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A necessary voice: Climate change and lived experiences of youth in Rigolet, Nunatsiavut, Canada

Joanna Petrasek MacDonald [a,*], Sherilee L. Harper [b], Ashlee Cunsolo Willox [a], Victoria L. Edge [b], Rigolet Inuit Community Government [c]

[a] Department of Geography, McGill University, Montreal, Quebec H3A 0G4, Canada
[b] Department of Population Medicine, Ontario Veterinary College, University of Guelph, Guelph, Ontario N1G 2W1, Canada
[c] Rigolet, Nunatsiavut, Labrador A0P 1P0, Canada

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ABSTRACT

Globally, youth voices and their experiences, observations, and perceptions about climatic and environmental change and variability are relatively absent in the published literature to date. To address this gap, the goal of this research was to explore the observations and perceptions of climate change held by youth (12–25 years old) in the Inuit community of Rigolet, Nunatsiavut, Canada. Twenty in-depth interviews were conducted with youth in Rigolet to gather data about climatic and environmental changes young people have observed, and the subsequent impacts of these changes on their lives, culture, and community. Youth reported observing and experiencing climatic and environmental changes throughout their lives, with reported impacts falling within five main themes: changing travel conditions and access to hunting; challenges to Inuit culture; a concern for Elder and senior well-being; strong climate-related emotional responses; and youth-identified potential adaptation strategies. More broadly, this research demonstrated that young people have valuable knowledge and perspectives to offer. In particular, researchers, community leaders, and policy makers are encouraged to meaningfully engage youth as crucial stakeholders in future climate change work, research, dialogue, and policy.

1. Introduction

Climate change has become an international concern, as dramatic shifts and variability in climatic conditions are increasingly experienced globally (IPCC, 2007; Füssel, 2009). Currently, climatic and environmental change and variability are most severely impacting the Polar regions of the world (IPCC, 2007), with Northern empirical research and Inuit oral histories and testimonials documenting increased seasonal temperatures, rising sea levels, warming permafrost, and reduced sea ice quality, stability, and extent, all of which are indicators of a warming climate (Fox, 2002; Furgal et al., 2002; Krupnik and Jolly, 2002; Ford et al., 2006, 2008, 2010c; Furgal and Seguin, 2006; Nickels et al., 2006; IPCC, 2007; Prowse and Furgal, 2009; Prowse et al., 2009a,b,c,d,e). Specifically, these regions have experienced rapid changes in atmospheric temperature, with up to 5 °C increase in annual atmospheric temperature over extensive land areas throughout the 20th century, and an average annual temperature increase of approximately 1 °C per decade in the Arctic region (IPCC, 2007). In addition, dramatic changes in sea ice stability and extent have been documented, with the largest Canadian rates of decline witnessed in the Northern Labrador Sea at a rate of 1536 km^2 (17%) per decade (Environment Canada, 2011; Statistics Canada, 2011). Warming of shallow permafrost at a rate of 0.3–0.6 °C per decade in some Canadian regions has been attributed to warmer atmospheric temperatures and increased snow precipitation (IPCC, 2007; Smith, 2011). These changes continue to have subsequent impacts on the flora, fauna, and human populations that rely on the Arctic ecosystem (IPCC, 2007).

The Inuit who live in these Polar Regions are often considered to be particularly vulnerable and susceptible to these climatic changes and variability due to their geographic location, reliance upon the local environment for harvesting renewable resources for subsistence, and their history of colonization that lead to socio-economic transitions and transformations (AHDR, 2004). Past research has examined how climate change and variability have led to social, economic, political, health, and cultural pressures on Inuit communities (Berkes and Jolly, 2001; Nuttall, 2001; Fox, 2002; Berman et al., 2004; Ford and Smit, 2004; Furgal and Seguin,

* Corresponding author at: Tel.: +1 514 398 7456.
E-mail addresses: joanna.petrasekmacdonald@mail.mcgill.ca (J. Petrasek MacDonald), harpers@uoguelph.ca (S.L. Harper), ashlee.cunsolo@mail.mcgill.ca (A. Cunsolo Willox), victoria.edge@phac-aspc.gc.ca (V.L. Edge), townmanager@rigolet.ca (Rigolet Inuit Community Government).

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2006; Laidler, 2006; Smit and Wandel, 2006; Prowse and Furgal, 2009; Prowse et al., 2009a,b,c,d,e; Ford et al., 2010b,c; Cunsolo Willox et al., 2011, 2012; Harper et al., 2011a). For instance, as Arctic marine and freshwater systems are impacted by changes in temperature and water level, the wildlife that depends on these systems are subsequently affected, resulting in decreased accessibility and availability of wildlife for hunting and trapping, which compounds existing food insecurity, as well as mental and emotional health and well-being status (Furgal and Seguin, 2006; Ford et al., 2006, 2008, 2010b,c; Cunsolo Willox et al., 2011, 2012).

While there has been burgeoning research in the Canadian North on climate change observations, impacts, and adaptation strategies, most of these studies have focused on the extensive experience and knowledge held by Elders and active hunters due to the extent and depth of their experience, their intimate knowledge of the land, and their cultural standing in the community (e.g. Krupnik and Jolly, 2002; Ford et al., 2006; Furgal and Seguin, 2006; Laidler, 2006; Nickels et al., 2006; Alessa et al., 2008). Furthermore, there has been a concerted effort among researchers to work with these groups to document their wisdom and ecological knowledge due to fears of this knowledge disappearing before it can be shared and transmitted with younger generations (Krupnik and Jolly, 2002; Ford et al., 2006; Pearce et al., 2010).

While working with Inuit Elders and hunters is essential, it is also imperative to include other voices and age groups within climate change and adaptation research to ensure the representation and participation of numerous individuals. In particular, youth are an important source of land-based knowledge and skills around hunting, trapping, fishing, foraging, travel conditions, and weather patterns, and will become the future leaders and innovators in climate change adaptation in their communities. For example, research related to environmental change in other fields, such as disaster management, risk perception and communication, environmental stewardship, and natural resource management, have focused on the necessity of encouraging and empowering children and youth to be active in dealing with disasters and environmental issues (Ronan et al., 2001; Bartlett, 2008; Mitchell et al., 2008; Peek, 2008; Tanner et al., 2009; Tanner, 2010). In particular, research investigating children's risk communication and management is burgeoning (La Greca, 2001; La Greca et al., 2002; Peek and Stough, 2010), and has demonstrated that children have accurate risk perceptions, awareness of risk mitigation, and a belief in their ability to cope with current and future hazards (Ronan et al., 2001; Tanner et al., 2009; Tanner, 2010). This focus on children and youth has not extended into peer-reviewed published climate change vulnerability and adaptation literature to date (although there are gray literature reports through international organizations and programs available through the World Wildlife Foundation, Children in a Changing Climate, and Many Strong Voices). This research gap is particularly surprising in the Canadian North, as over half (57%) of the Canadian Inuit population is comprised of individuals under 24 years of age (ITK, 2008), and as such, youth represent a substantial and important part of the Inuit population. Despite some important youth-related climate change work in the gray literature, youth voices, observations, and insights are largely absent within published climate change and adaptive capacities literature, resulting in an unfortunate and substantial gap in research and associated policy development. Furthermore, a recent literature review on Northern climate change scholarship identified the absence of youth voices as a major research gap and climate policy shortcoming (Ford and Pearce, 2010).

