

**The Impacts of Climate Change on the Health and Well-being of the
Peoples of Whitefish River First Nation, Ontario**

by

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Abstract

Indigenous communities in Canada are some of the most vulnerable to the impacts of climate change. Research has tended to focus more on the Arctic region in Canada and more recently, a need to understand how climate change is impacting First Nations communities in the Great Lakes region has emerged. Whitefish River First Nation is an Anishinaabe community located on the northern shores of Georgian Bay in Lake Huron in the Great Lakes Ecosystem of Ontario. This qualitative research study, by working with the Whitefish River First Nation aimed to address how a First Nations community's health and well-being is being impacted by climate change. Indigenous research methodologies and environmental justice concepts were used to frame this research study. Through focus groups with community members and Elders and key informant interviews, information and knowledge from participants of Whitefish River First Nation was gathered and analyzed. Impacts to the community's health and well-being as a result of climate change and other environmental stressors was shared. Based on the discussions and adaptation strategies that emerged from the community, this paper outlines recommendations for how to move forward and address the impacts of climate change on First Nations communities in the Great Lakes region.

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Foreword

In the course of my Masters in Environmental Studies, I wanted to explore how climate change affects communities' health and well-being, especially vulnerable populations that have contributed little to the problem of climate change but are facing the greatest burdens. In line with this, my Plan of Study (POS) is focused on Climate Justice and Community Organizing. The impacts of climate change vary globally and how climate change is experienced locally is best assessed by understanding how its impacts are experienced by communities at the local level. This is why in my POS there is a focus on communities and how they experience climate change. Environmental justice was integral to my POS as it offered a framework for highlighting the unequal distribution of the impacts of climate change being experienced by vulnerable populations that have contributed the least to global greenhouse gas emissions. Through the efforts of this Major Paper, I have had the opportunity to work with a community to apply what I set out in my POS. Working with Whitefish River First Nation, this research study aimed to address how climate change is affecting their health and well-being. In this work, I have grasped a better understanding for the ways that communities can work at the local level to address the impacts of climate change. Also, working with Whitefish River First Nation, I was able to see community organizing around climate change issues as the community is focusing their efforts on addressing climate change and environmental impacts in their environment. Through this Major Paper, I have been able to draw on each of the components laid out in my POS and see firsthand the power that communities hold in being a driving force towards addressing climate change and environmental injustices.

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Chapter 1: Introduction

Different parts of the world will be challenged with diverse impacts of climate change, and this is especially concerning given the role the environment plays as a determinant of human health and well-being (Patz, Gibbs, Foley, Rogers, & Smith, 2007). Understanding how communities will be affected by climate change can help to create effective adaptation strategies and cope with the challenges brought on by this global problem (Ebi & Semenza, 2008). In Canada, Indigenous communities are seen to be some of the most vulnerable to the impacts of climate change owing to a number of factors (Ford, Berrang-Ford, King, & Furgal, 2010). Ford et al. highlight some of these factors and state “the existing burden of ill-health increases the sensitivity of Indigenous peoples to the adverse impacts of climate change, which combined with a proportionally higher dependence of many Indigenous livelihoods on the environment, spiritual and cultural ties to the land, demographic trends, and experience of marginalization, makes Indigenous peoples particularly vulnerable” (2010, pp. 668–669). Colonialism and institutionalized discrimination are also factors that affect how climate change is experienced by Indigenous peoples (Whyte, 2014). However, most of the climate change research in Canada has focused on communities living in the northern Arctic region (Healey et al., 2011; Peace & Myers, 2012). There is far less research for the Great Lakes region in Canada, where most of the population of Canada and United States live. In recent years more attention has been devoted to southern Canada to address this gap in research and understanding of climate change impacts on these communities.

In part to address this gap in knowledge, I have collaborated with the Whitefish River First Nation community to better understand how a First Nations community in the Great Lakes Region of Ontario is being impacted by climate change. This will help to address possible adaptation strategies to cope with the impacts on the environment and health of the people.

Knowledge Gaps

Much of the research on climate change issues in Canada has focused on impacts to the northern Arctic region and how communities there are being affected (Healey et al., 2011; Peace

& Myers, 2012; Petrusek MacDonald, Harper, Cunsolo Willox, Edge, & Rigolet Inuit Community Government, 2013). There are many First Nations communities living around the Great Lakes (**Figure 1**) in Ontario, approximately seventy-five (Assembly of First Nations, 2011), however there is not as much information available on how climate change is impacting these communities.

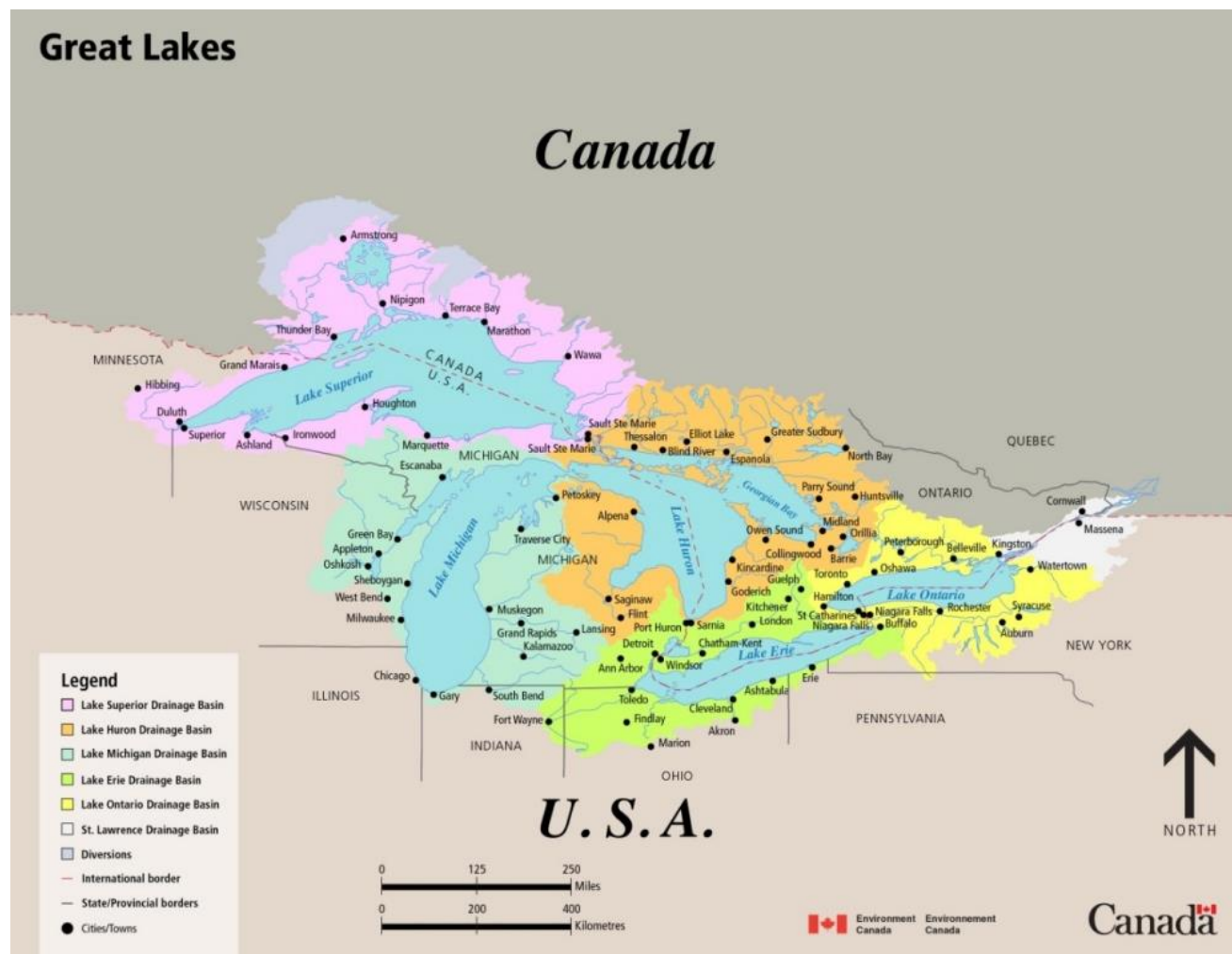


Figure 1 Map of Great Lakes (Government of Canada, 2017b). Whitefish River First Nation is part of the Lake Huron drainage basin and the closest town to the community that is visible on this map is Espanola.

There is also a need for interdisciplinary research that looks at how communities and localities are being impacted by climate change in order to cater adaptation strategies for their needs (Ford et al., 2010). Since less research has focused on First Nations communities further south of the Arctic region, especially around the Great Lakes in Ontario, there is less data and research available to assess how these communities will be affected. This knowledge gap is a challenge when it comes to creating effective adaptation strategies. Pearce et al. state that “community

collaboration in community–environment research is important because effective research cannot be done without community involvement; it is difficult, if not impossible, to identify who is vulnerable to what stresses, and in which way and why, without community collaboration” (2009, p. 12). Through working with the Whitefish River First Nation community, this project aims to address this knowledge gap and understand how climate change is impacting the health and well-being of a First Nations community in the Great Lakes region of Ontario.

Research Question

This research project emerged through the need to understand how the Whitefish River First Nation community is being impacted by climate change. Also, to address the gap in knowledge around how First Nations communities south of the Arctic circle and around the Great Lakes region were being impacted by climate change.

The research question that frames this research project is:

How is climate change impacting the health and well-being of the Whitefish River First Nation community?

Research Objectives

The three objectives of this research are:

1. To address the gap in knowledge around the impacts of climate change on First Nations communities in the Great Lakes region (south of the Arctic circle)
2. To gather the perceptions of the Whitefish River First Nation community members on how they are being impacted by climate change
3. Learning from the experiences and traditional ecological knowledge from the people of Whitefish River First Nation to identify potential adaptation strategies that are suited for the needs of their community

Chapter 2: Literature Review

The following chapter is a literature review to support this research study. It was important to have a thorough literature review to lay the foundation for this research paper. In line with Indigenous research methodologies, an in-depth literature review was also necessary to capture and summarize information related to climate change impacts and the broad ways in which it affects human health and well-being. To address the objectives of this research, this literature review was written to ensure that it provides a thorough summary of climate change issues to aid the Whitefish River First Nation community in their climate change mitigation and adaptation endeavors.

Climate Change

Climate change is regarded as one of the greatest problems of the 21st century (Costello et al., 2009). In 1992, the United Nations stated climate change “means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.” (United Nations, 1992). The Intergovernmental Panel on Climate Change (IPCC) is a body that focuses on assessing the scientific aspects related to climate change and its impacts. The IPCC states that climate change “refers to a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity” (IPCC, 2007, p. 30). Both the United Nation’s and the IPCC’s definitions highlights the connection between climate change and human activity.

Although climate variability can naturally occur, the current warming trends seen are unique in terms of the rapid rate of the rise in the global temperature (IPCC, 2014a). The IPCC states that:

anthropogenic greenhouse gas emissions have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years. Their

effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are extremely likely to have been the dominant cause of the observed warming since the mid-20th century (2014b, p. 4).

Anthropogenic activities, such as the use of fossil fuels, has resulted in an increase in atmospheric greenhouse gases (IPCC, 2007; Klein, 2014; Sandberg & Sandberg, 2011). Development since the industrial revolution has been built on fossil fuel consumption for energy (IPCC, 2007). Burning fossil fuels such as coal to heat homes or gasoline to power cars contributes to the increased concentrations of greenhouse gases in the Earth's atmosphere. These gases in the atmosphere trap more heat which has led to climate change and its impacts being felt across the globe (IPCC, 2014a).

Climate change is a problem that has emerged because of many contributing factors (IPCC, 2014a; Klein, 2014). Naomi Klein (2014) addresses how climate change is rooted in the current capitalist economy. Tackling the issue of climate change cannot be done with a simple solution to stop the release of fossil fuels or change peoples' behaviours, but must address the current capitalist system that favours corporations over communities (Klein, 2014). However, as Elinor Ostrom (2010) has described, addressing the issue of climate change requires a multi-level approach and should involve all actors working together at different scales. Ostrom describes this as a polycentric approach, and states that "instead of the benefits derived from reducing greenhouse gases existing only at the global level, multiple benefits are created by diverse actions at multiple scales" such as at the local level to tackle the issue of climate change (Ostrom, 2010, p. 553). This includes not only global initiatives or agreements between global actors like the Paris Accord, but also small-scale initiatives such as adaptation strategies implemented at the community level to cope with the impacts of climate change (Ebi & Semenza, 2008; Ostrom, 2010). For the purposes of this paper, it is important to understand how community-level initiatives are necessary to address the issue of climate change and to help adapt to its impacts.

Even if the further release of greenhouse gases into the atmosphere was curbed, the current concentrations present in the atmosphere have already led to a warming of the Earth's surface (IPCC, 2014a). The process for greenhouse gases to be sequestered through carbon sinks

such as the ocean takes a long time. According to the IPCC, only 40 percent of the atmospheric concentrations of greenhouse gases that account for human activity has been sequestered by sinks such as forests and the ocean (2014a, p. 45). This is evident given how the current concentrations of greenhouse gases in the Earth's atmosphere have already had a profound impact on the planet. Many studies have and continue to assess how climate change is impacting the planet from rising sea levels to droughts (Khedun & Singh, 2014).

Impacts of Climate Change

The impacts of climate change are variable from place to place and tend to disproportionately burden vulnerable populations (Khedun & Singh, 2014; Patz et al., 2007; Sandberg & Sandberg, 2011). The impacts of climate change include rising sea levels, ocean acidification, melting of ice caps and glaciers, droughts, and more frequent extreme storm events (Flannery, 2015; IPCC, 2014a; Khedun & Singh, 2014; Patz et al., 2007; X. Wang, Huang, & Liu, 2016). The IPCC (2014a) states that climate change is impacting both natural and human systems and researchers have observed strong influence of climate change on natural systems around the world. For example, rising sea levels threatens the existence of low-lying island nations and coastal regions such as the Maldives in the Indian Ocean (Harrington, 2010; Khedun & Singh, 2014). The Maldives has had to take measures to protect its shoreline from rising sea levels and erosion by building sea walls (Khedun & Singh, 2014). In other parts of the world, droughts threaten agricultural activity and the global food system (Government of Canada, 2012b).

With rising temperatures, Canada is predicted to experience longer growing seasons which should increase the food supply (Government of Canada, 2012b). However, there are also concerns that droughts and extreme storm events can end up decreasing agricultural yields (Government of Canada, 2012b). "The last 50 years have seen the fastest growth rate for atmospheric CO₂ in the entire geological record" (Flannery, 2015, p. 56). Climate modelling has been used numerous times to help predict how climate change will impact various part of the world, but as Naomi Klein expresses, most often climate modelling underestimates just how much of an impact climate change will have (Klein, 2014). Also, climate models can only predict what may occur given different scenarios, and adaptation requires being prepared for different

impacts of climate change (Klein, 2014). For instance, it would not suffice for Canada to plan in terms of how rising temperatures can improve agricultural yields, but must also prepare for droughts or extreme storm events (Government of Canada, 2012b; Klein, 2014).

Climate change research has often focused more on how it is impacting Northern Canada than other parts of the country (Ford, Pearce, Duerden, Furgal, & Smit, 2010; Ford, Smit, & Wandel, 2006; Healey et al., 2011; Parkinson, 2010; Pearce, Ford, Cunsolo Willox, & Smit, 2015). With warmer temperatures, sea ice melt is one of the greatest impacts in the Arctic region (IPCC, 2014a; Klein, 2014). It is estimated that if the planet warms to 4 degrees Celsius above the pre-industrial average, it could mean an Arctic with no sea ice during parts of the year (Flannery, 2015; Klein, 2014). Not only is this changing the natural systems in the Arctic and impacting Arctic species that rely on sea ice, but it also has an impact on human political and economic systems as the opening of the Arctic draws attentions for fossil fuel exploration and new trade routes (Borgerson, 2008). Countries such as Russia, Canada, and the United States of America are laying claim over parts of the Arctic to gain access to possible oil exploration in the near future (Borgerson, 2008).

