community makes you more or less vulnerable to potential environmental changes or emergencies?

Through the questions I selected (Appendix I), I gained insight into the following: 1) the key informant's role within the community, 2) the social and environmental changes (if any) they have observed, and 3) the attributes that they believe make these communities both strong (i.e., resilient) and vulnerable in the face of future changes.

Before each interview started, I gave a brief introduction to my research and had participants sign a consent form (Appendix II). I gave participants the interview template (Appendix I) to aid the interview process. I recorded eleven interviews using a digital recording device, took notes during the interviews, and developed memos following every interview. I took these notes to capture information about the demeanour of informants, as well as the flow, setting, length, and content of the interview. I did not record three interviews; two at the request of the interviewees and one due to a technical malfunction. Immediately following the interviews, I encouraged key informants to ask questions and to provide feedback on the interviews, my research, and the work of the larger research project.

Following the interviews, I listened to the recording multiple times. A departmental secretary transcribed interviews and I read through the transcriptions for accuracy. It has been noted that many qualitative researchers do not give transcription quality much thought (Gubrium and Holstein 2002).

Factors that can influence quality include:

- inability of transcription to capture social reality,
- difficulty in identifying run on sentences and punctuation,

- difficulty in identifying when respondents paraphrase, mimic, or quote others,
- inefficiencies in stopping and backtracking of recordings for missed points, and
- mistaking similar sounding words (Gubrium and Holstein 2002).

In an attempt to minimize these problems, I listened to all recordings, while reading along with the transcriptions, and made changes to the transcript where necessary. Two additional challenges I experienced while reviewing the transcriptions were clarity in phrasing and Haida words (e.g., place names). While some words could be easily corrected, others required additional research or follow up (i.e., Qay' LInagaay Heritage Centre).

All interviews were coded using a selective coding method for content specific to the research questions. Gubrium and Holstein (2002) provide an example of selective coding, illustrating that transcriptions are reviewed for themes that key informants suggested may contribute to local vulnerability and adaptive capacity, rather than attempting to code every sentence for meaning. I chose this method as I believed that some of my discussions with key informants were not directly related to themes of vulnerability or adaptive capacity. In addition, themes generally encompassed more than a single sentence or line of text, allowing me to attribute a theme to an entire paragraph, rather than have repeat themes in every paragraph. To organize the thematic coding results from interview data, I created a chart where the answers to each question could be compared. More specifically, I first filled in the chart based on notes taken during

the interviews themselves. Second, I filled in additional information based on notes taken following the interviews (my reflections and observations). Third, I listened to the interviews twice adding to the chart. And fourth, I reviewed the coded transcriptions. Where interviews were not recorded, the data from notes taken during and after the interviews provided the information for selective coding. Data from these interviews were not as qualitatively rich as those recorded and transcribed, as the notes taken during the interviews are limited because my priority was to maintain a comfortable and conversational pace for the interview. However, memos were made immediately following the interviews, in addition to detailed memos maintaining consistency with the recorded interviews. While these memos do not provide direct quotes, I was able to recall key themes and ideas. I will present the results of these interviews in Chapter 5 (section 5.1).

3.3.4.3 Door-to-Door Surveys

Surveys are an effective way to obtain data focused on a particular topic (Hoggart *et al.* 2002). There are many different types of research surveys, including face-to-face, telephone, internet, computer-assisted, self administered, and postal questionnaires (Gray and Guppy 1994). A door-to-door survey can allow for participant confidentiality, but not the complete anonymity achievable in a mail out survey. This confidentiality can yield results that may otherwise not surface, particularly when dealing with sensitive topics (Gubrium and Holstein 2002).

Personal surveys (Gray and Guppy 1994) involve face-to-face interaction between the surveyor and respondent. Telephone, self-administered, postal and online surveys are generally more impersonal by nature as the respondent's identity can remain anonymous. With these more impersonal survey types the administrator also has less impact on the respondent's answers, as opposed to the impact they may have in a face-to-face or telephone survey (Hoggart *et al.* 2002). As mentioned previously, following the focus group (section 3.3.2), we decided that the survey should be done door-to-door to create a more personable approach, stimulate a higher response rate, and meet literacy needs. Additional benefits of face-to-face interactions, as outlined by Gubrium and Holstein (2002: 60) include:

- an increase in flexibility of the questions asked and target population,
- a higher response rate,
- a greater application of long interviews,
- a greater ability to use visual aids in presenting questions and response options, and
- a better opportunity for unobtrusive interviewer observations of the respondent and their surroundings.

Three team members administered the survey: a recent geography graduate from the University of Victoria, a local resident of Tlell (hired specifically to administer surveys) and myself. Hiring a resident of Tlell met a local training and outreach objective of the larger project. Additionally, a male Haida student from Old Massett was hired as a researcher assistant. This student participated

in the workshop and began the workshop map analysis; however he was unable to continue working during the door-to-door survey component of the field season. The characteristics of those who administered the surveys (hereafter referred to as 'surveyors') are not especially relevant to this research topic, as data collected was not of an overly sensitive nature. It is important to note that all three of us were white females in our mid-twenties, and were personable survey administrators. While surveyors did not report feeling discriminated against, it is difficult to determine the influence of gender and/or ethnicity of the surveyors without having a male or non-Haida surveyor. The coding sheet for open-ended survey questions was created and added to throughout the duration of the surveys, by all three team members that administered the survey. Surveyors met regularly during the early stages of data entry to enhance the consistency and rigour of data. While the survey responses and the coding sheet do not capture the detail with which respondents provided feedback, they capture the general themes and attributes mentioned by survey respondents.

We conducted an early pilot study of six households prior to beginning the door-to-door survey to deal with any glitches that arose. Pilot studies, such as this, are an effective way of gaining better knowledge and understanding of the research population and area before initiating the full research project (Babbie and Benaquisto 2002). They are a beneficial tool in survey design and implementation as they provide information about demographics and social issues (e.g., individual and community health, education levels) that are not necessarily apparent to an outsider preparing a survey (Hoggart *et al.* 2002). Surveyors also met on a regular basis preceding the interviews to conduct trial

surveys to ensure consistency between our surveying approaches and discuss surveying strategies. During the early stages of the administration of the surveys, we met to discuss issues around clarity, uncertainty and any potential discomfort in administering the surveys.

Pertinent contact information and details of the project were made available on an information sheet for interested participants on request. Consent was assumed with the participants' completion of the survey and the identity of individuals remained confidential.

A cross-section of society is necessary to gain a general understanding of the average condition in an area. Often, random samples are drawn from a list of a specific target group, mailing list, or phone book (Babbie and Benaquisto 2002). The Village of Masset and the Old Massett Village Council (OMVC) provided us with the number of occupied homes in each municipality. Some of the homes in this count however, had been abandoned and some residents owned multiple homes. Haida Mapping provided us with a map showing all lots; however, these maps contained occupied and non-occupied lots, as well as residential and commercial lots. Due to the limitation of the residential map of occupied homes, creating a random sampling strategy was not possible. Instead I decided to use random-systematic sampling to gain a diverse sample of 20% of households in Masset and Old Massett. In these communities every third house was sampled, beginning at the first home on the first street. In communities with less than 100 homes (Tlell and Tow Hill), we sampled every second household to get a minimum sample of 30, also beginning with the first home. We selected these four communities due to their proximity to the northeast coast (the biophysical

study area of the larger project). My research focuses specifically on the communities of Masset and Old Massett due to their close proximity to the coast and official community designation, as well as the availability of quantitative aggregate data (e.g., employment) from Statistics Canada, Skeena Native Development Society, and local sources. When a household declined to complete the survey, we selected the next household. When there was no answer, we left a note encouraging the resident to contact us and indicating that we would return in the evening hours. There were only two respondents that contacted us to book a survey time. Returning in the evening hours proved to be a successful strategy for catching more people at home and increasing the number of surveys collected.

We identified the vacant lots, commercial lots, abandoned houses, and most importantly surveyed homes on the maps obtained from Haida Mapping on a regular basis to ensure no overlap, to identify the number of declined responses, and to document that all neighbourhoods were being sampled. Though compiled on a map for logistical reasons, the locations of homes surveyed were not recorded as part of the analysis to satisfy confidentiality agreements.

Table 3.3. Number of surveys completed and no responses by community.

Community	Household Surveys Completed (n)	No Responses (refusals) (n)	Total Number of Homes Approached
Masset	92	61	153
Old Massett	51	27	78
Tow Hill Road	30	4	34
Tlell	30	5	35
Total	203	97	300

As anticipated, there were a large number of non-responses in both Masset and Old Massett. A 60% response rate to the survey was attained in Masset and a 65% response rate in Old Massett (Table 3.2). Babbie and Benaquisto (2002) recommend to researchers that a response rate of 50% is adequate for analysis, 60% is good and 70% is very good. Based on these guidelines, this survey yielded a good to very good response rate in the two communities.

The survey (Appendix III) was designed to obtain community perspectives on attributes of adaptive capacity and vulnerability to climate change and sea-level rise impacts. The population demographic questions (questions 27 to 35) provided us with information on how representative the sample was of the communities compared to existing quantitative data from Statistics Canada and Skeena Native Development Society (Chapter 5).

Interview results, along with survey results, are presented in Chapter 5 of this thesis (section 5.3.2 and 5.3.3). As with the workshop, the majority of interviews⁵ helped shape several questions asked in the household survey. For example:

- What are some of the strengths of your community that may help it deal with future climate change impacts?
- What are some, if any, weaknesses of your community that may make it susceptible to future climate change impacts?

⁵ Some interviews occurred after the survey had begun. Data collected in these interviews were therefore not incorporated to the survey.

These questions were asked to gather local perspectives on attributes that may strengthen adaptive capacity or contribute to local vulnerability. While the key informant interviews explored similar questions, I believed that asking those questions again of door-to-door survey respondents would ensure I was getting a broader range and depth of answers. While there is some repetition in the data (i.e., between my initial views in Chapter 4, the interview results and the survey results), this repetition in data is a benefit of triangulation as it ensures greater reliability in the results presented and limits the bias in the selection of key informants (Baxter and Eyles 1998, Bradshaw and Stratford 2000).

I used question 26, “What are some, if any, weaknesses of your community that may make it susceptible to future climate change impacts?” to elicit community perceptions on vulnerability (section 5.3.2). I also used question 4, “What do you like most about your community?” and question 25, “What are some strengths of your community that may help it deal with future climate change impacts?” to gather community ideas on local strengths and adaptive capacity. Responses are presented in Chapter 5 (section 5.3.3).

3.4 Conclusion

The collection of data for my research involved the use of multiple methods and sources. Using multiple methods worked to enhance the rigour of this research as ideas that emerged during my preliminary field season were both supported and challenged by the key informant interviews and door-to-door surveys. The overlap in these data and other emerging themes worked to enhance the reliability of data.

My initial perspective of local attributes of vulnerability and adaptive capacity to climate change impacts will be presented in Chapter 4. These perspectives are based on my preliminary field season in Old Massett and are grounded in academic literature on the vulnerability of coastal communities to climate change and accelerated sea-level rise impacts, presented in Chapter 2.

In Chapter 5, I present the data collected through the key informant interviews and the door-to-door surveys and in Chapter 6 I discuss my current view of vulnerability and adaptive capacity to climate change impacts. These multiple research methods were employed using the participatory approach outlined in Chapter 2. These included a preliminary field season, a pilot study, a community workshop, key informant interviews, a door-to-door survey, and participant observation. This approach was beneficial in preventing what Bradshaw (2003) warns are to be some of the assumptions of participatory research (i.e., a bias sample of participants), as this research did not focus on the views of a select group of key informants. Through the community workshop that was open to the public, and the strategic random survey, we gained broader insight into community issues. In addition to these tools, I gained further insight during the preliminary field season through the pilot study and by the general approach (i.e., open to community feedback) of the research project. By comparing the information presented in Chapter 4 with that presented in Chapter 5, I will reinforce the usefulness of this participatory approach in the early stages of vulnerability assessments to climate change and sea-level rise impacts.

4.0 Outsider Perceptions of Vulnerability and Adaptive Capacity: Masset and Old Massett

4.1 Introduction

In this chapter I introduce the case study communities of Masset and Old Massett, Haida Gwaii, B.C. My objectives are to illustrate the environmental sensitivity of this area to future climate change and accelerated sea-level rise impacts and to identify the social attributes of local vulnerability and adaptive capacity using published quantitative data. Data I present in this chapter are from my preliminary field season in Old Massett, from both local (e.g., Village of Masset) and outside sources (e.g., Statistics Canada), as well as an academic literature review. I have grounded these ideas in academic literature, to illustrate how researchers may view these remote coastal communities as ‘vulnerable’, ‘resilient’ or ‘adaptive’ to projected impacts of climate change and accelerated sea-level rise, thus fulfilling the first objective of my thesis (to identify how elements of the literature on vulnerability and adaptive capacity could be applied to the study of these communities). I drew from a variety of sources to collect information for this chapter including published government documents (e.g., Statistics Canada data), academic journal articles, community publications (e.g., The QCI Observer), preliminary interactions (i.e., face-to-face meetings) with local community members and personal observations.

This preliminary evaluation of vulnerability spurred my interest for a closer examination of vulnerability attributes and the need to incorporate community perspectives as part of the development of a site-specific understanding of vulnerability. In Chapter 6, I will compare this evaluation to the community’s

perspectives (Chapter 5) to illustrate the utility of including community members in identifying local attributes of vulnerability and adaptive capacity. While there is overlap between data presented in this chapter and Chapter 5, this repeat in data enhances the rigour of research results obtained through the use of multiple methods (Chapter 3).

This chapter is divided into four theme sections which discuss various local attributes of adaptive capacity and vulnerability in Masset and Old Massett to climate change and sea-level rise impacts. These themes are environmental, social, economic and political attributes.

4.2 Environmental Attributes of Vulnerability and Adaptive Capacity

In this section I highlight environmental attributes of vulnerability and adaptive capacity of NE Graham Island, such as geophysical sensitivity, location, and exposure.

4.2.1 Geophysical Sensitivity

Climate change experts predict that by the year 2100, there will be a 9 to 88cm rise in mean relative sea level (IPCC 2001). The NE coast of Graham Island, Haida Gwaii has been identified as among the top 3% of Canada's most 'sensitive' coastlines (Shaw *et al.* 1998). Shaw *et al.* (1998: 369) define sensitivity for their study as "the likelihood that physical changes due to sea-level change will occur at the coast". This study was a geophysical assessment including, coastal geomorphology, shoreline erosion and accretion rates (m/yr),

coastal slope, relative sea level rise, mean tidal range, and mean wave range. These measurements are typical of the first approach to vulnerability assessments, where researchers focus on physical attributes of the environment to determine sensitivity to changes. This ‘sensitivity’ assessment on Canadian coastlines initiated the interest of CCIAP Project A580 on North Graham Island and in the case study communities.

4.2.2 Location

Masset and Old Massett are located approximately 820 km N of Vancouver and 80 km W of Prince Rupert (Figure 4.1), on Graham Island, Haida Gwaii. Graham Island is the largest of more than 150 archipelago islands that comprise Haida Gwaii. The communities of Masset and Old Massett are located along Masset Sound on the north of Graham Island and face northwest towards Dixon Entrance.

Haida Gwaii is home to several remote communities, remote not only because they are on an island, but because of their distance from other major urban centres. This limits their access to services (e.g., health care), and other communities, making them geographically isolated. Like other remote communities, climate change scholars believe that a lack of access to other resources and communities resulting from isolation, contributes to vulnerability (Armstrong and Read 2002, Dolan and Walker in press). However, in other fields (e.g., health geography) it is noted that geographic isolation or rural location can “actually enhance resiliency because local leadership and infrastructure [may be]

developed to deal with situations” (Kulig 2000: 380). This enhanced leadership and development of infrastructure is often present in response to past situations (e.g., emergency evacuations, medical emergencies), as the communities are aware of their isolated nature and make greater efforts to respond to hazards.

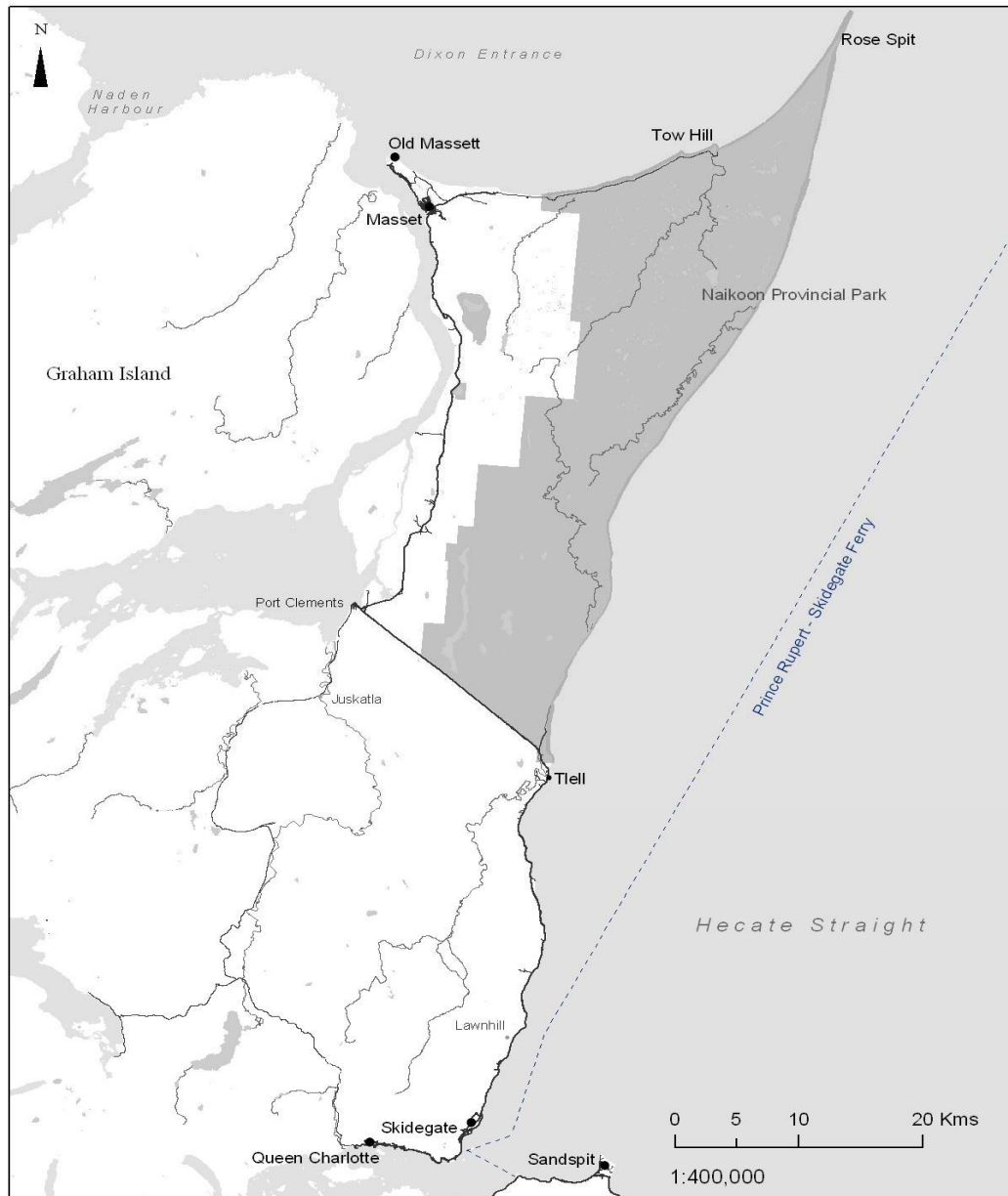
Many coastal communities face the additional challenge of accelerated sea-level rise. Where relative sea level is rising, the land to shoreline ratio is decreasing, especially in the case of island communities (IPCC-CZM 1992, Barnett 2001, Harvey *et al.* 1999, Harvey and Read 2002). As previously stated, relative sea level in the study area is rising at a rate of 1.6 mm/yr (Abeyirigunawardena and Walker pers. com 2005, Walker and Barrie in press). Additionally, coastal communities often have a high dependence (i.e., economic, social and cultural) on environmental resources such as fishing, which may be vulnerable to changes in climate (IPCC-CZM 1992, Monirul and Mirza 2003).

Graham Island is only accessible by airplane or ferry. Flights come into Masset from Vancouver and Prince Rupert, as well as into Sandspit, on South Morseby Island, 129km south of Masset. However, those traveling to Masset by airplane, as well as flight cargo for the north end of the island, often fly into Sandspit, as flights to Masset are charter only and generally more expensive. Cargo and passengers then have to travel north from Sandspit (Figure 4.1) B.C. Ferries provide transportation between Skidegate Landing⁶ and Prince Rupert and from Prince Rupert south to Port Hardy (located on the north end of Vancouver Island). While flights and ferries are regularly scheduled, disruptions

⁶ Skidegate Landing is located along the main highway route between Queen Charlotte City and Skidegate.

and cancellations are not uncommon, due to severe weather, high volume and mechanical problems (McCooley 2004a).

Figure 4.1. Map of the case study communities (Masset and Old Massett) and surrounding areas on NE Haida Gwaii (Feyrer 2005).



Island transportation is limited to a private shuttle bus and personal vehicles as no public transportation is available. Limited transportation further

isolates the northernmost communities on the island from ferry access and from Queen Charlotte City⁷, the other major on-island settlement. The distribution of population on the island will be further explored in sections 4.3.1 and 4.3.2 of this chapter. On Graham Island, a single highway (Highway 16) connects communities. Sandspit is accessible from the other communities only by ferry. Northern communities are especially dependent on the highway as the majority of supplies arrive by ferry to the south and are transported northward along the highway.

The highway, however, is vulnerable to sea-level rises and increased storminess, as most of it is exposed to the coast. In recent years, parts of the old Highway 16 route, located close to the ocean, have repeatedly eroded. The Ministry of Transportation does ongoing work on this highway to repair damage and attempt to stabilize it against future impacts. Despite this, the highway remains exposed to storms and sea-level rise.

There is another route (Figure 4.1) that provides transportation from Queen Charlotte City to Port Clements via Juskatla. This road is not maintained by the Ministry of Transportation and Highways, but rather it is a logging road. However, in emergency situations it is the alternative route for those on the north end of the island.

⁷ 'Queen Charlotte City' is not officially a city or a town, as it is unincorporated and has a limited population of approximately 1045 in 2001 (Statistics Canada 2001).

4.2.3 Exposure

Exposure to environmental change contributes to community vulnerability as it increases the chance of damages caused by hazardous events and long-term change. Such factors may include the likelihood of natural disturbances (e.g., earthquakes, mass wasting), geology, physical exposure (e.g., high amount of coastal areas exposed to severe storm surges), the nature of climate change (e.g., increased temperatures), and sea level changes (Burton *et al.* 1978, Briguglio 1995, Barnett 2001, Armstrong and Read 2002, Walker and Barrie in press). The remote coastal location, combined with the physical landscape characteristics (e.g., low elevation, exposure to coastal winds and storms, erodible shorelines) give Masset and Old Massett a history of environmental exposure due to past storms, and high winds. Climate change researchers predict changes in both short-term extreme events (e.g., more frequent and severe storms) and long-term trends (e.g., sea-level rise) that will potentially increase the physical vulnerability of coastal communities (Clark *et al.* 1998, Adger 1999, Klein and Nichols 1999, Bell *et al.* 2001, Smit and Pilifosova 2003). If we consider past exposures as indicative of future conditions, a brief look at the history of environmental exposures in Masset and Old Massett suggests potential increased vulnerabilities to future climate-related changes. Abeysirigunawardena and Walker (pers. com 2005) project that there will be twice the rate of extreme water level trends due to storm surges (+3.4 mm/yr) and 1.6 mm/yr of sea-level rise relative to climate variability.

