Chapter 7
'As Long as the Sun Shines, the Rivers Flow and Grass Grows': Vulnerability, Adaptation and Environmental Change in Deninu Kue Traditional Territory, Northwest Territories

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Abstract Drawing on several years of collaboration with the community of Fort Resolution, Northwest Territories, this chapter highlights the complex relationship between environmental change and community vulnerability. We draw attention to water as the medium that connects people to their environment and affects local livelihoods and community well-being, although our discussion of capacity-building reflects a broader engagement with multiple forms of change. We used a participatory approach that incorporated a range of iteratively developed methods, including a literature review, semi-structured interviews, a household questionnaire, focus groups, and participant observation. Qualitative scenarios offered a valuable tool to assess future vulnerability. Results indicate that current exposure-sensitivities are largely experienced by land users, and that adaptations to date have generally been reactive and undertaken on an individual basis. Climate change and resource development are the primary drivers of concern to residents, as they threaten to exacerbate existing trends and introduce new challenges. Priority adaptation options were identified in five sectors: environment and natural resources, economy, community management and development, infrastructure and services, and information and training. In Fort Resolution, vulnerability and adaptive capacity are determined not only by changes to water resources, but by key socio-cultural relationships, values and worldviews operating at individual and community scales. Building adaptive capacity for an uncertain future should focus on incorporating different knowledge systems, engaging actors and institutions, and adopting a multi-level systems view. A collective engagement of actors at multiple levels to address vulnerabilities, support adaptation, and share experiences and knowledge, will support improved well-being in northern communities.

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7.1 Introduction

> For the Chipewyan of Deninu Kue, the Great Slave Lake is like a heart and all the rivers, streams and channels are like veins that supply the heart with blood. If you contaminate the blood, everything begins to shut down, and soon your heart stops. This is what we see for the future of the Great Slave Lake with all the development north, south, east and west of it. – Deninu Kue First Nation (2007)

Across Canada's vast northern spaces, environmental and social change are sources of uncertainty and concern (Berkes et al. 2005; Ford and Smit 2004). Concern about 'change' is the focus of countless workshops, research studies and government reports seeking to document the implications for wildlife, human health, northern cultures and economic sustainability. In the Traditional Territory of Deninu Kue First Nation (DKFN), Northwest Territories (Canada), however, few topics garner as much concern as the relationship between people and water. For the Chipewyan Dene and Métis in Fort Resolution, water is life and a material and symbolic construct around which related forms and types of change often intersect.

Drawing on several years of collaboration with the community of Fort Resolution, our goal in this chapter is to highlight the complex relationship among environmental change, the resulting exposure-sensitivities, and the adaptation strategies that are emerging (as they must) in response to change. The scope and intensity of environmental and social change in DKFN Traditional Territory is significant, with threats to water resource quality and quantity among the most dramatic (Brock et al. in press; Prowse et al. 2006; Wolfe et al. 2008), and of great concern to community members (DKFN 2007). In addressing current and future vulnerability, we draw particular attention to water as the medium that connects people to their environment and affects vital aspects of local livelihoods and community well-being. However, our discussion of capacity-building for future adaptation reflects a broader engagement with multiple forms of social-ecological change and vulnerability.

In the DKFN Traditional Territory, like other northern contexts, the ability of residents to adapt to on-going and future changes is connected with the community's social structure, economy and broader governance arrangements (see Keskitalo and Kulyasova 2009; Natcher 2008). Relationships of trust among people, and their historical bonds and connections, have been strained over the past several decades. The result has been periods of significant conflict and uncertainty, as well as the polarization of groups (i.e., DKFN and the Fort Resolution Métis). Moreover, the 'lost generation' that emerged from a tragic period of forced residential schooling created a disconnect between children, their extended families and traditions. More recently, an emphasis on individual and

family-based economic activity (e.g., from employment in offices, mines and other resource sectors), and a gradual shift away from collective action in the community, have further exacerbated vulnerability and engendered challenges for proactive adaptation. Evolving self-government processes and Treaty negotiations, in contrast, are creating new governance opportunities that may have a profound influence on the capacity of DKFN and the Fort Resolution Métis to adapt to change and influence the manner in which ecosystems and resources upon which they depend are utilized. These historical and current experiences are central in efforts to understand change, vulnerability and adaptation, and the strong connections between environment and society.

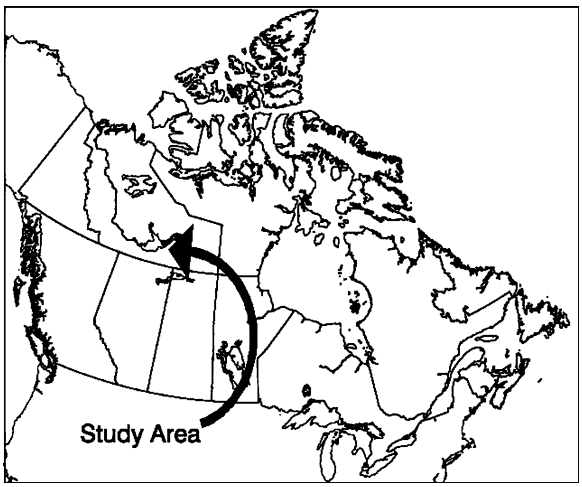
Here we examine the case of Fort Resolution using a vulnerability lens (see Chapter 1). First, we introduce the case study site, reflecting on the biophysical, social, political and institutional contexts. We then outline our approach and methodology, which was participatory and exploratory, and which used a range of qualitative methods. The chapter goes on to examine current and future vulnerability in the community, addressing both exposure-sensitivities and adaptive capacity. The subsequent discussion focuses on overarching strategies for building adaptive capacity to respond to an uncertain future.

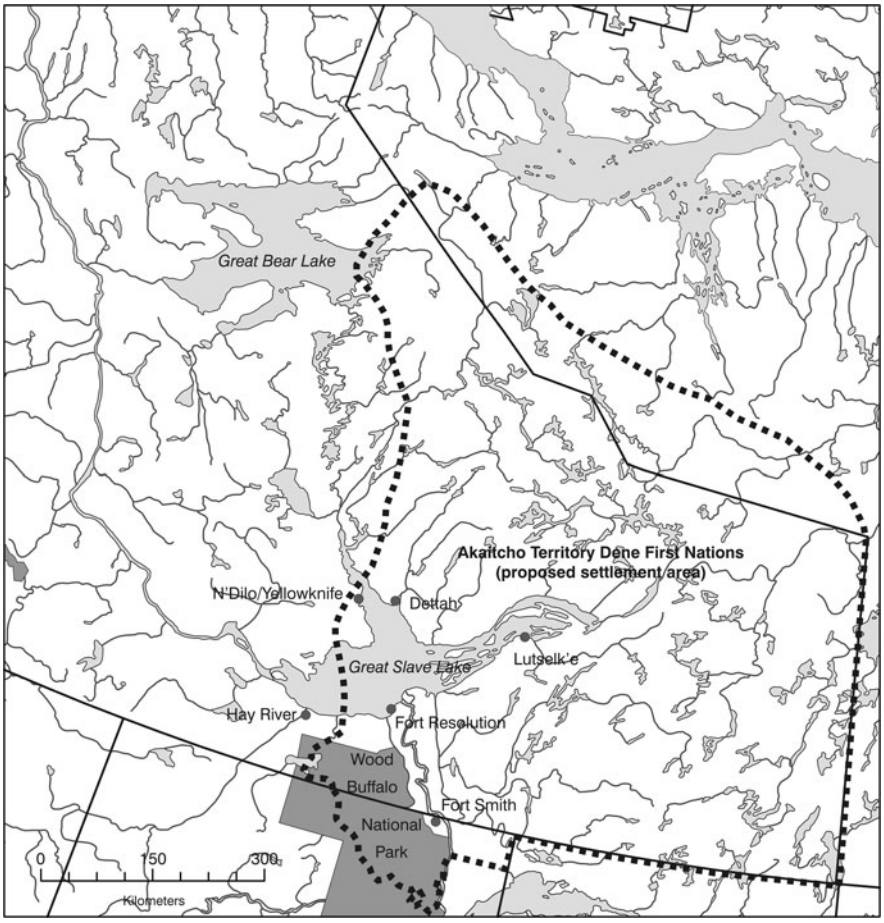
7.2 DKFN Traditional Territory and the Slave River Delta Region, NWT