In Tim Flannery's book *Atmosphere of Hope* (2015), he explains how adapting to climate change is an ongoing process and how different communities around the world are finding unique ways to cope with the challenges they are facing as a result of climate change. The impacts of climate change are so widespread yet differ from place to place which often requires adaptation measures at the community-level along with systemic changes (Flannery, 2015; Klein, 2014; Ostrom, 2010). For island nations facing an impending disappearance to the land they call home, extreme measures such as purchasing land in other countries has been proposed such as the case in the Maldives (Harrington, 2010). In a vast country like Canada, the needs of communities differ from place to place, as the impacts of climate change experienced vary immensely from droughts, to melting sea ice to extreme storm events (Government of Canada, 2012b).

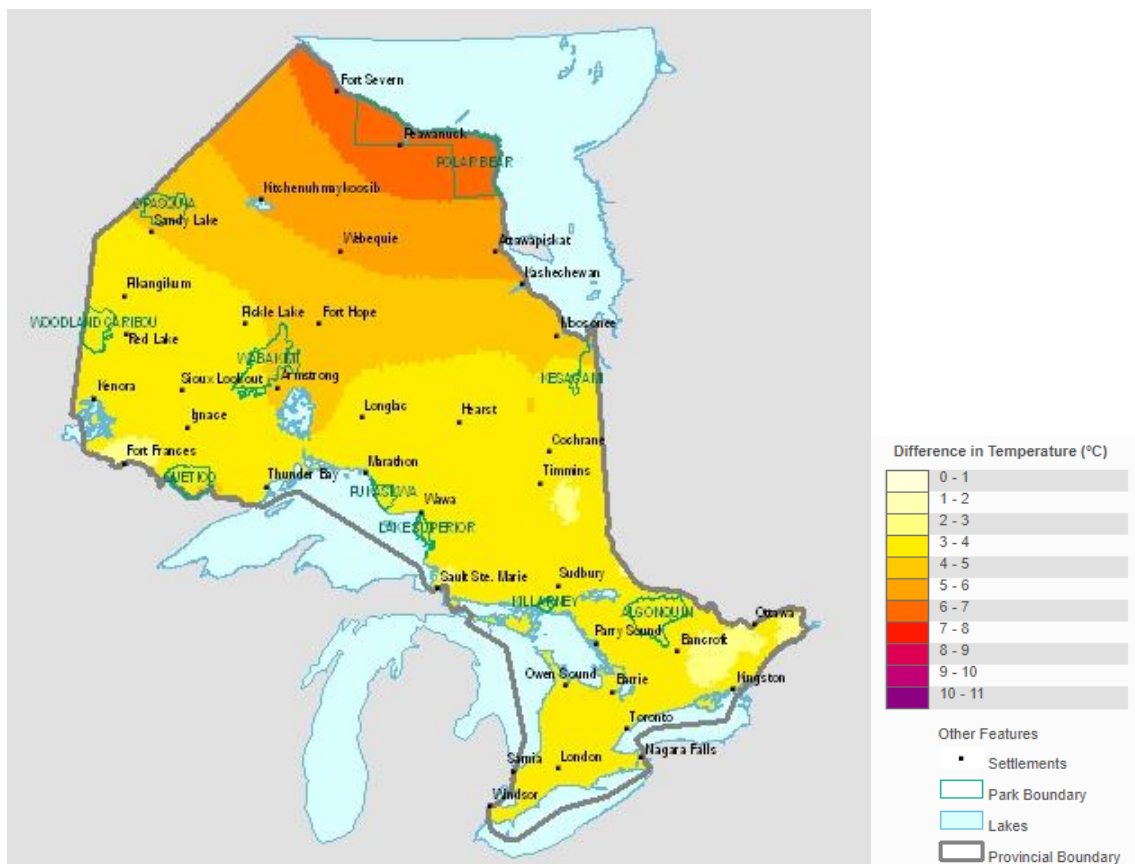


Figure 2 "A2 Scenario Average Winter Temperature Difference Between 1971-2000 and 2041-2070 in Ontario" (Government of Ontario, 2007)

Approximately, one-third of Canada's population inhabits the Great Lakes Basin (Wang et al., 2011). The projected impacts of climate change to the Great Lakes region will affect lake ice cover, surface water temperature, and more extreme and severe weather events such as droughts (McDermid et al., 2015; Wang et al., 2011). **Figure 2** is a map of Ontario with projected changes given a scenario of higher greenhouse gas emissions and shows the projected rise in average winter temperatures for 2041-2070 compared to the 1971-2000 average (Government of Ontario, 2007). All across Ontario, the average winter temperature is expected to be greater than the average in 1971-2000, showing that under this scenario Ontario is projected to have warmer winters (Government of Ontario, 2007). **Figure 3** shows a map of Canada with Aboriginal communities represented by dots and the projected mean annual temperature rise across the country for 2041-2060 compared to 1941-1960 (Ford et al., 2010). The scenario models used to predict the change in temperature across Canada shows that the

mean annual temperature is expected to rise. **Figure 3** highlights the numerous Indigenous communities that live along the Great Lake Basin (Ford et al., 2010). Climate projections for Canada tend to show a warming trend across the provinces and territories (Ford et al., 2010). The warming of the planet can also have other consequences and the impacts of climate change can be broadened to include the impact on human health and well-being through the spread of diseases or the effects on people's mental health as a result of changing environments (Costello et al., 2009).

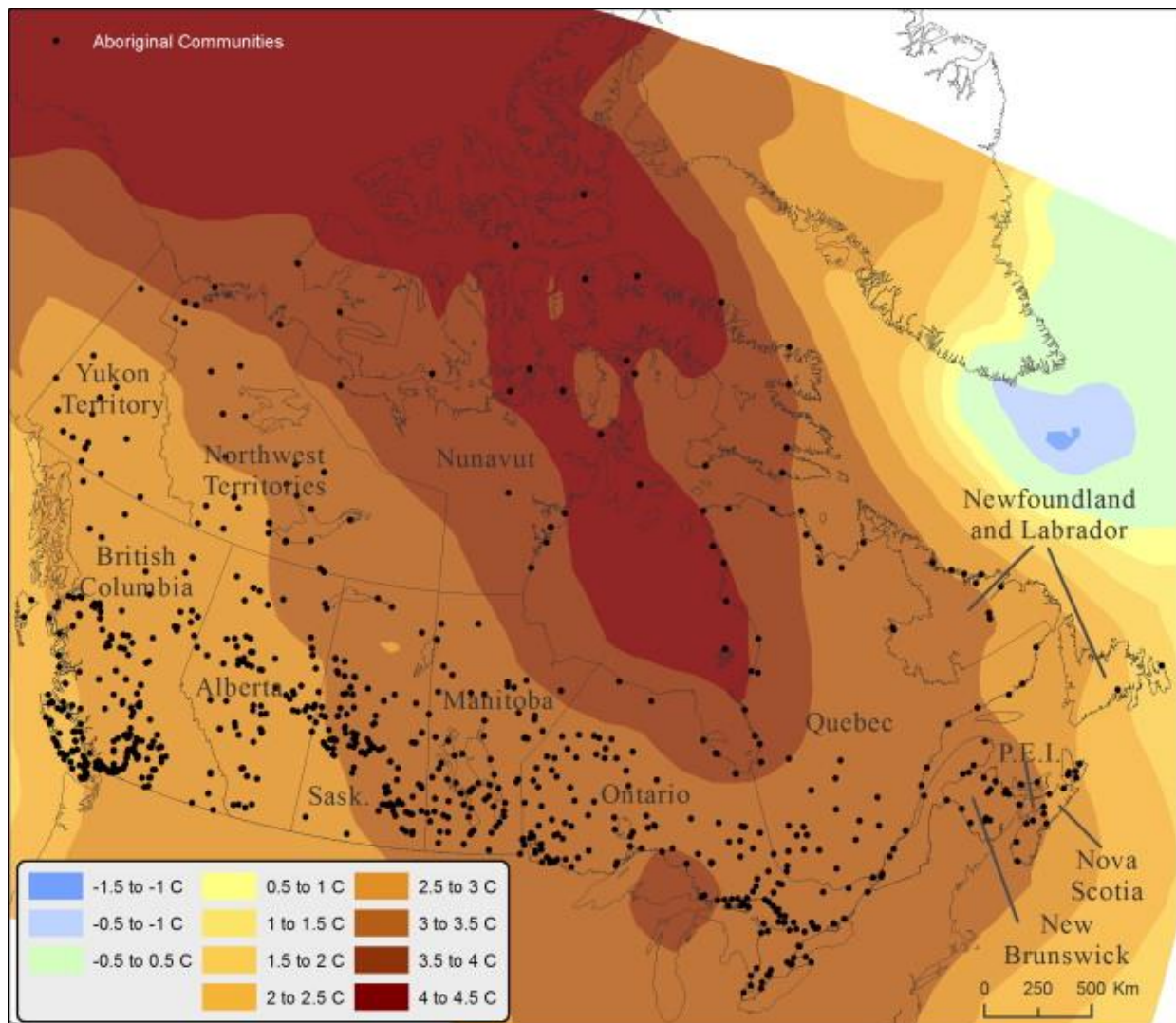


Figure 3 "Projected change in mean annual temperature across Canada by 2041–2060 compared to 1941–1960, based on A1B emissions scenario (data from CCCma). Temperature projections are superimposed on the map of reserve and territory based settlements." (Ford et al., 2010, p. 672)

Climate Change, Health and Well-being

Human health can be impacted by climate change through a number of different ways. The IPCC categorizes how climate change can affect human health into three pathways (Smith et al., 2014). The three pathways include: “directly through weather variables such as heat and storms; indirectly through natural systems such as disease vectors; and pathways heavily mediated through human systems such as undernutrition” (Smith et al., 2014, p. 716). For example, extreme storm events or floods not only pose a direct risk to human health, but indirectly through experiences that could act as stressors for mental health issues (Berry, Bowen, & Kjellstrom, 2010; Costello et al., 2009; Khedun & Singh, 2014). Khedun and Singh (2014) state that after disasters such as floods, it could take many years for the people in the community to recover and many people could suffer from mental health issues years after the event.

The effect of climate change on human health varies regionally and existing vulnerabilities in different communities and regions can factor into how human health is impacted (Berry et al., 2010; Patz et al., 2007; Smith et al., 2014). Communities that are already facing issues of inequality, poverty, and disease are all more vulnerable to the impacts of climate change (Ford et al., 2010; Gough, Anderson, & Herod, 2016; Patz et al., 2007). Many of these underlying issues will only be exacerbated by the challenges that come with climate change (Gough et al., 2016; Patz et al., 2007). In a Government of Ontario report, it highlights that those who are elderly, chronically ill and socially disadvantaged are the people who are most vulnerable to the impacts of climate change within the province (Gough et al., 2016). In Canada, the stark health inequities between Indigenous people and non- Indigenous as a result of historical and systemic issues is likely to worsen as a result of climate change (Ford et al., 2010; King, Smith, & Gracey, 2009; Richmond & Ross, 2009). Location can also be a contributing factor for being more vulnerable to climate change given the variations in how climate change impacts different places (Haines, Kovats, Campbell-Lendrum, & Corvalan, 2006; Smith et al., 2014). For example, low-lying coastal communities and cities are particularly vulnerable to flooding (Haines et al., 2006).

Another challenge related to human health is that existing global disease burdens and health inequities could be exacerbated as a result of climate change (Patz et al., 2007). For

example, a vector-borne disease that is of concern for being effected by climate change and could potentially increase the number of cases given the right climatic conditions is malaria. Malaria kills an estimated 1-2 million people each year and with climate change there is uncertainty whether cases of the disease can increase in different localities (Patz et al., 2007; Smith et al., 2014). In Ontario, Canada warmer temperatures has increased the risk for the transmission of Lyme disease, which is also a vector-borne disease (Gough et al., 2016). Lyme disease is transmitted by ticks and in southern Ontario, there have been incidents where ticks carrying the disease have been found (Gough et al., 2016; Smith, 2017). A scenario-modelling study on the impact of climate change on the spread of ticks-carrying Lyme disease in Canada predicts that ticks could spread up into northern Ontario by the year 2070 (McPherson et al., 2017; Smith, 2017). Scenarios such as this demonstrate the potential challenges that emerge as a result of climate change as people become exposed to health risks that were once not present in their environment (Smith, 2017).

Climate change is now another pressing issue for public health and requires preparedness and adaptation measures to be taken for the health challenges that may arise (Gough et al., 2016; Haines et al., 2006). “Bridging the divide between the human health and environmental impacts of climate change is the key to promoting healthy environments – both natural and built – improving health and reducing health and social costs” (Gough et al., 2016, p. 21). Understanding both existing health challenges and the ones that may arise as a result of climate change in a given area can help shed light on the health risks to communities (Berry et al., 2010).

Indigenous People, Health and Traditional Knowledge

In Canada, Indigenous peoples’ health and well-being is being impacted by climate change by many factors. Climate change impacts traditional foods of Indigenous people which in turn impacts their health as traditional foods are often more nutritious (Rosol, Powell-Hellyer, & Chan, 2016). Indigenous communities are particularly vulnerable to the impacts of climate change as it affects traditional knowledge that guides their understanding of anticipated seasonal outcomes which are now more variable with climate change (Turner & Clifton, 2009). Tobias and Richmond state that “the land is a fundamental component of Indigenous culture, and central to the health and wellness of Aboriginal societies. As a result, the physical displacement of

Indigenous peoples from their traditional lands and territories, in Canada and around the world, has negatively affected the collective well-being of Indigenous populations” (2014, p. 404). A history of assimilation policies, displacement of Indigenous communities and the history of colonialism increases their vulnerability to climate change (Tobias & Richmond, 2014). In a study by Big-Canoe and Richmond, youth spoke of the impact on culture as a result of “the loss of knowledge keepers (i.e. Elders)” (2014, p. 132). Big-Canoe and Richmond state that “the loss of Indigenous Knowledge, particularly as it relates to traditional ceremonies and spirituality was viewed as detrimental to the preservation of the Anishinabe way of life” and impacted the health and well-being of the community (2014, p. 132). The impacts of climate change pose greater pressure on Indigenous peoples’ culture, land and traditional knowledge which can have negative impacts on their health and well-being.

Environmental Justice

Environmental justice is a term that emerged from social movements in the United States to bring attention to the unequitable distribution of environmental harms for racialized and socially-disadvantaged communities (Gosine & Teelucksingh, 2008). Gosine and Teelucksingh define environmental justice as a term used “to represent, explain, and draw attention to how racialized discrimination, socio-economic conditions, and environmental health are inextricably linked” (2008, p. 4). In 1991, at the First National People of Colour Environmental Leadership Summit (1991) seventeen principles of environmental justice was adopted. Included among these principles is the need for justice not only for people but for Mother Earth (First National People of Colour Environmental Leadership Summit, 1991). These principles have stood as a guiding doctrine for many environmental justice causes (First National People of Colour Environmental Leadership Summit, 1991). Environmental justice draws attention to the inequities present in the distribution of environmental goods and harms.

In relation to climate change, environmental justice highlights the inequitable distribution of climate change impacts on the poor and disadvantaged communities and regions that have contributed the least to the problem (Klein, 2014; Patz et al., 2007; Sandberg & Sandberg, 2011). To put into perspective the inequities that exist in relation to climate change responsibility, approximately “20% of the world’s population is responsible for 75-80% of the historical

emissions that created the climate crisis” (Sandberg & Sandberg, 2011, p. 57). However, the people and places that will be the most affected by climate change are not those responsible for the greenhouse gas emission seen today (Klein, 2014; Sandberg & Sandberg, 2011).