4.2.3.1 Severe Winds and Storm Surges

Masset and Old Massett are prone to damage caused by high winds, tides, and storm surges. High tides often (e.g., annually) wash out the 'Old Sanctuary Road', due to its low elevation (Mushynsky pers. com Aug. 2005). This road is one of two that connect Masset and Old Massett to the rest of Graham Island and is the emergency evacuation route for these communities. In addition, many of the residents of Masset and Old Massett with coastal property have experienced erosion of their property (Mushynsky pers. com Aug. 2005). The west and northerwest winds are predominant during the summer months (Pearce 2005). While Masset and Old Masset are exposed to northwest winds, there have been recent damages on the island caused by southeast storm surges in Hecate Strait. These southeast winds are generally more powerful as they occur in the winter months during storms with lower atmospheric pressures and longer fetch on Hecate Strait (Abeyvirigunawardena and Walker pers. com 2005).

As Masset and Old Massett are not on the eastern coast, they do not directly bear these impacts; however, these storms affect their access to the rest of the island. For example, a storm surge during December 2003, known locally as 'the Christmas Eve Storm' resulted in the destruction of part of the main highway just south of Tlell (Figure 4.1) and caused flooding in several areas, erosion of land (i.e., between 1-10 m (McCooey 2004b)), and the loss of one home (Rinfret 2003). Fortunately, the peak of the storm occurred approximately one hour after low tide (Walker pers. com 2004). Had the storm peak and high

tide coincided, the impacts would have been more severe (Walker in McCooley 2004b). In total, an estimated one million dollars worth of damage to the local area occurred as a result of this storm event (Rinfret 2003).

4.2.3.2 Flooding of Low Lying Grounds

Due to the elevation of Masset and Old Massett (approximately 1-5 meters above mean sea level) these communities are also prone to flooding caused by storm surges and high tides. The communities are not only located on low lying grounds, but are situated on the shores of Masset Inlet and Dixon Entrance, making them exposed to strong north-northwest winds and high tides. Flooding in this area is uncommon as these winds are less frequent than the above described southeast winds.

The Masset Sanctuary road is a crucial part of the community's emergency evacuation plan and is particularly vulnerable due to its low elevation. It was inundated and parts of it washed away from high tides and winds in November of 2003, which caused road closures until late May 2004 (Mushynsky pers. com Aug, 2005). Cemeteries, culturally significant sites, and critical infrastructure on the north end of the island are all located on low-lying grounds and therefore vulnerable to impacts of future flooding and sea-level rise.

4.2.3.3 Local Temperature and Precipitation

Annual temperature on the north end of the island varies, with a daily temperature range of 0.7°C to 5.6°C in January to 12.1°C to 17.9°C in August (Environment Canada 2004). Average annual temperatures in B.C. have

increased during the 20th century and are projected to continue to increase in the 21st century by between 1°C and 2°C (Walker in press). For Haida Gwaii, and other coastal regions, this may have both positive and negative impacts on the environment and tourism in the area. On a positive note, warmer air temperatures may attract more tourists to the area. It is also projected that sea surface temperature may increase, impacting local fish species (mainly salmon), which lure many tourists to the area (BC-MWLAP 2002).

Average rainfall as recorded by the Sandspit weather station (Figure 4.1) is 134 cm and snowfall 6.2 cm (Environment Canada 2004). It is projected that precipitation may increase by 0.25 to 1.0 mm/day in the winter and that there may be a slight decline of 0.25 mm/day in the summer (Walker in press). This may have a positive impact as more fresh water will be available for human and natural system use (e.g., increased ground water supply, higher stream flow for salmon spawning). However, depending on the timing and distribution of precipitation, there also may be associated negative impacts, such as flooding (BC-MWLAP 2002).

4.3 Social Attributes of Vulnerability and Adaptive Capacity

This section will identify various social attributes of vulnerability and adaptive capacity as identified in scholarly literature and link them to the case study communities of Masset and Old Massett.

4.3.1 Social Capital

Social capital can be a measure of the stock of community resources (e.g., education, supplies, emergency planning), formal networks (e.g., communication between governing bodies), and informal networks (e.g., support systems, kinship relations, community groups) (Watts and Bohle 1993, Yohe and Tol 2002, Adger 2003a, Mendis *et al.* 2003). Strong social capital facilitates associations and partnerships and is used to build community adaptive capacity. This occurs by influencing the willingness and ability of community members to work together towards common goals (e.g., emergency planning and preparedness) (Tobin 1999, Mendis *et al.* 2003, Dolan and Walker in press). Greater access to transportation may facilitate easier intercommunity networks, enhancing social capital. For example, the ability of volunteers to attend meetings and events may be dependent on transportation networks. High immigration and emigration rates of people in the community, on the other hand may weaken social capital, as high population fluxes affect emergency planning, social service provision, and community networks (Townsend *et al.* 1988, Watts and Bohle 1993, Briguglio 1995, Cutter *et al.* 2000, Armstrong and Read 2002, Wu *et al.* 2002).

It was difficult to gain insight into the conditions that contribute to local social capital from available data. Through my observations and preliminary interactions with community members, it appeared that the community had numerous attributes that contribute positively to social capital, such as an emergency response plan and that there were strong community support systems (e.g., a strong sense of community), kinship relations (e.g., many family

bonds among the Haida), and many community groups (e.g., Lions club, volunteer firefighters) within Masset and Old Massett.

4.3.2. Experience

Section 4.2.3 illustrated that the exposure of the communities of Masset and Old Massett to severe storms, flooding, and climate change may increase their susceptibility to future environmental impacts. It is also believed that past societal experience with environmental changes increases awareness of, and preparedness for, climate-related changes, particularly short-term adjustments (Burton *et al.* 1978, Barnett 2001, Smit and Pilifosova 2003, Dolan and Walker in press).

During my preliminary field season I was informed that the communities of Masset and Old Massett have an emergency plan, designed for tsunamis, which can be used for any emergency evacuation (Mushynsky pers. com July 2003). Initially this information led me to believe that these communities were prepared for emergency situations (e.g., increased frequency and magnitude of storm events associated with future climate change), thus enhancing their resiliency and adaptive capacity. However, it became apparent during my preliminary field season that this plan was not well disseminated throughout the community, therefore limiting its effectiveness and perhaps not decreasing vulnerability as much as I had thought. The effectiveness of this plan was therefore further investigated and will be presented in Chapters 5 and Chapter 6.

4.3.3 Population Trends

4.3.3.1 Population Size

The total population of the Queen Charlotte Islands as indicated by the Canada census is 4935 people (Statistic Canada 2001). Of this, roughly one third live N Graham Island in Masset, Old Massett, and the larger electoral area 'D'⁸ (Table 4.2). While this small population is thought to facilitate closer relationships between people, thus strengthening community resiliency, it may also have negative impacts on the economy (e.g., less income to support local businesses) (Tapsell *et al.* 2002). Population and population density are low in Masset, Old Massett, and surrounding communities. While population density is unknown for Old Massett, population density of Masset is 49.6 people per square km (B.C. Stats 2004). This population density is low, compared to urban centers (e.g. Victoria's population density as given by B.C. Stats (2004) is 3939.9 people per square km). As high population density has been recognized as an attribute of vulnerability because it makes emergency evacuations difficult, this low population density should therefore increase local adaptive capacity in emergency situations (Townsend *et al.* 1988, Cutter *et al.* 2000, Tapsell *et al.* 2002, Wu *et al.* 2002). Local perspectives on the impacts of population will be explored in Chapter 5.

⁸ Electoral area 'D' represents all rural areas of Graham Island. There are no data specific to the north end of the Island.

4.3.3.1.1 Old Massett

The population of Old Massett increased by 2.2% between 1996 (692) and 2001 (739) (Statistics Canada 2001). As Old Massett is a First Nations community with band members who reside in Old Massett (total residency) and those who reside elsewhere, I have divided Table 4.1 into local residents and total band membership. Skeena Native Development Society (SNDS) is an organization that provides economic statistics on First Nations communities in the Skeena region. According to SNDS (2004) the total residency population and band membership of Old Massett have increased from 1994 to 2003 (Table 4.1). Membership population was 2512 in 2003, of whom 799 lived in the village (32% of total membership). Due, in part to a lack of housing in Old Massett some band members reside in Masset. Previous membership and residency as illustrated in Table 4.1 indicate that band membership, as well as residence, have been on a continual rise since 1994, with the exception of 2000 (SNDS 2004). Of the 799 people living in Old Massett, all but 20 are First Nations (SNDS 2004).

Table 4.1. Old Massett population trends in local residency and band membership (SNDS 2004).

Year	Total Band Membership Population	Old Massett Residency Population
1994	2181	626
1995	2224	614
1996	2270	644
1997	2305	724
1998	2346	731
1999	2388	750
2000	2413	739
2003	2512	799

4.3.3.1.2 Masset

The population of the Village of Masset in 2001 (Table 4.2) was 926 (Statistics Canada 2001). This number is down from 1293 in the 1996 census, indicating a 28.4% population decline. B.C. Stats (2004) carry more recent population data for the community of Masset indicating that the total population in 2004 was up to 965. While population is slowly increasing again, the drastic decrease between 1996 and 2001 was due primarily to the closure of the Canadian Forces Base. In February of 1994, the Canadian Armed Forces announced that the station in Masset was downsizing and would be converted to a remote operation site by 1997-1998. The downsizing reduced personnel on the site by 90% (Robinson forthcoming). Today, there are approximately 30 military personnel onsite who operate the station. It is estimated that between 500 and 600 military personnel and their families left the community in the two-year period subsequent to the downsizing (Mushynsky pers.com July, 2003). Declines in fishing- and forestry-related employment have also contributed to this out-migration since 1996 (Holman and Nicol 2004).

The median age of the population in Masset is 36.6 years old, with 78.4% of the population over 15 years of age (Statistic Canada 2001). In British Columbia the median age of the population is 38.4 and 81.1% of the population is over 15 years of age. The age demographics in Masset are therefore slightly younger than British Columbia averages. Of the 926 people living within Masset, 90 are foreign-born and 195 are of Aboriginal descent. Table 4.2 illustrates

current population and population changes in the communities and regions on Haida Gwaii, relative to British Columbia.

4.3.4 Population Stability

Table 4.2 clearly illustrates population growth and decline on Haida Gwaii between 1981 and 2001. Changes in fishing and forestry, military withdrawal and town closures (e.g., Tasu and Jedway on South Moresby Island closed due to reductions in mining) on Moresby Island are primarily responsible for the population declines (Holman and Nicol 2004).

Table 4.2. Changes in population for Queen Charlotte Islands communities (1981-2001) Compared to Provincial Averages (Holman and Nicol 2004).

Area	1981	1991	1996	2001	% Change 1981-2001	% Change 1996-2001
Graham Island	4343	4552	4980	4475	+3.0	-10.1
Masset	1569	1476	1293	926	-41.0	-28.4
Old Massett	580	632	692 ⁹	739	+21.9	+2.2
Port Clements	380	483	558	516	+35.8	-7.5
Area D (rural Graham Island)	385	282	520	538	+39.7	+3.5
Queen Charlotte City	1070	933	1222	1045	-2.3	-14.5
Skidegate	322	469	695	743	+130.7	+6.9
Moresby Island (area F)	1278	764	618	460	-64.0	-25.6
Sandspit	754	702	568	435	-42.3	-23.4
Other Moresby	524	62	50	25	-95.2	-50.0
Total	5621	5316	5598	4935	-12.2	-8.5
British Columbia	1,411,964	1,682,044	3,724,500	3,907,738	176.8	+4.9

⁹ The number of residents in Old Massett varies between the data collected from SNDS (2004) and the data gathered by Holman and Nicol (2004) using Statistics Canada as their primary source.

According to Statistics Canada Census Data (2001), overall population on Haida Gwaii has declined by 11.8% since 1981, although there are local exceptions including the two Haida communities of Old Massett and Skidegate, and Tlell and Port Clements. The most notable decreases have been in Masset and on Moresby Island, likely attributed to military downsizing and mining closures, respectively. The most notable increases are in Old Massett and Skidegate, likely attributed to “high natural increase, low out-migration and Indian Act amendments [Bill C-31] restoring status rights to Aboriginal women married to Non-Aboriginal men”, according to the Land Use Plan Process Management Team (LUPPMT (2003: 6).

High population change is recognized by scholars as an indicator of vulnerability as it can make emergency planning more difficult (Townsend *et al.* 1988, Watts and Bohle 1993, Tapsell *et al.* 2002). For example, it is difficult to organize transportation for a changing number of people over large, sparsely populated areas (e.g., Area D). The population in Masset and Old Massett, as well as other island communities, have gone through many fluctuations and changes indicating high population instability. From my preliminary field season I believed that while the size of local population may contribute to community resiliency, the population changes would contribute to the vulnerability of Masset and Old Massett. Further insight on population was gained through this participatory research and is presented in Chapter 5 and discussed in Chapter 6.

4.3.5 Health

Assessing community health needs to include physical measures of individual health (e.g., death, disease and disability), as well as investigating mental and social well-being (e.g., quality of life, life satisfaction and happiness) of a community (Hancock *et al.* 1999, Tapsell *et al.* 2002). The health of a community can also be impacted by the socioeconomic conditions within that community (section 4.4) (Berkman and Kawachi 2000). For instance, income and employment may increase choice and awareness (section 4.4) and greater social capital and cohesion may increase community strength to withstand changes (section 4.3.1). These and other social attributes such as politics (section 4.5) can strengthen community ability to adjust and adapt to changes. Additionally limited access to health services can also increase vulnerability in emergency situations (Armstrong and Read 2002). Like many rural and remote communities access to services (e.g., health care) is limited on Haida Gwaii, due in part to its small population base and to its distance from urban centres. Restructuring, both environmental and socioeconomic, have had negative impacts on the health of coastal communities in British Columbia (Dolan *et al.* 2005).

As the majority of the population in the case study is First Nations and one of the communities (Old Massett) is a Native reserve, it is important to note that Aboriginal people tend to have lower health status according to measures of morbidity than Non-Aboriginal people (Herring 1995). For example, average life expectancy is approximately 6 yrs less in Aboriginal populations than in the

overall Canadian population and infant mortality rates are twice as high. Aboriginal people suffer from excess injuries, higher rates of infectious disease, and have higher than average respiratory and endocrine diseases (Herring 1995). In comparing health indicators reported in the Skeena Queen Charlotte Regional District (36% Aboriginal population), to B.C. Statistics data (2001), it is clear that there is more drug crime per capita, lower life expectancy at birth (77.8 compared to the B.C. average of 80.6, from 2000-2004 data), higher infant mortality rates (4.8 compared to the B.C. average of 4.0, per 1000 live births), higher teenage pregnancy (57.3 compared to the B.C. average of 20.3 per 1000 women age 15-17), and more potential years of life lost due to suicide and homicide in the Skeena Queen Charlotte Regional District. This, consequently, leads me to believe that First Nations populations on Haida Gwaii may be especially vulnerable due to low population health status. In addition to health, education is considered an attribute of community vulnerability and adaptive capacity.

4.3.6 Formal Education

Table 4.3 highlights the breakdown of formal education in Masset from Statistics Canada data (2001). With greater education it is assumed that people will have greater awareness of the hazards that exist (Hutton and Haque 2004, Degg and Homan 2005). Higher education levels also are more likely to lead to greater employment and income opportunities (Holman and Nicol 200, Hutton and Haque 2004). Increased awareness and higher income can increase

adaptation and adjustment opportunities (Santrock 2003, Blanchard-Boehm and Cook 2004, Holman and Nicol 2004, Hutton and Haque 2004). For example Blanchard-Boehm and Cook (2004) found that formal education level was one of four variables that helped predict whether residents of Edmonton, Alberta had protective measures against future tornado occurrences.

Table 4.3. Education as a percentage of the population by age category in Masset (Statistics Canada 2001).

Highest Level of Schooling	Masset % population by age			British Columbia % population by age		
	20-34	35-44	45-65	20-34	35-44	45-65
Less than a high school graduation certificate	32.5	28.6	32.3	14.6	17.5	23.5
A high school graduation certificate and/or some postsecondary	5.0	28.6	25.8	34.5	25.0	22.3
A trades certificate or diploma	17.5	14.3	16.1	10.5	14.3	14.3
A college certificate or diploma	15.0	14.3	9.7	17.0	20.2	17.5
A university certificate, diploma or degree	30.0	19.0	16.1	23.5	23.0	22.4

Table 4.3 demonstrates that formal education levels in Masset are lower than the provincial averages. Of particular interest is that 32.5% of 20-34 year olds in Masset have less than high school graduation as their highest level of formal education. This is double that of the same age group in British Columbia (14.6%). Many young people are not completing high school which has potential for increasing local vulnerability as indicated by Santrock (2003), Blanchard-Boehm and Cook (2004), Holman and Nicol (2004), and Hutton and Haque (2004) due to the impacts on employment opportunities, awareness and economic status.

Current formal education levels are not available for Old Massett; however, education levels and participation rates in the formal education system

are much lower among the Haida than for Haida Gwaii as a whole according to previous investigations (Holman and Nicol 2004). Higher high school incompleteness rates in communities are also associated with increased drug use, delinquency and higher teenage pregnancy rates (Santrock 2003). As illustrated in the health section (4.3.3) the numbers of teenage pregnancies are much higher in the Skeena Queen Charlotte Regional District compared to B.C. Additionally, juvenile crime rates (age 12-17) for both violent crime and property crime rates are higher than B.C. averages, as are the number of drug offences (B.C. Statistics 2004).

Due to a low and declining percentage of people who speak Haida (i.e., community elders), there has been an increased emphasis among Haida communities to revitalize their language and culture. This is being done through the Skidegate Haida Immersion Program (SHIP) and the Old Massett Education Program. Activities by these groups include immersion projects in day care and pre-school programs, a variety of course work for elementary and high schools, youth groups, adults and seniors' groups, as well as an on-island university accredited course in linguistics (LUPPMT 2003).

This preliminary view of education gathered from my initial observations and data collection illustrates that formal education levels in Masset are lower than B.C. averages and that it is believed that education levels in Old Massett are even lower. It is assumed that these low education levels may contribute to greater community vulnerability due to lack of awareness of hazards, less job opportunity, less income opportunity, and decreased ability of individuals and the

community to successfully adjust to change (Santrock 2003, Holman and Nicol 2004).

4.3.7 Haida Culture

Haida Gwaii has a unique cultural heritage, as it is the homeland of the Haida people. Based on my observations, the Haida culture and a sense of community remain strong, as evident in the various cultural events (e.g., potlatches, repatriation, burial ceremonies, Haida singing and dancing groups, and the teaching of the Haida language). In Haida Gwaii, attachment to place is rooted deep in the many culturally significant sites and ways of life (Holman and Nicol 2004). Unfortunately, many of these sites (e.g., the local cemetery, some of the old Haida village sites and other spiritual sites) are located close to the shoreline and are at greater risk of future sea-level rise impacts, making these locations vulnerable to environmental changes. It is a common sentiment that this attachment to place and commitment to remain in place extends beyond the Haida culture to include other community members.

Attachment to place has been identified as an indicator that works to strengthen local adaptive capacity, as it enhances the determination to adapt and adjust to changes (Yamada *et al.* 1995, Magistro and Roncoli 2001). Local culture can also positively influence community resiliency as it encourages greater human interactions with the environment (Yamada *et al.* 1995, Magistro and Roncoli 2001). Such local cultural practices may include spiritual links with the local environment, traditional knowledge of the local environment, survival

skills (e.g., hunting, fishing, gathering berries). The following section will investigate economic attributes of vulnerability and adaptive capacity.

4.4 Economic Attributes of Vulnerability and Adaptive Capacity

Masset is the business centre for the north end of Haida Gwaii. It is home to approximately 128 businesses and community services, including grocery stores, a bank, the RCMP, an elementary and a secondary school, a hospital, an airport, harbour facilities, and visitor accommodations; therefore it is also the major employment centre on the north end of Haida Gwaii (Village of Masset 2003). The community of Old Massett operates two gas bars with convenience stores, a coffee shop, a health centre, a preschool, and artisan shops and is home to numerous artist entrepreneurs (Holman and Nicol 2004).

4.4.1 Employment and Income

Higher incomes increase choice and access to resources that help individuals, families and communities cope with hazard events. Therefore, with steady employment income, it is believed that adaptive capacity would be strengthened (King 2001, Tapsell *et al.* 2002, Clark *et al.* 1998, Wisner 1998, Kundzweiz 2002, Yohe and Tol 2002). In total, 520 people in Masset reported employment income in 2001, which consists of 67.6% of the labour force¹⁰,

¹⁰ “Refers to total income received by persons 15 years of age and over who received wages and salaries, net income from a non-farm unincorporated business and/or professional practice, and/or net farm self-employment income during calendar year 2000, who reported non-zero earnings.” (Statistics Canada 2001)

making the unemployment rate 32.3% (Statistics Canada 2001). Earnings in Masset are slightly lower than the British Columbia averages. For example, the average earning of all persons with income per year in Masset is \$29,915 compared to the B.C. average of \$31,544. Full time employees¹¹ report an average earning of \$41,668, compared to B.C. average \$44,307 (Statistics Canada 2001). As average incomes in Masset are lower than the B.C. averages, this preliminary review led me to believe that they would have greater vulnerability.

Employment, economic stability, and a high level of economic development have been recognized as attributes that enhance adaptive capacity (King 2001, Tapsell *et al.* 2002, Sidle *et al.* 2004). The high dependency on seasonal employment (e.g., forestry, fisheries, tourism) in Masset and Old Massett results in high levels of unemployment during the off-season, creating economic instability throughout the year. For instance, there are fewer job opportunities in the winter months. Of the 640 people that make up Masset's labour force, 520 were reported to have income in 2001, equating to a 19% unemployment rate (Statistics Canada 2001). This is similar to the BC unemployment rate of 20%. Of the 416 people that make up Old Massett's labour force¹² in 2003, 225 were employed, 144 full-time, 50 part-time, and 41 seasonal. This results in a 46% unemployment rate (SNDS 2004). This number

¹¹ "The term full-year full-time workers refers to persons 15 years of age and over (excluding institutional residents) who worked 49-52 weeks (mostly full time) in 2000 for pay or in self-employment." (Statistics Canada 2001)

¹² The Skeena Native Development Society identifies the labour force as those between the ages of 15 and 65, with the exception of students and instituted persons.

is down from 1997 (68%) and 2000 (61%). It is difficult to compare these unemployment rates as one set of data (Masset) came from Statistics Canada community profiles (2001) and the other came from SNDS (Old Massett) (2004), and both represent different years. The lack of current and consistent data emphasizes the need for a community-based approach, gain greater insight on the community demographics. However, compared to the average unemployment rates (55%) of 25 native communities profiled by the SNDS service area, local unemployment rates are similar at 54%. Of this, 5.3% identify themselves as actively seeking employment. Like most First Nations communities in the SNDS service area, unemployment in Old Massett is higher among males at 60% (average for the district 56%) than among females (SNDS 2004). "Limited local funding" is given by SNDS (2004: 23) as the primary reason for high unemployment in Old Massett. "Seasonal work", a "high dependency on social assistance" and "lack of incentive" are also believed to contribute to high unemployment rates (SNDS 2004: 23). Given these findings from existing data, it appeared that local income was low, which would increase local vulnerability (King 2001, Tapsell *et al.* 2002, Clark *et al.* 1998, Wisner 1998, Kundziewicz 2002, Yohe and Tol 2002).

Some of the major employers on the north end of the island are OMEGA packaging (a local fish processing plant), Old Massett Village Council (OMVC), Delmas Co-operatives (a grocery, pharmacy, and hardware store), Council of the Haida Nation (CHN), B.C. school district #50 (Masset), Singing Surf Inn, QCI Regional Hospital (Masset), and the Village of Masset. OMEGA is the largest seasonal employer, providing jobs for up to 50 people in the summer season to

as few as 6 people in the winter season (SQCRD 1999). This statistical review of local employment and income from the preliminary field season supports the fact that there is high unemployment in Old Massett, with employment fluctuations throughout the year, and slightly lower annual average incomes compared to other communities in B.C.. The importance of income as a determinant of wealth would suggest higher vulnerability.