DKFN Traditional Territory is located along the southern shoreline of Great Slave Lake in the Northwest Territories (Fig. 7.1). Initially, this land area was informally demarcated based on historical land use. It is now more formally referred to as DKFN Traditional Territory, forming part of the larger Akaitcho Territory land claim. Despite the name of this land base, it refers as well to land used by the Métis (Aboriginal people of mixed First Nation and European ancestry who also have long held ties to the area). 'Akaitcho Territory' refers to the entire proposed land claim area, and encompasses the Traditional Territory of several First Nations around Great Slave Lake: Deninu Kue First Nation, Lutsel K'e First Nation, Yellowknives Dene First Nation (including the communities of both Dettah and Ndilo), Salt River First Nation, and Smith's Landing First Nation.[1]

Three river systems dominate the DKFN Traditional Territory – Little Buffalo River, the Slave River and Taltson River. Each of these river systems has a distinct geography and is a place of historical connection for different groups within the main community centre of Fort Resolution (population ~500). The actual settlement of Fort Resolution dates back to the 1780s and is located

[1] Salt River First Nation and Smith's Landing First Nation have already resolved their land claims through Treaty Settlement Agreements and are not involved in the current Treaty 8 negotiations.





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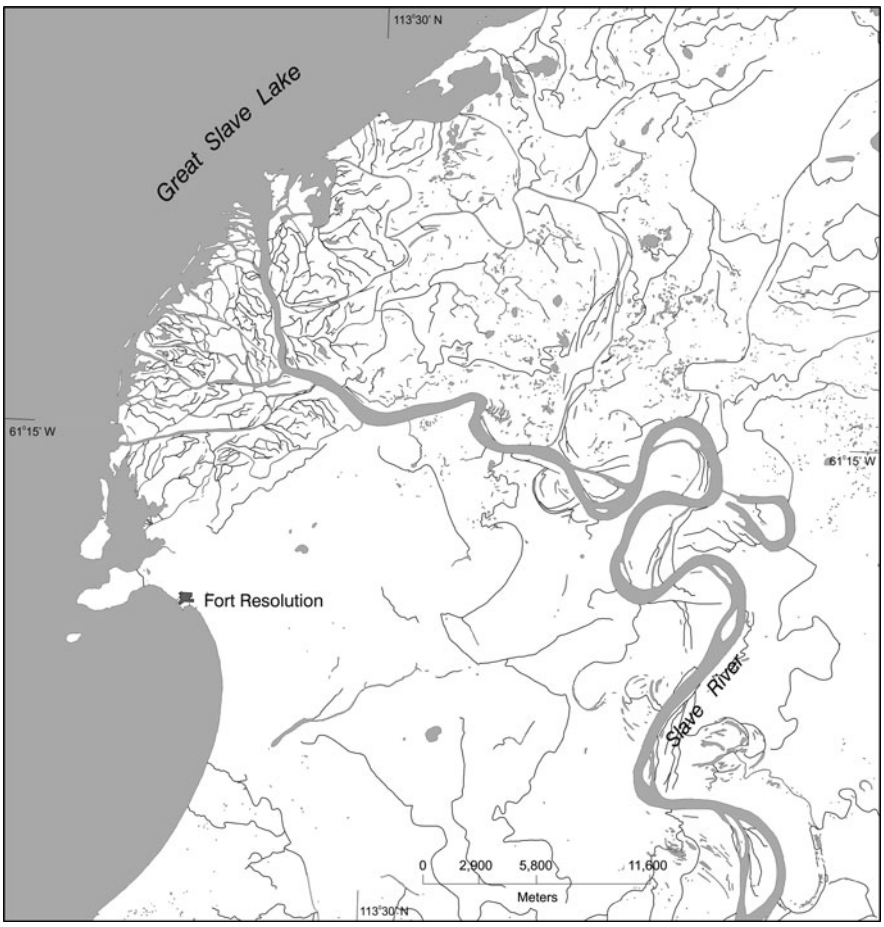

Fig. 7.1 (continued) (**a**) The case study area, (**b**) Akaitcho Treaty 8 Territory, (**c**) The Slave River Delta and community of Fort Resolution

ten kilometres west of the Slave River Delta (SRD). The SRD is the central geographic feature of the region. The delta is a highly productive ecosystem and supports a range of riparian plant communities and wildlife species, several of which are socio-economically and culturally valuable (Milburn et al. 1999). Key hydrological processes include seasonally fluctuating water flow and the deposition of nutrient-rich sediment during annual high water events that sustain extensive shoreline habitat and the overall vitality of this northern ecosystem (English et al. 1997). Like other large fresh-water deltas in the Mackenzie Basin, however, the Slave River Delta is highly sensitive to the changing climatic conditions experienced in the region (Wolfe et al. 2008), and the numerous resource and economic development activities associated with the land base and its waters (e.g., upstream water-taking for industry).

The delta's habitat diversity and wildlife resources are of central importance (historically and into the present day) to the livelihoods and socio-cultural integrity of Dene and Métis in Fort Resolution who use the area for hunting, trapping, fishing, transport, and recreation (Hoare 1995; Wesche 2009). In recent decades, alternative employment opportunities and local economic diversification have increased access to goods and services. Nevertheless, a strong sense of place exists within the community as a number of residents continue to participate in land-based occupations (e.g., trapping, hunting) that are dependent upon the delta and connected waterways (Wesche 2009). However, changes to the Slave River Delta specifically, and wider Akaitcho Territory more generally, have exposed the community to a range of vulnerabilities associated with travel access, food security and cultural identity. Such vulnerabilities are compounded by past and proposed resource development activities (e.g., mining, hydroelectric generation).

The political and institutional context in the region is also in transition. DKFN, in conjunction with three other First Nations, is involved in land claim negotiations for Akaitcho Territory (Treaty #8). The Métis of Fort Resolution are also in the process of seeking a separate contract agreement with the federal government to consolidate their Aboriginal rights (e.g., land access, hunting). The rapid environmental changes occurring within the Traditional Territory are compounded, therefore, by the evolving institutional and self-government arrangements, which may lead to co-jurisdiction over lands and resources.