Developing countries that have contributed far less to global greenhouse gas emissions will be the places most impacted, whereas developed countries like the United Kingdom, United States and Canada have made a far greater contribution but will not face the same drastic consequences (IPCC, 2007, 2014b; Sandberg & Sandberg, 2011). “The richest populations use up to 20 times more energy per person than those from the poorest countries” (Wilkinson, Smith, Joffe, & Haines, 2007, p. 970). As climate change is very much rooted in energy consumption, countries like the United States who emit more greenhouse gases and consume more energy bare much of the responsibility but will not will face the greatest negative impacts (Patz et al., 2007). On the other hand countries that have contributed the least to the problem are experiencing negative consequences such as increase in diseases (Patz et al., 2007). Scholars have used “natural debt” as a way to quantify and measure responsibility for greenhouse gas emissions (Patz et al., 2007). If all parts of the world’s energy consumption imitated North America’s consumption, four planet Earths would be required in order to support life and that level of energy consumption (Wilkinson et al., 2007).

Naomi Klein (2014) sees climate change as an opportunity to not only address the injustice that is occurring as a result of climate change but the injustices that have long been present in society. Klein states:

how it could be the best argument progressives have ever had to demand the rebuilding and reviving of local economies; to reclaim our democracies from corrosive corporate influences; to block harmful new free trade deals and rewrite old ones; to invest in starving public infrastructure like mass transit and affordable housing; to take back ownership of essential services like energy and water; to remake our sick agricultural system into something much healthier; to open borders to migrants whose displacement is linked to climate impacts; to finally respect Indigenous land rights – all of which would help to end grotesque levels of inequality within our nations and between them (2014, p. 7).

In Canada, environmental injustices against Indigenous communities and their ignored rights needs to be seen through a climate justice framework as the impact of climate change threatens

not only their environments but ways of life (Ford et al., 2010; Haluza-Delay, 2007; King et al., 2009). Although, Indigenous peoples in Canada live in a so-called “developed country” or “rich country” that is responsible for current emissions, the conditions on many reserves are akin to developing countries with little to no access of clean-drinking water (Ford et al., 2010; Haluza-Delay, 2007; King et al., 2009). There is an “utter disconnect between who has caused the crisis and who is living and will live its worst effects” (Sandberg & Sandberg, 2011, p. 57).

Acknowledging the unequal distribution of the impacts of climate change and who is responsible for increased atmospheric concentrations of greenhouse gases is necessary not to address the injustice in the distribution of environmental burdens but to enforce those to take responsibility and act on it (Gosine & Teelucksingh, 2008; Sandberg & Sandberg, 2011).

Indigenous Approaches to Environmental Justice

Indigenous knowledge systems and worldviews can greatly differ from mainstream Western ways of thinking (Baskin, 2016; Kovach, 2009). Gosine and Teelucksingh (2008) draw attention to how the environmental justice movement’s mainstream representation can exclude racialized people and their struggles for equity. In line with this, Indigenous approaches to environmental justice diverge from Western views and tends to be broader in scope. McGregor describes environmental justice from an Anishnaabe worldview:

An Anishnaabe understanding of environmental justice considers relationships not only among people but also among all our relations (including all living things and our ancestors). Environmental in-justice, then, is not only inflicted by dominant society upon Aboriginal peoples, people of colour, and people in low-income neighbourhoods but also upon Creation itself (McGregor, 2009, p. 28).

This view of environmental justice goes beyond academic and Western perspectives of how it is defined. Environmental justice from an Anishnaabe perspective is broadened to include all living things beyond humans, to also include plants and animals (McGregor, 2009). This is characteristic of other Indigenous communities as well, in that relations and connections to all things are considered, valued, and seen as important (Baskin, 2016; Kovach, 2009).

The principles of environmental justice adopted at the First National People of Colour Environmental Leadership Summit (1991) also includes Mother Nature’s rights. There were some Indigenous groups that participated in this summit and assisted in drafting these principles

(Schlosberg & Carruthers, 2010). Different environmental justice movements have different interpretations of the meaning of environmental justice and whose justice is being ignored (Gosine & Teelucksingh, 2008; Schlosberg & Carruthers, 2010). Schlosberg and Carruthers examine Indigenous environmental justice using Amartya Sen and Martha Nussbaum's capabilities approach and state that "this theory of justice gives ethical significance to human functioning and flourishing, and finds harm—injustice—in forces that limit that potential" (2010, p. 15). For Indigenous peoples, their culture, livelihoods, spiritual beliefs, and identity is very much entrenched into their lands and connection to that land (Ford et al., 2010; King et al., 2009; Richmond & Ross, 2009). Any injustice to the land is then also an injustice to the Indigenous peoples who are connected to that land (Ford et al., 2010; King et al., 2009; Schlosberg & Carruthers, 2010).

From an Indigenous worldview, climate change is not just an injustice on people who have contributed the least to greenhouse gas emissions but it is an injustice to living things, the land, and Creation (Kovach, 2009; McGregor, 2009). Schlosberg and Carruthers (2010) state that in many Indigenous environmental justice movements a key component is community. Examining climate change issues not just from the perspective of the connections between people, living things, and the land, but also the generational impact is part of many Indigenous cultures (McGregor, 2009). It does not suffice to simply consider the current generation and its needs, but how current decisions and actions will impact seven generations from now is something that is inherent in Indigenous worldview, including their approaches to environmental justice (McGregor, 2009).

The United Nations Declaration on the Rights of Indigenous Peoples is an important document that makes clear the rights of Indigenous peoples all over the world (United Nations, 2008). The United Nations General Assembly adopted the United Nations Declaration on the Rights of Indigenous Peoples in 2007, but it was not until May 2016 that the Government of Canada (2017c) had stated that it was a "full supporter" of this document. Under Article 32 of the United Nations Declaration on the Rights of Indigenous Peoples, it is written that "states shall provide effective mechanisms for just and fair redress for any such activities, and

appropriate measures shall be taken to mitigate adverse environmental, economic, social, cultural or spiritual impact” (United Nations, 2008, p. 12).

In Canada, Indigenous peoples are amongst the most vulnerable to the impacts of climate change (Ford et al., 2010; King et al., 2009). There have been studies in Canada that have assessed the impacts climate change is having on many First Nations and Inuit communities (Cunsolo Willox et al., 2012; Durkalec, Furgal, Skinner, & Sheldon, 2015; Ford et al., 2006). In 2016, the Government of Canada (2017a) announced a program of \$24.70 million over a five year period to help First Nations communities south of the 60th parallel adapt to climate change. The program is intended to support First Nations communities that are located south of the 60th parallel in Canada with adaptation initiatives like infrastructure projects (Government of Canada, 2017a). Whyte (2013) states that programs such as these that are federally-funded could greatly help Indigenous people adapt to the impacts they may face with climate change. Framing the issue of climate change from an Indigenous approach to environmental justice is necessary to understand how Indigenous communities will be impacted given their relationship with their lands (Baskin, 2016; Ford et al., 2010; McGregor, 2009).

Indigenous Approaches to Health and Well-being

Indigenous communities’ view of health and well-being encompasses many different factors that can often be overlooked from a Western medical perspective (Assembly of First Nations, 2007). Health and well-being is approached from a more holistic perspective and central to this approach to health is balance (Assembly of First Nations, 2007). The Medicine Wheel is a framework entrenched in many First Nations communities (Assembly of First Nations, 2007). The “four elements of life, the physical, emotional, mental, and spiritual, are represented in the four directions of the medicine wheel.” (King et al., 2009, p. 76). Health is based on maintaining balance in the Medicine Wheel (Assembly of First Nations, 2007; Lavallee, 2008; Richmond & Ross, 2009). Therefore “the Indigenous idea of sickness or illness tends to refer to an absence of wellbeing or an imbalance” (King et al., 2009, p. 77). Integral to this approach is that one’s health is not just about the individual but their relationships, from other living things to Creation (Assembly of First Nations, 2007). Lavallee and Poole (2010) discuss how for Anishnaabe important teachings that relate to health are that of the Medicine Wheel and the Seven

Generations, where the current generation must live in such a way and make decisions based on how it will impact seven generations from now (McGregor, 2009).

Spirituality is also an important part of Indigenous peoples' health and well-being (Baskin, 2016). Baskin (2016) speaks of the importance of spirituality to Indigenous health and well-being and a key component of that is Indigenous people's connection to their land. Baskin (2016) argues that this is not often the case with Western perspectives of health where instead people are disconnected somehow from the environment. In a study by Isaak and Marchessault (2008) that asked First Nations people in Manitoba on the meaning of health, and participants spoke of the importance of traditional practices to their health. Isaak and Marchessault (2008) found that the adults who participated in the study spoke more directly in relation to the Medicine Wheel in defining health, whereas most of the youth participants did not reference the Medicine wheel when defining health, they still spoke of the four main elements that are embodied by the wheel. Baskin also speaks to "the importance of ceremony for one's well-being" for many Indigenous people (2016, p. 56).

Recognizing the holistic, all-encompassing approach to health and well-being from an Indigenous perspective is essential to understand the imbalances created by climate change (Durkalec et al., 2015). Baskin expresses the deep connection to the land and states "the land has the ability to calm and restore us and to inspire creativity. The land is home. The land is in us. The land is us" (2016, p. 53). In terms of climate change then what happens to the land can have a profound affect on Indigenous peoples' health and well-being (Richmond & Ross, 2009). This necessitates that the issue of climate change be approached from an Indigenous perspective of health and well-being, that encompasses the physical, emotional, mental and spiritual (Assembly of First Nations, 2007; Baskin, 2016; King et al., 2009).

Research Bias to the North on Climate Change

Climate change research in Canada has often focused efforts on understanding how climate change will impact Northern Canada and the Arctic region (Cunsolo Willox et al., 2015; Healey et al., 2011; Peace & Myers, 2012; Petrusek MacDonald et al., 2013). There have been many studies that have engaged with Northern Inuit and First Nations communities in Canada on

climate change issues (Healey et al., 2011; MacDonald, Ford, Willox, & Mitchell, 2015; Peace & Myers, 2012; Petrusek MacDonald et al., 2013). A study in Rigolet, Nunatsiavut, located in Newfoundland and Labrador, assessed how Inuit youth are important voices in climate change research and have noticed changes within their own lifetime, which are valuable experiences that add to the discussion on impacts of climate change (Petrusek MacDonald et al., 2013). The youth spoke of hazards related to hunting as a result of climate change and the unreliability of sea ice, and expressed concern that the changing environment was a threat to their Inuit identity and culture (Petrusek MacDonald et al., 2013).

Some of the challenges that many Inuit and Northern First Nations communities have to cope with in respects to changing environments include unreliability of sea ice cover for traditional hunting and transportation, which impacts traditional food sources (Ford et al., 2006; Golden, Audet, & Smith, 2015; MacDonald et al., 2015; Petrusek MacDonald et al., 2013). Also, there are concerns about the impact of climate change on the infrastructure such as housing in the north (Ford et al., 2006). Pearce et al. (2015) have highlighted the importance of traditional ecological knowledge for creating effective adaptation strategies by drawing on Inuit knowledge and experiences. For example, knowledge of the local environment and knowing when it is safe to hunt and go out on the ice based on experience and traditional ecological knowledge (Pearce et al., 2015). Research around mental health and climate change in the north is an area that is lacking, but less data is readily available for other First Nations communities compared to the Arctic region within Canada (Cunsolo Willox et al., 2015).

Not enough research has focused on understanding the impacts of climate change on Indigenous communities in Canada south of the Arctic circle. Golden et al. (2015) have collected climate change data on ten First Nations communities in northern Ontario that are located in remote areas and many are fly-in communities that are only accessible by plane or ice roads during the winter season. However, for First Nations communities around the Great Lakes region in Ontario, there is not as much data or information being gathered in those areas. One reason for this could be that the impacts of climate change are expected to be more severe in northern parts of Canada (Cunsolo Willox et al., 2012; Dudley, Hoberg, Jenkins, & Parkinson, 2015; Government of Canada, 2012b; IPCC, 2014a; Romero-Lankao et al., 2014). Without adequate

data and information on how First Nations communities will be impacted further south of the Arctic circle and in places like the Great Lakes, it makes it difficult for these communities to create effective strategies to cope and prepare for impacts of climate change (Ford et al., 2010).

Water Security, Health and Climate Change

Water is directly connected to human health and well-being and the impacts of climate change on water quality and quantity will have dire consequences on the environment and its people (Khedun & Singh, 2014). Two of the greatest threats related to climate change and water come from floods and droughts (Khedun & Singh, 2014). Water is an essential resource and there are also concerns that climate change can lead to conflicts over water (Khedun & Singh, 2014). Khedun and Singh state that “global warming is expected to accelerate the hydrological cycle and consequently affect precipitation depth, intensity and frequency, timing of snowmelt, soil moisture, infiltration and evapotranspiration” (2014, p. 8). As a result of the impacts of climate change, North America can expect to face greater stress on its water supply (Romero-Lankao et al., 2014). The Great Lakes is already under stress from agriculture, pollution, invasive species and other human activity and uses (Assembly of First Nations, 2011). In a report by the Ontario Ministry of Environment and Climate Change, it stated that “the Great Lakes are among the most rapidly warming on a global scale. Temperature increases close to or above the average rise (0.34 degrees Celsius) were seen in Lake Huron, Lake Ontario and Lake Superior” (Government of Ontario, 2016a). Also, when assessed using various scenarios, the Great Lakes’ water levels are predicted to decrease (Cohen, Koshida, & Mortsch, 2015). Understanding a community’s water vulnerability in terms of climate change is a complex issue that requires the analysis of many different factors from the social to the ecological (Plummer, de Grosbois, Armitage, & de Loë, 2013).

Despite being a country with an abundance of fresh water, many Indigenous communities in Canada lack access to safe drinking water (Galway, 2016; Plummer et al., 2013). In Ontario alone, between 2004 to 2013 there were 402 drinking water advisories for First Nations communities (Galway, 2016). In a study that surveyed First Nations communities compared to non-First Nations Canadians on drinking water, Ontario First Nations communities were “more likely to spend large amounts on bottled water and to report drinking 100% bottled water”

(Dupont et al., 2014, p. 5898). The lack of access to safe drinking water for many First Nations communities across Canada is an environmental injustice that is likely to be exacerbated by the impacts of climate change (Galway, 2016; Plummer et al., 2013). For First Nations communities living around the Great Lakes region, it is imperative to understand how climate change will impact the water, both quality and quantity.

A challenge with water security and protection is there are many different bodies and authorities that have competing interests and jurisdiction over the Great Lakes (Assembly of First Nations, 2011). In 2015, the Government of Ontario (2016a) passed the Great Lakes Protection Act and part of this act includes a progress report every three years. In the 2016 progress report it stated that “Ontario has collaborated through voluntary partnerships with First Nations who choose to participate in Ontario’s drinking water source protection program” (Government of Ontario, 2016b). The report also stated that including traditional ecological knowledge when available and offered was part of the act (Government of Ontario, 2016b), which is another reason for the need for community-based climate change research working with First Nations around the Great Lakes region.

Food Security, Health and Climate Change

Regional impacts of climate change could lead to disruptions to the global food system (Lake et al., 2012). As Lake et al. state:

as some effects of climate change upon nutrition may be localized or only affect specific subgroups of the population, there is a need for more targeted monitoring of vulnerable populations such as low-income individuals who are most likely to be affected by rises in food price, those already at nutritional risk (e.g., children, frail elderly), and consumers who choose a diet predominantly sourced from a small geographical area (2012, p. 1524).