To actively address this research gap, and recognizing that climate change and related climate policy activities will have lasting implications for young people and their futures, this work draws on a case study conducted in Rigolet, Nunatsiavut, Labrador, Canada, and examines the observations and perceptions of climate change held by youth (12–25 years old). This definition of youth was chosen to be consistent with that of the community and was identified by community members as the most culturally appropriate age range to define youth. The research objectives were to identify youth observations and perceptions of climatic and environmental changes and explore youth expectations for the future in light of these changes. While this research represents a single exploratory case study conducted in a small Inuit community, the findings that emerged from youth voices, knowledge and experience offer insight into the impacts of climate change on youth populations in the Canadian North, other Circumpolar regions, and potentially other parts of the world experiencing rapid climatic and environmental change. This work also serves to inform further climate change adaptation research and policy development in Canada and globally.

2. Background

2.1. Canadian Inuit

As Aboriginal peoples in Canada, Inuit have lived in the Polar Regions for thousands of years. Traditionally, Inuit led a subsistence nomadic lifestyle, surviving on hunting and trapping, and practicing a rich culture of art and storytelling. As with other Indigenous peoples, however, Inuit culture and communities have experienced tremendous impact from colonization over the past 60 years, leading to rapid social, cultural, economic, and political transitions linked to this history: forced relocation from homelands by the government; the killing of sled dogs ordered by the Canadian government; forced residential schooling representing a systematic removal of children from their homes, languages, and culture; and the forced settlement of families into towns and away from nomadic land camps (Lehti et al., 2009; Richmond, 2009; Richmond and Ross, 2009; Ford et al., 2010b).

Today, the Canadian Inuit population is comprised of approximately 55,000 people who live primarily in 53 remote communities across the Canadian North, with populations ranging from under 200 to over 6000 within four Inuit settlement regions: Nunavut, Nunavik, Inuvialuit, and Nunatsiavut. While Inuit comprise a small proportion of the Canadian population, Inuit regions cover over one-third of Canada's landmass. Many Inuit continue to have a close relationship and dependence on the local ecosystem for subsistence, and continue to practice other cultural activities including throat singing, drum dancing, storytelling, dog sledding, carving, and grass weaving.

The majority of employment opportunities are in resource-based industries, construction, health care and social services, and educational services; approximately 16% of Inuit report selling fish, meat, carvings, skin clothing, furs, crafts, marine ivory or similar goods (Statistics Canada, 2006). With high unemployment rates (15–23%) and lower median income ($13,699CAD per year) in comparison to the rest of Canadian (5%; $22,120CAD) (ITK, 2008), most Inuit report unemployment to be a problem in their community (77%; Statistics Canada, 2006). These limited economic resources and opportunities can be challenging, especially considering the remote location of Inuit communities and the higher cost of living in the North, with staple food items such as milk, meat, and flour costing two to three times more than in other Canadian communities, and with many food options unavailable (ITK, 2008). Therefore the practice of hunting, trapping, and fishing are not only cultural practices, but also required for subsistence, for nutrition, and for economic well-being. Indeed, the majority of Inuit continue to hunt (72%), fish (77%), forage (80%), and trap (35%) (Statistics Canada, 2006)—practices that provide most of the meat and fish eaten in the household (ITK, 2008). Many children

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and youth participate in hunting, fishing, trapping or camping, spend time with Elders, and eat wild meat (Table 1; Statistics Canada, 2006).

Given their intimate connection to the natural environment, and their cultural history of adapting to changing conditions in the North, Inuit communities continue to play an important leadership role in climate change research by collaborating with researchers, contributing valuable Indigenous knowledge, identifying and setting research priorities, and initiating their own research to gain further understanding about climate change and its impacts (Krupnik and Jolly, 2002; Ford et al., 2006; Furgal and Seguin, 2006; Nickels et al., 2006; Pearce et al., 2010; Cunsolo Willox et al., 2011, 2012; Harper et al., 2012).

2.2. Study community

Formalized in 2005 from the Labrador Inuit Land Claims Agreement, Nunatsiavut is situated on the Northeast coast of Labrador, Canada, and is comprised of five Inuit communities: Nain, Hopedale, Postville, Makkovik, and Rigolet (Natcher et al., 2012). This study was conducted in collaboration with the community of Rigolet (54°N, 58°W; Fig. 1), the Southern-most Inuit community in the world. A remote coastal community with approximately 95% of its 269 residents identifying as Aboriginal (Statistics Canada, 2007), Rigolet sits at the intersection of the Northern Boreal Forest and Tundra zones. The community is comprised of approximately equal numbers of men and women, with children and youth (ages 0–25) representing 40% of the population (and youth 12–25, the study cohort for this research, representing 25%) (Statistics Canada, 2007).

The economy in Rigolet is a combination of wage and subsistence practices, with many employment opportunities through government agencies and short-term government grants. In addition, several people own or work for local small businesses, and other residents gain seasonal employment outside of the community as oil rig workers, mine workers, shrimp and fishing fleet members, and hunting guides. Rigolet residents rely strongly on the land for sustenance, with the majority of residents highly valuing and actively participating in some facet of a subsistence way of life (www.rigolet.ca). The main community food-gathering activities include fishing, trapping, and hunting a variety of animals, including fish, geese, ducks, partridge, caribou, seal, and rabbit. There is an abundance of red berries, bake apples, and black berries on the land surrounding Rigolet, making berry picking another popular foraging activity. There are no roads in or out of the community; local transportation is primarily by snowmobile during the winter months and by boat throughout the summer months, and these modes of transportation are dependent on weather conditions, as well as ice and snow quality. Modes of transportation to other communities include the seasonal ferry or year-round plane, although poor weather conditions frequently make these forms of transportation unreliable. All residents in Rigolet speak English (Statistics Canada, 2007), and although some community members speak Inuttitut, the Rigolet Inuttitut dialect is only maintained by four people and is listed as a UNESCO endangered language (UNESCO, 2010).

Similar to other Northern regions (Ford et al., 2006, 2008, 2010b), spending time at family cabins on the land and away from town is identified by Rigolet residents as an important aspect of their well-being (Cunsolo Willox et al., 2011, 2012). In addition to the factors presented from colonization processes mentioned above, Rigolet residents also face challenges in access to healthcare services and resources, housing shortages, and inadequate economic opportunities present in the region (Statistics Canada, 2006). Despite these challenges, Rigolet is proactive in creating community support networks, supporting the health and wellness of their residents, and participating in climate change and adaptation research.