4.4.2 Livelihood Dependencies

Populations that are highly dependent on natural resources for employment have been described as being more susceptible to climate change impacts (e.g., changes in forests, fish stocks) (Barnett 2003, Mendis *et al.* 2003). The largest employment sector in Haida Gwaii is the natural resource sector, employing 29% of the population (LUPPMT 2003). The service sector is highly dependent on tourism (e.g., food services and accommodation) and provides 7% of employment, while wholesale and retail trade employ 13% (LUPPMT 2003).

A traditional dependence on natural resources (e.g., fishing, forestry, and agriculture) remains high on Haida Gwaii (LUPPMT 2003). Forest-based communities have been identified as particularly vulnerable as “northern forest ecosystems are among those regions at greatest risk to the impacts of climate change” (Davidson *et al.* 2003). Masset and Old Massett are not strictly forest-based (Table 4.4 and 4.5) as fishing and agriculture also contribute to the natural resources sector. However, these resources may also be vulnerable to climate change impacts due to changes in fish species and abundance, as well as

changes in the growing season and pest infestations (MWLAP 2002). Much of the tourism on the island is also related to fishing. Therefore, changes in fish stocks, caused by both natural and human impacts, may not only have a direct impact on the fisheries themselves, but may have trickle down effects on the tourism sector and thus local businesses, as much of the local tourism is linked to the sports fishing industry.

As reported by Statistics Canada (Table 4.4) and the Skeena Native Development Society (Table 4.5), the major sectors of employment in Masset and Old Massett are fishing and fish processing, forestry, tourism and government services (2001).

Table 4.4. Employment by sector in Masset (Statistics Canada 2001).

Employment Sector	Masset (%)	B.C. (%)
Agriculture and other resource-based industries	8.3	5.2
Manufacturing/construction	6.3	15.5
Wholesale and retail trade	23.0	15.7
Finance and real estate	0.9	6.1
Health and education	24.0	16.9
Business services	14.0	19.6
Other Services	22.0	21.1

Table 4.5. Employment by sector in Old Massett (SNDS 2004).

Employment Sector	Old Massett (%)	Skeena District (%)
Fisheries	18.3	13.1
Forestry	11.1	10.5
Mining	0.0	2.3
Public	40.9	56.2
Tourism	0.4	1.6
Other	29.4	15.9
Unknown	0.0	0.3

In Masset, the largest employer is the public sector (health and education equates to 24%). According to Table 4.4, 8.3% of the workforce is employed in

agriculture and other resource-based industries. Conversely, in Old Massett, 41% of the population is employed in the public sector and 27% in natural resource industries (fishery and forestry) (SNDS 2004). The data in Masset are difficult to interpret as jobs in fishing, forestry and agriculture are not clearly delineated as they fall within the “Agriculture and other resource-based industries” category.

Tables 4.4 and 4.5 illustrate that both Masset and Old Massett are more dependent on natural resources, notably fisheries and agriculture, for employment than the province as a whole.

4.4.3 Long Term Economic Trends and Development

The traditional economic staples of the Queen Charlotte Islands as illustrated in the previous section are forestry and fishing industries (Statistics Canada 2001, Holman and Nicol 2004, SNDS 2004). Within the past ten years, there have been significant downward trends in these two industries. Agriculture on the other hand, has remained more stable (Holman and Nicol 2004). This has caused declines in job opportunities in the natural resource sector. The local fishery has suffered as a result of reduced populations of salmon, herring and other marine resources, as well as issues associated with the allocation of fishing privileges (e.g., implementation of the Pacific Salmon Revitalization Plan) (Holman and Nicol 2004). In forestry, downward economic trends have been associated with international timber markets, increasing costs of accessing timber, changes in forestry management, and changes in technology (LUPPMT 2003).

Locally, there has been downsizing and cutbacks in program funding by both the federal and provincial governments. For example there have been cuts to the school district (The QCI Observer April 1, 2004, May 6, 2004), and local health services (Bevington 2004). Fluctuations in tourists have also been high on the island causing instability in the tourism industry. There have been many local population fluxes, as discussed earlier, which have also had an impact on local business. These downward trends and economic fluctuations have all had negative influences on employment and income levels of local communities (LUPPMT 2003).

In response to these economic changes, there have been a number of initiatives to assist in restoring some economic security and stability within island communities. These programs include: Gwaii Trust¹³, Haida Nation Economic Development Programs, South Moresby Forestry Replacement Account (SMFRA), Greater Masset Development Corporation (GMDC), Haida Gwaii Community Futures Development Corporation and Islands Community Stability Initiative (ICSI) (Holman and Nicol 2004). The initiatives of such programs and funding bodies can increase adaptive capacity by strengthening the local economic base through job creation and economic support for education (Lorenzoni *et al.* 2000a, Barnett 2003, Sidle *et al.* 2004).

The high rate of local unemployment in Old Massett as given by SNDS (2004), combined with the slightly lower than provincial averages for employed

¹³ Gwaii Trust is a fund that was “established as a locally controlled, interest-bearing fund to advance economic diversification and sustainable development on Haida Gwaii/Queen Charlotte Island” (Gwaii Trust 2005)

people (Statistics Canada 2001) given in this preliminary investigation of vulnerability and adaptive capacity, led me to believe that these factors contribute to increasing local vulnerability. This is grounded in the belief that less income decreases choice and the ability to access resources that may help people and communities cope with hazards (King 2001, Tapsell *et al.* 2002, Clark *et al.* 1998, Wisner 1998, Kundzewicz 2002, Yohe and Tol 2002). The high dependency on the natural resource sector for employment also adds to this vulnerability, due to the susceptibility of natural resources to climate change impacts (Barnett 2003, Mendis *et al.* 2003). Another theme that was investigated during my preliminary field season was local politics.

4.5 Political Attributes of Vulnerability and Adaptive Capacity

Although Haida Gwaii is home to approximately 5000¹⁴ people (Table 4.2) (Statistics Canada 2001), the political systems governing the island are quite complex. There are two First Nation Band Councils that manage the native reserves: the Old Massett Village Council (OMVC) and the Skidegate Band Council (SBC). They are funded by the Department of Indian and Northern Development (DIAND) and are given jurisdictional authority over reserve lands by the Indian Act. There are three town councils; The Village of Masset (VOM), The Village of Port Clements, and Queen Charlotte City, that are responsible for town

¹⁴ The most complete data set for Haida Gwaii's population is 4935 according to Statistics Canada 2001 data set. B.C. Stats however, has reported the population of Masset to be 965 in 2004, up from 926 in 2001 and Port Clements to be 533 in 2004, up from 516 in 2001.

management, infrastructure and services. At the provincial level, the Skeena-Queen Charlotte Regional District represents Haida Gwaii.

The Council of the Haida Nation (CHN) is the governing body for Haida affairs, representing Old Massett, Skidegate and all Haida people. Originally the CHN was developed in 1980 as part of a mandate to deal with land issues and is now a more encompassing political body for the Haida people. The Haida Tribal Society (HTS) was formed in 1984 to assist the CHN with administrative issues and legal documents. Although, politically, the traditional decision making authority of Hereditary Chiefs has lost some of its power, it remains part of the CHN mandate that the chiefs must be in agreement in decision-making (Russ pers. com July 2003). The CHN therefore plays an active role in decision-making on behalf of the Haida people and is actively involved in the Haida Land Claims case.

In addition to the band councils, community councils and the CHN, there is one national park on Haida Gwaii, Gwaii Haanas National Park Reserve and Haida Heritage Site, which is co-managed by Parks Canada and the CHN, and one provincial park on Graham Island, Naikoon (including Agate Beach, Misty Meadows and Pure Lake) Provincial Park, managed by the Government of B.C., with co-management of the Agate Beach Campground (Parks Canada 2005, BC-MWLAP 2005).

The diverse group of decision-makers that exists on Haida Gwaii can be an advantage to the people that live there, as there is a broader range of ideas and opinions expressed on local issues when these decision-making bodies work together. The inclusion of various groups and representatives works to enhance

community adaptive capacity as it ensures the views of different interest groups are heard in planning and development. For example, the Village of Masset and the Old Massett Village Council are engaged in a water servicing agreement, sewer treatment planning, and co-own the Greater Masset Development Corporation (GMDC) (Jarvis pers.com July 2003). Final results produced by such joint efforts are more likely to reflect the interests of the broader community leading to a more community-based, bottom-up approach to planning and development (Wood 2003). However, including multiple interest groups can also be a disadvantage due to varying political agendas, community needs, histories, points of view, and access to resources. Such diversity can make consensus decision-making more difficult in community planning (e.g., emergency planning), thus contributing to enhancing community vulnerability (Woods 2003).

4.6 Conclusion

In this chapter I have provided a profile of local attributes of vulnerability and adaptive capacity, based on my preliminary field season. I based this interpretation on an examination of available data, initial contact with community members, as well as my personal observations and academic background. These attributes include: exposure to environmental risks, environmental 'sensitivity', remoteness, high resource dependency, population instability, limited access to services (e.g., health care), low education levels, high unemployment, and economic instability. Local attributes such as attachment to place, social cohesion, experiences with storm events, location, and cultural knowledge of the

area, however may work to strengthen local adaptive capacity. These attributes have been discussed throughout this chapter and are summarized in Table 4.6.

Table 4.6. Preliminary view of community vulnerability and adaptive capacity in Masset and Old Massett.

Category	Attribute	Contributes to Vulnerability	Contributes to Adaptive Capacity
Geographic	Geophysical sensitivity	Yes	No
	Location	Yes	Yes
	Exposure and experience	Yes	Yes
Social	Population size	Yes	Yes
	Population instability	Yes	No
	Lack of education (formal)	Yes	No
	Cultural	No	Yes
Economic	Employment and income	Yes	No
	Livelihood dependencies	Yes	No
	Long-term economic trends and development	Yes	Yes
Political	Institutions	Yes	No
	Planning and decision making	Yes	Yes

Table 4.6 summarizes the attributes of community vulnerability and adaptive capacity that have been discussed throughout this chapter and categorizes them. In the third and fourth columns, 'yes' implies that the corresponding attribute adds to vulnerability or adaptive capacity, whereas 'no' implies that the variable does not appear to contribute to vulnerability or adaptive capacity. In some case I believe the attribute may have both positive and negative impacts on local resiliency, thus contributing to both vulnerability and adaptive capacity. At first glance, Table 4.6 suggests that the communities of Masset and Old Massett may be vulnerable to future climate change and sea-level rise impacts. For example, the high biophysical fragility, low education levels, and livelihood dependencies are all believed to increase local vulnerability. I would also assume that the community of Old Massett may be especially

vulnerable given lower education levels and employment rates. However, it was brought to my attention during my preliminary field season that other locally and culturally-specific characteristics such as the determination to remain in place, cultural attachment to the land, and the ability of locals to cope with external stresses due to previous experiences may reduce vulnerability in either community, and therefore, require further research. While top-down vulnerability assessments might use the information presented in this chapter to devise a measure of local vulnerability based on a set of preconceived indicators, it became apparent to me that a more bottom-up approach was needed to gain deeper insight into local attributes of vulnerability and adaptive capacity to climate change and accelerated sea-level rise impacts. In a similar vein to Mendis *et al.* (2003), I believe that building a community background report is a useful, and necessary, preliminary step in a social vulnerability assessment. The benefits of going beyond this background research to include community input in the research will be evaluated in Chapter 6.

In the following chapter I highlight local perspectives of community strengths and vulnerabilities, through my interpretations of key informant interviews and a door-to-door survey, in the communities of Masset and Old Massett.

5.0 Interview and Survey Questionnaire Results

5.1 Introduction

In this chapter, I identify locally perceived characteristics of vulnerability and adaptive capacity, thereby fulfilling the second objective of my thesis (using a participatory approach). The chapter is divided into two main sections. In the first section, I present the results of the key informant interviews (section 3.3.4) and in the second section I focus on the door-to-door survey results (section 3.3.5). In Chapter 6, I synthesize results from both of these two sources, as well as compare these results to my outsider perceptions of local vulnerability and adaptive capacity (Chapter 4), to illustrate the utility of including community members early on in the research process.

5.2 Key Informant Interview Analysis

The key informant interviews were successful in generating a variety of responses from both local community members and outsiders that work with these communities (Table 3.2). These interviews gave me greater insight into locally perceived characteristics of vulnerability and adaptive capacity. Some of the ideas expressed by the key informants were specific to the local area (e.g., the Haida Culture), while other ideas could be applied in other remote communities (e.g., remoteness, high resource dependence).

I identified several locally-identified themes reflective of both vulnerability (5.2.1) and resilience (5.2.2) in Masset and Old Massett from key informant interview responses. I generated these themes through the use of a selective

coding method highlighted in Chapter 3 (section 3.4.4.2). The themes centering on vulnerability include: local health services, formal education levels, high unemployment rates, and the lack of involvement of youth. Themes related to resilience and adaptive capacity include: the strength of the people who live in Haida Gwaii communities, community characteristics, culture, attachment to place, local control/governance, experience with change, location/environment, health care programs, and employment opportunities. The term 'strength' was used in place of resilience or adaptive capacity, as it was the term I used in the interview questions (Appendix III). I chose this word given it is a more common term for the general public and allowed for more general responses around positive community abilities.

5.2.1 Community Identified Characteristics of Vulnerabilities

To gain some local perspective on vulnerability, I asked key informants how the location of their home or community might make them more or less vulnerable to potential environmental changes or emergency situations (Appendix III). While most respondents felt that their location in proximity to the coast exposed them to potential impacts of sea-level rise and storm surges, there was also a sentiment that isolation from the mainland created strength and independence within the communities. Key issues associated with increased vulnerability to environmental changes raised by key informants included:

- Exposure to storms, earthquakes, tidal waves and tsunamis,
- Potential sea-level rise impacts (e.g., loss of land),

- Reduced transportation services (e.g., ferries, planes and highway access) in emergency situations,
- Lack of island wide emergency response plan and,
- Quality of health services (e.g., poor condition of hospital infrastructure).

While many interviewees could identify some aspect or issue that made them 'vulnerable', there was a general resistance to this term. This resulted in many respondents commenting on strengthening elements of the community (e.g., community resilience and adaptive capacity).

5.2.1.1 Access to Health Care Services and Community Health

As indicated in Chapter 4, health has implications for overall community well-being (Tapsell *et al.* 2002). Most key informants agreed that limited access to health services in emergency situations may increase local vulnerability. Other attributes of health vulnerability were also identified, including:

- Drug and alcohol addictions/problems within the community (Larissa, Megan),
- Inadequate and barely functional health care systems (i.e., lack of services, the need for a new hospital) (Riley),
- Residential school legacy that has led to generational sickness (i.e., physical abuse, apathetic and negative attitudes) (Isabelle, Larissa),
- Unhealthy eating with outside influence (i.e., obesity) (Larissa, Megan),
- Poor water quality (i.e., common occurrence of skin rashes among children) (Tyler) and,

- The short duration of doctors staying within the community (Aaron, Kira).

Some of these negative aspects can be linked to both the size and location of the communities. Several key informants reflected on this as being one of the sacrifices you make when you choose to live in an isolated island community (Fiona, Jenny). Additionally, the enduring impact of residential schools on the mental and physical health of Aboriginal residents in both Masset and Old Massett was also a common topic in this section (Isabelle). While these ideas reflected some of the negative aspects of local health, section 5.2.2.8 will highlight some of the positive aspects of local health as identified by key informant interviews.

5.2.1.2 Education

Many key informants expressed belief that cultural awareness and informal education are increasing on Haida Gwaii. They also identified many problems associated with education, especially formal education. There was a collective sentiment that a lack of resources in the north for education and provincial funding cuts to school district 50 were the biggest problems affecting the formal education system in the area. Other responses emphasized a range of education-related issues, and include concerns such as:

- There are fewer classes and less extra curricular activities offered (Larissa, Victor),
- The schools are a rough environment (Larissa, Victor),
- There is often a lack of support for learning at home (Larissa, Megan),

- It is difficult to get teachers that will stay for a long period of time (Aaron, Larissa),
- The teachers do not know how to treat the children (Riley, Tyler),
- Many of the Haida teachers do not speak Haida and should (Riley) and,
- There is a general disinterest in school by children (Larissa).

Some key informants stated that the education of children had as much to do with a child's home life as it did with the schools (e.g., teachers, other students, and curriculum) (Aaron, Larissa, Riley, Victor). These key informants suggested that it takes a community to raise a child, not just parents and teachers, attributing this disinterest of children in education to the lack of encouragement and support by the community. These community identified attributes of education, along with the local education statistics presented in Chapter 4, suggest problems with formal education in the area. As illustrated in Chapter 4, low education rates may increase local vulnerability due to a lack of employment skills, lack of awareness of hazards, and increased social problems (Santrock 2003, Holman and Nicol 2004).

5.2.1.3 High Unemployment Rates

There was belief among key informants that the type of employment on Haida Gwaii was not suited to local needs. For instance, many of the jobs available are not flexible with local lifestyles (e.g., food gathering in the summer season) and are often lower paying. Several informants (Aaron, Dakota, Isabelle, Fiona) expressed the view that unemployment is often chosen by the local

population over low paying and inflexible jobs (e.g., Monday to Friday, nine to five). Key informants also commented on labour shortages, lack of available high-paying and highly-skilled jobs, decreases in forestry jobs, and the lack of initiatives in value-added products (e.g., processing of wood products on Haida Gwaii, rather than shipping out all the raw timber) (Aaron, Isabelle, Megan, Victor). While limited employment opportunities were clearly an issue, key informants also recognized lack of people with a strong work ethic, as a significant problem on Haida Gwaii.

5.2.1.4 Lack of involvement of Youth

Concern with the lack of involvement of youth and an increase in apathetic and negative attitudes, was a recurrent theme expressed by informants (Larissa, Riley). This lack of involvement was generally associated with school classes and activities. However, key informants reflected that many of the youth are not involved in most community events and activities either.

Fiona emphasized how important it is for the younger generation to start getting more involved in the community and on a positive note was pleased that youth attended our community workshop. The general lack of involvement of youth is believed by key informants to increase local vulnerability as youth are the future of Haida Gwaii and their ideas and opinions are important for future planning. While this theme has not been addressed in my review of the literature it is believed by key informants to be an important theme to consider in a vulnerability assessment to climate change and accelerated sea-level rise impacts.

5.2.2 Community Identified Characteristics of Resilience

To gather local perspectives on community resiliency and adaptive capacity, I asked respondents what they believed made their community strong (i.e., resilient) in the face of change. The two most common themes key informants raised focused on the type of residents who live on Haida Gwaii and the size of the communities. In this section, I highlight these and other themes that key informants believed to contribute to the strength of the local communities.

5.2.2.1 Social Capital

Social capital contributes to the resiliency and adaptive capacity of a community as it refers to the resources within a community, as well to local formal and informal networks (section 4.3.1). When asked what contributes to the strength of the community, the most common response was the ‘strength of the people’, particularly when it came to pulling together in times of need. I have interpreted the response of ‘strength’ to mean mental strength, rather than physical strength, of people within the community and provide some examples here. Fiona noted that,

“I think the people are our biggest assets because whenever anything happens everybody comes together. It doesn’t matter whether you’re First Nations or non-First Nations or from Masset or Old Massett, the whole town pulls together”.

Despite this sense of community, she noted that there is often still a sense of competition within and between communities. She notes, “They’ll bicker and argue and scrap...but then something will happen and that’s put aside and

everybody pulls together” (Fiona). Many key informants also emphasized the sharing of goods within the communities (e.g., food during the harvest season). Key informants (e.g., Dakota, Jenny, Lana) spoke of this sharing often with reference to the Christmas Eve, 2003 storm and common ferry delays. Jenny, who was on the islands at the time of the storm recounts, “As recently as December 23rd when we had that major storm that threw debris on our highways, and took out people’s property... I got to actually see first hand how people in the communities came together to support one another”. She provided examples of food sharing and an informal network of community members checking in on each other to ensure everyone’s safety. These informal networks of support enhance community social capital (section 6.2.2.1).

Another element that strengthens social capital, as indicated by Aaron, Fiona, Isabelle, Kira, and Victor, is the support for local fundraising events. Events mentioned include: mini Timmy Telethons ¹⁵, Haida repatriation festivities ¹⁶, loonie-toonie ¹⁷ auctions and other local fundraising events for medical emergencies (e.g., for family members to go off island to visit those in hospital care). Key informants believed that there was not only a number of events for a community of such small size, but that the amount of volunteerism that goes into preparing these events and the community support for such events

¹⁵ Telethons held in Masset to raise money for Easter Seal House in Vancouver, hosted by the Lions Club (Fiona)

¹⁶ Haida Repatriation Festivities include fundraising events (e.g., loonie-toonie auctions and clothing sales) for bringing home Haida remains and cultural goods, which were removed from Haida Gwaii by museums.

¹⁷ Fundraising events held within communities, where local businesses and artists donate items to be raffled off in a draw. Such auctions are done for various charitable events (e.g., Haida Repatriation, to assist families with emergency medical support).

is vast. High levels of volunteerism (e.g., the volunteer firefighters), as well as high community support (e.g., fundraising auctions) also contribute to this sense of people pulling together and community social capital. Adrian describes this support by saying, “[you] couldn’t find a more giving place”. Key informants attribute some of this social cohesion to the small size of their communities and the isolated location.

5.2.2.2 Small Size

Many key informants commented on the size of the community as a factor contributing to its strength, particularly with regards to the value of people knowing each other and having neighbours to look out for their wellbeing. Informants frequently commented that the small population base makes their communities more resilient. Isabelle describes this by saying, “I think if anything [disastrous] happens, a small community is the best place to be. I think the community support [here] or island support is phenomenal”. Other positive aspects attributed to small size were the number of community events for such a small population (Jenny), the level of activeness of the people, and the network of small associations doing “a bunch of good things” (Adam). Having a small population with strong social networks contributes to community cohesion, an attribute of social capital.

5.2.2.3 Community Isolation

Even though the isolated location of Haida Gwaii can contribute to community vulnerability, as discussed in sections 4.2.2 and 5.2.1, community

members also view the isolated location of the island as an element that strengthens their communities. Isabelle believed that, “In the face of change I think it’s lucky that we’re isolated on an island”. To support her point, Isabelle and others, described the type of lifestyle that exists on Haida Gwaii as an interconnectedness with nature and the potential for a healthy outdoors lifestyle (Fiona). Also, it was noted that isolated northern communities, “...tend to be a little bit more independent and strong; self-sufficient” (Fiona). Some key informants referred to this as the ‘frontier mentality’ or ‘homestead ingenuity’ of Haida Gwaii (Lana, Larissa). Isolation is therefore an attribute that has been perceived as both a strength and source of vulnerability in Masset and Old Massett.

5.2.2.4 Cultural History

Whether the key informants were local, Haida, non-Haida, newer or older residents (Table 3.2), most identified with Haida culture as a source of community strength. The key informants describe the strength of the Haida community as stemming from the culture; leaders and elders, their history, close ties to the land, cultural pride, and ability in the past to transcend changes (Isabelle, Aaron, Lana, Victor). With this long history, Isabelle expressed that, “as a [group of] people over time [we] have adapted to the changes that have occurred”. The following account from a Haida key informant from Old Massett describes a deeply rooted strength that he feels is a part of the culture and their people today.

“Well there’s a lot of faith, I think, in who we are and the history of who the Haida [are]...there’s a rich history passed to the people that have lived here since time immemorial and the reason why is because of ...very intrinsic, close ties that we have [which] draws our strength. So whenever things overtake us to a certain degree we’ll always have that to back us up.” (Victor)

The emphasis on cultural strength and determination to remain in place coupled with the strong historic ties captured by Victor and other key informants (e.g., Aaron, Adam, Fiona, Isabelle, Kira) also have been recognized in academic literature (Eisenhauer *et al.* 2000, Vorkinn and Riese 2001, Yamada *et al.* 1995). For example, sense of place will be explored further in section 5.2.2.4 as it pertains to both the Haida and non-Haida residents of Haida Gwaii. Culture can influence human-environment interactions by increasing connection with and caring for the environment and ultimately contributing to local resiliency (Magistro and Roncoli 2001). While culture contributes greatly to this local attachment to place, increased cultural awareness, through local education programs also was believed to be a strengthening element of Masset and Old Massett.