In Canada, some of the most vulnerable to the impacts of climate change and to food insecurity are Indigenous communities (Golden et al., 2015; Rosol et al., 2016; Skinner, Hanning, Desjardins, & Tsuji, 2013). Indigenous people are particularly more vulnerable to the impacts of climate change as a result of their connection to the land and practices such as hunting (Ford et al., 2006; Romero-Lankao et al., 2014). For Indigenous communities living on-reserves or in remote areas, their “food systems are primarily characterized by two avenues of food provision:

the harvesting, sharing and consumption of traditional (or country) foods and the purchasing and consumption of market (or commercial and store-bought) foods” (Skinner et al., 2013, p. 2). For many Indigenous communities, traditional foods are not only beneficial for their health, but it is an important part of their cultural identity (Rosol et al., 2016). For Indigenous communities in Arctic Canada, studies have assessed the impact of climate change on traditional foods and how that is impacting the health and well-being of the communities (Durkalec et al., 2015; Golden et al., 2015; Rosol et al., 2016). Traditional foods tends to be more nutritious and affordable than store-bought foods, however with changing environmental conditions it is becoming more difficult to get due to less abundance (Rosol et al., 2016).

Traditional Foods and Hunting

Hunting for traditional foods is becoming more precarious and unreliable as a result of climate change and the impacts on the environment (Durkalec et al., 2015; Golden et al., 2015; Guyot, Dickson, Paci, Furgal, & Chan, 2006; Skinner et al., 2013). In a study that looked at the issue of food security in Fort Albany First Nation located in northern Ontario, respondents spoke about the challenges related to hunting (Skinner et al., 2013). Not only was cost, including fuel and equipment, something the respondents spoke of as a deterrent for hunting, but changes to the environment were also making it more difficult for having successful hunting seasons (Skinner et al., 2013). For First Nations in Ontario, there is a risk from forest fires when hunting or gathering traditional foods (Wotton, Martell, & Logan, 2003). According to the IPCC, Indigenous people in North America “are at higher risk from wildfires” (Romero-Lankao et al., 2014, p. 1461). A study that used scenario modelling to understand how climate change could impact the occurrence of forest fires induced by people in Ontario found that “an increase in people-caused fire occurrence across the province of around 50% or more by the end of the 21st century” (Wotton et al., 2003, p. 292). This can also have a negative impact on availability of traditional foods if there is an increase in forest fires in the area (Wotton et al., 2003). Hunting is also a huge and important part of many Indigenous cultures and their identity (Durkalec et al., 2015). The changes to the environment impacts not only their ability to hunt but their cultures, histories, and identities given their close connection to the land (Durkalec et al., 2015).

Traditional Ecological Knowledge and Adaptation Strategies

Traditional ecological knowledge is more and more being incorporated into climate change research (Whyte, 2013). There is no one way of defining traditional ecological knowledge. As McGregor states, Eurocentric meanings of traditional ecological knowledge excludes Indigenous peoples and is used as a basis for “extracting knowledge from Aboriginal people” (McGregor, 2004, p. 397). Traditional ecological knowledge, however “from an Aboriginal point of view, is about what you have learned and how you have learned it” (McGregor, 2004, p. 404) and it “reflects an Indigenous understanding of relationships to Creation” (McGregor, 2004, p. 386). Studies have greatly focused on how Inuit and First Nations communities’ hunters carry traditional ecological knowledge and experiences that can highlight how the community is being impacted by climate change (Berkes, 2009; Pearce et al., 2015; Pennesi, Arokium, & McBean, 2012; Tam, Gough, Edwards, & Tsuji, 2013). Traditional ecological knowledge and Indigenous knowledge is being used to better understand the changes that are happening as a result of climate change to help adapt to climate change (Pearce et al., 2015). For example, Rosol et al. (2016) looked at the potential for alternatives to traditional food sources or other animals that could be substituted into their diet for animals that were not as abundant. Pearce et al. (2015) discuss how Inuit people in Canada have already used traditional ecological knowledge to adapt to climate change in regards to hunting practices. This includes being more prepared by talking to elders before hunting trips or taking more supplies due to the unpredictability of the weather conditions (Pearce et al., 2015). Traditional ecological knowledge is being used by Indigenous communities to prepare and create effective adaptation strategies that are culturally-appropriate (Pearce et al., 2015).

Conclusion of Chapter

There are many ways in which climate change impacts the health and well-being of communities. This literature review highlights how Indigenous communities’ histories, cultures, traditions, knowledge, health and well-being are all connected and impacted by climate change. Understanding Indigenous environmental justice provides a framework for analyzing how climate change impacts Indigenous communities and the injustices that occur as a result of their limited contribution to the global emissions crisis. Many Indigenous communities’ health and

well-being are being impacted, however in Canada research has focused more on understanding the experiences of Northern communities in the Arctic Region. Based on the gap in knowledge of climate change impacts on Indigenous communities in the Great Lakes, this study was designed to focus on understanding how the Whitefish River First Nation community is impacted by climate change. The following chapter will address the research approaches and methodologies used to carry out this research study aimed at addressing this knowledge gap.

Chapter 3: Research Approach and Methodology

This chapter addresses the research approach and methodologies used for this research study. The importance of incorporating Indigenous research methodologies and including the community throughout the research process is addressed. Also, a detailed explanation of the steps taken to address the research question are provided. This chapter also provides reasons for why a qualitative research approach using a case study of the Whitefish River First Nation was selected. Limitations of the methodology and how these limitations were overcome is discussed in this chapter. Appropriate research approaches and methodologies were chosen that allow for the research question and objectives of this study to be addressed.

Introduction

This research has employed indigenous research methodologies and framed the issue of climate change and health using an environmental justice framework. This qualitative research study uses a mixed methods approach to address the research question. Focus groups and key informant interviews were used to gather data from participants from Whitefish River First Nation. This research project emerged to provide data to better understand how climate change is impacting the Whitefish River First Nation community to empower the community in their efforts to adapt to the impacts.

Indigenous Research Methodologies

This qualitative study is framed by indigenous methodologies and approaches to research. Historically, research involving Indigenous peoples has been invasive and they were often not included or consulted in the research process (Maar et al., 2011; McGregor, Bayha, & Simmons, 2010). In line with Indigenous worldviews and Anishnaabe ways of knowing and looking at the things in relation to others (McGregor, 2009), it was important for this research to look at climate change from a broad perspective and to analyze the interconnected and inter-relational aspects of climate change and its impacts (Kovach, 2009). This research is framed keeping in line with teachings of the Medicine Wheel and the Seven Generations and approaches the issue of climate change and health from a holistic and broad perspective. Kovach states:

Indigenous research, flowing from tribal paradigms, shows general agreement on the following broad ethical considerations: (a) that the research methodology be in line with Indigenous values; (b) that there is some form of community accountability; (c) that the research gives back to and benefits the community in some manner; and (d) that the researcher is an ally and will not do harm (2009, p. 48).

This research emerged from a need to understand how climate change was impacting the Whitefish River First Nation community and knowledge translation (Maar et al., 2011) is a very important aspect of this research to ensure that the study benefits the community. For climate change research with indigenous people, Peace and Myers state that “it is important to involve those communities that are being directly affected by climate change in monitoring, discussing, advocating and participating in the process of climate change adaptation” (2012). This study was designed to ensure that the community can discuss issues around climate change to begin the process of figuring out what they need in terms of adapting to the impacts.

Case Study: Whitefish River First Nation

The Whitefish River First Nation (2017) community is located on Birch Island, Ontario off the shores of Georgian Bay and the North Shore Channel of Lake Huron. **Figure 4** shows a map of Whitefish River First Nation in Ontario (Statistics Canada, 2016). The land of the Anishinabek of Whitefish River First Nation is approximately 5600 hectares (Whitefish River First Nation, 2017). In 2016, according to Statistics Canada the population of Whitefish River First Nation was 456, which is a 6.4 percent decrease since the 2011 census (Statistics Canada, 2017). The Whitefish River First Nation (2017) community however is made up “of approximately 1,200 citizens of the Anishinabek Nation.” The community is governed by chief and council, made up of one elected chief and six councillors and serve a two year term before elections are held again (Whitefish River First Nation, 2017).

This research study is a project that emerged from the community of Whitefish River First Nation in Ontario, Canada through their Health Department. Working with Leslie McGregor, the Health and Social Services Manager at Whitefish River First Nation’s Health Department, concerns over climate change and the lack of literature on how it will impact First Nations communities around the Great Lakes was addressed. Also, as climate change impacts

localities differently, the experiences of communities also differs based on many social factors such as culture and traditional practices. As a result, utilizing a case study approach is most appropriate for this research study in order to understand how one particular community in the Great Lakes region is being impacted. The gap in knowledge and need for research around how climate change was affecting First Nations communities much further south of the Arctic Circle led to the development of this research project.

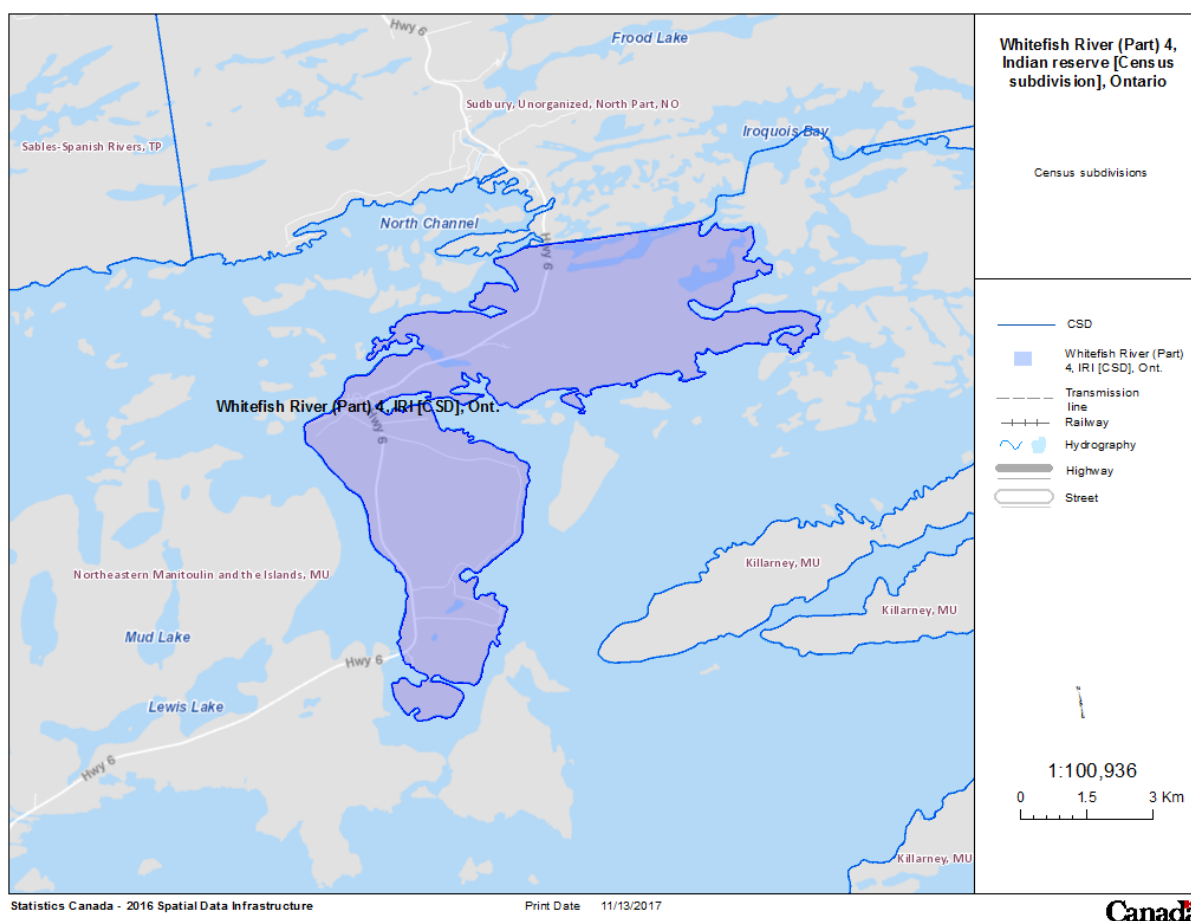


Figure 4 Map of Whitefish River First Nation (Statistics Canada, 2016)

Together with Leslie McGregor, a methodology was formulated that aligns with indigenous research and that would also allow for the research question to be addressed. Part of what was needed for the community was a detailed literature review on the issue of climate change and human health and well-being, which is an important part of this research project.

Maar et al. state how “qualitative research methods were seen as an important component of research in Aboriginal communities as open-ended questions respect people’s desire to provide information from their own perspective instead of squeezing their experiences into predetermined checkboxes” (2011, p. 750). Semi-structured focus groups allow for participants to talk about their experiences and discuss with other participants about a topic (Kitzinger, 1995). It was important to include as many voices as possible in this research study to capture the community’s experience and knowledge on the issue of climate change and health. Also, “adaptations to climate change are not isolated from other decisions, but occur in the context of local demographic, cultural and socioeconomic conditions” which meant that including as much of the community in the discussion was important (Pearce et al., 2009, p. 12). For the purposes of this research, community members who were 18 years or older was asked to take part in this study.

Recruitment Methods

Posters were used to recruit participants to take part in the focus group sessions. The poster used to recruit participants for the focus groups can be found in **Appendix E**. The posters were put up in the Whitefish River First Nation community by the Health Department. Key informants were community members who were approached and asked to take part in the study based on their knowledge and experience of the land. Key informants were known to Leslie McGregor prior to the research and were approached to participate in this study by Leslie. On behalf of the Health Department at Whitefish River First Nation, key informants were gifted with tobacco as part of the community’s cultural protocol and traditions before beginning the research interviews.

Focus Groups

Focus groups are a great way of collecting qualitative data by using open-ended questions to encourage participants to discuss amongst each other and share their views (Basch, 1987; Bertrand, Brown, & Ward, 1992; Kitzinger, 1995). Kidd and Parshall state that “focus group participants relate their experiences and reactions among presumed peers with whom they likely share some common frame of reference” (2000, p. 294). Since this research was focused on a specific case study and there is a strong sense of community and a distinct cultural identity

among the people of Whitefish River First Nation, focus groups as a method would allow for participants to build from each other's comments (Kitzinger, 1995).

Two focus groups were held, one for participants 18 to 59 years of age, which will be referred to as the "community focus group" and another for participants 60 years of age or older which will be referred to as the "Elders focus group". There were 15 participants that took part in the community focus group. There were 9 participants that took part in the Elders focus group. Given the small sample size of the population and to maintain anonymity of participants, personal information such as gender was not collected for the purposes of this research, but both men and women took part in both focus groups. The duration for both focus groups was about one hour. Both focus groups were audio recorded and then transcribed verbatim to be analyzed.

Key Informant Interviews

Key informant interviews are a useful technique to get data from an expert on a particular topic (Marshall, 1996). Key informants are selected for their role in the community or knowledge on an issue (Marshall, 1996). Key informant interviews allow for more in-depth discussion with an expert compared to a group setting like in a focus group (Marshall, 1996). For the purposes of this study, key informants were identified by Leslie McGregor based on their role in the community, experience and knowledge about the land, such as Elders. There were seven key informants, four males and three females, all of whom were part of the Whitefish River First Nation community. The key informants were asked to be a participant and take part in the interview based on their experience and knowledge within the community. Many of the key informant interviewees were Elders from the community. The duration of the key informant interviews ranged from ten minutes to an hour.