3. Methods

3.1. Conceptual approach

A case study approach was used in this research (Stake, 2005); this method is particularly important for climate change and adaptation research, as in-depth case studies enable access to place-based knowledge and wisdom on long-term climate information and observations (Ford et al., 2010a). This case study emerged from a larger community-led research and capacity development initiative, the *Changing Climate, Changing Health, Changing Stories* project, situated in Rigolet, which explored the relationship between climate change and well-being in Rigolet (Harper et al., 2012). The transdisciplinary and participatory nature of the project brought together a team from numerous backgrounds, including community members, decision makers, and researchers from diverse educational fields as equal stakeholders in the research process. Community perspectives and local knowledge were considered essential to the research process

Table 1
A summary of activities, food, and education for those age 6–14 years old in the four Inuit regions in Canada (Statistics Canada, 2006).

	Canadian Inuit region				Canada
	Inuvialuit	Nunavut	Nunavik	Nunatsiavut	
Activities					
Spent time with Elders (once per week or more)	64%	51%	42%	46%	–
Spent time at clubs like youth groups, drum or dance groups (once per week or more)	37%	18%	30%	29%	–
Participated in cultural activities (once per week or more)	36%	24%	28%	23%	–
Average number of hours per day spent playing video games	0.4 h	0.5 h	0.5 h	0.4 h	0.8 h
Average number of hours per day spent using a computer	1.1 h	1.0 h	0.8 h	1.3 h	–
Average number of hours per day spent watching T.V., videos, or DVDs	2.8 h	2.9 h	2.4 h	2.9 h	2.2 h
Food					
Eat wild meat, caribou, walrus, muktuk (once per week or more)	80%	92%	83%	92%	–
Education					
Ability to read Inuit language 'relatively well' or 'very well'	13%	41%	74%	11%	–
Attended an early childhood development or preschool program	56%	55%	42%	81%	62%
Currently attending school	96%	99%	98%	100%	98%
Child or youth is happy at this school	82%	92%	75%	84%	92%
Absent or missed school for a period of 2 or more weeks in a row	5%	9%	9%	8%	3%
Believe they are challenged to work to full potential	73%	78%	64%	81%	85%
Believe their school has high academic standards	54%	61%	47%	70%	80%
Believe that school prepares them to make choices about their future	71%	73%	65%	70%	83%
Parent attended a residential school	47%	16%	16%	16%	–

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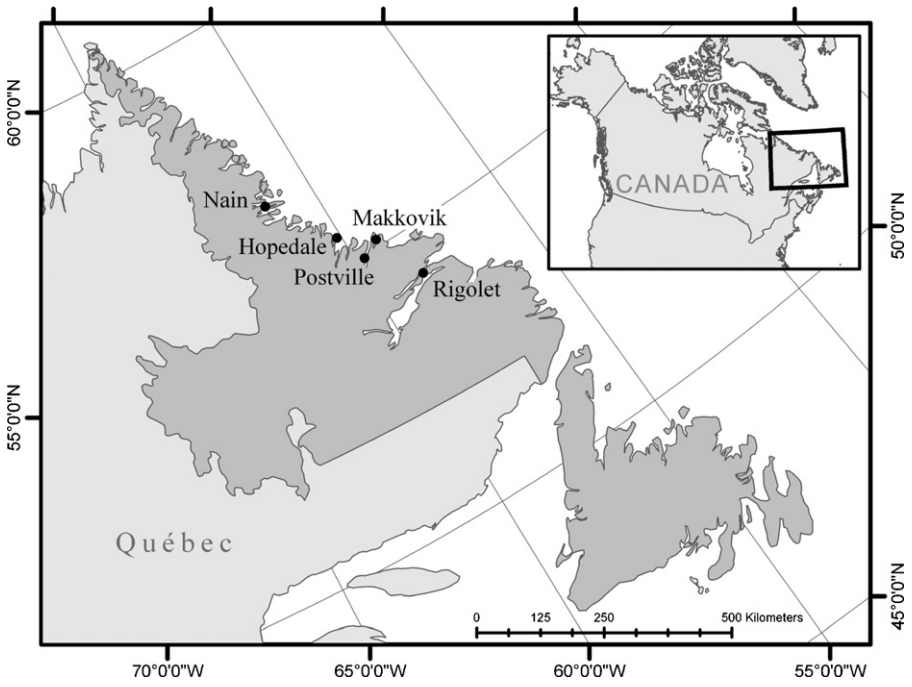

Fig. 1. The community of Rigolet is located at the tip of the Hamilton Inlet on the coast of Nunatsiavut, Labrador, Canada (54°N, 58°W).

(Wilcox and Kueffer, 2008; Pearce et al., 2009; Webb et al., 2010), and the emphasis on engaging the younger generation was an intentional project goal. As such, youth observations and perceptions were integral to all stages of the research.

3.2. Data gathering methods

Participants were initially recruited from youth-specific digital storytelling workshops associated with the *Changing Climate, Changing Health, Changing Stories* project (Harper et al., 2012; www.rigolet.ca). In addition, community researchers and community government representatives made recommendations of youth who were engaged in hunting and outdoor activities. These interviews were, however, open to all interested youth in the community, and concerted effort was made to inform youth about the research through community posters, flyers, radio announcements, school announcements, and word-of-mouth. Furthermore, the establishment of positive and engaged relationships with the community, including the interviewees, in previous climate-health research was also key to engaging youth in the research (Harper et al., 2011a,b).

Twenty in-depth, semi-structured interviews were conducted with thirteen youth (five males and eight females) in Rigolet between the ages of 12 and 25 (Fig. 2). Fewer males were interviewed due, in part, to a lower number of male youth available in the community to participate in the research during the data-gathering periods. All participants were raised in Rigolet and reported spending time with friends and family hunting, fishing, or out at their cabins. Some youth participants were students at the Northern Lights Academy in Rigolet and others were employed workers, university students, and/or regular hunters. While the sample size was small, it is consistent with in-depth qualitative case study approaches (Stake, 2005; Ford et al., 2010a) and reflects the size of the community.