5.2.2.5 Cultural Education

The importance of informal education (e.g., wilderness survival, fishing and cultural ties with nature) was brought to our attention during the pilot study in February 2004 and was prominent with key informants in questions about the strength and weaknesses of education on Haida Gwaii.

For example, there has been an increased emphasis on the preservation of the Haida language, due to the limited number of people that speak Haida (Riley). On the north end of Haida Gwaii, the Haida language is now taught in

the public school system in Masset, as well as at Chief Matthews School in Old Massett, in hopes of restoring the Haida language.

Rediscovery Camp, located on Lepas Bay, NW Graham Island, is host to a summer youth program that fosters cultural and environmental education. It is open to both Haida and non-Haida youths. Several key informants, both Haida and non-Haida, believe that the sharing of this traditional knowledge of the local environment and Haida history is a strengthening element of their communities, that it fosters a different type of learning and is said to inspire a sense of pride in local culture. Through the key informant interviews and my interactions within the communities of Masset and Old Massett, I believe that this increased cultural pride contributes to empowerment. This empowerment fosters greater social capital, as it increases local knowledge and understanding (section 4.3.1).

5.2.2.6 Attachment to Place

Attachment to place and the commitment to remain in place was also expressed by key informants as a contribution to the strength of these communities. For individuals, the attachment to place in these communities was described most commonly as being a cultural trait of the Haida people. Accounts such as, “We’ve always been able to maintain our presence here because of our ties to the land. Our ties to the land are very, very close” (Victor) reflect this attachment. However, key informants also noted that this sense of attachment and commitment to stay on the island extends beyond the Haida history to include the non-Haida who also have strong ties to the land and its people. This is evident in remarks such as, “At an individual level I think that the type of people

that are attracted to living here are really quite independent and self-sufficient, and therefore, at an individual level, I think a large percentage of the population is pretty resilient” (Kira). Residents believe there is an inherent resiliency to the island people which can strengthen the commitment of the community to remain in place.

It is a local sentiment that Haida Gwaii is a special place and that those who come to the island, choose to be there because of Haida Gwaii’s unique community and environmental beauty (Lana). Some key informants described islanders as having a ‘Wild West’ mentality and a commitment to care for the environment, as well as being a group of people who are community-oriented. Attachment to place or sense of place often involves emotional attachments to place that can foster an intense caring for the land (Eisenhauer *et al.* 2000, Vorkinn and Riese 2001, Yamada *et al.* 1995). This attachment to place and desire to live on Haida Gwaii is consistent with the ideas presented in Chapter 4 (section 4.2.5), which indicated that this attachment can contribute to strengthening local adaptive capacity (Yamada *et al.* 1995, Magistro and Roncoli 2001).

5.2.2.7 Local Control/Governance

One of the current issues on Haida Gwaii is the Haida Aboriginal Title Case, which was filed with the B.C. Supreme Court in March 2002. This case claims Aboriginal title to all the land, inland waters, sea and seabed of Haida Gwaii, including resources located beneath the seabed (Taillon 2002). Various key informants mentioned the Haida Aboriginal Title Case as an element that has

strengthened the island community because it has fostered greater local awareness (Isabelle, Victor).

Another common view expressed was that there has been an increase in communication and governance between Haida and non-Haida on the islands (Riley). For example, many of the newer boards and committees on Haida Gwaii ensure that Haida interests are represented (Lana). For example, the Land Use Planning committee involves representatives from various sectors of Haida Gwaii, from logging companies and local mayors to medicinal plant users and environmental organizations. Such initiatives have been described as creating better communication and understanding among all island communities, both Haida and Non-Haida.

This increase in local governance as stated in Chapter 4, can strengthen adaptive capacity because a broader range of ideas and opinions are considered in community decision-making and planning. Therefore, final results are generally more reflective of the broader community (Wood 2003). Another attribute that strengthens the community is their past experience with changes.

5.2.2.8 Experience with Population Changes

Investigating past experience with change should be included in a local vulnerability assessment to climate change and sea-level rise impacts, as experience with changes can strengthen awareness and preparedness (section 4.3.2) (Burton *et al.* 1978, Barnett 2001, Smit and Pilifosova 2003, Dolan and Walker in press). As impacts of climate change will manifest themselves

physically and socially, investigating local adaptive capacity to a variety of changes is important.

Most of the key informants (e.g., Fiona, Larissa, Megan, Riley, Victor) of Masset and Old Massett who have lived in the community for ten or more years¹⁸, noted an increase in the level of support and cooperation between the communities. This was often attributed to the downsizing of the Canadian Forces Station in Masset (section 4.3.3.1.2). It was noted that the military, “brought in a fairly large payroll”, therefore increasing economic input into the community, which had positive impacts on local businesses (Kira)

It was however, a common opinion that the local community does not miss the military presence as “things are getting better since the military have left” (Larissa). Some key informants felt that they were “an insular community and as an insular community they did a lot of things on their own” (Victor). Others felt they were “really divisive” (Fiona) and intimidating as “they were assertive and they got brownie points¹⁹ for being on boards and brownie points for volunteering for this and stuff like that and they really took over a lot of things” (Larissa). From the perspective of key informants, this out-migration of people that resulted in a large population decrease has had a positive influence as communities have become more cohesive following the military withdrawal. This cohesiveness contributes to the strength of community networks, therefore strengthening social capital (section 6.2.2.1). This increase in communication can have a positive

¹⁸ This length of residency was indicated as the criterion because it was within the time-frame that the military downsizing occurred.

¹⁹ By ‘Brownie points’ Larissa was referring to the incentives that military personnel received for doing extra activities within the community.

impact on community planning (e.g., emergency planning), therefore contributing to local adaptive capacity to deal with future changes.

5.2.2.9 Experience with Economic Changes

The idea that ‘change makes you stronger’ was expressed in many of the interviews with statements such as, “there’s a certain resiliency to a community that’s seen a lot of things come and go” (Larissa). At a broader community level (the island community), key informants expressed the view that they have experienced many changes stemming from population fluctuations associated with boom and bust cycles of employment in the forestry and fishing industries (Holman and Nicol 2004). Community members believe that their experiences with these types of changes have made them diversify, and therefore become more adaptable to future changes (Victor, Larissa, Lana). Jenny expresses this succinctly with reference to how these communities have dealt with downward trends in the natural resource sector:

“I’ve seen a big downturn in that [Masset/Old Massett] area, [which] forced them into finding other ways to diversify their economy... diversification is a huge thing and a lot of it’s now based on tourism... so tourism has been a big focus for many years now for several of the communities”.

According to key informants (e.g., Fiona, Jenny, Victor), people have learned to cope with changes, realizing that sectors of their economy such as forestry, fishing, and even public administration can be unstable at times. Local connectedness with the environment is viewed as a community strength, as illustrated in the following quote from Isabelle, “Even though there may be a lot of people out of work right now... people are able to sustain themselves because

we still live off the land”. Here, Isabelle is referring to the ability of local residents to hunt, fish and gather food, which subsidizes income when not formally employed. Interviews support information presented in Chapter 4, recognizing that economic fluctuations can contribute to local vulnerability. However, local residents also recognize that such experiences with employment boom and bust cycles in the natural resources sector have taught locals how to deal with economic changes and thus made them more adaptable and prepared for such changes in the future.

5.2.2.10 Employment Opportunities

Past employment fluxes in local industries such as forestry and fishing on Haida Gwaii have led to increased unemployment and challenges associated with unemployment (Holman and Nicol, 2004). While key informants discussed the lack of compatibility between the type of employment available on Haida Gwaii and the needs of the local population, both negative and positive aspects of employment were raised. For example, key informants noted that while there have been significant job losses in the resource sector, there also has been a recent increase in personal businesses, perhaps in response to resource-related job losses. Key informants also noted that there has been an increase in funds available for new community initiatives that foster an increase in entrepreneurial activities (e.g., Gwaii Trust and First Nations business grants). It was noted however, that taking advantage of these opportunities requires certain skills, such as proposal writing, that many community members may not have (Aaron, Adam). Riley also mentioned that there is little employment training on the

reserve communities. Key informants (e.g., Isabelle, Victor) also mentioned that there is a need to investigate the time community members spend on unpaid work (e.g., raising family, art, fishing, and gathering) that contributes to the overall strength of the community.

5.2.2.11 Local Natural Environment

The effect of location on the quality of life was another recurring theme in the interviews. When asked to reflect on attributes of community health many of the positive attributes that key informants referred to were associated with the surrounding environment and the lifestyle that can be attained living on Haida Gwaii. For example, the surrounding natural environment is thought to contribute to a healthy lifestyle and strengthen the communities. In particular, Dakota, Kira and Lana mentioned the clean air, purifying ocean, and forested land as elements of the environment that contribute to local health and well being. These resources also provide a healthy source of local food such as fish, deer and berries. In addition, 'island lifestyle' involves a slower, less stressful pace of life and greater accessibility to the outdoors and is thought to contribute to overall well-being in Haida Gwaii.

5.2.2.12 Health Care Programs

While key informants cited a lack of local health services (section 5.2.1.1) as contributing to vulnerability, there are many local health care programs that are considered positive attributes of health. Several indicated that there are a number of new health care programs in the communities. The Haida Health

Centre²⁰ and the Healthy Humans Program²¹ were the two most commonly recognized initiatives on the north end of the island. These programs, sponsored by Gwaii Trust, are intended to promote community health by increasing health awareness. Such programs were viewed positively by key informants.

5.2.3 Community Identified Means of Strengthening Local Adaptive Capacity

Several key issues emerged on the topic of increasing community adaptive capacity to future environmental and social changes. Many key informants believe that there is a need to improve access to scientific information (e.g., potential environmental threats) and suggest that this information be presented in a more accessible way (e.g., local talks, the local newspaper). Key informants believe that there is a need to increase local education, both formal education (e.g., reading and basic math) and cultural education. There was a common view that having greater control over the island and its resources would further protect the local environment, contributing to the strength of the local communities. Improvements to the local economy were another common theme such as, fostering progress in the tourism industry and creating opportunities for value added products (e.g., wood and fish processing)

While these factors are associated with vulnerability, local adaptive capacity is inherently linked to vulnerability - increasing adaptive capacity

²⁰ The Haida Health Center runs programs promoting healthy lifestyles in Old Massett, as well as offering services to the community such as regular optometrist visits.

²¹ The Healthy Humans Program is funded by Gwaii Trust and operates island wide. This is one of the programs ran out of the Haida Health Center.

decreases vulnerability. Though some of the above attributes (e.g., increasing cultural and historic knowledge) may have previously been listed in the community strengths section, there was a view that cultural education can still be improved upon. Many key informants believed that locals work together in times of need; however they also expressed that greater communication and cooperation on a regular basis would further strengthen social capital. As indicated in Chapter 4 (section 4.3.1), strengthening social capital is believed to strengthen adaptive capacity (Tobin 1999, Mendis *et al.* 2003, Dolan and Walker in press). Key informant interview results will be discussed again in Chapter 6 (sections 6.2 and 6.3) as they contribute to outsider understanding of local vulnerability and adaptive capacity to future climate change and accelerated sea-level rise impacts.

5.3 Door-to-Door Survey Analysis

The door-to-door survey was used to collect complementary data following the community workshop and the key informant interviews. We designed the majority of the survey questions to provide data for the larger vulnerability assessment project (CCIAP Project A580). It is important to note that the surveys began immediately following The Old Massett Band Council's official announcement that they would be laying off 80% of their employees (section 5.4) (King 2004). The survey sample consisted of 92 households in Masset and 51 in Old Massett.

In the first section of the survey results (section 5.3.1), I focus on the demographics of the surveyed population to illustrate sample representativeness

of the local population. In the second section (5.3.2), I highlight respondent's ideas surrounding local vulnerability and in the final section (5.3.3), I provide ideas on local resiliency and adaptive capacity.

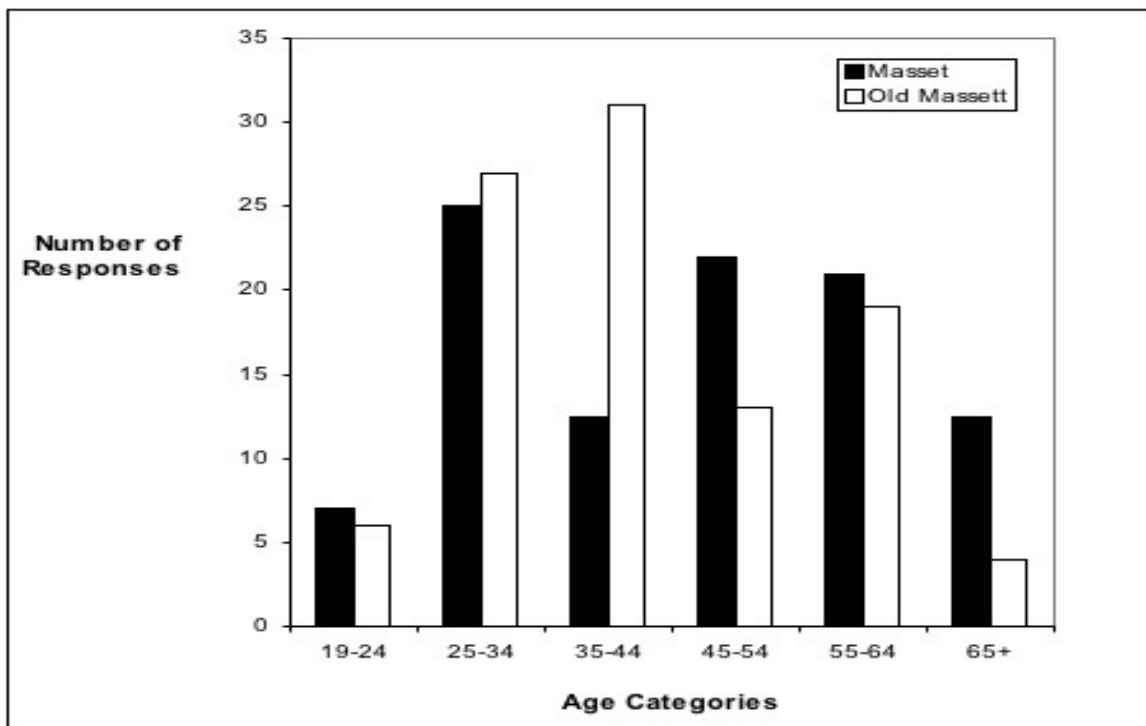
5.3.1 Population Demographics

In this section I highlight some of the demographics of the surveyed population to evaluate whether the 20% sample of households was representative of local households, compared to data presented in Chapter 4. While it would have been helpful to distinguish ethnicity and gender characteristics, we were advised through the pilot study that these personal questions may be perceived as offensive and therefore we did not ask them.

5.3.1.1 Age

Age was grouped into seven categories (Figure 5.1). Of the 92 people surveyed in Masset, 95% responded to this question. The mean age was early 50s. Of the 51 respondents in Old Massett, 94% responded, yielding somewhat lower average age of mid to late 40s. Since the survey was administered to those over age 18, average age results are slightly higher than that of the communities (Statistic Canada 2001). Statistics Canada does not have recent data for Old Massett however the mean age in 2001 for Masset was 36.6 years which is much lower than our survey results of early 50's. I attribute this difference in mean age to the fact that our survey was administered to those 18 years of age and older.

Figure 5.1. Age distribution of survey respondents in Masset and Old Massett.

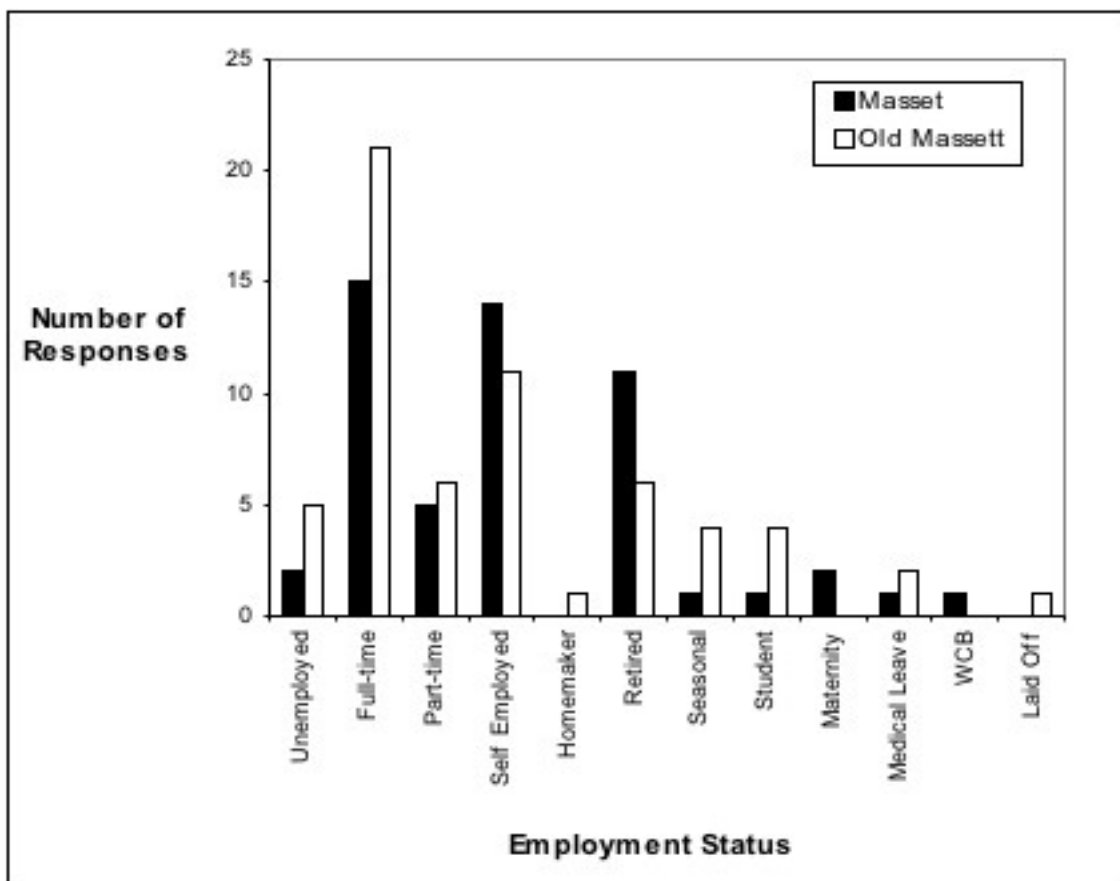


5.3.1.2 Employment

Employment levels (i.e., full time, part time, self employed, etc.) (Figure 5.2) were much higher in both communities relative to existing statistics (Statistics Canada 2001 and SNDS 2004). Of those surveyed, 4.4% were unemployed in Masset, whereas Statistics Canada reported an unemployment rate of 32.4% in 2001. In Old Massett the survey yielded an unemployment rate of 7.8%, whereas SNDS reported an unemployment rate of 53.37% in 2003 (SNDS 2004), which is dramatically different. One possible explanation for this difference is that the door-to-door survey was conducted during the summer months, when employment is often higher. From observation and interaction with community members it was observed that during the summer the majority of the

seasonal and contract workers are employed, therefore influencing positive responses to this question. Another possible explanation is that our employment question was not dichotomous (i.e., employed or unemployed), but was open-ended asking ‘what is your present employment status?’ This gave people the option to indicate such things as medical leave, homemaker, or retired, which may have otherwise been selected as unemployed (Appendix V).

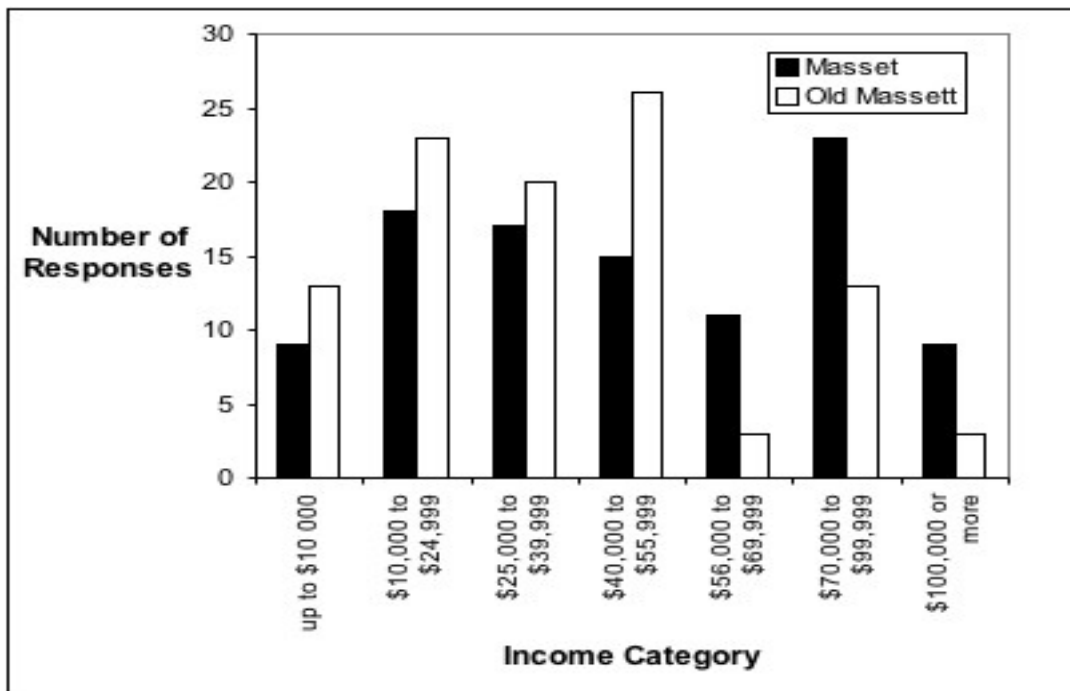
Figure 5.2. Employment status as a percentage of survey respondents in Masset and Old Massett.



5.3.1.3 Income

Of the households sampled, 74% and 61% responded to the household income question in Masset and Old Massett, respectively. These lower response rates, as compared to other demographic questions were due in part to some respondents not knowing their exact annual household income as a result of high annual fluctuation, as well as the personal, and often sensitive, nature of the question. Average annual household income in Masset was between \$40,000 and \$54,999 (Figure 5.3). This household level data cannot be compared to Statistics Canada individual data (23,389 for females and 34,959 for males (2001), as presented in Chapter 4), as our survey did not ask for individual income levels.

Figure 5.3. Reported household income as a percentage of survey respondents in Masset and Old Massett.