7.3 Approach and Methods

Vulnerability is a function of both exposure-sensitivity and adaptive capacity (Adger and Kelly 1999; Smit et al. 2008). In this context, vulnerability represents the extent to which a particular group or community is susceptible to socio-economic, institutional and/or biophysical variables or conditions that affect (directly or indirectly) their well-being (Smit et al. 2008). Our approach to identifying exposure-sensitivities and adaptation opportunities in Fort Resolution was participatory and collaborative. This approach is consistent with broader calls for research in the North that is integrative, engages local groups and communities at early stages in the research process, draws on the knowledge and experiences of northerners, and facilitates capacity building (Graham and Fortier 2005; Wolfe et al. 2007). The approach is also consistent with application of the overall CAVIAR framework, which involves assessing the likelihood of changes in the conditions that are pertinent to the community, drawing on traditional knowledge and scientific predictions of change in natural and social systems, and characterizing the scope of and limits to adaptive capacity (Smit et al. 2008).

Identification and assessment of both current and future exposure-sensitivities and adaptive capacity in the DKFN Traditional Territory was based on a variety of methods, the results of which we have selectively drawn on for this analysis (see Wesche 2009). Methods evolved in iterative cycles with community input,

building on previous results. They included: a document and literature review, semi-structured interviews with 33 land users and Elders, semi-structured interviews with 19 local and regional officials, a questionnaire administered to 104 heads of households, five focus groups using qualitative scenarios to understand exposure-sensitivities and adaptation options, and participant observation (Table 7.1). The development of qualitative scenarios offered a

Table 7.1 Summary of project methods

Method/data source	Timing	Participants	Content
Semi-structured interviews	• May–September 2005; December 2005; February 2006	• 33 land-users and Elders	• Land use, environmental conditions and observed changes (weather, water, ice, animals) • Existing exposure-sensitivities • Existing adaptation strategies
Semi-structured interviews	• March–May 2006	• 19 individuals involved in environmental governance at multiple levels	• Incorporation of climate change into planning and decision-making; major influences on policy-making • Cross-level linkages with other departments and governance organizations
Social dimensions questionnaire	• March–May 2006	• 104 heads of household in Fort Resolution	• 35 questions (individual information, environment and quality of life, social relationships and networks, trust and sharing, cooperation and collective action)
Scenario-based focus groups and interviews	• March–May 2006; November 2006	• 5 focus groups (20 participants) • 1 adaptation workshop (11 community leaders) • 3 interviews (3 community leaders)	• Qualitative scenarios of possible alternate futures, focusing on climate change and resource development as drivers (projected exposure-sensitivities, adaptation options and capacity-building)
Participant observation	• May–Sept 2005; December 2005; February 2006; March–May 2006; November 2006	• 15 field visits with local guides • Daily life with my 'adoptive' local family	• Knowledge of land use during different seasons • Environmental changes and impacts • Photographs

Source: adapted from Wesche 2009

particularly valuable tool to help make sense of the range of future socio-economic, institutional and biophysical conditions influencing community vulnerability. These scenarios and supporting narratives were constructed to reflect 'possible futures' in Fort Resolution and the Slave River Delta, based on potential future exposure-sensitivities as identified by community members. The scenarios were not predictive, but served instead to create dialogue about change and its many implications. Three scenarios were developed, each of which reflected different dimensions of change (with a focus on climate change and resource development) and the influences on key parameters of community life (e.g., hunting, health and wellness, economic opportunities, migration and demographics, etc.). Using these scenarios in the context of focus group discussions, participants were asked to: (a) reflect on the changes exhibited in the scenarios; (b) explore the exposure-sensitivities from an individual and community perspective, and (c) explore options to build adaptive capacity to address future exposure-sensitivities by reflecting on resource issues (e.g., human, financial), institutions and governance.

Fort Resolution residents often discussed environmental and socio-economic changes simultaneously, reflecting a general perspective of connectedness. With regards to the land user/Elder interviews, reported changes are largely based on personal observation tied to a defined area within the region, as different family groups traditionally connected to different river systems: Little Buffalo, Slave, Taltson. Observations of change from individuals are typically linked to the area where they have the longest association. However, sharing of knowledge, anecdotes, and experience among land users across geographical space occurs frequently.

7.4 Current Vulnerability

The current vulnerability of community members in Fort Resolution is determined by existing exposure-sensitivities and adaptive capacity. The region has been exposed to a number of biophysical, socio-cultural, economic and political stressors that have impacted local livelihoods. At the same time, residents have shown remarkable adaptability, considering the rapidity of change to date. Figure 7.2 provides a summary of the current and future vulnerabilities described below.

7.4.1 Existing Exposure-Sensitivities

7.4.1.1 Biophysical Exposure-Sensitivities

Through semi-structured interviews, study participants highlighted a diverse range of current exposure-sensitivities, with water emerging as a common reference point. Key biophysical concerns include reduced water levels, reduced

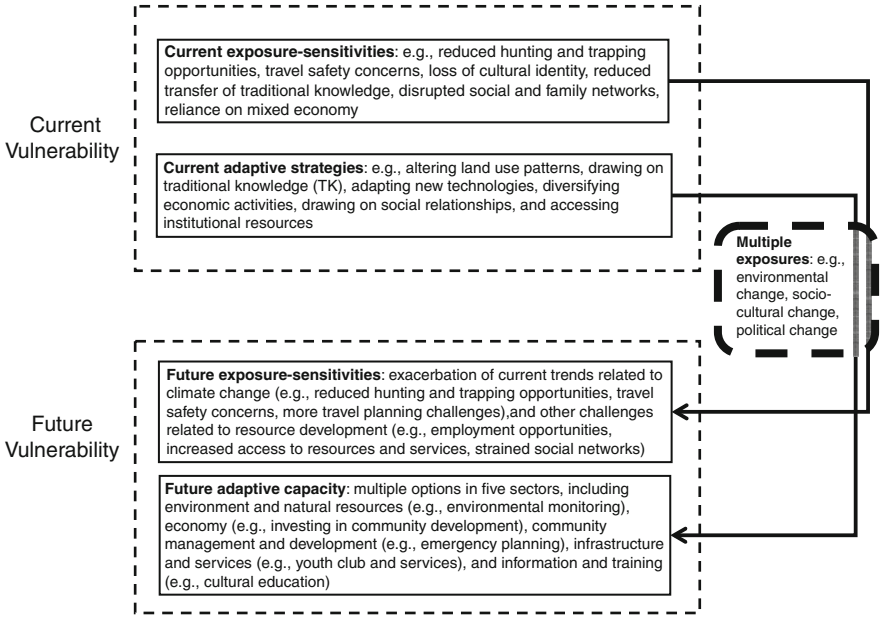

Fig. 7.2 Summary of current and future vulnerability in Fort Resolution

winter flooding, decreased ice quality and thickness, and reduced spring flooding. These changes are generally perceived to exceed 'natural variability', thus challenging the capacity of residents to adapt. While water-taking upstream is seen as a major source of exposure-sensitivities, warmer winters and less predictable weather patterns were also identified as priority concerns. Changes in water-related conditions have been identified by hunters and Elders to lead, in turn, to multiple livelihood impacts. These processes reduce overall hunting and trapping opportunities as small streams and tributaries in the delta become inaccessible by boat. Muskrat habitat is declining as a result of lower water levels and willow encroachment, a cycle initially exacerbated by a three-year period of water retention to fill the upstream Bennett Dam in the late 1960s/early 1970s. Unnatural and unpredictable beaver mortality is a consequence of winter water releases by upstream dams for hydroelectric power generation, which drown beavers in their lodges. In the winter and shoulder seasons, decreased ice quality and thickness is connected with reduced travel safety and compromises people's ability to plan travel consistently (see Fig. 7.3).