All interviews were conducted in person at a location preferred by the participant. All interviewees were given the option of conducting the interviews in Inuttitut but all chose to speak in their first language, English (Statistics Canada, 2007). The interview schedule contained 30 open-ended questions, and to engage participants in dialogue, interviews were conducted in a conversational manner allowing participants to direct the conversation while at the same time providing room for interviewers to pursue interesting comments for further detail (Kvale, 1996). The interview questions were designed to gather information about the land around Rigolet, long-term changes in weather patterns, land-based activities such as hunting, trapping, fishing, foraging, and traveling, and human health. Interview tools were formally pre-tested for content, context, and clarity by community youth ($n = 6$), other community members ($n = 9$), and academics and professionals ($n = 5$) in November 2009. Based on pre-testing, changes were made to both the content of the interview guide (e.g. the topics covered), as well as the context (e.g. the terminology). Youth interviews took place between January 2010 and October 2010 and averaged 33 min in duration and lasted as long as 82 min. All interviews were audio recorded with permission, and the audio recordings were transcribed verbatim by a professional transcription company and hand-checked for errors by researchers. The

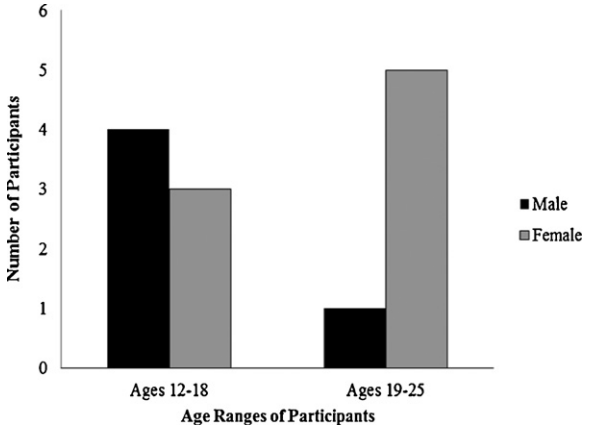

Fig. 2. Youth interview participants stratified by age and gender in the *Changing Climate, Changing Health, Changing Stories* Project, in Rigolet, Nunatsiavut, Canada (2009–2010). Due to the small population size of Rigolet, specific ages are not provided to ensure privacy and confidentiality of participants.

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research protocol was approved by Health Canada's Research Ethics Board, the Nunatsiavut Government Research Advisory Committee, and the Research Ethics Board of the University of Guelph, and all protocols allowed for the interviewing of individuals under 18 years of age.

3.3. Data analysis

A rigorous qualitative analysis (Mays and Pope, 1995; Patton, 2002) was conducted by a multidisciplinary team using an immersive constant comparative method, which involved ongoing comparison of data between and within interviews (Bradley et al., 2007). Specifically, this analysis included many iterative steps: (1) team members independently reviewed transcripts while listening to the audio recordings and writing reflective memos (including ideas, concepts, and relationships illustrated by key quotes, tables, and concept maps) for each interview, looking for major and/or consistent themes among the data; (2) weekly multidisciplinary team meetings were held to discuss each interview transcript and develop a list of descriptive nested open codes from key words to describe common and disparate threads within and between the interviews (Miles and Huberman, 1994); (3) weekly team meetings were again held to constantly compare concepts and codes resulting in expanding and collapsing codes to best reflect the data as new ideas emerged until code categories were saturated and sufficient regularities emerged (Miles and Huberman, 1994; Denzin and Lincoln, 2005); (4) five key emergent and salient themes were identified and were checked with community members and community researchers, to ensure accuracy and authenticity, and to make sure that each of the themes represented the local and cultural context from which they emerged; and finally (5) a final list of codes was created to describe the data, and every line in every transcript was coded by segmenting and labeling the text with these codes. Given the small sample size, stratification of data and certain comparative analyses were precluded. Qualitative data analysis software (ATLAS.ti version 6) was used to assist with data organization and retrieval. This software provided a platform for writing memos; visualizing data, ideas, concepts, and relationships; coding transcripts by segmenting and labeling the text; and searching and retrieving quotes (Miles and Huberman, 1994).

4. Results

4.1. Climate change observations, perceptions, and impacts

Through extensive experience on the land, hunting and trapping with family and Elders, and regular trips to the cabin, Inuit youth in Rigolet have directly observed substantial environmental changes within their lifetime that they consider indicative of climate change and climate variability (Fig. 3). Youth made continual comparisons between present day and childhood memories of ice, snow, and water conditions. For instance, one young woman described changes in snow conditions, explaining that

> when we were kids, it used to freeze up faster around here. Like even around Halloween time we would have snow. And now we do not get snow 'til December. Like Christmas Day usually we get snow. Seems like it is a real big change; like we hardly get snow anymore.

There has been recent variability in climate in Nunatsiavut, with the winter of 2009–2010 reported by all research participants to be the warmest in living memory. Youth explained that this variability was responsible for changes on the land and in the environment which had severe implications for the community. For instance, one youth in her early twenties who regularly hunts and travels on the land whenever the weather conditions and her schedule allows, reported that

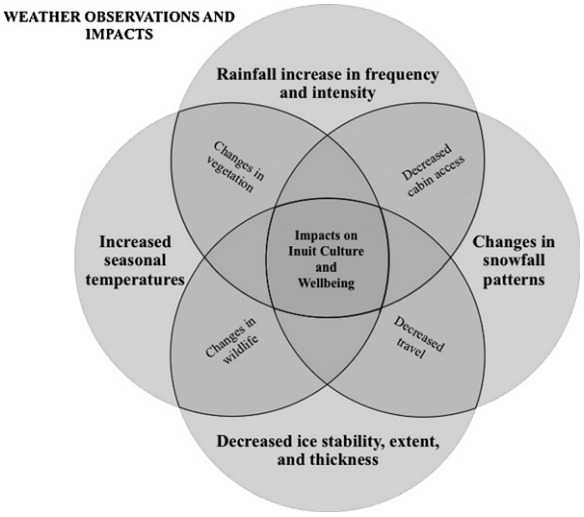

Fig. 3. A figure illustrating the relationships between the codes under the theme "weather observations and impacts" for youth in the *Changing Climate, Changing Health, Changing Stories* Project, in Rigolet, Nunatsiavut, Canada (2009–2010).

> [the winter of 2009–2010] has been a crazy winter. When I left, it was beautiful out. The sun was shining. And then all the time I was gone it was rain, rain, rain, rain, rain, and usually that time of month we'd have two or three feet of snow on the ground. And then when I came back there was just ice everywhere. No snow anywhere. When I was coming back on the plane it was [bare] ground on tops of the hills and usually it'd be snow white.

Youth reported that this variability and change in conditions disrupted the ability to travel on the land to cabins, to hunt, or to participate in land-based activities. For example, youth were aware of how the impacts from changes in snow conditions had harmful and increasingly serious implications on their lifestyles and the activities they value, including traveling to cabins. As one participant in her early twenties who values her time spent on the land commented:

> if it keeps going the way it's going, and we're not getting much snow, then in a few years time of course we're not gonna have any at all and we won't be able to go skidooing and going off, like, in the woods. . .like, we won't be able to do naturally what we do in winter.

Travel in and out of the community during winter is by snowmobile; however, the lack of proper snow and ice conditions had limited the use of snowmobiles to access the land and had implications on several aspects of Inuit cultural lifestyle. For example, decreased ice and snow conditions and the associated dangers of traveling on bad ice conditions also impacted the ability to travel on the land and to cabin. As a male in his early twenties who is an avid hunter and fisherman explained:

> well, I remember. . .we'd be going out to Big Brook, eight hours up north. . .in April we'd go out there for a week. But now we can't even get out anywhere that time of year. That was only about 12 [or] 13 years ago now. Like, I don't even bother to go out there and try to get into Big Brook now, in the last couple of years, because the ice is not fit to go on.