Ethics Guidelines and Review

For every research study, following the ethical guidelines is key to ensuring the quality of research. This is particularly important when working with Indigenous communities in ensuring cultural understanding and to demonstrate respect for their histories and cultural knowledge. In the past, Indigenous peoples have been excluded in the research processes involving research on

their own communities which has led to invasive and unethical research (Maar et al., 2011; McGregor et al., 2010), which is why this study was designed to include the community in the research process and followed two ethical guidelines. This research followed both York University's research protocol and ethics guidelines and Guidelines for Ethical Aboriginal Research (GEAR). Ethics approval from York University's Office of Research Ethics and Manitoulin Anishinaabek Research Review Committee was received to carry out this study. In line with York University and GEAR, this research followed the requirements to consider and incorporate the seven grandfather teachings. It was important to respect and revisit the seven grandfather teachings throughout the research project. Also, this research study is guided by the OCAP principles for the Whitefish River First Nation to have complete ownership, control, access, and possession of the research transcripts and materials. It was vital that this research be carried out by working with the Whitefish River First Nation community given the unethical way in which many studies have been done in the past by excluding Indigenous people in the research process. This research study emerged from the community and by working with Leslie McGregor at the Health Department at Whitefish River First Nation, this research project was designed to ensure that it met the community's needs.

Data Analysis

The data collected from the focus groups were analyzed around the main questions posed to the groups and common themes during the discussions. Analyzing the transcribed focus groups for places where there was disagreement (Kidd & Parshall, 2000) or any comments that stood out were also highlighted. As Kidd and Parshall (2000) state, it is important to analyze a focus group for common themes that arose and for areas of disagreement. The common themes around which the focus group data was analyzed were drawn from the main questions and what was discussed during the focus group. The main guiding questions of the focus group can be found in **Appendix B**. The common themes identified were: climate change impacts to the physical environment, impacts to the health and well-being of the community, impacts to the water, impacts to traditional foods and hunting, and potential adaptation strategies.

The key informant interviews were analyzed similar to the focus groups around the themes drawn from the questions asked during the interviews and focus groups found in **Appendix A**

and **Appendix B**, and also on comments that stood out. The key informant interviews and focus groups will be analyzed along the same themes but will be identified as either data gathered during key informant interviews or focus groups.

Limitations

There were a few limitations with this study design and the methodologies used. One of the limitations was that because the focus groups and key informant interviews were being audio-recorded, in some cases not all that was said was audible. When transcribing the focus groups and key informant interviews verbatim everything said could not be captured in the transcription in its entirety. It was difficult to understand when there were multiple participants speaking at the same time during the focus groups. However, much of the audio-recordings were audible and only short sections or phrases were inaudible. Another limitation was that during both the focus groups, it was difficult to determine who was speaking so each time a different participant spoke, it was identified as a separate comment while transcribing verbatim. This did not however impact the study as the focus groups was more of a group discussion with participants building off each other's comments and it was not necessary to distinguish who said specific comments as the content was what was important to the analysis of this study. In retrospect, a way to have mitigated the limitations would have been to assign a note-taker during the focus groups to help determine the inaudible sections on the recording device.

Summary of Research Methodology

Table 1 Table summarizing the research methods used and number of participants and the age range for each method.

Research Method	Number of Participants	Age Range of Participants
Key Informant Interview	7 (4 males, 3 females)	18+
Community Focus Group	15	18-59
Elders Focus Group	9	60+

This research is a qualitative mixed methods design that involved a case study with the Whitefish River First Nation community. This study was designed to incorporate Indigenous

research methodologies and knowledge, and an Indigenous environmental justice framework.

Table 1 summarizes the methods used to collect the data, the number of participants for each corresponding method, and the age range of the participants that were recruited for the research purposes. The following chapter highlights key findings and analyzes the research through five main themes that emerged from the data gathered through focus group discussions and key informant interviews.

Chapter 4: Analysis and Findings of Research

This chapter delves into the analysis of the research study and presents the main points of the data collected. The transcriptions of the focus groups and key informant interviews were analyzed according to five main themes drawn from the questions posed to the participants, found in **Appendix A** and **Appendix B**, and through key points made during the discussion. The key findings from the data collected are summarized and presented in this chapter.

Introduction of Themes

The analysis of the data collected from the key informant interviews and focus groups is organized into five main themes. The five themes, which address the research question and the key points made during the data collection, are:

1. climate change impacts to the physical environment,
2. climate change impacts to the health and well-being of the community,
3. climate change impacts to the water,
4. climate change impacts to traditional foods and hunting,
5. and potential adaptation strategies.

The key points made by community members who participated in either the key informant interviews or one of the focus groups is presented in this following section.

Climate Change Impacts to the Physical Environment

Climate change and the impacts to the physical environment from the perception and experiences of those living in Whitefish River First Nation was shared by the participants. When community members from Whitefish River First Nation were asked if they had noticed any changes to the environment over their lifetime, all the key informants said yes and spoke of various impacts they have experienced. Also, participants in the focus groups spoke of changes they had experienced and seen in the physical environment, such as changes to the land and the weather.

Many of the participants spoke of the unreliability and unpredictability in the current state of the weather and weather patterns. A participant in the community focus group spoke of the change in seasons and said, “it used to be April showers, May flowers but that’s changed where May has become the showers so if you pay attention to the months and what’s actually happening it’s all changed so they’ve kind of moved forward.” The change in how seasons are experienced in the community was echoed by a key informant who happens to be an Elder in the community as well. The male Elder said: “you used to be able to rely on the weather. Summer was summer, winter was winter and now you get twenty-degree weather in March you know, it’s crazy or the drought that we’ve been getting is longer so everything dries up before you know, you don’t have rain in between so that dries up.” He said that the area around the community had experienced a drought over the past few years and that only this year had the water levels come up. During the Elders focus group, another Elder felt that it was getting warmer in the wintertime. Based on the experiences of the community members, many participants expressed that they felt that even within seasons there is growing unpredictability and fluctuations.

Whitefish River First Nation has a highway that passes right through the middle of the community and many of the participants spoke about their concern with pollution and smog. One Elder talked about the poor air quality in the Manitoulin region and was nostalgic about the past when there was less air pollution in his community. He said:

...and the air, you never used to see a blue haze on the Manitoulin. You drive there today they’ll be a big blue haze, right from the south, blowing right up on the island. I never thought I’d see that, till one day we were driving to town there, twenty years ago maybe, there’s a blue haze. You see it over there on the mountains, pollution from down south. And we had it so nice, so nice. They don’t have it anymore and like we’re saying climate change, you see it on the mountains over there.

When speaking about climate change, he acknowledges that it is a “global challenge” and that what occurs further out from their community still has an impact on them. Another Elder spoke about climate change in relation to the interconnectedness to others and felt it was hard to point the finger at just one group of people. The Elder in the focus group, in response to another participant’s comment that the “white man” and “greedy people” were to blame for climate change, said “well, they’re a big problem but... it’s not just them. The world is one unit, we’re stuck with everybody.” This participant’s response does not just capture the reality of climate

change as a global problem that requires global solutions, but is also in line with Indigenous knowledge and worldviews on how everything is connected and the importance of looking at the relations between things (Kovach, 2009; McGregor, 2009).

In terms of climate change, things must be seen in relation to others, there is no use in looking at an issue in isolation as changing weather patterns resonate and impact many things in the environment. There were instances during the interviews and focus group sessions where participants would talk about the impacts of climate change around the world they had seen on the news, read in articles, or had heard about. Their concern was not just isolated to within their own community but stretched out to how climate change was going to impact First Nations to the North, to communities in British Columbia that were ravaged by forest fires during the summer, and to people suffering from droughts and lack of water in Africa. During the Elders focus group, an Elder said, “I think it’s going to get worse for everybody, not only us, everybody.”

Storms and Extreme Storm Events

Extreme storm events and changes to the storms that the community experienced were voiced by multiple participants in both the key informant interviews and focus groups. A male key informant said “... we’re getting thunderstorms in the middle of winter time, like this year late February we had like a lightning thunderstorm with snow, rain and that’s very, very odd.” Something that stood out and was an issue that was repeated by the participants in some of the key informant interviews and focus groups was the occurrence of tornados in the area. Participants stated that they were certain that tornados had occurred which was unusual for the region. A participant in the community focus group spoke of an incident where Environment Canada said it was not a tornado but based on the damage to trees and what others witnessed, the participant strongly believed it must have been the result of a tornado. A male key informant on the other hand had said “...we’re starting to get microbursts in this area where we hardly ever did. Like some people call them tornados but I think they’re just called microbursts. Just the tops of trees are taken down and things like that. I don’t think it actually touches down or anything but the weather is more aggressive I guess we’ll call it.” Based on how tornados are classified, it could have been a burst of really strong winds that caused damage to tree tops on

different occasions. However, changes to storms was a common impact that participants spoke about and thought could very well be attributed to climate change.

A way Indigenous knowledge is passed along and shared is often through stories and this is embedded in many First Nations cultures (Kovach, 2009). Speaking to an Elder from the community who was a key informant, she spoke about changes she has noticed in relation to storms and used story as a way to convey her knowledge. From her experiences of living in the community for a little under forty years, she spoke about the lack of thunderstorms she has seen over the years. She very vividly paints a picture of the changes she has witnessed and draws on traditional stories to piece together her experiences. She said:

... there are times when we tell true storyline of some information that you're given or that you're being asked so we'll do it sometimes like that. So, it's not really done as an academic way of thinking. I'll start where we are right now, I've noticed the differences in the storms. There's a big difference in the storms of what used to take place. Years ago, growing up as a child we lived on the land a lot, off the land and the way we lived is pretty much always knowing what is coming through the environment of the storms and how nature provided and was going to provide. But there's a big difference I noticed in the storms now. They're not like how they used to be. The thunderstorms we don't have as much as we used to, that's one thing that I noticed, we don't have as much as we used to have and back when I was growing up and there were different types of thunderstorms. The reason for that is that from what I was aware of was that it keeps a natural balance to Creation, to the water life, to the crawlers, to everything like that. So, what I noticed is the over abundance of snakes today, and the only legends that we go back is that the thunders kept a balance of the snakes and in the water life snakes, they kept them at a balance because they, whether they had to. You know its just like any child you need a parent to take care of that child you need that somebody to take care of things so that's the same thing, the Thunder Beings used to look after those things, so the thunders are not as much anymore as they did.

Examining the interconnected aspect of the environment, she goes on to say:

... what happens too is that balance of the thunderstorms and the lightning, and the natural fire that it creates, it burns off the sicknesses and the overabundance of let's say insects, the over populations of insects. That's the natural balance, that's how they take care of each other. So, it's a disaster alright and a lot of people what they're losing, but after that comes new growth right, and nature rebuilds its balance again into that equal place. So that's part of what I see in the changes in the storms.

Some participants did state that they felt the impacts they were experiencing was part of nature's way of restoring balance. There were participants in the community focus group that did not feel like humans could influence the climate and attributed changing climate conditions to Creation and a cyclical process where once it could be drought-like conditions and a few years later it can be heavy precipitation. This shows a lack of understanding on climate change issues and the role that people have played in contributing to unprecedented levels of atmospheric greenhouse gas concentrations and a need for more information which was raised by other participants in the group. A participant asked during the community focus group for more clarification on what climate change was and how humans could have an influence because the participant believed only Creation had influence over the controlling the climate. When climate change was explained generally as being tied to greenhouse gas emissions from human activity, participants agreed that they were seeing impacts and were worried for the future of their children and generations to follow. During both focus groups, participants voiced that the weather did seem to be more extreme than it did before and felt that the changes were attributed to climate change. This showed that once participants were given more information and clarification on climate change and its impacts, they were able to focus their observations and determined that greater awareness and information was needed in the community on climate change issues.

Winters and Summers

Community members who participated in the study described changes they saw and felt in relation to seasonal changes. Many felt that there were temperature fluctuations in the summers and winters, which was not what they had experienced in the past. For example, during the community focus group, the group was discussing how the summers recently felt hotter. A participant said, "hotter and shorter though eh. It feels like you don't really get that much of a summer anymore, it feels like you get like maybe two months and then it starts to get cool by the time it's already September." A male key informant spoke about similar changes he has seen as a member of Whitefish River First Nation and having lived there his whole life. He said,

with the temperatures and the weather that changes rapidly it affects how people react and how they interact with each other. I never really paid that much attention growing up, I just assumed that it was hot all summer, but now it seems like the temperature fluctuates so much from, you know when they've been plus

25, plus 26 degrees Celsius to the next day being you know a high 18 degrees. I don't remember that happening in the summer, I remember once it warmed up then it stayed warm until you know late August early September.

A male Elder and key informant expressed the difficulty with heat waves in the area, whereas before working outside it was comfortable but now he must contend with more heat waves. This was shared by people in the Elders focus group where participants spoke about it being “too hot.”

The changes to the winters that participants spoke to and was commonly addressed during the focus group discussions and interviews included the decrease in snowfall and warmer than usual temperatures. All the key informants spoke about changes to winter that they have noticed and experience living in Whitefish River First Nation. A male key informant and Elder said “yeah, when it used to get cold, it would just go right into the ground, your first snow would stay but now the ground it's so hot.” Reminiscing about his childhood experiences, another male Elder talked about it being colder and having more snow when he was a child growing up in Whitefish River First Nation compared to what he sees now. This experience was shared by other Elders in the community during the Elders focus group discussion and by some Elders who participated as key informants.

During the community focus group, a participant said “... for me it goes in cycles, you know, we may have a real, real cold winter but a couple of years later it's you know it's warm enough to wear shorts. I don't know how we have control over mother nature and her desire to punish us with cold weather or hot weather.” Another participant then stated how the changes they were experiencing now was unlike the usual weather fluctuations they had experienced in the past. A male Elder who was a key informant said “oh yeah, lot of changes. I remember when winter used to be winter, we had a lot of snow. It was always, always the same as I can remember.”

There were participants that spoke of the changes they had seen in the recent past and a reason for this could be that it was easier to recall. In general, many of the participants spoke about warmer summers and winters. Through the focus group discussions and key informant

interviews, participants shared experiences of more unpredictable weather patterns in the winter and summer seasons. The temperature fluctuations they were experiencing in the last few years was unprecedented compared to what they were used to experiencing in their environment.

Changes to Ice

Participants were concerned about the impact warmer winters was having on the ice conditions of the lake and surrounding waters. Many Elders who participated as key informants and in the focus group spoke of the unreliability and changes to the freezing over of the lake and surrounding waters in the winter time. An Elder described how the cold used to reach deep down into the ground and when they had to dig graves in the cemetery the frost was about forty inches deep. He describes how much has changed and said "... you could drive a skidder or horses right on the ice and the swamps, there's no ice there now. You break through there like when your skidoo-ing out on those old trails, mud, no frost."

A key informant Elder spoke of the impact the warmer winters and the impact of ice cover was having on a ceremony that was important to her family. The Elder, she said,

my husband has been doing the eagle feast... for about twelve years or more now. And he would do it on the ice. Past couple of years he was not able to do it on the ice, cause usually he does the ceremony on December 21 and he couldn't past couple of winters, he can't do it on the ice anywhere cause there's no ice at that time.

The Elder describes the ceremony and says,

it's the eagle feast ceremony that he does... he puts fish out there... does that ceremony out there but that's one thing that he said that he notices, he can't do that anymore and the eagles know when to come and they're wondering why their feast hasn't taken place because it used to being on the ice so now he's thinking maybe I'll have to build a platform out there where they're used to gathering and eating the fish, their feast.

Other participants described the impact of the lack of ice cover on recreational activities. During the Elders focus group, an Elder spoke of the concern over the thickness of the ice and inability for children to go out to skate on the bays as previous generations had done before and said it was no longer safe for children to be out on the unreliable ice. This was echoed by a key informant Elder as well, and he said "... from growing up it used to freeze late November early

December and when we're usually by mid-December we're able to skate on it when we were kids. Now we're lucky that it freezes by Christmas time and when it does finally turn to winter it just like a turning of a page it's just really rapid, it's not a gradual thing that happens."