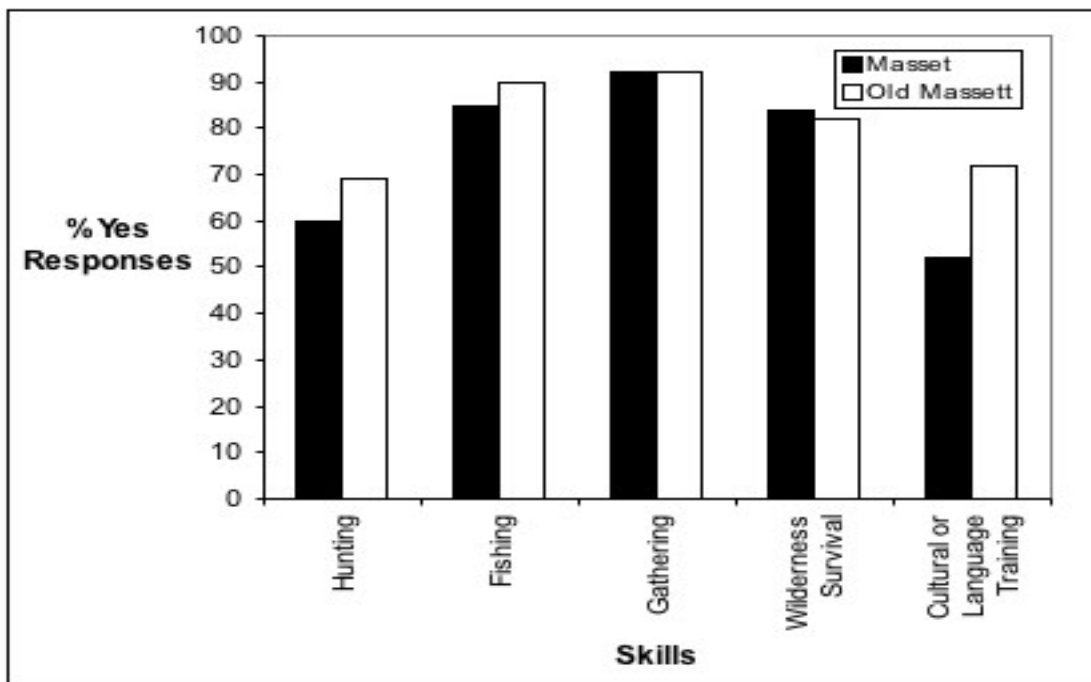


In Old Massett, average annual household income was on the upper end of the \$25,000 to \$39,999 range. Since the Skeena Native Development Society does not provide income data for Old Massett and Statistics Canada does not have household income data, or any data after 1996, a comparison to provincial data (Statistics Canada 2001) to ensure a representative sample was not possible. However, by comparing these data to the income data for Masset it is obvious that income is lower among the population sampled in Old Massett (\$25,000 to \$39,999) than those sampled in Masset (\$40,000 to \$55,999).

5.3.1.4 Education and Skills

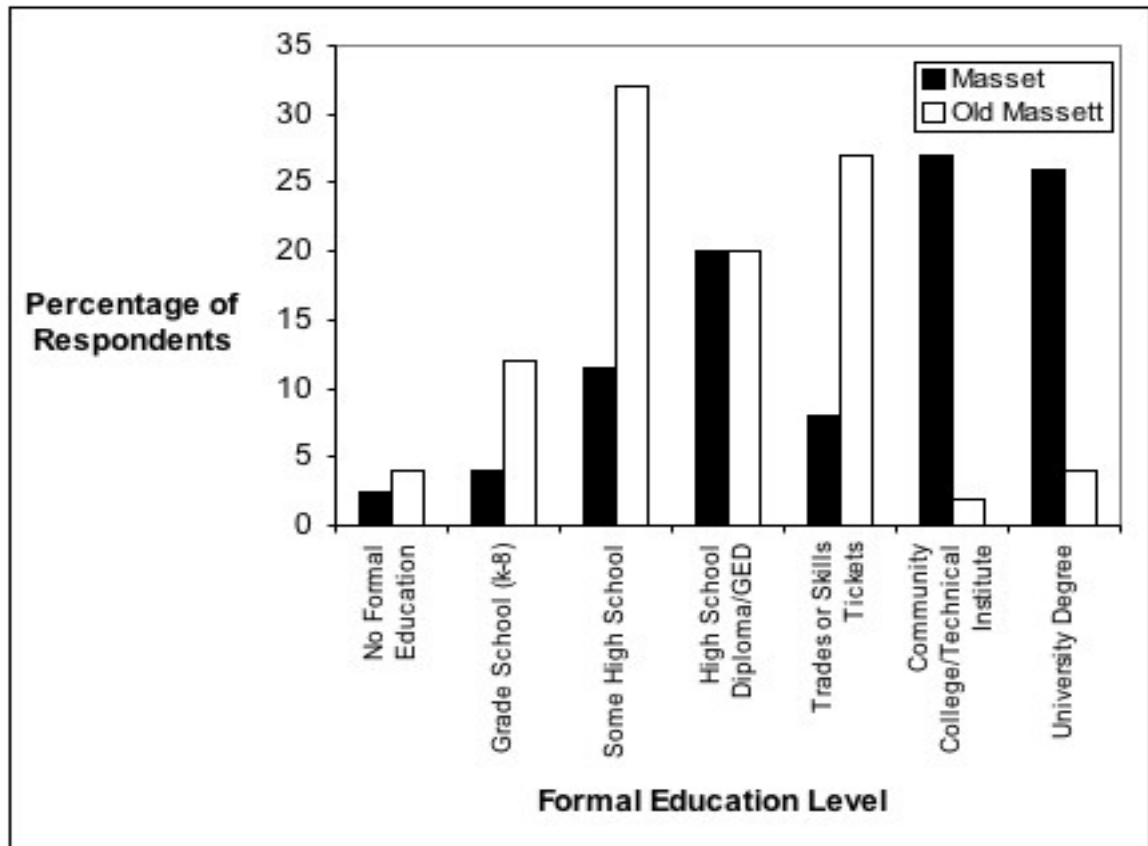
The question on education aimed to capture a more holistic view of education, beyond standard formal education. This question was not open-ended, rather it consisted of 12 categories (see Appendix III; question 29 or categories in Figure 5.4 and 5.5). The question started with 'informal' skills and ended with 'formal' education. It was suggested by the pilot study (section 3.3.2) that the restructuring of this question would result in respondents feeling empowered by their answers, rather than challenged by the emphasis on formal education, as the local skill set on Haida Gwaii was high. All 92 respondents from Masset and all but one respondent from Old Massett answered this question. There were a lot of 'yes' responses to the skills section. These responses are presented in Figure 5.4.

Figure 5.4. 'Educational skills' as a percentage of survey respondents in Masset and Old Massett.



While there were minimal differences between the two communities on the responses to informal education levels, formal education levels were much different. In Masset, 60% of the population surveyed had higher than secondary school, 22% had completed high school, and 18% had less than a high school diploma. These education figures are higher than those reported by Statistics Canada (30% of the population had less than a high school diploma; Statistics Canada, 2001). In Old Massett, only 32% of the surveyed population indicated postsecondary education, 20% had completed high school and 48% indicated less than a high school certificate (Figure 5.5).

Figure 5.5. Highest reported 'formal education' as a percentage of survey respondents in Masset and Old Massett.



Although current data were not available, our survey results support other evidence that formal education is lower among the Haida than the general population (Holman and Nicol 2004). Survey results indicate that respondents from Masset have higher levels of college and postsecondary education and slightly higher high school completion rates. The number of respondents from Old Massett with trades or skills tickets was much higher than in Masset, possibly contributing to the lower high school completion rates as indicated by one interviewee (Isabelle). The following sections (section 5.3.2 and section 5.3.3) will present survey results that identify local elements of vulnerability and adaptive capacity as perceived by survey respondents.

5.3.2 Vulnerability

The door-to-door survey asked an open-ended question on local vulnerability (weakness), as illustrated in Chapter 3 (section 3.3.5.1). Responses to these questions varied greatly and ranged from environmental to social attributes of the community. The varied nature of the responses to this question made them very difficult to categorize (Appendix V; Question 26). In total, there were thirty-nine different responses that I grouped into eleven themes of vulnerability (Table 5.1). Table 5.1 not only illustrates these themes, but also the percentage of respondents who mentioned them.

Table 5.1. Themes of vulnerability identified by survey respondents.

Community	Masset (%)	Old Massett (%)
Negative attitudes within the community	35	37
Lack of resources	26	8
Social problems (economic/education/health)	21	8
Critical infrastructure and resources	20	3
Geographic location	19	3
Lack of emergency preparedness	9	33
Poor leadership	7	11
Lack of self governance	5	6
Divides in the community/ies	2	3
Lack of government support	2	3
Nothing/other/don't know	11	19

5.3.2.1 Negative Attitudes within the Community

Survey respondents in both communities identified negative attitudes as contributing to increased local vulnerability. Some of the more specific comments related to the stubbornness of local people, their inability to work together and to agree on things, the apathetic nature of people (e.g., no one is willing to stand up for things, people lack ambition) and of children (e.g., the younger generation

does not care), systemic racism, and general disrespect for natural resources. I believe the response of negative attitudes (over one third), in both Masset and Old Massett, was linked to the news of the OMVC's plans for cut backs in local jobs. This is a potential bias that I recognized prior to data analysis (section 5.4) and therefore kept 'poor leadership' as its own distinct category in Table 5.1 due to the high response rate, 7% and 11% of total responses in Masset and Old Massett, respectively.

5.3.2.2 Lack of Resources

A limited access to resources was a common theme believed to contribute to vulnerability, especially by those surveyed in Masset (26%). Community members expressed that there is a lack of emergency resources within the community to deal with emergency situations or change (e.g., emergency facility and lack of knowledge of risks). A lack of self-sufficiency of community members (e.g., do not know how to hunt and gather berries) was also included in this category as locals believe these skills enhance adaptive capacity. A third attribute that I grouped into this category was a lack of spirituality and religion, as this can be a strengthening resource that draws community members together. Respondents mentioned that the younger generation of children has a lower sense of spiritual connectedness with the environment, which is viewed as a valuable resource that strengthens community cohesion.

5.3.2.3 Social Problems

Social problems relating to the local economy, education and health emerged in the survey responses in a fashion similar to the ideas raised by key informants. Relating to health, those surveyed expressed a concern with the high consumption of alcohol and/or drugs and a high occurrence of fetal alcohol syndrome. Additionally, community members feel that there are many problems within the medical system (e.g., doctors leave the community too often, insufficient services). In terms of the local economy, community members believe that there is a lack of employment, as well as a lack of money [incomes] in the community. Low education levels (e.g., formal education) and a general lack of awareness (e.g., potential impacts of climate change) were also mentioned as social problems within the community that may contribute to vulnerability.

5.3.2.4 Critical Infrastructure and Resources

'Dependency' on such things as transportation, outside funding sources, and technology, was a common theme from the surveyed population in Masset, but not in Old Massett. This may be attributed to the perceived availability of funding for First Nations (e.g., First Nations business grants). Survey respondents identified dependency on ferries, and air planes for off island access as contributing to community vulnerability. Island-wide there is a dependency on a single coastal highway (Highway 16), which links southern communities with northern communities. Access to Masset and Old Massett is restricted to one bridge and one low-lying access road. Other attributes of vulnerability that I categorized under 'dependency' include: the dependency of island communities

on the government for continued funding, on modern technologies such as electricity, internet and telephone, and on diminishing natural resources (e.g., declining salmon stocks). These ideas were linked to the changing way of life on Haida Gwaii and were often associated with the dangers of over-dependency on modernization and were believed by respondents to contribute to local vulnerability.

5.3.2.5 Geographic Location

Location was another common theme that community members believe contributes to local vulnerability. Ideas from survey respondents were similar to those presented in Chapter 4, section 4.2.2. The remote location of Haida Gwaii from the mainland can enhance vulnerability due to the distance from services (e.g., medical care) in emergency situations. For Masset and Old Massett, being located on the north end of the island was also believed to increase their vulnerability due to the distance from ferry access. The close proximity of Masset and Old Massett (both homes of local residents and commercial areas) to sea level also places them at risk to sea-level rise impacts. Numerous culturally significant sites (e.g., Masset cemetery, Old Massett cemetery, and the museum) are also dangerously close to sea level.

5.3.2.6 Lack of Emergency Preparedness

Lack of emergency preparedness was a common theme among survey respondents. Survey respondents identified lack of preparedness and lack of knowledge of potential future change, lack of stocks in stores, and lack of

emergency services (including a backup communications system) as contributing to the vulnerability of Haida Gwaii communities. All of these ideas related to potential emergency situations and how locals believe the community could be better prepared for emergency situations. As the research progressed, it was discovered that there was an emergency evacuation plan for the north end of the island. While one key informant recalled that the evacuation plan was practiced approximately 15 years ago (Megan), it was expressed that the plan is currently not very well known by local community members. To gain a sense of community awareness of the plan we asked the surveyed population if their community had an emergency evacuation plan. Of those surveyed in Masset, 73% knew that there was a plan, 4% believed there was not, and 23% responded that they did not know. Of those surveyed in Old Massett, 55% knew there was a plan, 18% believed there was not, and 27% responded that they did not know. However, of those who indicated that they knew a plan existed, not all were aware of what the plan was. It is apparent that while there is some awareness of an emergency evacuation plan, there needs to be greater effort in informing the public of it, especially in Old Massett. This lack of knowledge about the emergency plan contributes to the vulnerability as community members may be unaware of the procedures, therefore creating a less timely evacuation.

5.3.2.7 Lack of Self Governance

Answers referring to land claims were mentioned by a small number of respondents (approximately 5%). I believe however, that this is especially important because of the uncertainty associated with land claims and tenuous

control over local natural resources. Even though the door-to-door survey did not capture further detail on this attribute, section 4.5 and section 5.2.2.7 provide further information on the Haida Aboriginal Title Case. While community respondents mention this lack of control in decision making that affects the communities, it appears that local control and governance have increased on Haida Gwaii, for example, the round table discussions of the LUPP that involved various stakeholders and the co-management initiatives with Parks Canada and B.C. Parks.

5.3.2.8 Divides in the Community

Divides in the community refers to a lack of support and cohesion between community members. Those surveyed expressed the view that there are many divisions in their community which stem from differences in local culture (e.g., long-term versus short-term residents, Haida versus non-Haida). Haida Gwaii is home to a diverse range of people. While this diversity is believed to be a strengthening element in the community, it also can work to make consensus decision-making difficult. One example of these differing views is reflected in the differing views on local tourism and development. While many respondents believe tourism is beneficial to the island, still others believe that increased tourism (e.g., fishing, hiking) will result in an abuse of natural resources.

5.3.2.9 Lack of Government Support

Similar to divides in the community, lack of government support was indicated by approximately 2% of respondents. There was a perspective that the

government does not listen to local opinion, especially in the case of oil and gas exploration in Hecate Strait. Community members also stated that there needs to be greater support from the provincial government when it comes to the maintenance and reconstruction of local roads. Other responses linking to government support were education and health care services as illustrated in section 4.3.6 and section 4.3.5.

5.3.3 Community Identified Strengths

While survey respondents identified various attributes of potential community vulnerability, there were also survey questions that identified attributes of community resiliency and adaptive capacity. Assuming that 'attachment to place' is a strengthening attribute of Masset and Old Massett, I wanted to gain a better insight as to why residents of Masset and Old Massett have a strong 'attachment to place'. To do so and to explore other positive attributes of the communities we asked survey respondents what they like about their community (Appendix III; Question 4). This question was open-ended and results were categorized into twenty-five main responses. To illustrate general characteristics emerging from these data, I grouped them into six general categories (Table 5.2).

The more common answers in Masset were, nature and surrounding environment, laid back island lifestyle (i.e., smallness and privacy), and people (i.e., community and friends). Other answers that occurred less frequently in Masset were employment opportunities, diversity and acceptance, and the peacefulness and tranquility of Haida Gwaii as a place to live.

In Old Massett the most common answers to what people like the most were: nature and surrounding environment, people (i.e., community and friends), and respect for elders. Answers that occurred less frequently in Old Massett were family, attachment to birthplace, local food (e.g., fish and berries), community support networks, and the re-emergence of Haida culture and language.

Table 5.2. What survey respondents liked most about their community as a percentage of responses.

Response Category	Ideas within Category	Masset (%)	Old Massett (%)
Environment	<ul style="list-style-type: none"> • Nature and surrounding environment • Local food (sea food, gardens) • Weather (rain)/climate 	27	22
People	<ul style="list-style-type: none"> • Friendliness/get along • Helpfulness • Support network • Diversity and acceptance • Closeness of people • Family • PEOPLE/community/friends. 	29	26
Location	<ul style="list-style-type: none"> • Smallness (population/laid back/island lifestyle/privacy) • It's a special place (its like nowhere else) • Attachment to place because that where they grew up • My life • Peaceful/quiet • Recreation (fishing) • Local (geographical location)/isolated/rural. 	35	15
Culture	<ul style="list-style-type: none"> • Elders are respected • Regaining the Haida culture/language • Spiritual • Heritage and culture 	6	36
Economic	<ul style="list-style-type: none"> • Employment opportunities • Affordable housing 	5	0
Nothing	<ul style="list-style-type: none"> • Nothing 	1	1

In a second survey question on community strengths, participants were asked to list community strengths for dealing with change (Question 25). We

grouped the responses into twenty-four different themes and later into nine categories (Table 5.3).

Table 5.3. Community identified strengths for dealing with change as a percentage of responses.

Community Attribute	Ideas within Category	Masset (%)	Old Massett (%)
Adaptable people	People adaptable and resourceful Self sufficient/independent (working with land) Unincorporated, flexible communities.	72	20
Supportive people	People in the community stick together (know each other/work together) People pool resources	59	68
Strength of People	People more environmentally aware/care Strength of people who volunteer People show interest Strong leaders We're vocal in our needs The people ARE the strength	17	1
Past Experience	Past experience	11	7
Strength of Haida Culture	Conservation of what is here Culture/native strength Elders stories (traditional knowledge) Respect/communication.	10	37
None	None Don't know	7	5
Local Environment	Ocean purifies Lots of land/space to move to Local environment	5	3
Preparedness	Lots of food supply in house Lots of boats/vehicles	4	3
Local Infrastructure	No big building to collapse	0	3

Similar to the key informant interviews, the surveys emphasized that people are a strength in the community (e.g., adaptable, supportive, strong) in both communities. The strengthening element of local culture was emphasized more in Old Massett, but still was recognized as important in Masset. In Masset, 91% of the respondents gave one or more responses to this question. Residents of Masset noted that past experience with changes strengthens local adaptive capacity as community members are more prepared. There was a common

opinion that strong leaders within the community contribute to community strength because they represent positive role models for local youth. Locals also expressed the view that people on Haida Gwaii are environmentally aware and that there is a strong network of volunteers, which work to strengthen their community. The amount of boats and vehicles was also believed to be a strength of the local community in the event of an emergency situation.

In Old Massett, 80% of respondents provided one or more answers to this question. Sixty-eight percent of those surveyed mentioned that the greatest strength of Old Massett was that 'people in the community stick together'. Mutual respect and strong communication with each other and with the land were cited as strengthening elements of Old Massett. Locals believe that the type of building structures that they have are a local strength as they can withstand earthquakes, unlike high-rise buildings in larger cities. The strength of the First Nations culture was another community-identified attribute, as well as the availability of food reserves in times of need.

As the idea of community cohesiveness had been raised during both the community workshop and in the key informant interviews, all survey participants were asked if community members felt that others would pitch in to help if an emergency were to occur (Question 13). Of the 203 respondents who answered this question, 96% said 'yes' further substantiating the idea that there is high community support when needed. This level of community support further contributes to local social capital (section 6.2.2.1).

5.4 Potential Bias in Data Collection

While the majority of interviewees were creative, positive and thoughtful in their responses, there were a few pessimistic interviewees whose responses were preoccupied with the OMVC. This was due, in part to the talk of, and eventual announcement that, the OMVC would be laying off 80% of its workforce (approximately 64 of its 80 employees) on Thursday July 1, 2004. This announcement had huge implications for many community members, especially since the OMVC is the primary employer in the village. These cutbacks were due to an announcement by the Department of Indian and Northern Affairs Canada (DIAND) of an investigation of a \$7.4-million deficit in the OMVC's budget (King 2004). Such information may be responsible for the negative overtone in several interviewee responses.

Additional bias that I detected in the responses given were due to the presence of the research team and will be further explored in section 6.4. Furthermore, with the researcher often acting as the research instrument, there are inherent biases that emerge, as it is impossible to remain value free. I consider how my biases influenced the research in section 6.4.

5.5 Conclusion

This chapter has presented many themes on local vulnerability and adaptive capacity that emerged from the key informant interviews and the door-to-door survey and are summarized in Table 5.4.

Many of the responses in Table 5.4 were common themes identified by both key informants (section 5.2) and survey respondents (section 5.3). The

survey responses often worked to corroborate those of the key informants. The questions that were designed to gather greater insight on themes from the interviews also contributed to greater understanding of those themes. In addition to this overlapping, less common responses (e.g., sea-level rise) were also presented (Table 5.4) as these have particular relevance to the broader project on climate change and sea-level rise impacts.

Table 5.4. Locally identified attributes of adaptive capacity and vulnerability.

Attributes of Adaptive Capacity	Attributes of Vulnerability
The strength of the people who live there	Lack of resources to deal with changes and emergency situations
Community characteristic; size, isolated location	Dependency (transportation/government/electricity)
Culture	Limited transportation
Attachment to place	Lack of island wide emergency plan
Local control/governance	Exposure to environmental impacts
Past experience with change	Low education levels
Diversity and acceptance	High unemployment rates
Health care programs	Lack of involvement of youth
Location/environment; local food	Amount of alcohol and drugs consumed
Lots of food supply in the house	Minimal health services
Employment opportunities	Sea level rise
Community support networks	

In Chapter 6 community-identified attributes of vulnerability and adaptive capacity are revisited and compared to ideas generated by scholars in the field. Furthermore, I will illustrate the contributions of locally perceived vulnerability and adaptive capacity to a site-specific vulnerability assessment of climate change and sea-level rise impacts.

6.0 Discussion

6.1 Introduction

This chapter is divided into three sections. In section 6.2, I discuss how vulnerability can be characterized on Haida Gwaii based on the findings in Chapter 4 and 5. In section 6.3, I present my current perceptions of local vulnerability and adaptive capacity of Masset and Old Massett based on community interactions and the literature. This illustrates how some of my preliminary perspectives have changed, as well as the value of using multiple methods with a participatory approach. In section 6.4, I evaluate the utility of this approach in researching the case study communities, fulfilling the fourth and final objective of my thesis.

6.2 Characterizing Vulnerability on Haida Gwaii

6.2.1 Geographic Characteristics of Vulnerability and Adaptive Capacity

Some of the geographic characteristics of vulnerability that I investigated in the literature review and in my preliminary field season included geophysical sensitivity, location and exposure. These characteristics will be explored further in this section, highlighting what I have learned through community-based research in Masset and Old Massett.

6.2.1.1 Remoteness

It was evident from the perspectives of both the literature and the communities that the remote and isolated location of these communities may

contribute to their vulnerability (section 4.2.2 and 5.2.1). This was largely attributed to the accessibility of services (e.g. health care), availability of supplies and services in emergency situations (e.g., food, electricity), and emergency response capabilities (e.g., emergency planning) (Armstrong and Read 2002, Dolan and Walker in press). Community members are aware of the limited access that they have to outside services and believe that if there is a 'big environmental event' they will be one of the last communities to receive support from the mainland.

Through a participatory approach however, I learned that isolation is also viewed as contributing to the strength of the communities. Key informants explained that there is a 'frontier mentality' on Haida Gwaii and a culturally strong connectedness with nature (section 5.2.2.2). Survey respondents also emphasized that households on Haida Gwaii tend to prepare larger than normal food preserves from the summer harvest (section 5.3.3). I believe individual household preparedness fosters greater community preparedness, given the community support in high times of need (section 5.2.2.1). A vulnerability assessment of Masset and Old Massett would therefore benefit by investigating the amount of combined food supply between the communities.

6.2.1.2 Environmental Setting and Exposure

The physical environment of NE Haida Gwaii is identified as being 'highly sensitive' by Shaw *et al.* (1998), due to its geophysical conditions (e.g., shoreline erosion rates, coastal slope) and projected climate change and sea-level rise impacts (e.g., increase in the frequency and magnitude of storm events)

(Abeyirigunawardena and Walker pers. com. March 2005). While it was this geophysical sensitivity that initially drew the research team to this area, the only attributes related to environmental 'sensitivity' that were mentioned in the interviews and survey were sea-level rise, erosion, flooding and storm surges. I believe that this is primarily to do the presence of our research team (e.g., public meeting and newspaper article on climate change and sea-level rise), as there has been increased awareness of climate change impacts. Additionally, I believe that the lack of mention by community members of other geophysical features is attributed to the scientific nature of the data in the study (e.g., 'coastal slope' as a contributor to sensitivity), and partially due to the accessibility of such studies (e.g., study results were published in a report by the Geological Survey of Canada, but not published in the local newspaper). While such studies are freely available, there are certain skills required to access and interpret these data (e.g., internet, scientific literacy).