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Another female who hunts as often as her work schedule will allow, stated the impact of travel danger on hunting:

> Nobody wants to beat their machines up to go get some caribou. There is no snow covering the rocks. Some people like sink in the skidoo. It is dangerous.

This barrier to travel impacted the well-being of youth who value time at the cabin. The importance of spending time at the cabin with family and friends, and the opportunity to participate in land-based activities, were identified by participants as directly contributing to good health and well-being, because at the cabin "the worries just disappear."

As a young woman in her early twenties and avid outdoors person explained:

> it makes me feel real good when I'm at the cabin. I'm always happier. I've never seen anybody sad or not happy at the cabin. Whenever you go to someone's cabin, everybody's happy. If you think about going to the cabin, it makes you smile.

This sense of 'peace' and 'happiness' was reported to be important for youth, and served as a way for the youth not only to 'relax' and 'feel good', but also to learn from the knowledge and wisdom of their parents, grandparents, and great-grandparents.

Youth reported that these observed changes in the environment and land around the cabin also had negative implications for hunting skills and land-based knowledge from regular trips on the land and on-going hunting opportunities with parents and Elders. Furthermore, hunting was reported by participants as being very important to well-being, through physical activity, participation in cultural activities, and the ability to supplement or sustain dietary needs with wild meat. Climatic and environmental changes, however, were negatively impacting hunting practices, as youth hunters reported experiencing decreases in animal prey, changing animal migration patterns, and travel difficulties. As one young man in his mid-twenties who is a skilled hunter explained, "There wasn't very many geese this fall, like not a lot of people got their geese." Going further he reported:

> Last winter we were out, it was a real bad winter all the way around. There was no fish or nothing getting in, where we were anyway. It was just poor. I was there for like five [or] six hours ice fishing, never got a thing.

Many of the youth also reported that changing water and land conditions have led many ducks, geese, and other birds to change their migration and nesting patterns. As one young female identified:

> even the ducks this year, there wasn't very many. . . .I took notice of that because when we used to go out seal hunting and everything, we would try to get some ducks as well and there wasn't very many. They was all going to. . .different places. Like certain ducks was going up in Back Bay where they hardly ever used to go.

The lack of wild meat due to hunting difficulty from environmental and climate impacts leading to health impacts was another theme identified by several youth. Due to changes in travel conditions and animal migration patterns, people were buying food in the local grocery store that was considered less healthy to compensate for less wild game. As one young woman who prefers to eat country food that she and her family hunted explained:

> We got to always eat store bought food if we don't have any wild meat, right? And store bought food is getting really greasy and not very good for you anymore.

4.2. Concern for elders and seniors

Although youth reported experiencing changes in their lifestyles due to climatic and environmental changes, they were also aware of the profound impacts from changes that have been experienced by Elders and seniors over a much longer time period (Fig. 4). One young woman recalled the stories her senior father used to tell of large snow falls, stable ice, and longer winters, and his disappointment that "them times are gone." Reflecting on the rapid changes their Elders and seniors have faced, many youth wondered what their world would be like when they were older. As one woman in her early twenties explained, her elderly father's world has changed so drastically through socio-economic, cultural, and technological shifts; she was worried that climate change will exacerbate these changes for her father and that she, too, will also experience such changes:

> We don't do [the things we did when I was younger] anymore, like it's just changing, but it would be more of a bigger change for [my elderly Dad] because he lived off the land. Like that's the way he lived with no power, no electricity, no stuff like that and now there's no such thing as that. . .I just keeps thinking, man, what did he think about these changes? He must feel like he just got picked about at one place and put right and somewhere like on a different planet.

Not only were youth concerned about how the changes must feel to Elders and seniors, they also recognized that these changes in the land will decrease the opportunity to learn and practice land skills and knowledge. In particular, the drastic changes in temperature and snow and ice conditions observed during the 2009–2010 winter in Rigolet emphasized to youth the potential implications these changes have on cultural activities, and highlighted the importance of learning land-based skills from family, seniors, and Elders before it was 'too late.' As one woman who did not regularly hunt, but enjoyed going on the land, shared:

> if we has like anymore years like we did now then it's not going to be much of a winters and all that. It would be like the less chance to get out and learn and for our families to teach us what they know about the land and what they do on it.

Furthermore, youth were concerned that limited access to land might prevent those who have learned the traditions to carry them on and practice. For younger generations to take up the same activities as their Elders and seniors, they must have opportunities to learn and apply land-based knowledge before this wisdom is forgotten. As one female hunter and trapper explained:

> Well, I guess after a while you will forget. . .I mean if like my Dad taught me how to set traps we'd probably go out and set a trap now. But if it's like ten years of not doing it, I might go out there and set the trap and catch my finger. You know? If you're doing something all the time, there's nothing to it. But like if you got to think about it and try and remember and stuff when it should come naturally to you after a while you won't be able to do things. I think that it feels like everyone's going to lose their culture. . .and I really don't want that to happen.

4.3. Cultural identity

In Rigolet, there was a connection between youth and the land and cultural activities such as hunting, going to the cabin, and spending time on the land. When discussing such activities, the passion youth felt was evident, and these activities clearly shaped the lives of families in Rigolet and held incredible cultural and

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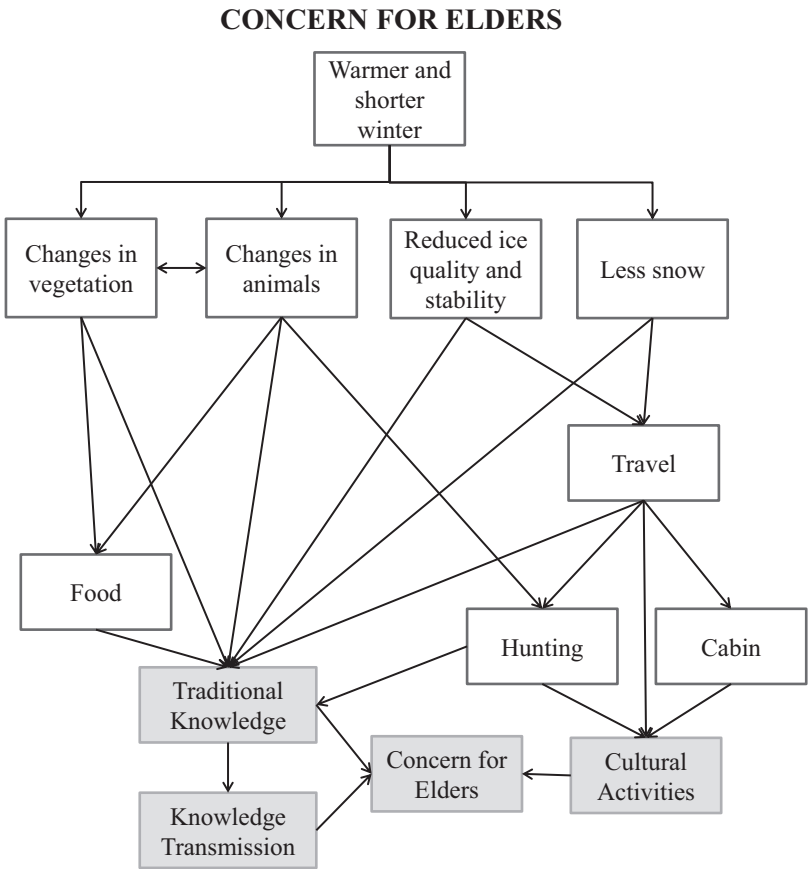