A male Elder during a key informant interview described impacts on winter ice conditions and said,

long ago we hear stories about my uncle he used to tell me when go skating on blue ice, it was blue ice, blue ice, not slush, it was blue ice, like glass. And you could go skating out there and look through the ice, now you get the warm spells that come in, you get the snow push the ice down, it freezes it's like a, a sugar and another layer, another layer, another layer... even the trails for snowmobilers are open later, January, February. Used to get, used to start getting cold in November, October, November. First week in November we'd get snow. Doesn't happen anymore. Or it'd get cold, and just cold but not penetrating the ground because I think we only had about that much frost, a foot maybe compared to forty inches. It's a lot.

Another Elder male who was interviewed described the same change in pattern for the bay and surrounding waters to freeze over. He said,

... the ice left I think about two, three weeks early this year as opposed to previous years. We used to get, the bay it'd freeze over more, third week of November, now you can run a boat in December, if you wanted to. And the ice leaves earlier, a couple of weeks. So obviously, there's a lot of warming.

The Elders spoke a lot about the changes they had seen in relation to the lakes and water bodies freezing over during the winter season. The lack of ice cover in December by Christmas time was unusual and participants spoke about not being able to rely on the ice freezing over as they had in the past by mid-December. From the experiences that were shared by participants, the ice is freezing over later than it had, and is staying frozen for less time during the winters. The participants spoke of the impacts of the unpredictability and unreliability of the lakes freezing over on their community in terms in terms of their health and well-being as the ice is used for recreational purposes, to travel across on skidoos, and for the impact it was having on ceremonies.

Changes in the Abundance of Animals

Key informants spoke about the changes to different species abundance. Three of the male key informants spoke about the decrease in the numbers of the smaller creatures like rodents and frogs. During the community focus group, participants spoke about the lack of snakes in the area in recent times compared to before and the decrease in the frog population. A male key informant said,

there's not as many rodents, I guess we'll call it, like rabbits and smaller rodents that, we start to notice more birds of prey in our area than when we were growing up. Yeah, like an eagle or even hawks, when we were smaller, when we were younger didn't hardly ever notice those types of birds around but I think what's happening, normally their north of us, more north but because of the climate changing it's forcing those types of birds to hunt more south.

Another thing that a few key informants noticed was the prevalence of deer in the area. A key informant Elder spoke about the changes he has seen in the wildlife and said,

... there's lots of deer, bear and stuff like that but none of the smaller ones, the rodent type things. So, after a while you miss those too even though you don't like, not very pleasant to see a skunk... but I haven't even seen those. Porcupine, they're all gone, at least where I go. There is a lot of changes.

Participants have noticed many changes to the physical environment, particularly to the changes in storm events, the temperature fluctuations during seasons, the warmer winters that have led to less reliable ice for recreational use, and changes in animal populations.

Climate Change Impacts to the Health and Well-being

The second theme that was prevalent in the discussions with participants in the study was the impact to the health and well-being on the Whitefish River First Nation community. There were various health issues raised and some that tied more closely to environmental health such as incidents of cancers and the concern from industrial pollution. Participants spoke about health issues such as allergies, the impact on future generations' health and well-being, and the historical impacts that still affect First Nations peoples and how that relates to climate change.

Allergies

When community members were asked to share how climate change was impacting the health and well-being of the community participants spoke of allergies and concern over quality of life for younger and future generations. A female Elder said,

I'm not a medical person or like a physician or a scientist of some sort but I know we're dealing with a lot of environmental illnesses more so now than before and its affecting a lot of people with their skin, their breathing, their allergies and it over, it's a lot. For me myself I've never had allergies, in the past two years I've just started experiencing allergies which was shocking to me because I never had it.

Allergies was a health issue that was raised by other participants in the study as well. Two other key informants spoke about noticing more children in the community with allergies and requiring inhalers. As a teacher one of the Elders saw first hand the number of students who had allergies. The perception of increased allergies in the community was also a concern discussed in the Elders focus group. A participant in the Elders focus group said,

look at how many children well even adults that are on allergies, asthma you know so many kids are like using puffers now and babies have to use those little inhalers and that. There's a lot of that now, I never see that when you know when I was young and now there's so many children like that.

The changes that many Elders saw in terms of health issues was the increase of allergies in the community.

Health of Future Generations

In terms of the challenges from climate change, a participant in the Elders focus group said,

yes, I'm more concerned about my kids and their lives. Their quality of life, because I had a good quality of life growing up like with the bountiful everything right, knowing that they're going to just learn like right now how hard it is for water and having medicines or stuff like that like I worry about them at my age. When they're 50 or something, what if there's like water wars or something like that you know, bad things like that.

There was concern that the impacts of climate change around the world could affect future generations with possible conflicts for resources. This relates to the seven grandfather teachings that is inherent in many Indigenous cultures and the need to look at the impact on future

generations. In this statement, this participant was concerned about the children and future generations well-being and approached the question about health from a holistic perspective.

Historical Impact and Climate Change on Health and Well-being

The loss of many practices is something that still affects the community's health and well-being. A key informant Elder explained how their culture and traditions had been eroded by colonialism and historical oppression and she said,

a lot of practices were lost because of religious, religious groups that came into the community and they Christianized the Native people, they colonized us, they wanted us, they wanted our land, that was their way of getting our land so the government worked with the religious groups so you weren't allowed to practice your culture. And they used the welfare system, the government used the welfare system, they introduced it to the Native people and before, before the money they used to give out coupons and they also did this after during the war I think and you could go the government office, the agency they called it, and you would get coupons for however how many children you had, you would get so many coupons and go to the grocery store. Well, that's a lot easier than going out in the bush, you know cause, and it was like a reward system so if you didn't practice your traditional practices, well your customs you got rewarded with these coupons.

The Elder, she spoke about a story her grandfather told her about an incident when a priest that visited the community complained to the agency that the community was practicing their culture and had enough food and did not require the coupons. The agency, what is now known as Indigenous and Northern Affairs Canada, during the Elder's grandfather's time would provide food coupons. For example, Canada has a history of racist policies that aimed to assimilate and stripe away Indigenous peoples' identities, cultures, and practices. Allan and Smylie state in their report that "the Indian Act (1876) and related policies and processes, which served to...dispossess Indigenous peoples of land and disrupt traditional economies thereby cutting off sources of food and manufacturing food dependence on colonial authorities (e.g. restricting hunting and gathering practices by restricting mobility)" (2015, p. 2). This coupon system by the Canadian government was something that prevented people from practicing their culture and hunting in fear that they would not be rewarded with those coupons. The historical impact of colonization still has a huge affect on the health and well-being of the community and the loss of these practices could put the community at a disadvantage in terms of climate change and adaptation.

Swimmers' Itch

With climate change, participants in the community focus group were worried about warmer summers impacting recreational use of the water and exposure to swimmers' itch. A participant said,

... the water, the bacteria that's in there when it gets really hot the kids come out of there with swimmers' itch and they have like hives and looks like bite marks all over their body and they have to go home and shower because it's itchy and that's when it gets really hot and that bacteria comes out in the water. That's something that I didn't have to put up with when I was a child, I could go swimming and not worry about having to go home and take a shower.

Participants described the changes they had experienced within their own lifetime of having been able to swim in the waters surrounding their community without dealing with swimmers' itch, but generations that followed them are now having to cope with this health issue. In the Elders focus group, a participant spoke about concern over algae blooms and health issues that may arise through recreational use of waters.

Environment, Mental Health and Well-being

Participants described the positive impact that nature and the surrounding environment can have on their own health and well-being. Two key informants spoke of the benefits of nature and how the changes to the environment and land around them was impacting their well-being. A male Elder said,

yeah, personally I enjoy the bush. I used to spend a lot of time there when I was younger and I found it very soothing. And you know, you look at the animals and birds we used to have, and they're all very soothing. I found it very comforting to be in the bush but you don't really get that now, you get it but without the little things running around like squirrels and stuff like that. So that's kind of one of the things that I miss, anyway.

A female Elder spoke of the challenges that come with the changing environment and said,

so it's different ways with this environmental sicknesses and also too we don't take into account what we are missing in the environment, the natural environment of creation, it also creates mental illnesses. Like the sun, the rain, the outdoors, the air, you know, it does create mental illnesses.

Participants felt that their mental health and well-being was tied to their land and being able to connect with their surrounding environment. The changes that Elders have especially witnessed

in their lifetime has impacted their well-being as key informant Elders frequently spoke about the things in the environment that they missed and found comfort in before.

Future Impacts on Health and Well-being

It was during the community focus group that a participant brought up concern for a possible health issue that could emerge in the community as a result of climate change. The participant was worried about ticks that carry Lyme disease spreading from the south into their community and surrounding environment. The participant stated, “one thing that I’ve heard about the kind of changes just that you read a lot of articles about how the ticks are spreading more because it’s warmer... that’s one thing that I’m concerned about and always like checking stuff for it.” The discussions showed that participants were concerned for both impacts that are currently present in the community and of the fear of future impacts to their health and well-being from climate change and its impacts.

Climate Change Impacts to the Water

The third theme that was apparent in the discussions and interviews with participants was the impact climate change was having on the water. Waters surround the community of Whitefish River First Nation and the well-being of the water was of high priority for the participants. Many key informants spoke about the water not being as “clear” as it had been for them growing up. A female Elder described the changes she has seen firsthand and said, “...there’s a definite change there. Like the water’s not even clear anymore. At one time, we used to look right down to the bottom of the water and you know see life down there you know bugs and crayfish swimming around, fish, now you don’t see anything.” There were many changes that participants spoke to regarding water quality including algae blooms, invasive species, water levels, the tourism industry in the Manitoulin region, and what the future holds in terms of climate change and water security.

Algae Blooms

The concern with algae blooms impact on the water quality was voiced by participants during this study. A key informant who lived and grew up along the water spoke about the differences he has seen and addressed the issue of algae blooms. He said, “...just in the last year

or two we've noticed more algae blooms, yeah I don't know, I'm not exactly sure what that's attributed to. But we notice it more often." Another female key informant also mentioned algae blooms in the water and it not having been an issue when she was growing up. During the community focus group, a participant felt that what they were witnessing off their dock had to be due to climate change. The participant said, "what I see around my dock though, a terrible amount of green slimy grass or whatever you call it. For years and years, I never saw it, this summer especially it's just all around my boat... I think that's due to the warming." The participant described it as a "green slimy" substance, which may or may not have been algae but has seen the emergence of this new phenomenon in the waters off their dock. There was concern that algae blooms could occur more often in the Great Lakes. Algae blooms would not only affect their recreational use of the waters, but participants were worried about the water quality and what it would mean for the environment and species.

Invasive Species

An environmental challenge that is impacting the Great Lakes and is a problem that many residents of Whitefish River First Nation are worried about is invasive species. Participants spoke of the impact zebra mussels and gobies were having on native fish species. A key informant Elder was concerned about these invasive species in the water and said,

they brought in, well not brought in but they came in the boats I guess, little black things, gobies we called them. And they're, they're pigs, they're little pigs down there, you throw your bait down there and they're the first ones there instead of getting a bass or pike or something you know. And they also have zebra mussels that plug up water lines and stuff like that, they never used to be there.

During the Elders focus group, participants spoke about noticing weeds that they did not have before. An Elder said, "invasive weeds. Like even down at our dock it used to be all clear, now you can't even see the bottom and it's all this green and brownish stuff floating around." These environmental pressures that exist and are impacting the Great Lakes and with the impacts of climate change more stress is going to be put on the Great Lakes system.

Changes to Water Levels

Participants spoke about having gone through a drought and only had the water levels come up this summer. Two key informant Elders felt that was a natural process of the lake as they had seen water levels fluctuate in their lifetime and said it was just its natural process. One Elder said, "... the water levels go up and down. I'm so grateful to see the water levels go up now but the days they do, say it goes through a cycle of change when the water levels go down and comes up." Another key informant Elder, he said "the levels fluctuate as usual as most lakes. This year its quite high but I have known it to be fairly low but it'll come... back and forth." It was during the community focus group however when participants expressed that they felt that the water levels were going down in their environment. One participant stated, "I think the streams and the ponds and the different things have dried up around here over the years, some of them that were fast and flowing." Whether or not climate change is to blame for the fluctuations in the water levels, one thing is for certain that there have been changes that the participants have seen in terms of water quantity with rising and falling water levels in their community. The impacts of climate change will exacerbate the changes to water quality and quantity.

Tourism and Impact on the Water

Manitoulin and the area surrounding it is a prime spot for tourists, especially during the summer which participants said was something that they were concerned about in terms of the impact on water and climate change. A community focus group participant said,

the tourism that happens because this is the big impact, I mean we're talking about emissions, this is a big impact time right now when all the tourists are here... but they talk about how many actual people are here that are just visiting, you know they got camps here, they got homes here or whatever, not taking into a fact that there are certain amount of people on this reserve and there's lots of people out there that we haven't even brought into this discussion to say okay well how is this impacting cause they're part of that water system, it's not just us here.

Participants wanted to know more about how their environment was being impacted by tourism and the influx of people during the summer months. They were also curious about the emissions from boats and road traffic, and whether that was impacting air quality and water quality. Emissions from boats was discussed and an key informant Elder, she spoke about there being much more water traffic in the area than there had been in the past just in her lifetime. A

participant during the community focus group felt that they lacked data on just how much of an impact tourism was having on their community and was hoping that more would be done to address this issue.

Future Impact on Water

Looking forward to the challenges that may arise with climate change and water was brought up in discussions with participants. During the Elders focus group something that stood out was a participant said,

... Canada's got a significant portion of fresh water in the world and we're not taking care of it really, you know. And there's places in the world where they have extreme water ... so the possibility of problems with it for sure. Territorial issues right now we're having them with the United States but I mean that's pale in comparison to what possibly could happen.

The participant was worried about the long-term impacts of climate change and possible disputes over water. Also, felt that more could be done to protect water resources. The Great Lakes is a freshwater resource shared by both Canada and the United States. Even within the Manitoulin district, there are many different stakeholders including the Whitefish River First Nation community. A participant in the community focus group said,

I think that like right now we don't, we sort of take for granted that we have all this water surrounding our community and everything, all these lakes and I'm worried about the lakes as well just because you see them going down and I'm worried about what condition they're going to be in like 10, 20, 30 years when my kids are adults.

It is evident from the discussions and comments made by the participants that the community is very concerned about what the future holds in terms of their water security with the impacts of climate change.

Climate Change Impacts to Traditional Foods and Hunting

The fourth theme that was present in the study was the impact of climate change on traditional foods and hunting for the Whitefish River First Nation community. Many participants addressed their concerns for the impact climate change was having on local plants and animals that are part of the community's traditional foods. For example, an Elder in the focus group

spoke of the impact on medicinal plants such as sweetgrass that there used to be an abundance of but now is hard to find. On the community's website it states that "local wildlife is abundant and includes deer, rabbit, beaver, muskrat, mink, bobcat and lynx and an abundance of fish including northern pike, lake trout, whitefish, pickerel and bass populate our many lakes, rivers and streams" (Whitefish River First Nation, 2017). Participants spoke of changes that they have had to cope with such as the changes to wildlife, blueberries, and native fish populations.

Blueberries

The lack of blueberries was one of the most common issue raised in the interviews and focus groups. Many participants spoke about the impact they have seen on wild berries, especially blueberries in the region and the changes that have resulted with the downward trend in blueberries in their environment. A key informant Elder, she said,

... I was thinking this summer, like I'm eating these blueberries, they're from the store, but have you ever tasted the natural berries from the earth? Oh my god, the taste is totally different, and the berries are totally different. Now we have steroid berries you know strawberries that are bigger.