In Fort Resolution, the overall livelihood impacts associated with these issues are a concern. For example, the sediment build-up and diversion of water flow in the delta reduces accessibility for boat travel, as noted. In combination with the drying trend in inland marshes and ponds that encourages willow encroachment, habitat for muskrats and bison is compromised. Debris build-up along the riverbanks also limits moose access to the water. Both individually and in

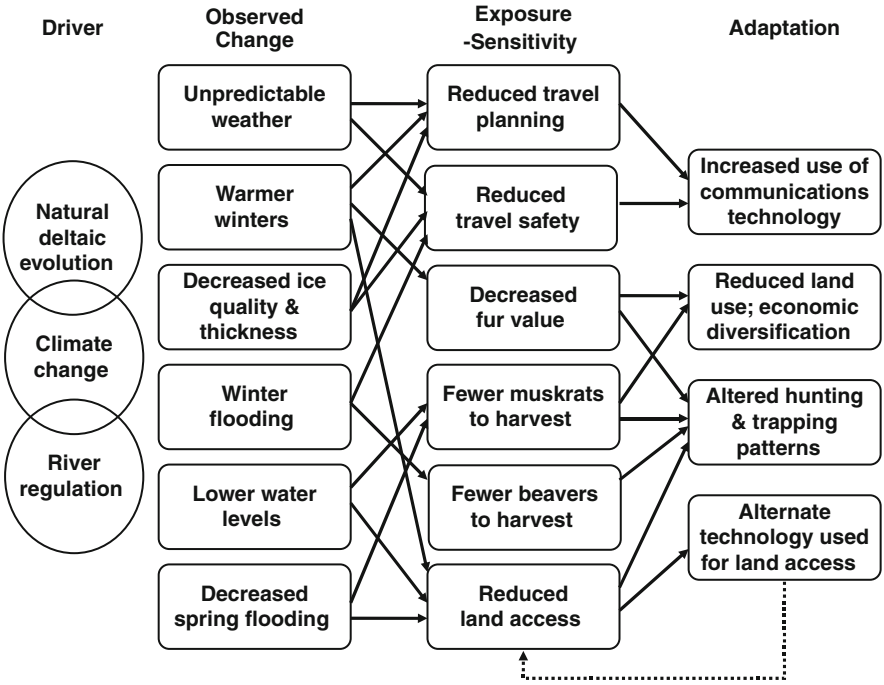

Fig. 7.3 Selected relationships linking observed environmental changes with current vulnerability, based on livelihood connections with water. *Source*: adapted from Wesche 2009

combination, all of these trends result in reduced hunting and trapping opportunities, which limits both income and traditional food harvests. As a consequence, many people feel that this (in combination with socio-cultural pressures such as modernization, alternate economic opportunities, income disparities, etc.) has challenged the transfer of traditional knowledge as past understandings and experiences do not always fit with more recent trends. Reduced food security and human health impacts were also identified as a result of these changes, as was the general loss of cultural identity, given the long association between people and the surrounding environment.

7.4.1.2 Socio-Cultural Exposure-Sensitivities

As critical as the biophysical changes are in terms of exposure-sensitivities, however, they interact with a range of uncertain social and political factors. One of the key issues confronting people in the region and the settlement of Fort Resolution, for example, is the nature of the community itself. Like many other northern societies, Fort Resolution has undergone rapid social, cultural and economic change. From its early strategic location on the river-based, north-south trade route and raison d'être as a fur trade centre, the community evolved

from a modest assemblage of individuals to a commercial hub. As travel by road and airplane has become common, the settlement is no longer on the main transport route, resulting in limited opportunities for economic development. The current population has lived through much of this change, and has struggled to emerge from a particularly difficult period of social challenge in the 1970s and 1980s after the permanent road to the settlement was constructed and Pine Point lead and zinc mine opened nearby. This precipitated a range of new pressures and opportunities for livelihood expansion (e.g., mine work), while also increasing access to cheap goods, drugs and alcohol, and amplifying the influence of outsiders who came to work in the region.

Questionnaire results (see Wesche 2009), supplemented by descriptive data derived from multiple methods, highlight a series of socio-cultural and political issues that influence vulnerability. For example, contemporary socio-cultural change (e.g., increased wage employment, fewer multi-generational family living arrangements) has disrupted and at times eroded important bonds within and among family groups. Federal government interest in designating legal identity to individuals (for enumeration and remuneration) has exacerbated tensions resulting from the loss of social connectivity. Despite a long and shared history, for example, the Dene and Métis in Fort Resolution live under different sets of regulations and maintain parallel political councils, which complicates decision-making. The 'differences' ascribed to Dene and Métis have become the basis for different levels of social status in the community, as well as access to both local and external funding, training and other benefits. Yet, this distinction has not always been as prevalent, emerging largely in the late 1980s with efforts by DKFN to clarify their strategy for land claim negotiations with the federal government. Thus, the legal designation of 'aboriginality' by the federal government, and tacit acceptance of the negotiating parameters on the part of the Dene has framed how individual and group rights are considered. Participants indicated that such distinctions result in the unequal distribution of jobs, housing and other resources within the community, causing tension among residents and marginalizing certain groups. These disparities result in reduced economic, social and political engagement, and an overall lower quality of life.

There are other socio-political concerns. For instance, the generation gap that has emerged in large part due to residential schooling has in many documented instances caused a disconnect between children, their families and traditions. This has negatively impacted the well-being of the community and its residents. Many members of this current parental generation highlight the cycles of addiction and destructive behavior they have experienced, and the challenges they face in raising children. The shift away from land use activities and the introduction of formal education has also impacted the intergenerational transfer of knowledge about the land and people's connection to place. In the past, moreover, Elders were looked to for leadership and advice in community life, and revered for their role in knowledge storage and transmission through stories and oral histories. While Elders are still trusted and

consulted, study participants often made the point that their advice is at times seen as outdated, leading inevitably to issues around identity and a sense of loss within the community (see Berkes et al. 2005). Participants also noted that the bonds between groups (inter- and intra-) have become less flexible and more exclusive than in the past when doors were always open, and livelihoods and material goods like meat from hunts were more readily shared.

The general shifts in social structure, finally, have influenced leadership in Fort Resolution. Elected leaders are the political face of the community, often spending significant amounts of time connecting with external officials and seeking outside resources. However, when local action is required, certain key community members quietly 'roll up their sleeves and do what needs to be done' (Wesche 2009). These individuals, who tend to be fairly consistent and small in number, provide essential social glue in the community. Often however, they are not in designated leadership positions, but rather engage in community-level work or in support roles for the elected leadership.