Fig. 4. A figure illustrating the relationships between weather and climate changes impacts and concerns for Elders reported by youth in the *Changing Climate, Changing Health, Changing Stories* Project, in Rigolet, Nunatsiavut, Canada (2009–2010).

social importance to youth (Fig. 5). In particular, anticipation for the winter season and its activities was a common feeling among youth in the community, with many youth identifying winter as "the best season of the year."

The challenges facing Inuit culture due to impacts of climatic and environmental change evoked strong feelings of loss for those interviewed, as they perceived that valuable aspects of their lifestyle were being disrupted. Although youth are currently living with changes, they were uncertain about how the future will unfold without the ability to participate in these familiar practices. For many youth, "it's hard to imagine something different." The value of Inuit culture, of which the environment is a vital part, and the importance it holds to youth identity was described in this statement by a female youth:

> I can't imagine not being Inuit, like I wouldn't feel like I was someone or something. I feels like when you are, you can tell someone your something, like if I wasn't Inuit what am I? Like you belongs with them and you're, you're, you're something different and you're like, when you does your cultural things like going out to the cabin and hunting and stuff it makes you feel more Inuit and you feels like you belongs like. . .you're someone different. . .

Much of this cultural identity is dependent on ice and snow, and therefore threats to the environment translated into direct challenges to culture. As one young woman explained:

> The main thing when people think of the [Canadian] Inuit: snow and going hunting on the ice. That is not going to be anymore. Definitely, like the Inuit people and people who live in the North, that is their life. There is going to be big changes. . . Definitely going to be a big change. Inuit culture is going to be like 360 because and that is all we did was go off on the ice and hunting, fishing.

4.4. Emotional impacts of climatic and environmental changes

Youth observations and perceptions of climatic and environmental changes also corresponded to strong emotional reactions (Fig. 6). As one young female participant in her early teens explained:

> [When people talk about changes in weather, it] makes me mad because they're always saying it and we already know and they keep repeating it. It's annoying; it just makes it worse because it's not going to change if they keep complaining. It's just a waste of time.

These feelings of anger and frustration triggered a sense of helplessness, but translated into an awareness of the need to cope with the changes. Comments from youth such as, 'there's nothing you can do,' 'just let it happen,' and 'hope for the best,' expressed feelings that were underpinned by intense emotional impacts. In addition, when faced with climatic and environmental changes, community members found themselves waiting for the winter conditions that they expected and needed to go out on the land. This waiting caused anxiety and exhaustion in the community. As one female teenager described:

> It's just tiring, it's really tiring waiting for snow when it's not coming, or a freeze-up when it's really long to wait for.

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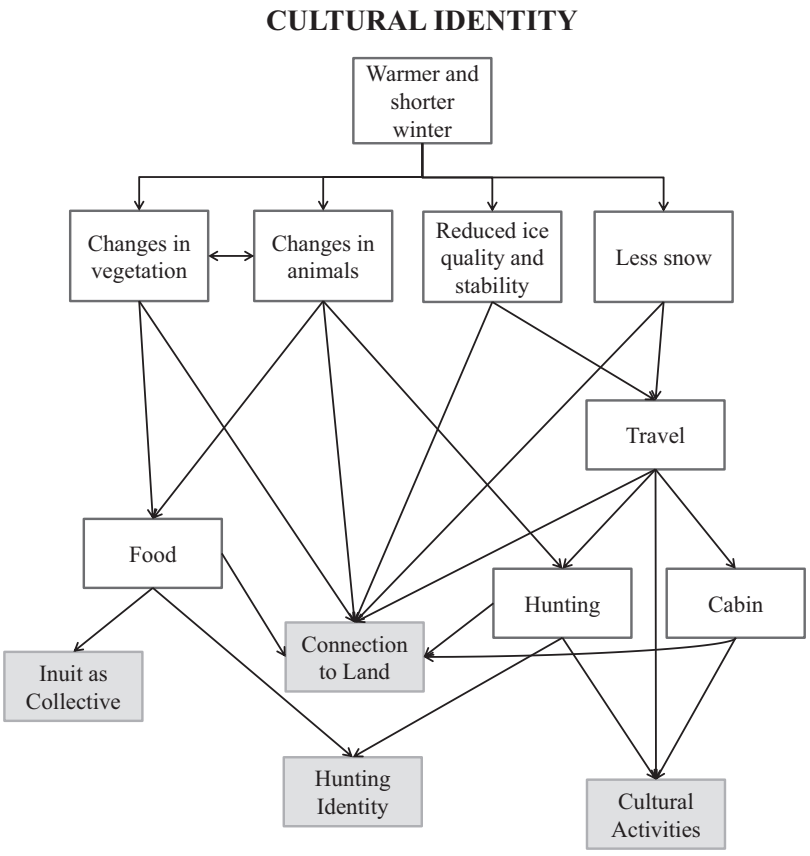

Fig. 5. A figure illustrating the relationships between weather and climate changes impacts and cultural identity reported by youth in the *Changing Climate, Changing Health, Changing Stories* Project, in Rigolet, Nunatsiavut, Canada (2009–2010).

Furthermore, the rate at which changes are occurring was alarming to youth. Since youth have less experience on the land than Elders, witnessing the rapidity of change and variability over their lifetimes caused youth to worry about what another decade will bring, and the speed and degree to which change might occur. This concern was voiced in a comment by a young female participant:

> It kind of worries me how fast it is going to happen. Are my kids going to be able to go off to the cabin in the wintertime on skidoo? I love travelling on skidoo more than the speedboat. It seems that might not happen when I get old. It seems like it is happening so fast.

Stemming from observed impacts and implications, as well as feelings of helplessness and anxiety over the future variability, youth felt genuinely afraid about the changes that define their lives—past, present, and future. Uncertainty about the future led the participants to speculate and worry about what will come in the future. These emotions were voiced in many comments, and exemplified by this statement shared by an avid hunter and trapper:

> I found that [this past winter] everyone was always talking about the weather, like that was the main conversation all the time and I think everyone's worried [about] next winter, wondering what it'll be like...[When I go out on skidoo I wonder will I] go out on the bay on skidoo ever again for the rest of my life? Was that the last time?