Not only did she feel that wild blueberries tasted different, but she explained the importance of eating wild berries and what it meant to her well-being. The Elder, she said

... there is one family, getting rare now in our community, a woman that goes to pick berries every time the berries are ready to be picked she'll go out there and she knows I'll buy some, buy them off of her. And last summer she was saying there is hardly any and she is fluent in the language and she says there is hardly any berries now I have to go further and further out there now to pick berries and they are not like they used to be, the strawberries they're rare. Right now, I go to a garden where people grow the berries and the natural process of we're going to say medicinal food is what the earth grows. Medicinal food is what the earth grows. If you want to look at that to get those foods, the earth grows, that's where you get the medicine, that's where you get the healing for your physical body.

The Elder pointed out that not only was it harder to find blueberries, but in the community itself fewer people go out to pick the berries.

When talking to the Elders in the focus group and in key informant interviews, many of them spoke about their childhood memories of spending time picking berries. During the Elders focus group, a participant said, "when I was a kid I used to just go out for hours and just pick

berries and they're all over the place. Now you go there, all you see is the little green ones and they're just barely, barely any of those." Another Elder responded, "in bushy areas even, my grandpa used to take me, there's nothing there. All dry and nothing." Picking blueberries was something that multiple participants, especially Elders talked about and said that it is harder to find blueberries in their environment. A key informant Elder, he spoke about the berries as well, and said "... I think it's the environment that's killing them" and "a lot of berries that are being affected, berries that we used to pick so now we have to buy them."

A key informant elder, she felt that the berries were not around as much as they were before because her ancestors used to burn the forest, which is not allowed to be done anymore. She said, "... for the regrowth you have to burn the forest." Without the occasional burning that was practiced long ago by their ancestors, she felt that the forest was not able to regrow which was affecting the abundance of blueberries in their lands. Alternatively, in the Elders focus group, a participant spoke about the weather having an impact on the blueberries and said,

I guess some of the lack of water not this year but, it seemed to be a trend before. There wasn't as much water so there weren't as many berries because I remember going, trying to go blueberry picking, and we had to go really far to find them. There's none locally or there was very little locally, which of course affects the bears as well because we get them in the community. They're starving so yeah, it does affect lots of things.

She even explained how the impact on blueberries was affecting wildlife in the area with bears roaming closer into the community, which is a risk to the community. Community members identified a chain reaction caused by the lack of blueberries leading to a number of other impacts on the community and the wildlife in this environment.

Maple Syrup Harvest

Participants spoke about the disruptions to the maple syrup harvest and how that was impacting the community. A male key informant said,

last year we had a dry summer, it was considered a drought based on Environment Canada and because of the dry summer whatever impacted that, there was hardly any berries so a lot of the wildlife actually made their way into the community, bears and stuff and then as a result of the dry summer, the drought it actually affected our spring harvest of maple syrup, where the trees

didn't produce as much sap as they normally would. That was a big difference we noticed this year because of the drought the year before.

He explains how their traditional knowledge of the harvest has been impacted as a result of changing temperatures. He said,

yeah, it fluctuates because we used to go, we used to start at early April, now we start mid-March. And then we don't, sometimes people even went in at the beginning of March the weather was good for it and then all of a sudden it got cold and then it slowly warmed up and it took long for the season to start again. So that, those types of things, the temperature changes quicker than normal or the seasons change quicker than normal.

In the Elders focus group, a participant stated,

well, one of the problems with maple sugar too is if you don't have snow, enough snow cover, it affects the run. So, if we're getting a melt in January and February that affects not just when it starts but how much you get which could put a lot of stress on the trees which you don't want to do.

The temperature fluctuations in the winter is impacting the community members' maple syrup harvest. Traditional knowledge about when the maple sap runs is being impacted by climate change where the time to collect the sap is changing with the climate conditions and how much sap the trees produce as well. The maple syrup harvest is just one of the issues mentioned along with the impacts to hunting.

Animal Abundance and Impact on Hunting

Multiple key informant participants spoke about the decrease in the numbers of smaller animals they had seen. Elders described them as rodent-type small animals like rabbits that were less abundant than they had been and larger animals like deer were around much more. A key informant Elder described his experiences over the years and said,

... when I was growing up, my dad worked in the bush, and they had the snares in the bush for rabbit because we ate that to supplement our diet with animals, deer, rabbits, partridge... this year I bought snare wire and everything but there are no rabbits. Like I said when I was working in the bush, cut my own wood, you think there was a rabbit? No.

Another key informant Elder also talked about the decrease in rabbits and partridge that he has noticed when asked if there were any impacts to traditional foods.

The changes in the species abundance was not the only issue that was raised in this study. A female Elder was concerned about how environmental pollution was impacting local wildlife. She said,

there's not as much as there used to be. We have to be careful what we eat because for one it's what the animals are eating out there, how far the pollutants have affected the plant life, and the water life, then in turn makes them sick so we need to I think be more cautious on that, eating, or having an outlook on that. When there's some hunters and elders that talk about how the animals are getting more cancers today and the water life, the fish life.

The environmental challenges that exist in the community from industrial pollution is something that community members are worried is having an impact on the wildlife in their region. It is another factor that they consider when assessing how not only climate change is impacting their wildlife but other environmental issues like pollution, as well.

A participant drew on traditional teachings and was concerned that the changes to the wildlife population was attributed to a shift in the axis. The participant in the community focus group said,

I was talking with somebody that they used to goose hunt... And I asked him, so how was your goose hunt? He said it wasn't very good. He said they got ten, where they used to get seventy or eighty geese for the whole year, and they only got ten. And that tells you because the birds, the geese migrate, they follow that magnetic north, so that goes to tell you how far that is off, when they are not landing into the places that where they usually go for these people into the northern communities. Those geese aren't showing up there anymore, they're showing up elsewhere, in the cities, places like that. So, you know that true magnetic north we have is not what it used to be, so our axis yes they are off and it's affecting everything.

Other participants in the community focus group also were concerned with changes they have seen to geese migration, and discussed the importance of including traditional teachings in research to better understand the changes that are occurring.

There were concerns brought up in terms of how climate change was impacting ability to go hunt. A key informant said, "I do a lot of hunting with my family for deer and it, I don't know if it really affects it too much, just that if it's too warm we usually don't go out and like I said because the weather changes so quickly we have to adapt quicker than normal." With warmer

temperatures, it can be challenging to spend time out in the bush to hunt. Although there is plenty of deer, he speaks to the impact that rising temperatures presents for hunting. In the community focus group, a participant voiced concern for the unreliability of the lakes and waters freezing over in the winter affecting animals' migration routes. The participant said,

I think it affects the animals in winters too as well because they're unable to cross the ice because of how warm the water is through the winter and how long it takes to freeze over so that becomes an impact too as well. So, we end up losing our animals to the water because there is no stability across that ice for them to migrate to wherever they need to go. So, when you think about our animals and you think about our livelihood and when we live off moose meat and when we live off deer meat and different things like that too we end up losing them to the water.

Not only is the wildlife being impacted, but the community as well that depends on the wildlife for their traditional foods.

Fishing and Climate Change

Being a First Nations community that is surrounded by many bodies of water, fish is an important part of the Whitefish River First Nation community's traditional foods and many key informants spoke about growing up fishing. An Elder, he said in terms of traditional foods, fish was very important and other participants also talked about fish being part of their diet. The key informant male Elder talked about bass and pike being a staple in their diet. A female Elder and key informant said, "there's definitely less fish, there was plentyful at one time you know when our kids were small they used to fish off the dock here and in no time at all they would catch like now its not so." Participants in the Elders focus group also discussed the issue of fish populations having decreased in their lifetime and mentioned their concern for fish having worms, which was echoed by a key informant as well. He said, "... I'm an avid fisherman so I noticed mostly in the last couple of years that some of the fish have worms in them."

During the Elders focus group, a participant expressed,

well, because of the fish and all the meat and all that kind of stuff like the traditional hunting and fishing things I guess you could say, habits, you know there's less of that good source of meat, good source of fish, so it affects our health so then we're not eating like the way we should be eating, vegetables, fresh fish as much. Cause what they say, you're limited to so much fish a month? You know and you shouldn't, and before you could eat, and we lived on

the berries, the fish, the venison was healthy you know, but now you got to resort to buying meat which is so expensive in the store which is always full of antibiotics unless you want to buy organic, which is so expensive you know for everybody has limited income. You can't afford all organic food all the time, you know.

The participant highlights the many benefits of traditional foods and not being able to rely as much on the land for traditional food sources forces them to buy food from the stores instead.

A key informant Elder, spoke a lot about the impact he has seen in regards to fishing. He described the changes he has seen in the size of fish that he used to catch and the size being much smaller now and that there was no longer any rock bass. Another challenge he spoke about was the impact climate change was having on ice fishing. The Elder said,

when we were kids we, all we needed was a little short stick and a little fishing line and, same thing with ice fishing, it's not there anymore... There's no more. The perch you know, if you have meal some place, what's that going to cost you? Twenty-five bucks? We used to just go get our own. All the kids would get perch off the dock maybe it's that big now when they were like that. My dad had places out there coming with a big basket full of perch so, we were eating off the land, now we can't eat there.

Many of the impacts to traditional foods described by participants was the decrease in abundance of both plants and animals. Foods that they have gone out and picked and hunted for generations are no longer around as much as they had been before and participants felt that climate change and environmental factors such as pollution and changes to weather patterns were to blame for the impact on traditional foods.

Adaptation Strategies

Through the discussion about climate change in the community, there were times when hope for the future was lost in terms of what can be done to cope with the impacts. A key informant Elder talked about all the ways in which climate change was wreaking havoc around the world, and said, "it's like a chimney effect from the, from the ice, get the vapours up there and have the water move. From there down, but now its all, all that air's so polluted and that greenhouse gases, we hear all about those. So, but a lot of times I think that we're almost too late. Everybody's scrambling." He felt that it was hard given the current political climate in the United States to bring about any change to tackle this global problem of climate change. When

talking about adapting to climate change, the Elder said "... if there's change it won't be in my time." Although many participants were concerned for what the future holds in terms of climate change, many had discussed strong initiatives, ideas and strategies that could help the community adapt to the impacts of climate change.

Connecting Youth to Nature

In interviews with key informants, some Elders were asked how they felt about connecting the youth to nature as a way to cope with some of the impacts they had talked about.

A female Elder said,

... we can help them connect but it has to start right from birth. Cause if we go and take let's say an eighteen year old and try to get them out there and do this and that but how can we expect them to do that when they were never connected with it in the first place since they were babies. It would be so natural for them to do it, just like all the animals, its natural for them to do it because they know no other right?

The Elder expressed that connecting the youth to nature to know how to live off the land is not only important for them, but that there are things in nature that depend on people such as some plants. She explained,

... there's one thing if we don't go and pick the medicines and if we don't go and pick them every year they'll stop growing. Because it's just like let's say, let's take a baby for instance, the baby let's say breastfeeds and the baby knows where the milk comes from or bottle fed the baby knows where the milk comes from and the baby grows up you know when the baby grows up and learn how to drink and eat and no longer needs the breast milk. What happens to the breast? The milk it dries up. So, it's the same as the earth, that's the mother out there. When she knows that we no longer want her medicine, she'll stop growing it, you see. And that's what's happening now. I can hardly wait till the natural blueberries come out, I don't go pick them anymore but for us that used to be, growing up as a child that was a must, we all picked blueberries. It was a, like a job for our family, for all the children, we had to do it cause if we wanted some of that nutrients all year, we needed to do it and our parents insisted that we do it so its something that we were taught.

She speaks to the important connections that are built on these relationships where the environment and people rely on each other to ensure growth and survival.

A key informant male Elder also felt that teaching the youth about hunting was “good for them to know.” In terms of hunting and teaching the youth to eat more traditional foods was something another key informant Elder spoke about it in terms of improving health and moving the younger generations away from fast foods. She explained an initiative that had taken place in the community before and said “... we started a fishing derby to try to get the kids to fish and the kids had to make their own fishing rods out of sticks and I only bought the hooks and line. They had to get their own worms, their bait so now I see a lot of kids that I had taught in the past, they’re out there fishing.” These Elders felt that connecting the youth to nature could have many benefits for the health and well-being of the community and the environment around them.

Connecting with Others

Another strategy that was discussed and had a lot of attention was reaching out and connecting to other stakeholders and interest groups that could work with the community to address climate change issues. In both focus groups, participants talked about the idea of connecting with other stakeholders to begin planning effective adaptation strategies and discuss how the Manitoulin region was being impacted by climate change. This was something that many participants spoke about during the community focus group.

One participant said,

... I think about seven years ago or five years ago we had a lawyer here who talked about that water, who talked about how that’s going to impact us in about another ten, twenty years down the road and what’s going to happen to our people then because everybody’s going to want that water. So, we have to be mindful of about it, because the earth is the blood of mother earth, water is that, and so we have to see it that way and we have to recognize it and be able to acknowledge that we as First Nation people are owners of that land. So, what do we do, how do we protect that, what is it that we need to do to be able to look and advocate for First Nations people too as well. It’s not just talking about it, it’s going out into the communities, not only within our own community but going outside externally and talking to agencies about what actually is happening. A lot of people are starting to turn towards us to be able to ask about what we see, because we have a lot of knowledge in terms of who we are too as well because we carry that, it’s traditional knowledge and it’s been passed down generation from generation so we know and we carry that.

The participant spoke about their responsibility as a community to the land and ways in which they can work towards protecting that land by connecting with other stakeholders and people to

better understand how climate change is impacting them and draw on traditional knowledge to adapt to climate change.

In the Elders focus group a participant spoke about creating alliances as well with the other stakeholders in the region like McGregor Bay Association, Bay of Islands, and Northeastern Manitoulin and the Islands (NEMI). The Elder in the focus group talked about the need to work with others because everyone had shared interests like the water and by working together they can address ways to protect the water. However, another Elder responded and felt wary of the idea given the ignorance of others towards First Nations peoples and did not feel making alliances was going to be effective when others lacked cultural awareness about the community.

In the community focus group, a participant wanted to increase awareness to people that live around the community by connecting with them and working together. The participant felt that the cottagers were not aware about their community and working with the people that live around the community would help address climate change issues and increase their awareness about the Whitefish River First Nation community. The participant said, “let’s work together because they obviously care about the land... I think it would be wise to kind of form a relationship, a working relationship where we can discuss things, their concerns too.” This participant saw not only the benefit of connecting with others to address climate change issues, but felt by reaching out to their neighbours they could increase cultural awareness in the region about their community.

Increasing Awareness in the Community

Building awareness within the community about climate change issues was something that participants felt needed to happen more in the community to address issues. A key informant male felt that there was something that was missing in the community, that there was a lack of awareness about climate change or how to address it. He said,

I don’t think it’s here yet. I don’t think there’s enough awareness. We’re trying to do it with our, we’re working on source water protection plan and we’re trying to do it that way so that it brings that type of awareness and you know it’ll start telling us what’s happening with our water and how, you know and why.

You know, like the algae blooms, why is that there, is it because the water is warmer or is it because of the nitrate levels in the ground or you know, what is it? So, I don't think there's not enough awareness and not enough people take the time to think about it, you know they're so busy with trying to keep up with life. They don't realize, you know, instead of walking a quarter mile to go visit their friend they'll drive.

There are initiatives within the community that are already taking place to address climate change, like he mentioned a water source protection initiative, but he felt that more could be done to increase awareness. He explained what changes he thought the community could slowly begin to implement locally to strengthen awareness and action on climate change. The changes he described were simpler day to day decisions that community members can actively make to be more conscious about their impact such as carpooling to reduce emissions. He said, "it's really, really hard to start changing the bigger picture you know and it's almost easier if you start at, start with what you can do at home and then hopefully some of your practices spread outward more people notice it."