7.4.2 Current Adaptive Strategies and Capacity

Taken together, the biophysical, socio-cultural and political complexities outlined above create a complex vulnerability landscape. Residents of Fort Resolution outlined a series of adaptation strategies currently underway to address the exposure-sensitivities described above. Key strategies have been mainly undertaken to reduce the risk to land users, who are most concretely impacted by environmental change. Strategies include: altering land use patterns, drawing on traditional knowledge, adopting new technologies, diversifying economic activities, drawing on social relationships, and accessing institutional resources. In combination, these strategies reflect both objective determinants of adaptive capacity (e.g., resources, institutional arrangements) and more subjective determinants (e.g., perceptions of risk and change) (see Grothmann and Patt 2005; Klein et al. 2007).

7.4.2.1 Altering Land Use Patterns

Land users have shifted the way in which they use the land over time to adapt to the increased expense of travel, travel safety concerns, reduced access to harvesting areas due to environmental barriers, declining fur value, and alternative economic options. Common strategies include reducing the time spent on the land, concentrating hunting during seasonal high periods, delaying or altering travel routes, using alternate travel technologies (e.g. ATV for winter travel when snowpack is low), and changing targeted wildlife populations (e.g. harvesting from a different caribou herd near Yellowknife rather than from the herd that migrates through the east arm of Great Slave Lake). A positive, recent trend shows increased recreational land use for those with

time and resources, providing a mechanism through which to strengthen cultural ties and identity through reconnection with the land.

7.4.2.2 Drawing on Traditional Knowledge

There are multiple ways to draw on available knowledge to better respond to variable environmental conditions. Land users draw heavily on their own knowledge of the land, paying more attention and taking added safety precautions when travelling. They also glean knowledge from family and friends, especially if travelling outside their area of expert knowledge. Local experientially-based culture camps are one method used to improve traditional knowledge transfer to youth, providing them with foundational survival skills on the land.

7.4.2.3 Adopting New Technologies

Technologies like the snowmobile and high speed power boats have greatly increased land user flexibility, making shorter and faster travel feasible, although the high associated costs are often prohibitive. Technology has improved travel planning and safety in multiple ways. As weather prediction has become more difficult, land users now rely on weather broadcasts (from radio, television and internet) to determine travel plans. Furthermore, many people carry Global Positioning System (GPS) units and satellite phones, or inform others of their travel plans to increase safety.

7.4.2.4 Economic Diversification

Opportunities in the wage economy combined with lower fur prices and government settlement policies have drawn trappers progressively away from the land during the past half century. Individuals, especially men, have become versatile in a range of labour activities, and adapted their mobility to take advantage of available opportunities, often working seasonally or on contract while continuing to trap during the off-season. Women have trended primarily towards work in local offices. Many have engaged in local training opportunities and office or mine work, while a few have developed local businesses, both formal (e.g. local convenience store, tourist operations) and informal (e.g. local catering, baked goods made to order), to generate income.

7.4.2.5 Drawing on Social Relationships

Strong social ties are extremely important in dealing with environmental change, especially in times of crisis. For example, when two community members failed to reach their destination across Great Slave Lake in 2006, a group of snowmobilers quickly assembled for the search. Land users are prone to helping each other out on the land to improve travel safety. Furthermore, the sharing of traditional foods is a custom that is still practiced, particularly within extended families.

7.4.2.6 Accessing Government Resources

In combination with opportunities in the wage sector, the ability to access family allowance, social assistance and pensions has shifted the mode of land use away from its former survival-based nature by introducing a formalized social safety net. This is a mixed blessing, offering resources during times of wildlife scarcity (which, in the past led to periodic famines), while at the same time failing to incentivize training and employment.

On another front, the Government of the Northwest Territories (GNWT) has implemented a complement of programs to support continuity within the territory's traditional economy. The Genuine Mackenzie Valley Fur Program promotes high quality, authentic NWT-harvested fur, while sub-programs (Guaranteed Advances, the Prime Fur Bonus Program and the Grubsteak Program) reduce individual risks to trappers. Funds from the GNWT Community Harvester Assistance Program are distributed to defray costs, and other GNWT programs (Take a Kid Trapping, Trapper Recognition and Trapper Workshops) promote and recognize trapper and general bush skills.

7.5 Future Vulnerability

The current exposure-sensitivities and adaptation options indicated above provide a basis for identifying likely or possible future vulnerability. Based on community input, we developed three scenarios of possible alternate futures that formed the basis of focus group discussions on future exposure-sensitivities and adaptation options.

7.5.1 Future Exposure-Sensitivities

Study participants established the two primary external drivers of concern as climate change and resource development, and we used these themes as a basis for three qualitative scenarios of possible alternate futures. Drawing on both traditional and scientific knowledge, narrative storylines and accompanying graphic images were developed, where exposure-sensitivities were identified by symbols (Fig. 7.4). The 'Small Town' scenario reflects business as usual, with moderate change in both climate and development. 'Shifting Seasons' draws on more extreme climate and impacts projections for the north, while 'Boom Town' illustrates significant resource development (e.g., a mine) in the region.

The climate change scenario was developed by extrapolating on past and current experiences with and local knowledge about change, combined with scientific projections. The broader Mackenzie River Basin system, within which the Slave River Delta is an important node, is experiencing significant

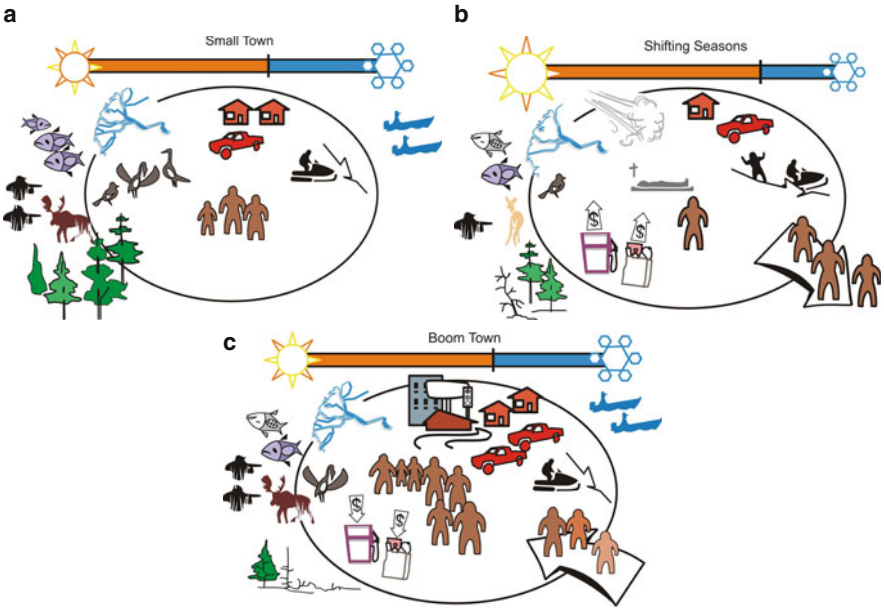

Fig. 7.4 Qualitative scenarios used to discuss future exposure-sensitivities and adaptation options. *Source*: Wesche 2009

change. Key trends and predicted changes in the region include mean temperature increases over the past century, with an expected temperature increase of four to seven degrees Celsius by 2100 and a trend in particular towards warmer winters (ACIA 2005). Paleohydrological and contemporary hydrological studies in the region provide further insight on these changes. For example, Wolfe et al. (2008) point out that shrinking headwater glaciers, decreasing high elevation snowmelt runoff, and declining river discharges at the hydrographic apex of North America (i.e., Canada's Rocky Mountains) will have uncertain implications for water allocation and downstream ecosystem function (see also Gibson et al. 2006; Schindler and Donahue 2006). Exposure-sensitivities under this scenario likely equate to an exacerbation of current trends (e.g., reduced travel safety, more travel planning challenges, reduced ability to harvest traditional foods, etc.).