4.5. Envisioning adaptation in the future

The youth in this study were aware that their generation would have to adapt and cope with continuing changes in land, sea, ice, snow, wildlife, and vegetation. Although adaptation was not initially part of the focus of the interview, several participants brought up suggestions for adaptation strategies. From experience, youth expected the snow and ice conditions to continue to worsen, which would restrict or eliminate the possibility to travel by snowmobile. As such, and although undesirable to most youth interviewed, adaptation strategies such as considering other modes of transportation were being considered. As one participant stated:

> I would say they are going to do everything in speedboat rather than on skidoo, which I do not really want. That is a part, a big part of our lives, travelling on skidoo. I was thinking about whenever we go to get wood, it is in the wintertime. I was thinking about that earlier, how are we going to get wood? I do not know if it is going to be still cold or what. But it is going to be different travelling, a lot different. We are going to need roads I guess [to get to] different communities for sure if you want to go off. Or even to the cabin, we are going to need roads, like everything is going to change I guess, or that is what I think.

Another youth-identified adaptation strategy to respond to the difficulty in travel to the cabin was to build cabins closer to Rigolet to avoid traveling far distances over unstable ice:

> I think people might start building their cabins closer to home so they can go on skidoo. My dad wants to build a cabin just when you get out of the portage up to Double Mer, up in the path end... That is somewhere where he can go whenever they want, like my parents, and it is just walking distance.

5. Discussion

Based on their lifetime of experience on the land, combined with knowledge gained from family and community members,

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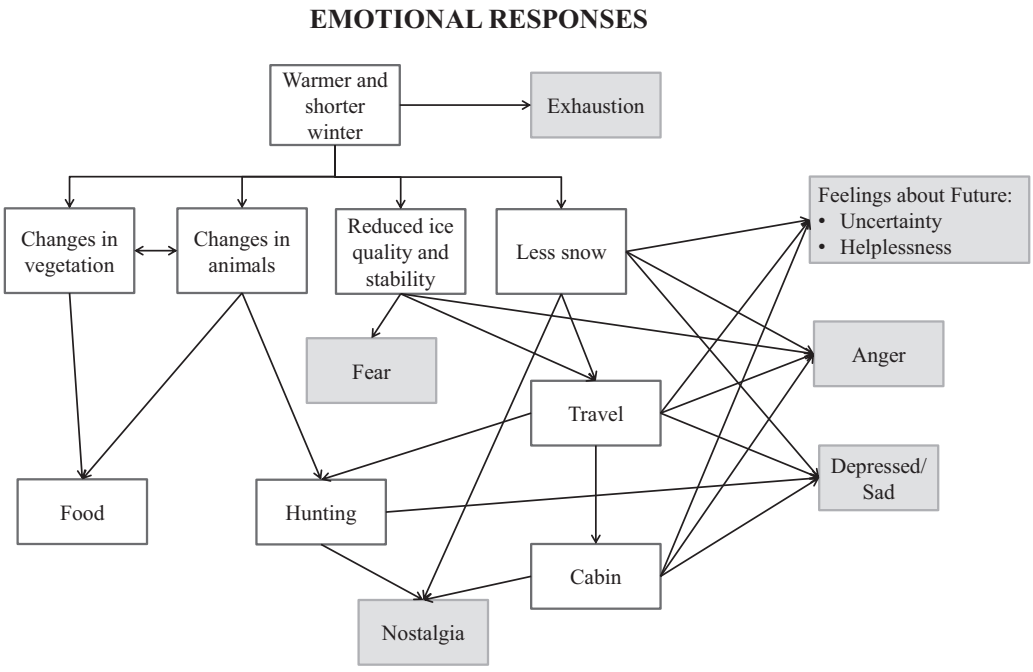

Fig. 6. A figure illustrating the relationships between weather and climate changes impacts and emotional impacts reported by youth in the *Changing Climate, Changing Health, Changing Stories* Project, in Rigolet, Nunatsiavut, Canada (2009–2010).

Inuit youth in Rigolet were very aware of climatic and environmental changes in their region. Youth have observed changes in ice formation periods, quality, and stability, which impact the ability to hunt and travel safely on the land. They made connections between changes in water and land conditions to the changes in animal and bird migration, and they recognized that warmer temperatures resulted in more rain and less snow, again impacting hunting and travel. Youth in this study identified that all of these changes affect health, well-being, food security, and financial security. These youth climate observations are similar to observations reported by adults in the community (Cunsolo Willox et al., 2011, 2012) and the Nunatsiavut region (Furgal and Seguin, 2006; Nickels et al., 2006), and are consistent with findings from Elders, adults, hunters, and trappers from throughout the Canadian North (Fox, 2002; Krupnik and Jolly, 2002; Ford et al., 2006, 2008, 2010c; Furgal and Seguin, 2006; Nickels et al., 2006). Having spent the majority of their lives participating in activities on the land and learning from friends and family in the community, young people have developed, and continue to develop, an awareness of these changes in the land from lived experience.

Past literature has indicated that Elders are concerned about youth's ability to cope with future environmental and climatic challenges facing Inuit youth in Canada (Ford et al., 2006; Nickels et al., 2006), and other Northern research has suggested that youth are not willing or prepared to assume leadership roles in terms of environmental management (Schlag and Fast, 2005). Youth in Rigolet were very aware of the potential for future climatic and environmental changes and understood that adaptation will be necessary; as such, youth should be provided opportunities to take an active role in addressing the implications of these changes. Indeed, in other disciplines such as disaster risk communication and management, the importance of youth in decision making and raising awareness has been emphasized (Mitchell et al., 2008; cf. Hood et al., 2011). It is therefore important for researchers, policy makers, and practitioners to understand, value, and actively include youth observations and perceptions of climatic and environmental changes.

Inuit youth in Rigolet were not only observing changes, they were also witnessing the socio-cultural impacts of climate change for themselves and their community. The activities and environment that shape Inuit identity has changed throughout young peoples' lifetimes, and youth expected these changes to continue. As such, in the face of climate change, the future ability for youth to link Inuit identity to the same historical traditions and environment was questioned in Rigolet. Youth were concerned about how they will create an identity given the implications of the uncertainties surrounding their climate and environment. As one young woman expressed: "If I wasn't Inuit, what am I?"