Residents recognize environmental changes are happening. In the workshop, interviews and surveys, community members identified that they live in an environment that is always changing and challenging them. However, because this environment is dynamic, there is a general acceptance of environmental changes, both short- and long-term and a willingness to adjust around the environment. Environmental changes do not seem to foster a local fear of short- or long-term environmental changes. While community preparedness (e.g., having household food stocks) may be inherently strengthened by this expectation of environmental change, from my perspective it may also create a false sense of security, as community members feel they can

handle whatever future environmental changes occur. Given that climate change impacts may influence various aspects of their day to day life (e.g., social, economic, culture), this sense of invincibility may hinder future anticipatory planning measures.

Geophysical attributes as contributing to local vulnerability were not mentioned as often as I had originally anticipated, given the 'sensitivity' of this area. However, there has been an increase in local knowledge of environmental changes related to climate change and sea-level rise impacts on Haida Gwaii with the presence of the research team. This increased awareness of potential hazards generally increases local adaptive capacity, as this information may be useful for local planning measures (e.g., emergency evacuation planning, allocation of new building sites) (Smit and Pilifosova 2003) on Haida Gwaii.

Environmental exposure was another theme identified in the literature and by the community as contributing to vulnerability. In particular, community members noted that exposure to flooding, severe storms, earthquakes, and potential exposure to tsunamis could increase local vulnerability. Much of this vulnerability was attributed to their lack of ability to predict such events. There was often a common view among key informants that the earthquakes and storms they experience on a regular basis are of a magnitude that would cause serious problems to infrastructure in other cities, but not on Haida Gwaii (section 5.2.1). For example, damage to building structures is rare with the exception of the Christmas Eve Storm in 2003.

6.2.2 *Social Attributes of Vulnerability and Adaptive Capacity*

Experiences with changes, population size and stability, education, health, social relations, access to services, and culture are social indicators of vulnerability identified by researchers that I examined in Chapter 4. In this chapter, I will summarize ideas that emerged related to each of these social themes.

6.2.2.1 Social Capital

As illustrated in section 4.3.1., strong social capital refers to high levels of investment in community associations and partnerships. These associations and partnerships can strengthen adaptive capacity through better community planning and cohesion (Watts and Bohle 1993, Tobin 1999, Yohe and Tol 2002, Adger 2003a, Mendis *et al.* 2003, Dolan and Walker in press).

Key informants and survey respondents believe there is a high level of volunteerism (e.g., firefighters, repatriation committee) that contributes to the strength of the community. The strength of the family unit and the traditional matriarchal family structure are believed by community members to contribute positively to social relations in Old Massett. Community members expressed that the traditional family structure contributed positively to greater community leadership and organization. Both interviewees and the surveyed population expressed a view that community members pull together in times of need.

Community members identified an increase in communication and partnerships between Masset and Old Massett since the military downsizing (e.g., plans for a new hospital). However, interviewees and survey respondents

also noted that despite improved relations, some underlying tensions still cause conflict within the communities. An example of underlying tension that was mentioned is racism. This local socio-cultural element of racism may impede information sharing having negative consequences for community planning. From an outsider's perspective, these local tensions and strengths in social relations are not easily understood, therefore highlighting the value and importance of including local perceptions in this research.

6.2.2.2 Experience with Hazards and Change

Both the literature and the communities recognize that prior experience with hazards can decrease vulnerability by increasing awareness of potential impacts. This awareness often spurs greater planning and preparedness for climate changes and sea-level rise impacts (Burton *et al.* 1978, Barnett 2001, Smit and Pilifosova 2003, Dolan and Walker in press). It became obvious throughout this research that there is a community emergency plan; however it appears that this plan is not well disseminated. Assessing the effectiveness of the community emergency evacuation plan, as well as current planning measures would contribute greater insight on community preparedness.

6.2.2.3 Population Size and Stability

My initial perspective of local population stability and size shaped by my preliminary field season was that this area was 'vulnerable' primarily because of large out-migration of people since 1981 (Chapter 4). This out-migration has resulted in a loss of income in the community and cuts in service provision that

are population-based (e.g., public education and health care services) as identified by community members (Chapter 5). As illustrated in section 4.3.3, a small population base can contribute to local vulnerability as it may limit the local economy (Tapsell *et al.* 2002).

While key informants and survey respondents noted that the withdrawal of the military (the primary trigger for mass out-migration) decreased the local economy and service provision, a closer qualitative investigation using a participatory research approach revealed a positive sentiment regarding this change. Key informants expressed that the military withdrawal strengthened community cohesion, especially between Masset and Old Massett, as the military was a rather 'insular' and 'intimidating' community within their community. Population change, in this case, therefore has both the potential to reduce and contribute to local adaptive capacity (Tapsell *et al.* 2002).

While small total population is an indicator of community vulnerability in the scholarly literature, contributing to limited local service provision, in this case the small population base and low population density is also a strengthening element to members in these communities. Residents believe that having a small population increases connections and support between people, while the vast amount of available land is believed to contribute to a healthy lifestyle with clean air and water, combined with an abundance of local foods.

6.2.2.4 Education

Education is assumed to be an element that strengthens both individual and community adaptive capacity, as education can be an important determinant

of risk awareness and employment and income, which can increase one's ability to adjust to economic changes (Blanchard-Boehm and Cook 2004, Holman and Nicol 2004, Hutton and Haque 2004, Degg and Homan 2005). Both Statistics Canada data (2001) and the door-to-door survey (2004) indicate that formal education levels in both Masset and Old Massett were lower than B.C. averages, especially in Old Massett. While key informants emphasized the need to strengthen the local formal education system and encouraged youth to pursue formal education, there was a common concern that an assessment of 'education' needed to be more broadly conceived. The focus groups (section 3.3.3) suggested that this examination of education should include more locally relevant skills (e.g., fishing and hunting), as they believe these skills are just as important for survival and success on Haida Gwaii.

From conducting this research in a participatory manner it became evident that a holistic view of education, including formal education levels, trade tickets, as well as traditional skills and knowledge, would be a better measure of community adaptive capacity. For example, the informal skill set within the community is high, which may enhance adaptive capacity in emergency situations.

6.2.2.5 Health

Limited health care services and a high Aboriginal population points to a lower health status, which may contribute to local vulnerability (Armstrong and Read 2002, Herring 1995). In the case study communities, community members believe that living on an island can contribute to their vulnerability due to the

limited access to health care services, as well as problems with local drug and alcohol addiction, and unhealthy eating habits due to outside influences (e.g., junk food). A number of key informants also mentioned that 'generational sickness' and 'negative attitudes' contribute negatively to local health. These deep-rooted impacts on local health require more than this surface level description of the issue and would need to be further investigated in an assessment of community health in Masset and Old Massett.

In contrast, key informants noted that the surrounding environment had a positive impact on both mental and physical health, due to lifestyle choices such as healthy eating and outdoor activities. In addition, community members identified that there has been a recent increase in community public health programs (Chapter 5), which work to educate community residents on healthy lifestyle choices and to strengthen local population health. These attributes work to strengthen what Dolan *et al.* (2005) refer to as socio-ecological health. Healthy people, in terms of physical, mental, emotional and spiritual health, need healthy communities (e.g., economic opportunities, health and social support services) and healthy biophysical environments (e.g., clean air and water, abundant and sustainable natural resources (Dolan *et al.* 2005)). A participatory approach has provided greater insight on how the communities view local health problems, as well as making researchers aware of some of the strengthening elements of health that come with living in these communities.

6.2.2.6 Local Culture

Culture was identified as another attribute of vulnerability as it often shapes human interactions with, and knowledge of, the local environment (Magistro and Roncoli 2001). By living in these communities, it was apparent that the Haida culture remains strong, with a commitment from the Haida people to maintain their culture through story telling, Haida language and history classes, and traditional art. There is also a high respect for elders in the Haida community and Haida singing, dancing and traditional clothing were evident at many community events and traditional celebrations. This resurgence of the Haida culture contributes to resiliency as it fosters a sense of pride in oneself and contributes to a sense of place attachment (Yamada *et al.* 1995, Holman and Nicol 2004). While it can be difficult to gain insight into local culture, interactions with these communities revealed a strong sense of attachment to place and a deep commitment to protect the land. Family ties and the small population base also contribute to social support and cohesion, especially in the event of emergency situations (section 6.2.2.1). These social attributes (experience, population, education, health, social capital and culture) may contribute to and/or reduce the degree of community vulnerability to future climate change and sea-level rise impacts.

6.2.3 Economic Attributes of Vulnerability and Adaptive Capacity

Scholars have recognized that employment rates, income, livelihood dependencies, economic stability, and levels of economic development can all be

used as indicators of vulnerability (Barnett 2003, Mendis *et al.* 2003, Tapsell *et al.* 2002, King 2001, Sidle *et al.* 2004). This section will investigate what has been learned using a participatory approach to identifying community attributes of vulnerability in Masset and Old Massett.

6.2.3.1 Employment and Income

Employment rates and income are viewed in the literature as indicators of vulnerability, as with greater income comes greater adaptation choices (Clark *et al.* 1998, Wisner 1998, Melick in King 2001, Kundzwiez 2002, Tapsell *et al.* 2002, Yohe and Tol 2002). While employment rates collected by the survey were consistent with Statistics Canada Data (2001) for Masset, those for Old Massett were not similar to comparable data available through Skeena Native Development Society (2004). The methods of data collection and definition of employment status also vary between Statistics Canada and the Skeena Native Development Society. While these surveys were done using a random-systematic sampling method, the responses only represent the employment status of the occupant that answered the questions. Additionally, the method of door-to-door surveying may impact responses like employment status due to its personal and sensitive nature (e.g., embarrassment associated with unemployment). Employment status may be better evaluated by including more community members in the survey, or by providing survey respondents with anonymity (e.g., a mail out survey).

Unemployment levels are high, according to all reviewed sources of data, for the communities of Masset and Old Massett. This may contribute to

increased vulnerability, as access to resources and adaptation choices may be limited. However, upon a closer, more participatory investigation of employment in the area, it became apparent that unemployment is often a decision taken in order to accommodate for subsistence activities such as food gathering and traditional entrepreneurial activities (e.g., art) that subsidize income. Statistical economic profiles do not necessarily convey a picture of personal wealth or well-being. This participatory approach has illustrated the importance of understanding the determinants behind employment statistics, rather than making assumptions based on existing aggregate level data (e.g., Statistic Canada).

6.2.3.2 Livelihood Dependencies

Communities that are highly dependent on natural resources are believed to be more vulnerable, as supply of natural resources and global markets directly influence employment and income at the local level (Barnett 2003). The communities of Haida Gwaii remain highly dependent on their natural resource sector (e.g., fishing, forestry, agriculture), employing up to 29% of the population (Holman and Nicol 2004). Similar to other coastal communities in B.C. there have been downward trends in the salmon fishing industry. The number of commercial salmon licenses has been reduced, resulting in the loss of 40% of jobs in the commercial salmon industry since the early 1990's (Gislason 1998 in Dolan *et al.* 2005). In addition to the fishing industry, B.C. has also experienced downward trends in the forestry sector due to global markets and trade rules (Dolan *et al.* 2005). While concerns about the future of the surrounding

environment were mentioned, they were not linked directly to livelihoods, with the exception of mentioning past changes in forestry.

Secondary data from Statistics Canada (2001) and Skeena Native Development Society (2004) also reveal that many residents are dependent on the natural resource sector for employment. In Chapter 4, I also stated that much of the tourism on Haida Gwaii was linked to fishing. Given that potential threats to these resources (e.g., fish species changes, pest infestations, growing season changes) may impact those employed in natural resources and tourism, this would affect the community's economic base. A vulnerability assessment would benefit from a social and ecological investigation of these links.

6.2.3.3 Economic Development

Community economic development can be an attribute of adaptive capacity as it can strengthen the local economy through job creation and economic support for education (Lorenzoni *et al.* 2000a, Barnett 2003, Sidle *et al.* 2004). It is apparent that Masset and Old Massett are supported by many funding bodies that contribute to economic development (e.g., Gwaii Trust, OMVC Economic Development Department, The Community Futures Development Association of British Columbia, Village of Masset economic development branch and SNDS).

With the key informant interviews and door-to-door survey it became apparent that there are several opportunities for economic development on Haida Gwaii due to an increase in tourism in the area. There also has been a recent push for the need to have more locally-based value added jobs (i.e., refining of

wood products), as many raw natural resources (i.e., timber) are shipped off island for processing. Key informants believe there has been an increase in economic development, as well as endless opportunities on Haida Gwaii for those who are motivated and have skills to start up their own business (e.g., job creation in the tourism industry).

6.2.4 Politics and Institutions

Some of the political aspects of a community discussed in relation to vulnerability include institutions and planning measures (Tapsell *et al.* 2002, Adger 2003, Sidle *et al.* 2004, Smit and Pilifosova 2003, Yohe *et al.* 2003). This section briefly investigates how local institutions (e.g., OMVC, VOM, CHN) may contribute to vulnerability or adaptive capacity. An investigation of community vulnerability to climate change and accelerated sea-level rise impacts would benefit by including an investigation of both local and outside institutions (e.g., provincial and federal government) and their impacts on community vulnerability and adaptive capacity. Also, the communication within and between these institutions, as well as the effectiveness of their emergency planning would help researchers to better understand how institutions may contribute to or reduce vulnerability.

Haida Gwaii is clearly an active political setting. With a small population base and numerous diverse stakeholders, decision-making can often be a time consuming process. A number of decision-making and management bodies (e.g., OMVC, CHN, VOM, Parks Canada, B.C. Parks) and organizations (e.g.,

volunteer firefighters, LUPP) are operating within these two communities, which can have both positive and negative impacts on decision making (section 2.5) (Wood 2003).

Through an investigation of community perspectives regarding decision-making, I discovered a sense of general dissatisfaction with the current state of the Old Massett Village Council (OMVC), due to issues with accountability and nepotism (section 5.3.2.1). On the other hand, it was a common sentiment that communication and cooperation between Masset and Old Massett has increased since the military downsizing. Joint projects, such as drinking water provision, a new wastewater treatment plant, and a new hospital are a few of the collaborative ventures these communities are working on. Given the small size of these communities, this type of cooperation is essential to decrease costs of local services. At the broader scale (e.g., island level), it is apparent through key informant interviews, surveys and community interactions and observations, that many islanders support the Haida Land Claims Case and believe that this will bring greater local governance. There are many opportunities for the local community to be a part of decision making. For example, Gwaii Haanas is co-managed by Parks Canada and the CHN, Agate Beach Campground is co-managed by B.C. Parks and the OMVC, and the LUPP involves various local stakeholders in the planning process, both Haida and non-Haida.

6.2.4.1 Emergency Planning

The existence of a good emergency plan and efficient dissemination of this plan can increase the adaptive capacity of a community. There appears to be

little evidence of an active community emergency evacuation plan, with the exception of a routine alarm that sounds throughout the community of Masset every Tuesday night.

Upon closer investigation, I discovered that the Village of Masset has created an emergency plan for the north end of the island. According to community members however, this plan is not very effective due to a lack of knowledge of the plan and its implementation (i.e., practicing) of the plan. The lack of knowledge of the community emergency plan may contribute to greater community vulnerability, should a hazard occur.

6.3 Vulnerability of Masset and Old Massett

All communities, whether coastal or non-coastal, rich or poor, prepared or unprepared, have a certain degree of vulnerability to future impacts of climate change. As an outsider researching these communities, it was my initial belief that Masset and Old Massett were particularly vulnerable based on their isolated location, dynamic coastal environment, exposure to hazardous events, limited access to services, high resource dependency, small population base, and fluctuating population.

A closer look at these communities through a participatory research approach has demonstrated that there are often elements of resiliency and adaptive capacity behind our outsider's perspective on 'indicators of vulnerability'. For example, some of the attributes presented in the literature as indicative of vulnerability, were also viewed locally as inherent community points of resilience:

- While the isolated location and small population may potentially increase vulnerability due to the lack of services in emergency situations, these attributes are also believed to increase social cohesion within and between the communities. For example, because of limited access to services, community members tend to have high food stocks and have an 'informal' check-in system (i.e., during big storm events and power outages, they check in on their neighbours).
- While formal education levels may be much lower than the B.C. average, the informal skill set within the community is high and may contribute to community adaptive capacity and resiliency.
- The high unemployment rates are often chosen in order to accommodate traditional subsistence activities such as the gathering of food, and other entrepreneurial activities that subsidize income. High unemployment, therefore, says more about the inflexibility of employment opportunities in accommodating traditional practices than it does about the actual employment status and economic health of the community.

Similarly, there were local perspectives that also provided greater insight on some attributes that I initially perceived to increase community adaptive capacity:

- While a community emergency plan is available, key informants and survey respondents noted that very few community members knew any details of the plan.
- While there is a strong sense of pride and community cohesion in times of need, it was expressed by community members that there needs to be greater communication and cooperation on a regular basis for more effective planning.

This participatory research approach has enhanced my knowledge of how local attributes may contribute to community vulnerability and adaptive capacity. As illustrated above many of my initial views changed. Additionally, new attributes were discovered. For example, community members believed that the strong cultural and family ties on island contribute to greater community cohesion and strength. They also suggested that while there may be many problems with

community health, the surrounding environment (e.g., clean air, ocean) contribute positively to community health.

A summary of community attributes I believe to contribute to both vulnerability and adaptive capacity are highlighted in Table 6.1. These elements should be taken back to the community to decide how they could be incorporated into an assessment of local vulnerability to climate change and accelerated sea-level rise impacts.

Table 6.1. A synthesis of local elements of vulnerability and adaptive capacity to climate change impacts in Masset and Old Massett.

Attributes of vulnerability	Attributes of adaptive capacity
Geographic sensitivity	Commitment to remain place
Lack of service provision (e.g., availability of health care)	Community support networks (e.g., strong family ties)
High exposure to environmental hazards	Increased communication between Masset and Old Massett
Poor dissemination of community emergency plan	Amount of emergency supplies in homes (e.g., food storage)
Low education levels	Haida culture
Generational health impacts (e.g., alcoholism, apathetic attitudes)	Experience with change (environmental and social)
Problems with local politics (e.g., OMVC)	Rich environment (e.g., abundance local foods)
High dependence on the natural resource sector	Increase in community health care programs
Low economic stability	Local connectedness with nature
High unemployment rates	High volunteerism
The communities are prone to changes (e.g., population, economic, environmental)	Unpaid work that contributes to the wellbeing of the community
Underlying community tensions	Economic development
	Informal skill set (e.g., hunting, fishing)
	Frontier mentality
	Increasing local governance

This thesis has helped to characterize the vulnerability of Masset and Old Massett by identifying local attributes of vulnerability and adaptive capacity. This identification of local attributes helps outsiders better understand the complexity behind academic 'indicators', as this thesis has highlighted several examples of

site-specific attributes that may enhance community adaptive capacity. An assessment of the vulnerability of these communities to climate change and sea-level rise impacts would require the creation of an index of attributes of vulnerability and adaptive capacity that can be measured. While my research does not assess vulnerability, it provides numerous attributes that could become part of an index for an assessment of vulnerability and adaptive capacity (Table 6.1). However, many of the attributes highlighted in Table 6.1 may be difficult to quantify and therefore incorporate in such a manner (e.g., measuring the strength of culture).

6.4 Evaluation of the Participatory Approach

Vulnerability assessment research is often conducted in a non-participatory, top-down manner. On the contrary, this research was designed to include community members, as much as possible, using a participatory approach and having researchers engage in everyday community life. The various benefits and limitations of this approach are evaluated below.

6.4.1 Benefits of Participation

6.4.1.1 Sharing of Knowledge

Participatory research and community-based research involve the sharing of information between researchers and community members, which requires respect and listening (Parkes and Panelli 2001, Garwick and Auger 2003, Savan and Sider 2003). This sharing of knowledge enhances the depth of research

results as researchers gain insight from local stakeholders (e.g., TEK, LEK, LK) (Riedlinger and Berkes 2000, Reed and Dougill 2002, McGlashan and Williams 2003, Sixsmith *et al.* 2003, Committee on Native American Child Health and the Committee on Community Health Services 2004, Nichols *et al.* 2004). For community members there is often an increased awareness of hazards, which can provide valuable information for capacity building (i.e., community emergency planning) within communities (Savan and Sider 2003, Sixsmith *et al.* 2003, Morford *et al.* 2004).

This research provided lots of opportunity for public input. The workshop was well advertised and the invitation was extended to all members of the north end of Graham Island. We also published an article in the local newspaper providing a basic project description and our contact information in Masset. This information also was available through several other public outreach initiatives (e.g., community presentations). Community members also were included in the key informant interviews and the door-to-door survey. In addition, community members were included in a focus group to review the door-to-door survey, a local resident was contracted to review and assist with the workshop and another local resident was contracted to help with the administration and data input of the survey. This local knowledge on how the community may better perceive our door-to-door survey questions and workshop structure were valuable assets to our project.

6.4.1.2 The Value of Participant Observation

Comparing this research to the framework by Mendis *et al.* (2003) for community adaptive capacity assessments (Figure 2.2), the level of community participation in this research was high. This research was similar to the Mendis *et al.* (2003) framework, in that there was communication with the communities, a complete background report, many public meetings including a one day community workshop, and verification of indicators via the use of multiple methods (e.g., key informant interviews, door-to-door surveys). Beyond the scope of the Mendis *et al.* (2003) participatory framework, this thesis research involved lengthy field seasons, whereby the research team lived and engaged in the case study communities. This participant observation and informal communication during the preliminary and primary field season were advantageous to the research team and it enhanced our understanding of the communities (Denzin and Lincoln 1998).

Observation and preliminary community interactions contributed not only to the richness of the data, but were also helpful in gaining greater insight into the research methods. For example, I had originally planned on conducting a series of focus groups, however after living in Old Massett during my preliminary field season and visiting the communities in February 2004, it became apparent that many community members were very busy with different community organizations and planning boards. As many community members had expressed feelings of being overworked with volunteer events, I kept the interviews to one visit. Community feedback on the research tools was

beneficial, as it made me aware of this before the preliminary field season. For example, we had originally planned on conducting the survey in a mail out form, rather than door-to-door. However, the feedback from the focus group advised against this approach in order to be more inclusive of those with limited literacy skills. It was believed by the research team and the focus group participants that we would have not only a much higher response rate, but that this approach would be more personable, thus better received by community members. In addition, scholars recommend that the wording of questions may be altered to better suit the understanding of participants (Garwick and Auger 2003). We made changes in some of our word choices to ensure clarity and understanding given our perceptions following the preliminary field season and at the advice of focus groups participants (e.g., using the term strength in place of resiliency).

One reason for using an adaptive capacity driven assessment, similar to the approach adopted by Mendis *et al.* (2003), was the anticipated resistance to the term vulnerability from the communities. As a research team, we had anticipated that the community may not like the term vulnerability due to its negative connotations. Approaching research from a standpoint of vulnerability can be undermining to communities as it implies weaknesses within the community. To counter this, the research project approached vulnerability and adaptive capacity in an exploratory manner, in a way that community members could identify what they believed to be community abilities or strengths, as well as weaknesses. This is a more empowering approach as strengths can then be linked to themes synonymous with resilience and adaptive capacity. Asking how the community could better prepare for disasters, can then be linked to

vulnerability. This was beneficial in creating positive relationships between researchers and the community.

6.4.1.3 Gaining Access

As an outsider, gaining access to the case study communities can present a challenge. One step in this process was getting permission by local authority figures, known as 'gatekeepers' to gain access to the communities (Burgess 1994). However, the degree to which the members of the community accept the researcher will also impact the quality of data collected. For example, there are often "historic hostilities or suspicions between partners" (Savan and Sider 2003: 313). Participatory research can be helpful in working with resistant groups, as it is an effective and flexible tool for working with marginalized populations (Choney *et al.* 1995, Sixsmith *et al.* 2003). In the communities of Masset and Old Massett, particularly among the Haida, there was a sense of resistance to outside researchers. This resistance was attributed to a perceived long history of researchers that gave nothing back to the community following their data collection. While my role as a researcher remained clear, I was fortunate in being involved in community events, forming friendships and making acquaintances. These interactions helped me to better understand the communities and local culture, as well as gain trust from community members. The preliminary field season and multiple visits to the communities were pivotal in establishing these trust relationships. Therefore, having an understanding of, and appreciation for, the Haida culture was important in carrying out research in Masset and Old Massett.