While the resource development scenario is somewhat speculative, it draws on past experiences of local residents with Pine Point mine, and on the experiences of other northern boom towns. It also takes into account likely and possible developments in the region, including hydro-electric development, mining, oil and gas, logging, and tourism, some of which are already under consideration. As well, on-going industrial development pressure upstream from the DKFN Traditional Territory in northern British Columbia and Alberta (e.g., Athabasca Oil Sands) further exacerbates exposure-sensitivities

(see Box 7.1) relating to water quality and quantity, ecosystem change and socio-economic impacts. Under this scenario, exposure-sensitivities will likely be more related to the social system. Resource extraction activity and infrastructure development may bring employment opportunities, but may also increase competition with outside workers. New resources may be available for community service development (e.g., food, accommodation, entertainment), and increased expendable income may allow more recreational land use. Local family groups and governance organizations (DKFN and the Fort Resolution Métis Council) may either be more or less motivated to work together for the common good.

Many overlapping concerns regarding exposure-sensitivities were expressed during the qualitative scenario discussions. For example, the integrity of the environmental system and quality of natural resources were universally at risk under climate change and resource development scenarios, with slight variations in perceived severity. This threatens to exacerbate existing harvesting and land use challenges. The potential effects on human health are also broadly concerning, especially those related to the deteriorating quality of water and traditional food. Another overlapping area of vulnerability is the negative impact on culture and traditional knowledge.

Box 7.1 Example of An Important Transboundary Exposure-Sensitivity

Water Use the Big Concern in Oilsands Developments, Native Leader Says

Edmonton Journal, Nov 8, 2006, FORT MCMURRAY

Water, not oil, is the big concern for many native people intervening at regulatory hearings for Imperial Oil's Kearl project, the environmental manager of the Deninu Kue First Nation said Tuesday.

'What you guys are discussing here is crazy talk,' Patrick Simon told a panel of representatives from the Alberta Energy and Utilities Board and the Canadian Environmental Assessment Agency.

Water is far more precious than oil, insisted Simon, who said a litre of bottled water costs about $2 while a litre of gasoline is below $1. He said it's unreasonable that water is being sacrificed so that energy companies can continue to develop the crude resources in northern Alberta. The Dene people, he said, are worried about the growing demand for water withdrawal from the Athabasca River, and question whether the water in the rivers around the oilsands development is safe for drinking.

Mark Little, oilsands development manager of Kearl, assured Simon that the project's impact on air, water and land are negligible. But Little also said that on average the project will draw more than one billion cubic metres of water from the Athabasca River for approximately 50 years.

Posted: March 22, 2007 on www.tarsandswatch.org [last accessed February 12, 2009]

7.5.2 Future Adaptive Capacity

In contemplating future alternate scenarios, climate change was perceived to cause mostly negative impacts on ecosystems and local livelihoods within DKFN Traditional Territory, whereas resource development was perceived to bring a distinct mixture of potentially more pronounced positive and negative impacts (e.g., threats to Aboriginal culture and way of life versus employment opportunities). At the same time, residents generally felt more able to adapt to climate-driven changes than those created by significant resource development. While strategies were linked to particular exposure-sensitivities, many overlapped, indicating that particular strategies are well-suited to concurrently address multiple aspects. Table 7.2 identifies the strategies (by sector) that were most commonly cited, and thus prioritized, by participants.

While there is some community support for resource development as an adaptation to lost opportunities on the land, participants in the study highlight a need for community planning, preparedness and risk mitigation. The level of local control over drivers of change also plays a role in shaping local perceptions. For instance, climate change is seen as an entirely external force that residents feel unable to influence, and they are thus resigned to its outcomes. In contrast, local residents have some degree of choice and control over if, when and how resource development projects are implemented in their Traditional Territory.

Table 7.2 Prioritized future adaptation options to address a range of future exposure-sensitivities, as identified by participants

Sector	Option
Environment and natural resources	• Modification of harvesting practices
	• Environmental monitoring program
	• Environmental health research
Economy	• Economic and livelihood diversification
	• Investment in community development
Community management and development	• Community planning
	• Emergency planning
	• Improve community consultation
	• Industry partnerships and agreements
Infrastructure and services	• Assessment of climate change impacts on community infrastructure
	• Infrastructure planning for population flux
	• Improved health infrastructure and services
	• Improved social service support and programs
	• Development of a youth club and programming
Information and training	• Environmental change awareness-building
	• Cultural education and development
	• Land use safety training
	• Employment training

Source: Wesche 2009

Some specific results of the qualitative scenarios exercise are worth noting in this regard. Individuals discussed how potential future changes could bring a combination of positive and negative impacts, thus requiring flexibility and openness to take advantage of new opportunities (e.g., employment, cultural renewal). Land use planning and management (e.g., a strategic plan outlining where, how and when development may take place, combined with systematic environmental monitoring) and cultural revival were deemed especially important in preparing for and responding to climate-induced changes. Political leadership, training and education were also highlighted as important elements of adaptation, although linked more explicitly to future economic development activities and livelihoods.

Coping and adapting to change demands an enabling institutional context (Agrawal 2008; Duerden 2004). In Fort Resolution, it is felt that locally-based institutions (e.g., DKFN council, Akaitcho Territory Government) and territorial government ministries (Environment and Natural Resources, Housing) provide important support and information to community members. Yet, there is also recognition that change must occur from within. This supports a focus on development at the local level, which is nested within a broader set of institutions that offer access to resources and expertise. Evolving governance structures (e.g., self-government and territory-based co-jurisdiction through land claim negotiations – see discussion below) which devolve control and resources to regional and local levels were identified by some as providing the scope for re-empowering actors within the community. Importantly, the underlying social structure based on kinship and shared history continues to offer a source of culturally-appropriate resources to support community members in times of need. As was witnessed on several occasions (e.g., with the sudden deaths of community members), the willingness of people in Fort Resolution to overcome family divisions and collaborate for the collective good does emerge in times of tragedy or crisis, and when the collective rights of the community are threatened. These social ties are often latent, but provide a foundation for social cohesion and cooperative action in response to change.