Youth were also concerned about the continuation of traditional knowledge, of losing land-based skills, and of a weakening of their ability to share and pass on traditions to future generations. Previous research has documented a generational loss of traditional ecological knowledge and wisdom (Krupnik and Jolly, 2002; Ford et al., 2006; Pearce et al., 2010), and it is likely that continued climatic and environmental change could have an increasing impact on this loss of knowledge and wisdom. Other research has found that more senior community members were concerned that youth do not value, access, or utilize traditional ecological knowledge (Alessa et al., 2008). Our research suggested, however, that Rigolet youth valued traditional ecological knowledge and understood the implications that climatic and environmental change hold for the sharing and practicing of this knowledge. Youth in this study indicated that they were already seeking opportunities to learn from their parents and grandparents about local ecological knowledge, and hunting, trapping, and fishing practices. Therefore, further research should investigate how the loss of traditional ecological knowledge could impact the knowledge base and future identity of young people, and work to develop potential adaptation strategies that purposefully and systematically engage youth in programmes that focus on land-based learning opportunities with parents, grandparents, and community Elders.

In the face of climatic and environmental changes impacting Inuit identity and traditional knowledge, youth reported experiencing a variety of emotions, such as fear, worry, stress,

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anxiety, anger, and frustration. Youth were also concerned for their Elders and seniors, and worried about how Elders and seniors are coping and feeling in the face of such changes in weather and climatic conditions. As one interviewee explained (as stated in Section 4.2), her elderly father "must feel like he just got picked about at one place and put right and somewhere like on a different planet." Negative feelings such as anxiety and distress related to changes in the environment have the potential to prompt mental health problems and consequently lead to other problems such as substance abuse and depression (Fritze et al., 2008; Hunter, 2009; Berry et al., 2010; Cunsolo Willox et al., 2011). Furthermore, if feelings of worry, stress, anxiety, anger, and frustration are shared among individuals, it could potentially affect the overall mood and atmosphere in the community. A climate of fear, anger, and frustration in the community could potentially decrease the resiliency of youth and affect their motivation to adapt (Cunsolo Willox et al., 2011). To create successful adaptation strategies, further research should investigate linkages between mental and emotional health and adaptive capacities among youth populations.

The majority of published adaptation literature has yet to explicitly recognize youth as important stakeholders or to actively engage them when identifying priorities, recommendations, and opportunities for enhancing adaptive capacity in the North in the face of a changing climate (Ford et al., 2010c). Globally, human dimensions of climate change researchers have called for work and research to include meaningful dialogue between stakeholders, improve the decision making environment, integrate climate change into long term strategic planning that considers political, mental, emotional, and socioeconomic factors, and increase knowledge and awareness about climate change impacts (Grothmann and Patt, 2005; Smit and Wandel, 2006; Patt and Schröter, 2008; Van Aalst et al., 2008; Young et al., 2010; Pouliotte et al., 2009; Westerhoff and Smit, 2009; Ford et al., 2010b,c; Ford and Pearce, 2010; Kuruppu and Liverman, 2011; Cunsolo Willox et al., 2011). These recommendations are broad in scope and should be used to develop or adapt research and policy in a way that reflects and respects community or regional values and local contexts. For instance, in Rigolet, youth can be engaged in each of these recommendations, but can also enhance the process and help create locally appropriate, culturally relevant, and sustainable adaptation strategies and policy. On a local level, the community council (Rigolet Inuit Community Government) should consider involving youth in developing locally appropriate and effective ways to communicate information about climate change impacts to community members, and the regional Inuit government (Nunatsiavut Government) should consider actively engaging the youth council (Rising Youth Council) and young representatives from all the communities to participate in regional decision making. Not only can youth contribute unique and important perspectives, they represent the future community leaders who will carry out adaptation strategies. Therefore, adaptation strategies that are developed in collaboration or partnership with youth are more likely to be effective and sustainable, since youth are more invested in the strategies, and will be in the position to advocate for these strategies in years to come.

Intentionally engaging youth in the research process also provides a platform for invaluable learning and training for both youth and researchers (Brook et al., 2009), and results in more robust data and analysis. A more engaged, knowledgeable, and skilled youth population is not only less susceptible to the socio-economic and socio-psychological impacts of climate change, but is also a benefit for any community. Through encouraging youth involvement in community-engaged and participatory research, projects and datasets will be more complete, rich, and representative, and thus ultimately mutually beneficial for communities and researchers.

Inuit culture has always been highly adaptable and dynamic; indeed, Inuit are an incredibly resilient people, whose culture and livelihoods are characterized by continual social, environmental, and economic change (Wenzel, 2009). Climate change is a new and additional stressor, and the rapidity of climatic changes experienced in Inuit regions has created an additional challenge to cultural activities, and social, economic, and health well-being (Cunsolo Willox et al., 2011, 2012). This study highlights that youth recognize climate change as an additional challenge on top of these other non-climatic transformations that are contributing to changes in their culture and lifestyle. Despite these challenges and the resulting social, economic, health, and cultural implications, youth recognize the importance for adaptation and the need for community-based adaptation strategies to meet the challenge of climate change, and have the knowledge and skills to participate as active stakeholders in climate change research and adaptation planning.

While this exploratory case study is from one small Inuit community in the Canadian North, the findings provide the foundation to direct future youth-related climate change and adaptation research. Specifically, further research should include exploring differences in youth perceptions based on gender, ages, livelihood activities, geographic location, and socio-economic situation. Further research in multiple communities could allow for regional comparisons and also a deeper understanding of youth observations and perceptions, and how youth perceptions and ideas about climate change impacts are shaped. Research should also include investigating opportunities and barriers for youth participation, understanding how youth participate in decision-making processes, and what venues and platforms are currently available or could be developed to allow greater youth participation in this field. Previous work with young people in the fields of disaster risk perception and communication provide an excellent foundation that could guide climate change vulnerability and adaptive capacity research with young people (Ronan et al., 2001; Babugura, 2008; Bartlett, 2008; Peek, 2008; Tanner et al., 2009; Tanner, 2010; Hood et al., 2011). In addition, future research could be informed by, expand upon, and further develop existing theories of youth development in Northern areas, youth participation theory, models of risk perception and communication, models of adaptation processes, and concepts of inclusion and marginalization within the context of climatic and environmental change.

6. Conclusion

Northern community-based research must not undervalue the contributions from youth or forget the importance of involving—and more importantly, engaging—Inuit youth. In the rapidly changing climate of the North, it is the responsibility of communities and researchers to create innovative and effective opportunities in research, policy, and education where youth can develop the skills to become the leaders in a future they will inherit from the current generation. To an even broader extent, environmental changes around the world are impacting, and will continue to impact, youth. In the face of these climatic and environmental challenges, youth are experiencing the changes, and have the potential to contribute to research and policy in these areas. There is, therefore, a growing need to focus on youth, engage them in dialogue and research, and provide educational opportunities and skills-training for youth to gain the needed knowledge to participate fully in mitigation strategies, adaptation plans, and the futures of their communities across the Circumpolar North and throughout the globe. The importance of involving youth in climate change research and policy on local, regional, national, and international levels is a message that could well be applied to broader international contexts, and should be heeded by those

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planning and participating in climate change and adaptation research and work.

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