6.4.2 Challenges and Limitations in Participatory Research

There are many challenges, both operational and methodological, to participatory research. While my research was successful in overcoming some of these challenges, some were beyond the scope of my research capacity.

6.4.2.1 Operational Issues

6.4.2.1.1 Time Constraints

This Master's research was intended to act as a scoping stage for potential indicators that may be used for the project's vulnerability assessment. One significant barrier to both my Master's work and the larger project, from a research perspective, is that of time. Research partnerships require a great deal of time to develop and they require ongoing attention and participation by both the community and the researchers (Morford *et al.* 2004). Time was a barrier for the research team, as research was limited to the summer field seasons. As indicated in section 6.4.1.2, the time of community members was also limited as there were other pressing community issues to occupy community residents. For example, when asked to identify some of the more important issues or concerns facing their community, environmental concerns were mentioned, but were not very common. The most common responses had to do with local control of resources (i.e., current oil and gas dilemma), land claims, education, drugs and alcohol problems, unemployment, health and nepotism. While community

members were interested in the project, many were not able to devote much time to us.

This being said, many people expressed a keen interest in the research project, providing researchers with their contact information, and then continuing to wait for the results from both the biophysical and community research dimensions of the project. Ultimately, as researchers, we realized that our interests may not take priority, but we were appreciative of the community support and input we received.

6.4.2.1.2 Cost

Cost also can be a barrier to effective participatory research. Operating on a limited budget can prove difficult in any research endeavour. While the larger project incurred some costs with the workshop, we were fortunate in having community support with the door-to-door survey materials. Not only can the cost of supplies act as a barrier to this type of research, but the repeated community visits can become costly when working in remote areas, such as Haida Gwaii.

6.4.2.2 Methodological Issues:

6.4.2.2.1 Bias in Community Responses

While being engaged with the community has many benefits regarding the collection of data, the presence of a researcher, or team of researchers, can also introduce bias to the data collected. Riessman (2002: 812) refers to this influence on data as “contamination”. For example, responses identifying erosion and sea-level rise may have been a result of increased community awareness of

projected climate change impacts due to the presence of the research team. Public presentations were also given on climate change and sea-level rise impacts prior to seeking community input on social vulnerability and adaptive capacity. Some community members expressed that this information instilled a sense of fear and urgency in the community that was not present before our research activities.

As mentioned in section 5.4, the OMVC made a community announcement the day before the survey team began the door-to-door surveys in Old Massett. This type of event can, and from my perspective, did cause a bias in the data collected (section 5.4).

6.4.2.2.2 Researcher Bias

In addition to the presence of our research team influencing data results, my interactions with community members also may have biased my interpretation and presentation of results. Given the relationships that are formed when living in the case study communities, as a researcher it is difficult, if not impossible, to present the data completely bias free (Riessman 2002). In the presentation of results and discussion, I tend to avoid elaboration on topics I believed were particularly sensitive to the communities. This was done not to avoid important issues, but rather to avoid misinterpretation for results. Also, I believe some attributes I perceive as contributing to community vulnerability may attach a negative stigma to the communities, as cautioned by the Committee on Native American Child Health and the Committee on Community Health Services (2004). Additionally, I believe many of the issues related to the history of the

Haida people are especially sensitive and complex. Due to my limited understanding of these issues I was not comfortable going into detail on many of them, and wished to remain politically and culturally sensitive. In avoiding sensitive or negative attributes my results are biased in that I focus more on the positive attributes of these communities and provide insight for the potential for capacity building.

6.4.2.2.3 Participant Selection Bias

It is cautioned in participatory research that often the views presented do not necessarily reflect the overall views of community members, as it is often the louder community members that are heard (Bradshaw 2003, Clark *et al.* 2003). Throughout this research project, my bias and the biases of other community members had an impact on those I selected for the focus group review of the door-to-door survey. My aim was to have it reviewed by local authority figures, so that they were familiar with the research questions. Additionally, I took a draft of the survey to people that had had experience with surveying in the case study communities. The systematic random sample method sought to extract a random sample of households within the communities. However, bias can occur as those who chose not to complete the survey may have very different views than those who eagerly accepted it. The workshop invitation was extended to all members of NE Graham Island. Posters were placed throughout both Masset and Old Massett and an advertisement was placed in *The Observer* (a local newspaper) and on the scroll (a T.V. news bulletin station). Our workshop was attended by an equal gender and ethnic representation. Participants also varied

greatly in age, occupation and role within the community. The selection of key informants was the most biased form of sampling I used. These people were selected based on who I believed were representative of different employment sectors, gender, ethnicity, and length of residency. These people were selected based on my preliminary field season and through snowball sampling during the key informant interview process.

The multiple methods used in this research provided various opportunities for community members to participate, provide feedback, and ask questions of the research team. The use of these multiple methods helps to reduce the risk of falsely representing the communities (Gubrium and Holstein 2002, Hoggart *et al.* 2002). As multiple methods provide more sources of data, researchers can compare these data in their presentation of results (Sixsmith *et al.* 2003). I used multiple methods to evaluate if my views of local vulnerability and adaptive capacity changed from my preliminary field season to my final results. Multiple methods were also useful in identifying repeat data among the different methods. For example, similar responses emerged between the community workshop, the key informant interviews and the door-to-door survey. This repetition in results from the different research methods enhanced rigour and quality of the overall findings. Additionally, some of the methods used worked to support other methods. For example, the focus group review of the door-to-door survey questionnaire worked to enhance the quality of the survey by omitting any potentially offensive questions (e.g., ethnicity) and to restructure other questions to be more meaningful (e.g., education).

6.5 The Contribution of a Participatory Approach to Vulnerability Assessments in Climate Change Research

In this section, I reflect on the gaps and limitations to vulnerability assessment research. I will also highlight the benefits of using a participatory approach in developing an index of attributes for climate change and sea-level rise vulnerability assessments. This section will also address some of the lessons learned through using such an approach.

Chapter 2 identified many limitations and gaps in traditional socio-economic vulnerability assessment research, such as the fact that many vulnerability assessments remain top-down in their approach. Additionally, assessments are generally reactive (assessing post damage) rather than proactive (focusing on capacity building prior to hazard). Other limitations arise from the inherent uncertainty in projecting future changes, and the data available for assessment (e.g., often out-dated or only available at the aggregate level). How this research has overcome some of these limitations and gaps will be highlighted in the following section.

While many vulnerability assessments remain reactive, this research and the larger project are proactive, aiming to develop strategies for capacity building prior to impacts. Vulnerability assessments in the past tend to occur after a hazard has occurred (Tol *et al.* 1998, Verheyen 2002, Klein *et al.* 1999). It has been recognized by scholars that pre-assessments tend to result in greater community preparedness, as adaptive capacity and capacity building can be a starting point (Smit *et al.* 1999, Smit and Pilifosova 2003). This research has identified many community attributes of adaptive capacity and vulnerability. The

attributes of vulnerability that I have identified could be strengthened to build adaptive capacity prior to projected impacts of climate change and sea-level rise on Haida Gwaii.

This research has also approached researching 'vulnerability' from a starting point of identifying local adaptive capacity. This is a more empowering approach to research when working with communities (Mendis *et al.* 2003, Smit and Pilifosova 2003). As community based research examines real places and real people, it is important for researchers to be sensitive to the diverse needs of the communities. While participatory research frameworks provide excellent ideas for enhancing community participation (e.g., Mendis *et al.* 2003), they need to be flexible in how research works within communities, based on the varying needs of different communities.

Uncertainty around physical climate change impacts is also recognized as a limitation to socio-economic vulnerability assessments. Without knowing the exact future of the environmental changes (e.g., water temperature increases, sea-level rise, erosion), it is difficult to come up with a measure of how susceptible communities really are (e.g., dependence on certain fish species, value of low lying grounds). This uncertainty was not a limitation in my research, as my research was guided by the underlying assumption that being prepared for any change strengthens the adaptive capacity of a community in dealing with potential climate change and sea-level rise impacts. However, the larger project, in which this research is situated, will produce future scenarios of climate change impacts.

This research used pre-existing data available on these communities for comparison purposes (Chapter 4 and the survey demographics); however it did not rely solely on these data. Scholars have cautioned the use of pre-existing data, due to issues of data decay and reliability (King 2001). This thesis underscores this caution on several occasions, as there were inconsistencies between data sources, as well as a lack of current and consistent data available for Old Massett. This thesis does not attempt to evaluate the quality of these data sources (e.g., Statistics Canada, SNDS), rather, I used them to build a picture of community demographics. To overcome the challenge of inconsistencies in available data I gathered as much information as I could from local sources (i.e., housing numbers for survey sample size). These data were accessible with the use of this participatory approach. Gathering data through the door-to-door survey on household incomes, employment, age, and education also provided the research team with a current representative sample of household demographics.

By conducting this research in a participatory manner, many site-specific attributes of vulnerability and adaptive capacity were identified, notably community cohesion, culture and many practical skills. While an outside perspective of this community may illustrate a picture of vulnerability, there have been many community-identified elements gained through incorporating local knowledge that are a part of this community that work to strengthen its adaptive capacity.

6.6 Limitations of the Research

While the literature recognizes that individual vulnerabilities need to be considered in vulnerability assessment research, this thesis did not attempt to identify individual-level vulnerabilities, but was focused on community-level attributes of vulnerability and adaptive capacity. I recognize, however, that there are individual vulnerabilities within households and between people in these two communities.

In their truest form, participatory research or community based research studies imply the inclusion of community members in all stages of the project (Savan and Sider 2003, Morford *et al.* 2004). However, there are varying scales of participatory research (Parkes and Panelli 2001). I believe this research could have been more participatory had community members been included in the research design, rather than just being given the opportunity to provide feedback on and approval of our intentions.

Another limitation of my research was the impacts-driven nature of early community presentations. These presentations focused on projected environmental impacts of climate change and sea-level rise (e.g., photos of erosion, flooded areas, washed out roads), leaving the community with a message that they needed to prepare just for increased storminess, and loss of property due to flooding and erosion. I believe that while these impacts-driven presentations have increased community awareness of climate changes, they also impacted the data collected and in some cases caused a resistance to our research team.

As a researcher, my avoidance of greater elaboration on sensitive community issues represents a biased interpretation of community vulnerability. I chose this approach firstly to be sensitive towards community issues and secondly because of my personal discomfort in writing about complex, sensitive issues I do not have a broad understanding of. The lack of emphasis on sensitive issues (e.g., generation sickness) that may contribute to vulnerability could be falsely interrupted as lesser importance than attributes contributing to resiliency and adaptive capacity. This is not the case. These attributes are equally as important and should emerge in community capacity building activities.

7.0 Conclusions

The purpose of my thesis was to investigate the contribution of a participatory approach to identifying site-specific elements of vulnerability and adaptive capacity in the remote coastal communities of Masset and Old Massett, Haida Gwaii to projected climate change and accelerated sea-level rise impacts. To fulfill this purpose, four main objectives were presented in Chapter 1 (section 1.6). The first objective was to review scholarly literature from hazards, famine, development, and climate change to define vulnerability and adaptive capacity as they could be applied to the study of remote coastal communities exposed to climate change and accelerated sea-level rise impacts. While the introduction of my thesis sets the stage for climate change research in Canada, in Chapter 2 I reviewed current scholarship on vulnerability and adaptive capacity, as well as highlighted various case studies on vulnerability assessments. In the fourth chapter, I illustrated my preliminary view of local attributes that I believed may contribute to vulnerability in Masset and Old Massett. These views were a result of observations made during my preliminary field season grounded in the relevant academic literature.

The second objective of this thesis was to develop a participatory approach for this research in Masset and Old Massett (the case study communities), so as to identify locally perceived characteristics of adaptive capacity and vulnerability. While Chapter 2 highlighted the need for greater participation and outlined ways that scholars have evaluated and categorized participation in the past, Chapter 3 outlined the methods I used in this

participatory research approach. These qualitative methods were selected to encourage greater community participation. They included a preliminary field season, a pilot study, a community workshop, key informant interviews, a door-to-door survey, participant observation and field notes. These methods provided many opportunities for the case study communities to become involved in identifying locally perceived attributes of vulnerability and adaptive capacity, as well as to provide feedback on research methods. With the presence of the research team in the communities, further insight was gained than a typical qualitative approach (e.g., Mendis *et al.* 2003). Because these communities were resistant to outside researchers due to past experiences, it was critical to the research to have spent more than one field season in the community building trust and rapport. The observations and connections made during these field seasons enhanced the quality of the research results. However, along with these positive interactions were some minor limitations in the research (section 6.4).

The third objective of my thesis was to examine the role of community-level research in better understanding site-specific characteristics of vulnerability and adaptive capacity. In Chapter 4, I outlined characteristics that I perceived as important to the study of vulnerability and adaptive capacity in the communities of Masset and Old Massett following my preliminary field season and review of the academic literature. My research has provided additional site-specific attributes of vulnerability, thereby adding to traditional assessments by including community perceptions on vulnerability and adaptive capacity. The combination of approaches resulted in enhanced understanding of local attributes that could be used for a vulnerability assessment of Masset and Old Massett. These were

illustrated in Table 6.1. In addition to learning more about the site-specific attributes this participatory research also increased community awareness of projected climate change impacts and what these impacts might mean for their local communities. This hands-on, participatory approach also strengthened the relationship between the community and the research team.

In section 7.1 I recommend that these attributes be further pursued with residents of the case study communities. In Chapter 6, I evaluated the utility of a participatory approach in identifying site specific elements of vulnerability and adaptive capacity of remote coastal communities to climate change and accelerated sea-level rise impacts. In this section, I express the view that, while the academic literature and the perspectives of local community members have much in common, valuable detailed insider perspectives (e.g., LEK, TEK, LK) were gained by including community members in the research. In addition to achieving greater insight on local elements of vulnerability and adaptive capacity, there were many benefits of conducting this research in a participatory manner. First, the involvement of local community members strengthens relations between researchers and the community. Second, researchers gain greater insight into the research topic. For example, while it is apparent that there are local attributes that may work to foster increased vulnerability (e.g., lower income levels, local health concerns, lack of dissemination of an emergency plan), there were also locally identified elements that may be viewed as a community strength (e.g., the tendency of community members to come together in times of need). Third, community awareness is heightened with the sharing of research results,

thus having the potential to strengthen local adaptive capacity through increased awareness for community planning.

7.1 Research Recommendations for CCIAP Project A580

As my thesis work acted as the preliminary stages of a vulnerability assessment of north eastern Graham Island, Haida Gwaii to climate change and accelerated sea-level rise impacts (CCIAP Project A580), I provide some recommendations for the continuation of the project and future vulnerability assessment research.

Three recommendations emerge from this research. First, I recommend that the attributes identified in this thesis be pursued with a focus group of diverse community stakeholders. This focus group should evaluate and decide which of the attributes presented in this thesis should be used as indicators in a vulnerability assessment of Masset and Old Massett. This group should also provide direction on how to measure and evaluate these attributes. As the aim of this thesis was to illustrate local attributes, these attributes require further development if they are to be used as indicators in a vulnerability assessment.

Second, I strongly recommend that the larger research project remain actively engaged with the community over the duration of the project, to ensure a community-based approach is maintained. Results of both the environmental and social assessments should be reviewed by community members prior to broader public release. This would assist in filtering any results that may be perceived as sensitive to the community (e.g., health problems, community conflicts).

Last, I recommend that following the vulnerability assessment, guidelines for capacity building should be developed with the community. While it is important to recognize local vulnerability and current adaptive capacity, the real value in such research is to build upon this awareness. This can be done by identifying ways the community can better prepare for future climate change and accelerated sea-level rise impacts.

7.2 Recommendations for Community-Based Research

In evaluating my own attempts at participatory, community-based, site-specific research, I have identified the following recommendations for similar research projects.

First, creating a community profile and spending some time in the case study communities before setting the research methods and goals is essential. During this time a researcher gains invaluable knowledge and understanding of local issues, concerns and perspectives. This early phase of a research project (Phase I in this thesis), is also beneficial in introducing the research team to the community and beginning to establish greater rapport with community members.

Second, as a part of the research methods, I recommend that researchers strive to host community events that are open to the general public. For this research, such community outreach was achieved through community information sessions (e.g., presentations that are followed by a question period) and a workshop. Additionally, the contact information for the research team was provided in the local newspaper.

Third, before implementing research methods, it is important that these methods be reviewed by community members first. For this research, a focus group reviewed the contents and method for our door-to-door survey. Additionally, a community member was contracted to review the workshop content and structure. Ideally, I would recommend that community members be involved in all the planning stages of the research.

Fourth, I recommend that community members remain involved in the research process during the analysis of research results. Their particular interpretations may provide researchers with greater confidence in the results. This may also reduce the degree of researcher sensitivity, as results are approved by the community.

And lastly, I recommend that community members are engaged in all stages of the research project. In order to ensure this happens, I recommend that a focus group of community members be contracted as research employees from the onset to the finish of a participatory, community-based research project. In doing so the degree of citizen participation is greater, thus fostering more community awareness of climate change risks and building stronger relationships between community members and the research team.

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Appendix I: Interview Template

What community are you a part of?

How long have you lived in _____?

What do you do within your community? (for how long)

What major social changes have you seen in your village/town? (health, occupational, cultural, social support, education).

Have you noticed any environmental changes where you live?

What makes this community strong in the face of changes? (both individuals and the community as a whole)

What do you feel makes people healthy or unhealthy?

What are some of the strengths and problems with education in this area?

How would you assess the status of employment in this community?

How would you assess the level of community support in this area? (why)

Are there things you could recommend that would make your community stronger in the face of potential future changes?

Do you feel the location of your community makes you more or less vulnerable to potential environmental changes or emergencies?

Given that with climate change, storms may become more frequent and stronger, and sea levels are predicted to rise. How do you feel climate change could affect this community?

Are you concerned about potential environmental changes?

Appendix II: Key Informant Consent Form

Coastal vulnerability to climate change & sea level rise, Graham Island, Queen Charlotte Islands

You are being invited to participate in the 'Coastal vulnerability to climate change & sea level rise, Graham Island, Queen Charlotte Islands' study that is being conducted by Dr. Ian Walker and fellow researchers. Ian Walker is the project director and a faculty member in the department of Geography at the University of Victoria and you may contact him if you have further questions by email at ijwalker@uvic.ca or by telephone at (250) 721-7347.

This research is being funded by the NRCan - Climate Change Action Fund (CCAF) and the Northern Scientific Training Program (NSTP).

The purpose of this research project is to assess the biophysical and social vulnerabilities of the communities of Northeast Graham Island to climate change-related effects, such as sea-level rise, enhanced erosion, biophysical changes to resources, infrastructure damage, resource availability changes. This project will assess broader human-environmental vulnerabilities

You are being asked to participate in this study to help us gain a better understanding of how the local people of Haida Gwaii perceive their ability to deal with change (adaptive capacity) of the communities of Old Massett and Masset.

We have a Contribution Agreement with NRCan Climate Change Impacts and Adaptations Program to share the results of our research (not raw data) with communities via a report and web-document including maps. All raw data will be archived on a protected computer server with access limited by Ian Walker. Results will be given as research theses, manuscripts, and finished documents provided via NRCan to any interested participants, and via an interactive website.

In addition to being able to contact the researcher at the above phone numbers, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Associate Vice-President, Research at the University of Victoria (250-472-4545).

Other individuals that may be contacted regarding this study include Teresa Conner (tconner@uvic.ca) and Leigh Cormier (leighcormier@yahoo.ca) or via telephone at (250) 626-3236 until July 31. Following this date at (250) 472-5136.

Your signature below indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researchers.

Name of Participant

Signature

Date

A copy of this consent will be left with you, and a copy will be taken by the researcher.

Appendix III: Door-to-Door Survey

Door-to-door survey: Summer 2004

Survey # _____

Location _____

Home Type _____

1. Do you currently live on Haida Gwaii?
 - a. Yes (Is this your home? Do you own or rent it?)
 - b. No (How often do you come, for how long, and, is this your home? Do you own or rent it?) Do you feel comfortable participating in this survey on community and household preparedness for emergencies and environmental change?

2. How long have you lived on Haida Gwaii?

3. Which community are you a part of?

4. What do you like most about your community?

5. What do you like least about your community?

6. We are interested in your participation in community activities and organizations. Of the following, which have you been involved with?

	Yes	No	Please Specify
a. Attended local council or school board meetings	1	2	
b. Signed a petition, spoke or wrote to an official about a local issue	1	2	
c. Volunteered with a cultural and/or spiritual organization	1	2	
d. Volunteered at a sporting, civic or other local event	1	2	
e. Involved in any local teams, clubs or groups	1	2	
f. Attended community events	1	2	
g. Involved in any other community activities	1	2	

7. On a scale of 1-5 (1 being not very important and 5 being very important), how important are the following items to making your community strong:

	Not Very Important				Very Important
a. Community events	1	2	3	4	5
b. Communities and councils on island working together	1	2	3	4	5
c. Local people volunteer within your community	1	2	3	4	5

8. In your opinion, what are the most important issues or concerns facing your community?
-

9. How important are the following educational attributes to strengthening your community for future changes?

	Not Very Important				Very Important
a. Traditional Education levels (hunting, berries collecting, fishing)	1	2	3	4	5
b. Involvement of elders in the school system	1	2	3	4	5
c. Formal education levels (ie. high school/college/university)	1	2	3	4	5
d. On island training of formal skills (report writing)	1	2	3	4	5
e. Resources allocated to the school district	1	2	3	4	5

10. How important are the following components of health to strengthening your community for future changes?

	Not very important				Very important
a. Access to health care	1	2	3	4	5
b. Environmental cleanliness (water/air)	1	2	3	4	5
c. Changes in diets away from traditional/local foods	1	2	3	4	5
d. Drug and alcohol addictions	1	2	3	4	5
e. Quality of doctors in your community	1	2	3	4	5
f. Attitudes	1	2	3	4	5
g. Social assistance	1	2	3	4	5
h. Personal/community gardens	1	2	3	4	5

11. On a scale of 1 to 5 (1 being very dissatisfied, 5 being very satisfied), please express your satisfaction with the following on Haida Gwaii:

	Very Dissatisfied	→			Very Satisfied
a. Access to health care	1	2	3	4	5
b. Emergency services (police, fire)	1	2	3	4	5
c. Access to important community information	1	2	3	4	5
d. Opportunities to contribute to local decision-making	1	2	3	4	5
e. Representation of your needs by community leaders	1	2	3	4	5
f. Communication services (phone and internet)	1	2	3	4	5

12. Who's responsibility do you feel it should it be to prepare your community for emergency situations?

- a. Yours
- b. Neighbours/friends
- c. Community elders
- d. Hereditary Chief
- e. RCMP
- f. Municipal government
- g. Provincial government
- h. Federal government
- i. Other

13. If an emergency were to occur, do you think that members of your community would pitch in to help?

- a. Yes
- b. No
- c. I don't know

14. Does your community have an emergency evacuation plan?

- a. Yes, please explain

- b. No
- c. I don't know

15. How important do you feel it is to have an emergency preparedness/evacuation plan?

Not Very Important				Very Important
1	2	3	4	5

16. How important do you feel it is for the community to practice the emergency plan (e.g. drills)?

Not Very Important				Very Important
1	2	3	4	5

17. We are interested in how you prepare for emergencies in your home. Which of the following do you have?

	Yes	No	Don't Know
a. Candles, oil lamps, flashlights	1	2	3
b. First aid kit	1	2	3
c. Woodstove, gas or propane stove	1	2	3
d. Generator	1	2	3
e. Food storage that would last your household 3 days.	1	2	3
f. Water supply that would last your household 3 days	1	2	3
g. Property, homeowner's or apartment insurance	1	2	3

18. Do you have an emergency plan for your home?

a. Yes, please explain

b. No

c. I don't know

19. Has your community ever experienced a big environmental event? By this we mean an event that is more intense than normal, and occurs rarely (e.g. a large storm, or earthquake).

a. Yes, please specify: _____

b. No

c. I don't know

20. Which of the following impacts have you or your community experienced as a result of big environmental events? Think about impacts that have affected both you personally and also your community.