7.6 Building Capacity to Adapt to an Uncertain Future

In the DKFN Traditional Territory, the future is uncertain. Climate projections for the Mackenzie Basin point to rising temperature trends and declining precipitation and water levels (Environment Canada 2004; Rouse et al. 1997; Wolfe et al. 2008). These conditions are closely connected to changes in water flow from the feeder watersheds of the Peace and Athabasca rivers. Paleohydrological evidence suggests this should be a period of increased precipitation and water flow through the system, although in fact there has been an extended period of increasingly drier conditions (Wolfe et al. 2008). Uncertainty stemming from climate conditions is exacerbated as well by initiatives and plans for

resource development, such as the proposed re-opening of the nearby Pine Point mine, and a proposal to place turbines on the Slave River between Fort Smith and Fort Resolution. Finally, changing governance systems which include Treaty negotiations and a move towards greater self-governance, along with shifting social conditions in the community, create additional sources of uncertainty.

A broad range of options to build future adaptive capacity can be identified that draw attention to governance issues and emphasize the multi-level dimensions of adaptation (Wesche and Armitage in press). Of central importance are the relationships among adaptive capacity and the features of social organization that facilitate collaboration and cooperation for mutual benefit, including local social networks, multiple forms of knowledge and equitable access to resources. Adaptive capacity at local scales reflects the wider sociopolitical and institutional context of the North, where the northern economic transition, government support programs, emerging land claims processes and governance models (e.g. co-jurisdiction) can have a profound influence on the ability of communities to proactively respond to change.

Based on the results of interviews and focus groups, we highlight here three key strategies that emerge from this context: (1) incorporating different knowledge systems; (2) clarifying the role of different actors and institutions in this transitional context; and (3) adopting a multi-level systems view. While the issues addressed here are most relevant to northern Canadian communities like Fort Resolution, they may also apply in whole or in part to other Aboriginal and/or remote community contexts.

7.6.1 Incorporating Different Knowledge Systems

A key lesson from experience with the vulnerability assessment process has been the importance of working from the bottom-up. Rather than starting a priori assigning vulnerabilities based on model projections, experience in Fort Resolution and the surrounding Traditional Territory highlights the value and importance of engaging knowledge holders to document key issues. The broad-based knowledge of active land users and Elders is also key to framing future adaptation options. Efforts to extract traditional and local knowledge to augment adaptation planning, however, will miss the point. To be sure, the knowledge of changing parameters of climate and its impacts on wildlife, water resources and livelihoods is powerful. Yet, it is the process of 'co-producing' knowledge (Davidson-Hunt and O'Flaherty 2007) within collaborative learning contexts that include stakeholders, researchers and others that is a critical feature of efforts to build future capacity to adapt to changes.

However, while there are many benefits to adopting a pluralist perspective on the incorporation of scientific and traditional knowledge, a number of important issues must be considered as was our experience in Fort Resolution. First, it is

important for researchers to take a flexible, participatory approach. Yet, finding ways to overcome the challenge of matching study time scales with community expectations and time-frames is a difficult task. In our study we tried to maintain community interest via an iterative feedback process throughout the duration of the project. In terms of future adaptation, therefore, it is important to develop and maintain strong relationships with leaders in both political and other community-based organizations, and reflect upon community dynamics and other potential challenges that influence cooperation in adaptation planning (e.g., local conflict, fluidity in roles of community members – see Wesche 2009; Wolfe et al. 2007).

More specifically to knowledge co-production efforts, experience in Fort Resolution suggests that knowledge is not evenly spread within the community. Incorporating knowledge from a range of people provides greater probability of developing a more holistic understanding of change. Knowledge of individuals is determined by the intensity and consistency of his or her land use over time, the diversity of activities undertaken, and the geographic location of these activities. The knowledge of those who participated in this study has been tied in many instances to particular river systems (e.g., Little Buffalo, Slave, Taltson).

Knowledge of land users and Elders is not static. Rather, it changes and evolves due to influences such as religious conversion, residential schooling, western worldviews and knowledge, and environmental change. Thus the term 'traditional knowledge' in Fort Resolution may not have the same connotation to people of different generations within the community (e.g., Elders may attach more spiritual significance). Similarly, exposure to new ideas has influenced the way local residents interpret their environmental surroundings, thus the nature of knowledge takes on a hybridized form. The embeddedness of externally-produced knowledge makes it difficult (and counterproductive) to clearly distinguish between historical concepts of traditional knowledge and 'other' components. As such, encouraging the active use of such knowledge within Aboriginal communities as conditions change is helping to ensure that knowledge of the land evolves and continues to provide an important source of insight for adaptation. In the context of studies and planning for adaptation, a shift in mindset and approach is required, from one of documenting traditional knowledge to prevent or pre-empt its extinction, to one where it is recognized and valued as a source of knowledge that changes and evolves with the world around it. This points to the need for the fundamental involvement of local communities in decision-making about their lands, stemming from the grassroots level.

7.6.2 Engaging Actors and Institutions in a Transitional Context

In the DKFN Traditional Territory, efforts to build adaptive capacity for future change must take into account a series of institutional and actor-specific issues. First, the region is in a period of political transition (in

addition to environmental change) associated with land claims and self-government negotiation processes. The claims processes and Treaty negotiations will likely secure greater local control over decision-making. This potentially has significant implications for future adaptation. Indeed, negotiations around land and self-government rights offer optimism for increased and improved involvement of local authorities and residents in management decisions regarding their territory and resources, and thus the potential for incorporating mechanisms for strengthening adaptive capacity and enhancing adaptation options. For DKFN, learning from the outcomes of other land claim processes has encouraged an adaptive management approach to multi-phased implementation. However, while changing governance arrangements provide a significant opportunity for transformation, it is uncertain whether the entrenched differences and relationships of power between the DKFN and federal/territorial governments will be changed in the short-term. Any new political structure will require local councils to be accountable and more participatory, and for all community members to feel that their interests are equally represented.

Second, certain determinants of adaptive capacity clearly relate to the community's operational context or the knowledge and skills, resources and technology, and institutional support that are available and accessible. However, underlying community characteristics including social networks and the level of equity among residents also play a significant role in shaping the capacity of individuals and households to adapt to future change, and in influencing whether or not existing adaptive capacity remains latent or becomes engaged. A range of community characteristics and affiliations were identified in Fort Resolution as important influences on the ability of individuals and households to adapt to change. These include legal identity (e.g., Dene, Métis, Other), family and location of origin, age, sex, education level, individual well-being, and economic and social status (Wesche 2009). Each individual in Fort Resolution has a unique combination of these characteristics and affiliations that, combined with personal capabilities, influences their adaptive capacity and the extent to which they would collaborate with others (see Box 7.2a, b for a comparison of adaptation options between a (fictional) Dene and Métis household).

Box 7.2 Comparison of Adaptation Options Between (Fictional) Dene and Métis Households, Based Largely on Differences in Legal Identity

(a) Dene Household

Household 1 consists of a family with middle-aged Dene parents and three school-aged children. The adult male is an avid land user with little formal education. The adult female has a full-time wage job at one of the local organizations. The female's steady wage allows the household to invest in a range of travel and harvesting equipment for different seasons (e.g. snowmobile, toboggan, truck, boat, boat trailer, ATV) which require capital inputs for purchase and continued maintenance. The male traps

intensively throughout the winter in the Slave River Delta area, and hunts and fishes year-round. Financial flexibility and access to equipment allow him to participate in a range of harvesting events (e.g. group hunts by snowmobile for caribou (which can be sold to DKFN for distribution), intensive beaver and muskrat harvest by boat in spring, goose hunting by snowmobile or boat in spring, and moose hunting by truck or boat in fall). The household also has the flexibility to engage in other opportunities such as short-term contracts available through DKFN (e.g. guiding, research assistance, trail maintenance, and local forestry operations). These opportunities are also supported by strong family and friendship ties with members of the local government and other community organizations.