Impacts	Yes	No	Don't Know	Specify
a. Infrastructure or property damage	1	2	3	
b. Coastal changes	1	2	3	
c. Transportation interruptions	1	2	3	
d. Power (electricity) loss	1	2	3	
e. Damage to important cultural/environmental areas	1	2	3	
f. Food shortages	1	2	3	
g. Loss of work hours	1	2	3	
i. Damage to food gathering/hunting sites/recreation sites	1	2	3	
k. Other	1	2	3	

21. How have you and your community dealt with these impacts?

22. Is there anything your community could do to be better prepared for big environmental events in the future?

- 23.** On a scale of 1 to 5 (1 being no risk at all, 5 being very high risk), what is your community's level of risk of being impacted by a big environmental event in the next ten years?

No risk	→			High risk
1	2	3	4	5

- 24.** As a result of climate change in the next 100 years we will experience warming of air and ocean temperatures, sea level rise, and changes in the amount and timing of precipitation. What might these impacts mean for your community?

- 25.** What are some strengths of your community that may help it deal with future climate change impacts?

- 26.** What are some, if any, weaknesses of your community that may make it susceptible to future climate change impacts?

Demographic Information

This information will be combined with other survey results for statistical purposes. No individuals will be identified in publications or presentations, nor will results be presented in such a way that individuals could be identified.

- 27.** Including yourself, how many people live in your household? _____
- 28.** Do you have any dependent children or seniors living in the household? (if yes please specify)
1. Yes, dependent child(ren)
 2. Yes, dependent senior(s)
 3. Yes, both child(ren) and senior(s)
 4. Yes, other (i.e., dependent sibling, dependent adult): _____
 5. No dependents living in household

29. What education, skills or training do you possess?

1. Hunting
2. Fishing
3. Gathering
4. Wilderness survival
5. Cultural or language training
6. Grade school (K to grade 8)
7. Some high school
8. High school diploma/GED
9. Trades or skills tickets (ie. carpentry, first aid)
10. Community college/technical institute
11. University Degree
12. Other education or training, please specify _____
13. No education or training

Do you mind us asking you a few questions regarding your employment status and household income?

30. What is your present employment status (for main job)?

1. Unemployed
2. Full-time work
3. Part-time work
4. Self employed
5. Homemaker (at home caring for children/adults, unpaid domestic duties)
6. Retired
7. Seasonal work
8. Student

31. What is your main occupation/source of income? (e.g., fishing vessel captain, grocery store clerk, librarian, artist, teacher, logger, public administration).

32. Where is your workplace located (area/community)?

33. What is your total annual household income before taxes, including income from all members of your household?

1. Up to \$10,000
2. \$10,000 to \$24,999
3. \$25,000 to \$39,999
4. \$40,000 to \$55,999
5. \$56,000 to \$69,999
6. \$70,000 to \$99,999
7. \$100,000 or more
8. Don't know

34. Are you the primary earner of this household income?

1. Yes
2. No (What is the occupation of the other primary income earner(s) in your home?) _____

35. Do you mind us asking what age you are? Or if you are more comfortable we could provide some age categories?

1. Under 19
2. 19-24
3. 25-34
4. 35-44
5. 45-54
6. 55-64
7. 65 or over

36. Can you give us some feedback on this questionnaire?

	Yes	No	Don't Know
Too long			
Difficult to understand			
Thought provoking			
Relevant to your community			
Other (please specify)			

Appendix IV: Survey Coding Sheet

Coding Sheet

Question 1

1. Yes
2. No
3. Other (live with parents/friends)

Question 2

Residence years

Question 3

1. Masset
2. Old Massett
3. Greater Masset (Masset/Old Massett)
4. Tow Hill
5. Tlell
6. Port Clements
7. Haida Gwaii / Queen Charlotte Islands
8. Queen Charlotte City
9. Skidegate

Question 4

1. Nature / surrounding environment
2. Friendliness/get along
3. Helpfulness
4. Smallness (population)/laid back/island lifestyle/privacy
5. Support network
6. Local food (sea food, garden food)
7. It's a special place (its like nowhere else)/way of life
8. Attachment to place because its where they grew up
9. Diversity and acceptance
10. Closeness of people
11. My life
12. peaceful, quiet
13. weather (rain)/climate
14. family (my family is here)
15. recreation (fishing)
16. local (central, geographical location)/isolated, rural
17. PEOPLE/community/friends
18. elders are respected
19. regaining culture/language
20. spiritual
21. nothing
22. heritage and culture
23. employment opportunities
24. safe for children
25. affordable property/ housing

Question 5

1. Garbage/cleanliness of yards/dogs
2. Access to luxury items, shops (lack of choice)
3. Limited service hours (banks, grocer)
4. Social problems/issues (Public drunkenness)
5. unneeded noise
6. schooling (access to)
7. transportation (both on island and off island)
8. resource extraction
9. lack of activities/entertainment cultural activities
10. lack of awareness

11. lack of essential goods/services (ie. Childcare)
12. drugs/alcohol
13. NO/I don't know
14. lack of privacy (gossip)
15. unemployment(poverty)/type of work available(seasonal)/economic development
16. weather
17. politics (band office/leaders)
18. lack of ambition/self confidence/effort/attitudes/back stabbing
19. healthcare system/health (no alternative healthcare)
20. location (distance to amenities), isolated
21. lack of culture/language/family structure
22. bad communication
23. petty crime, vandalism, speeding
24. expensive, cost of living
25. bad policing
26. abuse/domestic violence
27. bad fed government policies
28. prejudice
29. state/conditions of roads, highways
30. not enough send of community (cliques, non-consensus decision making)
31. disrespect of environment (ie. Driving on beaches/dunes)
32. lack of self-sufficiency
33. Rural development
34. power outages
35. no fire protection

Question 6

1. yes
2. no

Question 7

1. not very important
2. unimportant
3. neither important of unimportant
4. important
5. very important

Question 8

1. Oil and Gas
2. Local control of resources
3. Provincial / Federal laws that don't fit with what the islanders want
4. Economic Growth, development/ need for sustainable economy
5. Sports fishing industry
6. Sexual Abuse, Abuse of Women and Children, violence
7. Unemployment/unemployment for youth
8. Ability to attract people to live here
9. Lack of specialized services (health), social programs (ie. Addictions, parenting)
10. Ferries
11. Lack of housing, too expensive
12. No community plan
13. No town core
14. Tourism
15. Lack of preparedness (for big environmental event)
16. resource extraction and impacts, environmental issues/concerns
17. overall downward trend of state of island
18. speeding cars

19. poor state of housing (mold)
 20. financial concerns (OMVC)/local politics/accountability
 21. lack of island wide unity
 22. rural development
 23. increasing population
 24. highways, poor condition/maintenance
 25. poverty/no money
 26. preserving culture (language)
 27. education (access, lack of funding, quality)
 28. drugs and alcohol/addictions
 29. attitudes (discipline, motivation), apathy, fear of being political
 30. lack of support (help each other out)
 31. health: access to care, lack of adequate facilities
 32. welfare (childs)
 33. lack of tradition/culture assets/religion
 34. garbage/dogs
 35. reliance on social services
 36. land claims/title case
 37. diversity/minority groups
 38. lack of communication/experience
 39. environmental quality (fish, climate, storms), property loss, climate change
 40. lack of local hiring/qualifications
 41. decreasing populations
 42. lack of community cohesion/support network
 43. decreasing property values
 44. Bear Hunting
 45. cost of living
 46. lack of recreation/ teen services
 47. racism
 48. govt. funding cuts
 49. Northern Tax Allowance
 50. no emergency services for Tow Hill
 51. no public transportation on Island
 52. nothing
 - (A: policing/lack of personnel? I've had two now that deal with policing)
 53. need better communication system (cell phone)
- Question 9
1. not very important
 2. unimportant
 3. neither important of unimportant
 4. important
 5. very important
- Question 10
1. not very important
 2. unimportant
 3. neither important of unimportant
 4. important
 5. very important
- Question 11
1. very dissatisfied
 2. dissatisfied
 3. neither dissatisfied or satisfied
 4. satisfied
 5. very satisfied
- Question 12
1. Yours
 2. Neighbours/friends
 3. Community elders
4. RCMP
 5. Municipal government
 6. Provincial government
 7. Federal government
 8. Volunteers
 9. Community
 10. Other
 11. fire department
 12. hereditary chief
 13. ambulance/medical services
 14. parents
 15. coast guard
 16. youth
 17. schools
 18. everyone
 19. rangers
- Question 13
1. yes
 2. no
- Question 14
1. yes
 2. no
 3. I don't know
- Question 15
1. not very important
 2. unimportant
 3. neither important of unimportant
 4. important
 5. very important
- Question 16
1. not very important
 2. unimportant
 3. neither important of unimportant
 4. important
 5. very important
- Question 17
1. yes
 2. no
 3. I don't know
- Question 18
1. yes
 2. no
 3. I don't know
- Question 19
1. yes
 2. no
 3. I don't know
- Question 19a/b/c
1. Big storms (gale force wind)
 2. Earthquake
 3. mudslide/land slide
 4. temperature increase
 5. ice storm
 6. fuel docks burnt down
 7. tidal wave
 8. oil spill
 9. (forest) fire
 10. high tides/waves, flooding
 11. drought/ water shortage
 12. over fishing of salmon stocks/resource extraction
- Question 20 (0 =no specification)

- a.1 Hydro, power lines down
- a.2 Highways
- a.3 Sea Wall
- a.4 Vehicle damage
- a.5 Cracked walls/roof tiles, roof damage
- a.6 Financial burden on person
- a.7 Fences down
- a.8 Co-op burnt down
- a.9 property loss/erosion
- a.10 unfinished homes/temporary structures
- a.11 windows
- a.12 trees
- a.13 flooding
- a.14 house/building damage
- a.15 grazing fields/yard space
- a.16 fault line

- b.1 Loss of beach/property/erosion
- b.2 Gaining of beach/property/accretion
- b.3 River changes
- b.4 Sea level Rise
- b.5 Tidal Effects (changing tides)
- b.6 Threatening the highway (Tlell)
- b.7 north beach/north end
- b.8 loss of trees
- b.9 fault line
- b.10 logs and driftwood
- b.11 change in shellfish/ seafood populations
- b.12 river bank slumping

- c.1 Ferry (and/or barge)
- c.2 Highway
- c.3 plane

- d.1 Consistently
- d.2 Power outages (hydro poles down/transformer destroyed)
- d.3 Water pump out
- d.4 sometimes

- e.1 Agate (beach/campground)
- e.2 Sand dunes
- e.3 archaeological sites
- e.4 pasture land/hay fields
- e.5 slide along river/ trees down, blocking river
- e.6 limber loss tree (spiritually significant tree)
- e.7 cemetery
- e.8 spring (water)
- e.9 North Beach
- e.10 Kumdis slough
- e.11. Hielen
- e.12 Allard's Field
- e.13 Mariner's Point
- e.14 Tlell beach campsites/access
- e.15 Anvil Trail
- e. 16 St. Mary's Spring
- e.17 loss of coastline, all damaged areas of Island
- e.18 Sanctuary/ Slough Rd (Masset)

- f.1 Lack of food stocks at grocers (no produce/no milk)
- f.2 ferry scheduling, cancelled/ delay from storm

- g.1 Business closed from loss of power/infrastructure
- g.2 People Evacuated

- g.3 Work created
- g.4 Road closed
- g.5 Environmental dangers (wind, drought)
- g.6 affects crabbing
- g.7 danger/safety at work site
- g.8 from health impacts

- h.1 Damage or reduced access to food gathering sites (due to new/changed species)/erosion, destroyed habitat
- h.2 Damage or reduced access to hunting spots
- h.3 Damage to recreation sites
- h.4 high rivers (can't fish)
- h.5 loss of beach access
- h.6 damage from forestry (land more vulnerable to environmental impacts)
- h.7 trees (blown down/washed out)
- i.1 decrease in fish
- i.2 communication problems (phone lines)
- i.3 added work hours
- i.4 fear of safety/ reliability of hwy.
- i.5 had to relocate (find) livestock, farm animals

Question 21

1. Go without (deal with it)/nothing/don't fix
2. fix it
3. Formed Tlell Community Assoc.
4. Sharing of resources between friends and neighbours
5. Adapt/change strategies
6. Always keep gas (candles, food, etc.) on hand
7. PEP
8. get more work (cleaning up after storm), community clean-up/ work together
9. community support (check in with other people)
10. self sufficiency/ individual effort
11. Change to roof (tin, metal, spikes)
12. Band office fixes it/Gwaii trust
13. highways fixes it
14. upgrade buildings (made community hall bigger)
15. tsunami warning system
16. prevention planning
17. build sea wall
18. Town Meetings, share info about event
19. philosophical attitude, cheery/positive about the whole thing

Question 22

1. Yes, but don't know what
2. More community/town hall events
3. Communities working closer together (ie. Masset and Tow Hill)
4. No/community is fine/can't do anything
5. Share info (emergency planning through outreach/making people aware of plan)/ education/practice plan
6. Keep gas on hand/supplies/water
7. Plan (at the community level), preventative vs. reactive
8. plan (at the household/family level)
9. first aid kit and community first aid training
10. emergency evacuation facility/storage containers/ plan
11. emergency communication system
12. lobby provincial government for more support
13. better LUP
14. community council needs list of people who can't drive
15. don't know/ no
16. build better houses/reinforce

17. rebuild lost/endangered species
18. look at historical events
19. reinforce the beach
20. concentrate on highways
21. address issue of houses along coast
22. learn to adapt/ change with environment
23. develop PEP
24. community participation/ drills
25. better hospital/ emergency services
26. create alternate emergency transport/ route (not hwy)
27. need Tow Hill emergency plan/ facilities (ie. Water reservoir/ substation for fire)
28. become self-sufficient as an island
29. keep oil and gas moratorium in place

Question 23

1. no risk
2. low risk
3. neither no risk or high risk
4. likely risk
5. high risk

Question 24

1. Community under water/flooding/washed away/destruction of homes
2. More forest fires/change vegetation in forests, loss of rainforest
3. More moisture (more rain/snow) =rotting of vegetable gardens
4. Warmer (hotter/drier) weather/seasonal variation, affect gardening
5. I don't know, can't foresee future
6. Cultural loss (CMTs, berries, etc.)
7. Water shortage
8. Transportation problems (ferry, highways)
9. Food storage
10. Fishing changes/sea life
11. Land property changes/property values, resettlement
12. Changes to Masset inlet
13. Loss of food gathering sights (clam beds/berries), change in food resources
14. Environmental change/devastation
15. Increase # of earthquakes and tidal waves
16. increase in population (warmer climate)/decrease, more tourism
17. erosion/ accretion
18. more sever storms (increase winds)
19. medical (emergency response)
20. salt water intrusion, higher water tables
21. health impact (disease)
22. unemployment
23. better growing season
24. not going to affect us a lot or negatively increase economy
25. species change (flora/fauna), lifecycles and abundance
27. further isolation
28. people will have to change and adapt
29. change in main industry/ economy
30. can't anticipate or prepare for event

Question 25

1. People in the community stick together, know each other, work together

2. People adaptable and resourceful (strong and hardy people)
3. Living and working more off the land/self sufficient, independent
4. Lots of food supply in house
5. Conservation of what is here
6. No big building to collapse
7. People more environmentally aware/ care
8. Culture/native strength
9. strength of people who volunteer
10. past experiences/exposure
11. elders stories (traditional knowledge)
12. people show interest
13. respect/communication
14. ocean purifies
15. lots of boats/ vehicles
16. strong leaders
17. we're vocal in our needs
18. people pool resources
19. unincorporated, flexible communities
20. lots of land/ space to move to
21. diversity of people and environment, mild climate=less suffering
22. None
23. the people ARE the strength
24. need to add a don't know

Question 26

1. Some people are stubborn and don't work together, community can't agree on anything
2. Location, remoteness/sea level, stranded here in a big storm
3. Lack of resources to deal w/ situations/change
4. Lack of self-sufficiency (don't know how to hunt/berries)
5. Depending on transportation/internet/phone (dependency), govt.
6. Distant to emergency site, no centralized emergency center
7. Dependency on bridges out of town, and one hwy.
8. Rely on electricity
9. Too much alcohol consumed/drugs, FAS
10. Provincial and Federal government systems (don't listen)
11. NOTHING, don't know
12. Not in my back yard (stubborn attitudes)
13. Lack of preparedness/action/knowledge
14. No one willing to stand up (speak out)/do it
15. disrespect of natural resources/unsustainable carrying capacity exceeded
17. racism
18. lack of stocks in stores
19. younger generation doesn't care
20. lack of ambition (gossip)/attitudes, apathy
21. money (lack of)/poverty
22. lack of leadership
23. uncertainty (land claims)
24. low education/ awareness
25. lack of spirituality/religion
26. population changes
27. lack of resource control
28. dependent on natural resources/environment
29. lack of employment
30. location of homes(too far apart)/cultural areas
31. abysmal state of highways and roads
32. indifference/ disbelief of climate change
33. divisions in community (issues between people and cultures)
34. lack of island-wide unity

35. too much emphasis on tourism/ development (abuse of resources)
36. lack of emergency services for Tow Hill
37. medical (doctors change over too often)
38. proximity of hydro/transport corridor to beach/ coast
39. no backup communication systems
- Question 27
Number of people in household
- Question 28
1. Yes, dependant children
 2. Yes, dependant seniors
 3. Yes, both dependant children and seniors
 4. Yes, other
 5. No, dependants
- Question 29
1. Hunting
 2. Fishing
 3. Gathering
 4. Wilderness survival
 5. Cultural or language training
 6. Grade school (K to grade 8)
 7. Some high school
 8. High school diploma/GED
 9. Trades or skills tickets (i.e. Carpentry)
 10. community college/technical institute
 11. University Degree
 12. Other education or training, please specify _____
 13. No education of training
- Question 30
1. unemployed
 2. full-time work
 3. part-time work
 4. self employed
 5. homemaker (at home caring for children/adults, unpaid domestic duties)
 6. retired
 7. seasonal work, temporary
 8. student
 9. maternity
 10. medical leave/illness
 11. WCB –disability pension
 12. laid off
- Question 31
1. Fishing /clamming
 2. Forestry
 3. Education
 4. Art/ Music
 5. Military
 6. Social support/support worker
 7. Tourism (accommodation, charter)
 8. Trades (manufacturing, wood processing, printing, electrician, mechanic)
 9. Transportation
 10. Student
 11. Health/medical
 12. service sector (gas station, hospitality)
 13. self employed (various handyman, home business), business owner- merchant
 14. processing (fish, wood products)
 15. public administration
 16. homemaker
17. investment
18. religion
19. pension
20. research
21. government
22. Biologist
23. Parks
24. RCMP
25. farmer
26. WCB (disability)
27. E.I.
28. Lifeguard, swimming lessons
29. archaeologist
- Question 32
1. Masset
 2. Old Massett
 3. Greater Masset
 4. Tow Hill
 5. Tlell
 6. Port Clements
 7. No place of work
 8. Queen Charlotte city
 9. Island wide
 10. graham island
 11. home
 12. travel around/off island or on
 13. Sandspit
 14. Juskatla
 15. Skidegate
 16. Rennell Sound
 17. Gwaii Haanas
 18. Hecate Straight
- Question 33
1. Up to \$10, 000
 2. \$10, 000 to \$24,999
 3. \$25,000 to \$39,999
 4. \$40, 000 to \$54,999
 5. \$55, 000 to \$69,999
 6. \$70, 000 to \$99,999
 7. \$100,000 or more
 8. Don't know
- Question 34
1. yes
 2. no
 3. joint
- Question 35
1. Under 19
 2. 19-24
 3. 25-34
 4. 35-44
 5. 45-54
 6. 55-64
 7. 65 or older
- Question 36
1. yes
 2. no
 3. don't know

Appendix V: Regrouping of Responses

Question 4; What do you list most about your community? (recoded for analysis, Nov 10/05)

- 1 Environment; (1) nature and surrounding environment, (6) local food (sea food, garden food), (13) weather (rain)/climate.
- 2 People; (2) Friendliness/get along, (3) helpfulness, (5) support network, (9) diversity and acceptance, (10) closeness of people, (14) family, (17) PEOPLE/community/friends.
- 3 Location; (4) smallness (population/laid back/island lifestyle/privacy, (7) it's a special place (its like nowhere else), (8) attachment to place because that where they grew up, (11) my life, (12) peaceful/quiet, (15) recreation (fishing), (16) local (geographical location)/isolated/rural.
- 4 Culture; (18) elders are respected, (19) regaining culture/language, (20) spiritual, (21) heritage and culture.
- 5 Economic; (23) employment opportunities, (25) affordable housing.
- 6 Nothing; (24) nothing

Question 25; What are some of the strengths of your community that may help it deal with future climate change impacts?

(recoded for analysis, November 5/04)

- 7 Supportive people; (1) people in the community stick together, know each other, work together; (18) people pool resources.
- 8 Adaptable people; (2) People adaptable and resourceful (strong and hardy people); (3) living and working more off the land/self sufficient, independent; (19) unincorporated, flexible communities.
- 9 Prepared; (4) lots of food supply in house; (15) lots of boats/vehicles.
- 10 Infrastructure; (6) no big building to collapse
- 11 Culture; (5) conservation of what is here; (8) culture/native strength; (11) elders stories (traditional knowledge); (13) respect/communication.
- 12 Strength of people; (7) people more environmentally aware/care; (9) strength of people who volunteer; (12) people show interest; (16) strong leaders; (17) we're vocal in our needs; (23) the people ARE the strength.
- 13 Past experience; (10) past experience.
- 14 Environment; (14) ocean purifies; (20) lots of land/space to move to; (21) local environment.
- 15 None; (22) none.
- 10 Don't know; (24) don't know.

Question 26; What are some, if any, weaknesses of your community that may make it susceptible to future climate change impacts?

- 1 Attitudes; (1) Some people are stubborn and don't work together, community can't agree on anything; (12) Not in my back yard (stubborn attitudes); (14) No one willing to stand up (speak out)/do it; (15) disrespect of natural resources/unsustainable; (17) racism; (19) younger generation doesn't care; (20) lack of ambition (gossip)/attitudes, apathy; (32) indifference/ disbelief of climate change.
- 2 Location; (2) location, remoteness/sea level, stranded here in a big storm; (6) distant to emergency site, no centralized emergency center; (16) carrying capacity exceeded; (30) location of homes(too far apart)/cultural areas; (38) proximity of hydro/transport corridor to beach/ coast.
- 3 Lack...; (3) lack of resources to deal w/ situations/change; (4) Lack of self-sufficiency (don't know how to hunt/berries); (25) lack of spirituality/religion
- 4 Dependency; (5) depending on transportation/internet/phone (dependency), govt.; (7) dependency on bridges out of town, and one hwy.; (8) rely on electricity; (28) dependent on natural resources/environment.
- 5 Problems with soc/econ/education/health; (9) too much alcohol consumed/drugs, FAS; (21) money (lack of)/poverty; (24) low education/ awareness; (29) lack of employment; (37) medical (doctors change over too often).
- 6 Lack of plan/preparedness; (13) lack of preparedness/action/knowledge; (18) lack of stocks in stores; (36) lack of emergency services for Tow Hill (39) no backup communication systems.
- 7 Leadership; (22) lack of leadership.
- 8 Lack of control; (23) uncertainty (land claims); (26) population changes; (27) lack of resource control.
- 9 Divides in the community/ies; (33) divisions in community (issues between people and cultures); (34) lack of island-wide unity; (35) too much emphasis on tourism/ development (abuse of resources).
- 10 (10) Provincial government systems (don't listen); (31) abysmal state of highways and roads.
- 11 Nothing; (11) nothing/don't know.