(b) Métis Household

Household 2 consists of a family with middle-aged Métis parents and three school-aged children. The adult male is an avid land user with little formal education. The adult female is a homemaker, who intermittently works in short-term contract jobs. The male owns the necessary gear for trapping (e.g. snowmobile, toboggan, traps), purchased with the aid of harvester support programs and earnings. He traps intensively throughout the winter, and is able to make a small profit. However, the household has limited resources to spend time on the land in other seasons. The household resorts to lower cost activities such as fishing in Resolution Bay or at Little Buffalo River, or hunting in areas accessible to the highway to provide food for the family. They are able to sustain a living in a small rental unit, but have few luxuries. The cash-strapped Métis Local is unable to provide substantive assistance, and there are limited opportunities for extra contracts since most funding and opportunities are generated through DKFN (e.g. contracts with incoming researchers or resource companies; government programs).

Source: Wesche 2009

Third, considering the role of actors and institutions for future adaptation requires careful consideration of scale issues and the interactions among actors across scales. While most of the focus of this analysis has been on Fort Resolution and the DKFN Traditional Territory, an enabling context created by linkages across scales is important for adaptation. However, this is not a straightforward matter. Local mistrust in higher levels of government, largely influenced by historical experience, reinforces the belief that it is important to take advantage and get what you can while it is on offer, rather than taking a longer term view. Since residents feel that in the past such relationships have generally been divisive, they may fail to recognize the potential opportunities for external organizations to provide support for the less tangible social aspects of capacity development required to support adaptation. If locals continue to be mistrusting in these relationships, they are unlikely to support measures where money and resources are used for activities that do not bring immediate benefits, constraining the feasibility of anticipatory adaptation planning. While

there is significant political leverage when Aboriginal governments work together, community members indicate that efforts are often hindered by the perceived 'divide and conquer' approach taken by the Government of Canada and industry. This reinforces tensions between DKFN and the Fort Resolution Métis, as both groups are separately pursuing land claim and rights negotiations, despite the fact that individuals in the same family might be on opposing sides.

7.6.3 Adopting a Multi-Level Systems View

Fort Resolution, like many northern communities in Canada, is experiencing 'multiple exposures' from external and internal changes in socio-cultural, economic and biophysical conditions. In addition to economic development and climate change, northern Aboriginal communities must also address the legacy of cultural change catalyzed by the arrival of European settlers. Therefore, in most northern communities like Fort Resolution, the intersection of multiple exposures is complex. The ability of individuals and communities to cope with these exposures is mediated by access to economic resources, technology, levels of knowledge, information and skill sets, existing infrastructure, and the capacity and resilience of institutions and organizations. Framing these multiple exposures, moreover, are challenging socio-institutional relationships, values and worldviews operating at local to global scales (Armitage 2005), all of which shape the feasibility, effectiveness, cost and acceptability of adaptation options (Pelling and High 2005).

While all communities have some degree of coping and adaptive capacity, it is generally not specifically developed to deal with environmental change. In this case, the family bonds and knowledge of hunters, Elders and others in Fort Resolution engaged to overcome the negative consequences of the Pine Point mine, for example, are the same sets of social capital and memory required to deal with ecosystem changes and the implications for land use activities. Additionally, relationships among actors across different levels act as important social networks to draw on in times of need.

However, while it is important that strategies to build and apply adaptive capacity are focused at the local level, people in Fort Resolution have expressed a concern that these same foundations of adaptive capacity can be overwhelmed by external forces, particularly in the absence of a broader enabling institutional context. As indicated by participants in the scenario process, residents do recognize their shared future and limited ability to select the external influences that shape the community. Some suggest that climate change may bring residents together to face a common threat. Yet, this would likely not happen spontaneously until the community faces extreme conditions that threaten their livelihoods. However, residents may be brought together in other ways, such as through community visioning and community capacity-building programs.

Building the foundations for future adaptation, finally, will depend on how the emerging governance structure is able to foster collaboration and learning across multiple levels (Armitage et al. 2007). The limits of the DKFN Band Council to fully develop adaptive capacity are apparent. While many local level organizations beyond the Band Council appear intact and well-structured, the form does not always translate into functionality. In designing and developing new organizational structures through Treaty and Métis agreements, each responsible actor should recognize the need to create structures that support flexibility, social learning and adaptability (e.g., local governments that are open and participatory in nature, and that promote learning in cycles through periodic experimentation and evaluation).

7.7 Conclusions

> 'As long as the sun shines, the rivers flow and grass grows' – The understanding of rights with which the Fort Resolution Dene entered Treaty in 1900

In DKFN Traditional Territory, relationships among past and current environmental change, exposure-sensitivities and adaptations are cumulative and non-linear (e.g., Fig. 7.3). Perhaps now more than ever, the spirit with which the Chipewyan Dene from Akaitcho Territory entered into Treaty with Her Majesty the Queen in 1900 is under threat. Many overlapping areas of vulnerability are at play within the region as residents face social-ecological uncertainties beyond the range of historical experience. Changes to water resources, the delta and related environmental conditions are of particular concern and connect directly and indirectly to adaptation issues (e.g., travel, harvesting, economic diversification). Climate change is perceived to cause mostly negative impacts on water, lands and local livelihoods, whereas resource development, as noted, brings a distinct mixture of potentially more pronounced positive and negative changes. While many people in Fort Resolution feel more able to adapt to climate-driven changes than those created by significant resource development, general concern exists about adapting to any conditions that are beyond those experienced to date. There is, however, a significant overlap in the types of adaptation strategies proposed for both forms of possible future change, some of which could be readily implemented as 'no regrets' measures to reduce vulnerability under a range of conditions.

Within northern communities, consideration of adaptation options and vulnerability reduction has often been reactive and undertaken on an individual basis (e.g., hunter modifications of travel routes for safety, or modifications to timing and intensity of harvest). Yet, there is a growing recognition that a more proactive and collective approach is required. As experience in Fort Resolution illustrates, vulnerability and adaptive capacity are strongly determined not only by changes to environmental conditions (particularly water resources), but by key socio-cultural relationships, values and worldviews operating at individual and community scales. These relationships and values are without doubt under

enormous pressure from exogenous forces, including climate and large-scale resource development. Contemporary socio-cultural change disrupts and erodes important bonds both within and among family groups.

As reflected in the spirit in which the Treaty of 1900 was entered, however, northern peoples and communities are building resilience in the context of change and negotiating a path forward. This spirit has also been illustrated more recently by the renewed efforts to deal with social injustices and lay claim to lands and culture. A collective engagement on behalf of local, regional and national actors to address vulnerabilities, support adaptation, and share experiences and knowledge, will serve to support those efforts.

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