During the community focus group, participants also spoke about building awareness and taking steps within the community that were more environmentally-conscious. A participant felt that there were things the community could do to protect the water like taking shorter showers, and work at making smaller-scale decisions that could be done locally. The idea to reduce the use of Styrofoam and plastics in the community was also addressed. When discussing their responsibility to the land and water, one participant stated,

... First Nations have got to start educating their people on their rights and responsibilities, role and responsibilities to look after the water. You know, we could sit here till we're blue in the face and say yeah we have this responsibility but what the heck is it, how do we go about fulfilling our responsibility, is everybody on the same page as what our responsibility is.

Educating and creating better awareness about their rights and responsibility was stated as being important to building effective adaptation strategies and ensuring the health and well-being of the community.

Many participants spoke about the gap in knowledge around climate change within the community. A participant in the community focus group raised concern over the lack of

information that was available for community members in terms of protecting the water and climate change. The participant said,

... is there existing policies that maybe we need to be a little bit more aware of whether or not there are environmental standards that are set for building cottages, their sewers, our sewers, we're building them here? How does that affect the water? We're all by the waterways and we're putting in sewer systems, are there already existing things that govern us here in Whitefish River or is there, are we missing that? Like what are we missing? Is there stuff that exists that we could build upon or there's things that we need to start fresh with? You know, those kinds of things if we could find out some of that information, then we'd all have a little bit more idea of what we're talking about and what we're missing or what we need to look a little bit more into.

The need for more information to have the tools to better address climate change issues was something that participants stated was integral for the community. Another a participant during the community focus group stated, "I don't think we really have much you know, 15-20 years ago this was not really a big discussion at the time but over time yes in another 15-20 years it's just going to get worse if we won't start doing something." It was only more recently that climate change discussions became more common, but still participants felt more information was needed. There were already initiatives within the community taking place to address environmental concerns and one participant in the community focus group spoke of steps being taking to purchase biodegradable plates and cups in the community to move away from Styrofoam.

When talking about environmental activism during the community focus group a participant stated, "... I think there has to be a lot of support for grassroots movements who are trying to like raise awareness... make sure that there is going to be a future for our kids one day or there's going to be clean water, actual trees, and you know it's not going to be so hot that you can't go play outside in the middle of the day." The participant felt that supporting grassroots movements and initiatives was a strong way to build awareness and to make changes not just within the community but elsewhere.

A participant in the community focus group felt that increasing awareness about climate change and policies was necessary to be prepared for future impacts. The participant said,

... there's going to be more people coming because this is prime cottage area... you see all this farmland on Manitoulin being bought up, you see all of these lands being bought up, those people are coming here already... so, us as a community right, we need to be that much ahead of that so developing some policy to say, you know what we know this is going to happen so these are our lands and we know what will be impacted by, what do we need to put in place to ensure that we're not going to have negative affects to our people right. So that's where a lot of that comes from, is there stuff existing, is there not, you know, so we'd have a better understanding of what we need to kind of hone in on.

When speaking to participants, awareness and more information on climate change was the piece of the puzzle that many participants felt was missing and strongly felt was needed in the community.

Conclusion of Chapter

Participants spoke about a wide array of impacts on the community in relation to climate change. Various community members highlighted how the environment and their health and well-being was being impacted by impacts such as rising temperature, changes to the water, and plant and animal species abundance. Many of the Elders spoke about teaching the children from a young age to connect with the land and learn to hunt. This could be a challenge however with the impacts of climate change and the changing landscape that is impacting the traditional ecological knowledge that is passed down to them. There were some impacts mentioned that did not directly relate to climate change but had to do with existing environmental pressures that play into the challenges presented by climate change and are likely to exacerbate problems, such as invasive species. Many participants also looked ahead and addressed concerns for future challenges that the community may have to face as a result of climate change like Lyme disease and water conflicts. The participants stated strong adaptation strategies that were suited to the needs of their community and spoke about the direction they wanted to see the community move towards in terms of dealing with climate change and the need for greater awareness and information. The following chapter examines the key findings of this study and discusses what other studies have found and whether there are connections that can be drawn to the concerns raised by Whitefish River First Nation community members and the recommendations that came from the community to address climate change issues.

Chapter 5: Discussion

Drawing on the analysis and findings from the key informant interviews and focus groups, this chapter explores how climate change is impacting the community of Whitefish River First Nation. Data and information from research studies and reports are used to discuss the changes that participants have addressed to understand how climate change is affecting the community and what can be done. The findings of this research and what this means for the community and the future of the Great Lakes region is explored in this chapter.

Discussion

This study highlights many ways in which a First Nations community in the Great Lakes region is impacted by climate change. The people of Whitefish River First Nation raised many issues about the environment and climate change that plague their community's health and well-being. Through the perceptions, experiences, and knowledge they shared, many concerns about the changes in the Great Lakes region as a result of climate change and environmental pressures were addressed. The impacts that participants and key informants spoke about are similar to impacts addressed in other studies and reports regarding climate change in the Great Lakes (Assembly of First Nations, 2011; McDermid et al., 2015; Wang et al., 2011; Wang et al., 2016). For example, in a study by Wang et al., they concluded that "there is a significant downward trend in lake ice cover for all of the lakes for the period 1973–2010" which "translates into a total loss in all Great Lakes ice coverage of 71% over the entire 38-year record" (Wang et al., 2011, p. 1326).

This warming trend in the Great Lakes region was expressed by community members of Whitefish River First Nation in this study where changes in lake ice cover was impacting recreational activities, ceremonies, and wildlife. In a report by McDermid et al., they stated that changes in ice cover in terms of the period of time ice over remains and the extent and thickness of cover will be impacted as a result of climate change and warmer temperatures in the Great Lakes Basin (McDermid et al., 2015). The Great Lakes Basin is also projected to experience warmer surface water temperature, decreased water levels, "increased wind gust events," and "increases in frequency and extent of drought" (McDermid et al., 2015). All of these impacts

were raised by Whitefish River First Nation community members as issues that the community has already experienced and is currently dealing with. However, organizations and government agencies such as Ontario's Ministry of Environment and Climate Change do not know how the changes in the environment and climate are impacting the community's health and well-being as research has not focused on understanding the impacts on First Nations communities in the Great Lakes. The knowledge, experiences and observations shared by Whitefish River First Nation community members not only addresses the changes in the environment but raises awareness on how the community is affected by the impacts climate change.

When asking participants to speak to changes that they have seen in their environment that could be tied to climate change, many participants spoke of the changes they had seen more recently during the winters and summers. For example, participants mentioned the droughts in recent years with much lower water levels in contrast to this year's high precipitation and the return of the water levels for the surrounding water bodies. Many also spoke of their experience with the most recent summer and winter season compared to the last few years. The reason for this could likely be that participants can easily recall their more recent experiences as it was foremost in their minds. However, some impacts like that of the changes to the lakes freezing over was something that stood out for many Elders as only occurring in the last few years. Prior to this, the ice used to freeze over by mid-December and was much more reliable.

Guyot et al. state that traditional foods are not just important for maintaining food security but is part of First Nations cultural preservation as well (Guyot et al., 2006). Being able to hunt and pick traditional foods and medicines is important to many Indigenous cultures. The threats posed by climate change require strategies and initiatives aimed at preserving that cultural identity while also ensuring food security. For example, many participants talked about the lack of blueberries and described their childhood memories of picking blueberries as a chore and longing for the return of that lifestyle where they could easily pick wild blueberries.

Participants also spoke of the traditional story of the axis shifting and there being a change in the true north. However, most participants agreed that the current changes are attributed to climate change. They felt that if the community fails to address the issues and take

action, they will face dire consequences as a result of the lack of preparedness for climate change. In a study on a First Nation's community in Yukon, participants addressed issues such as changes with thunderstorms and fluctuations in weather and an Elder "explained changes in weather, not as something unusual, but instead as weather patterns, recalling that, in the 1950's, it was warm and then it became colder, and now has started to become warm again." (Guyot et al., 2006, p. 410). Although there is a natural cycle of variability, which Elders from Whitefish River First Nation spoke to as well, understanding that the current impacts studied around the world shows a drastic shift from nature's natural cycle is something that was important to convey. During the community focus group, participants raised the need for greater awareness within the community about climate change issues and the of lack of information available for First Nations community to adapt. The impacts of climate change many Elders felt was evident in the discussions surrounding the unpredictability in the lakes and water bodies freezing over. Participants said only in the last few years had the ice stopped freezing over by mid-December.

The Outlook Based on Future Projections

From the discussions with community members, there are many changes that have taken place and are impacting the Whitefish River First Nation community. This shows that there are many significant impacts that First Nations and other communities around the Great Lakes region are dealing with and more resources are needed to address these issues. Based on scenario modelling of climate change, Ontario could potentially see an increase in human-induced forest fires by the end of the 21st century (Wotton et al., 2003). The potential for human-induced forest fires relies on how the land is being used, and if more activities are taking place in forested areas in Ontario it increases the risk of forest fires (Wotton et al., 2003). The area surrounding Whitefish River First Nation is a prime location that attracts many tourists, cottagers and campers, for which many participants voiced their concerns. This poses a risk, especially for hunters, if there is a rise in forest fires with climate change. The potential increase in forest fires is something that the community may need to prepare for and include in their adaption strategies.

Research in the Great Lakes Region

The knowledge gap around climate change research in the Great Lakes and impacts on communities was a key motivation for this research. The Health Department of Whitefish River

First Nation stated a need for more information on how it was impacting the community and this was also an issue echoed by many participants in the study. Although this study sheds light on the climate change issues impacting the community of Whitefish River First Nation, it barely scratches the surface with understanding the magnitude of how climate change will affect communities in the Great Lakes region.

There are many environmental pressures on the Great Lakes with invasive species and human activity. Participants spoke about invasive species such as gobies and the visible increase in algae blooms in the waters around their community. Algae blooms have been a great problem in Lake Erie and “cyanobacteria harmful algae blooms now occur annually in most of the Great Lakes, especially Lake Erie, Lake Huron (Saginaw and Sturgeon Bays), Lake Michigan (Green Bay) and nearshore areas of Lake Ontario (Bay of Quinte, Sodus Bay and Hamilton Harbour)” (Carmichael & Boyer, 2016, p. 202). The impacts caused by algae blooms include “eutrophication or undesirable algae, restrictions on drinking water consumption or taste and odour, beach closures, degradation of aesthetics, costs to agriculture and industry and degradation of phytoplankton and zooplankton populations” (Carmichael & Boyer, 2016, p. 201).

More research, both qualitative and quantitative, that highlights the impacts in the Great Lakes and assesses local impacts on communities is needed. In a report on the Great Lakes, it states the need for more “cumulative effects assessments that examine multiple environmental stressors (including climate change)” as this type of assessment is lacking for the Great Lakes region (McDermid et al., 2015, p. 74). In the issues and concerns raised by participants from Whitefish River First Nation, a need for cumulative effect assessments was reiterated as many participants spoke about environmental pressures such as invasive species and industrial pollution. These other environmental stressors also play into how climate change is experienced by communities.

Climate Change as an Environmental Justice Issue

Themes were used to analyze the data collected, but there were many issues that were discussed that overlapped between multiple themes. For example, when participants spoke about

blueberries and the maple syrup harvest, they talked about how it impacted their culture and traditions, their health and well-being, the wildlife, and the environment. This shows how climate change requires a broad approach to understanding how communities are affected. It is not simply just an impact that affects one aspect of peoples' lives or the environment, but there are multiple ways in which climate change is experienced. Even in terms of understanding how communities are affected requires a deconstructive approach where aspects such as gender or socioeconomic status are included in the approach to understand the differences in experiences within the community itself. Kyle Whyte speaks about using a gendered-analysis to understand how women in Indigenous communities' experience and address climate change issues. Whyte states that,

climate change impacts in the Great Lakes are projected to affect the ecological contexts needed for some Anishinaabe women and water to carry out their responsibilities to each other. Climate change impacts that degrade water in different ways will affect some of the core dimensions of Anishinaabe women's identities and their contributions within their communities, and will make their responsibilities to water more time-consuming and harder (if not impossible) to carry out (2014, p. 606).

Whyte explains how the experience of climate change account to injustices on Indigenous women and states,

Indigenous women may not have contributed as much as other groups to climate change drivers like deforestation and greenhouse-gas emissions, and may be more vulnerable to harm owing to their living under certain institutions that they did not create nor benefit from (for example, sexist institutions, colonial institutions, and so on). Each of these injustices suggests that nonindigenous parties have political responsibilities to indigenous women relative to climate change impacts (2014, p. 609).

The experiences shared by community members from Whitefish River First Nation echoed how colonial institutions still affect the community and how this in turn impacts their experiences of climate change. Elders spoke about past trauma that stripped away at their cultures and traditions. Allan and Symlie state that,

the process of colonization has resulted in ongoing and entrenched racism against Indigenous peoples. Racist ideologies continue to significantly affect the health and well-being of Indigenous peoples, cutting across the social determinants of health, impacting access to education, housing, food security

and employment, and permeating societal systems and institutions including the health care, child welfare and criminal justice systems (2015, p. 2).

The impact of colonialism and the intergenerational trauma faced by Indigenous peoples is starkly evident in the health disparities of Indigenous people compared to non-Indigenous people in Canada. For example, the life expectancy of non-Indigenous Canadians is higher than that of Indigenous peoples. Statistics Canada (2015) stated that “in 2017 the life expectancy for the total Canadian population is projected to be 79 years for men and 83 years for women. Among the Aboriginal population the Inuit have the lowest projected life expectancy in 2017, of 64 years for men and 73 years for women. The Métis and First Nations populations have similar life expectancies, at 73-74 years for men and 78-80 years for women.” Also, when compared with non-Indigenous Canadians, for First Nations people on reserve the “rate of diabetes is three to five times higher”(Government of Canada, 2013). Indigenous peoples having higher rates of food insecurity than non-Indigenous Canadians as well. According to the Government of Canada, one in five or 20.9 percent of off-reserve Aboriginal households were food insecure between 2007 to 2008 compared with only 7.2 percent of non-Aboriginal households (Government of Canada, 2012a). Research focused on addressing these injustices along with how communities are being impacted is necessary to grasp the magnitude of climate change impacts on Indigenous communities as these impacts are likely to be made worse by the ongoing intergenerational trauma caused by colonialism.

This study was necessary to address the gap in knowledge on how First Nations communities in the Great Lakes region were being impacted by climate change. This was an issue that participants also spoke about with the lack of awareness in the community about climate change and not having the information necessary to help them adapt to the changes they have been experiencing. In the United Nations Declaration on the Rights of Indigenous Peoples, under Article 29 it states:

Indigenous peoples have the right to the conservation and protection of the environment and the productive capacity of their lands or territories and resources. States shall establish and implement assistance programmes for indigenous peoples for such conservation and protection, without discrimination (United Nations, 2008).

It is not just up to communities to address climate change on their own, but it is the responsibility of the state to ensure that Indigenous peoples have the tools they need to ensure the protection of their land and resources.

Indigenous people in Canada make up only about four percent of the population but face many challenges from colonialism and history of institutionalized racism and assimilation policies which is reflected in many health disparities and social health indications such as education and housing conditions (King et al., 2009). To make matters worse, the impacts of climate change will be felt by the most vulnerable populations which includes Indigenous peoples in Canada. Environmental justice theory draws attention to the injustices faced by racialized and socially and economically disadvantaged groups that bear more environmental burdens (Gosine & Teelucksingh, 2008; McGregor, 2009). The injustice for many Indigenous peoples lies in the fact that they have committed little to historic atmospheric concentrations of greenhouse gases, yet are some of the most vulnerable to the impacts. Despite being in a “developed country,” Indigenous communities face issues of poor housing conditions, lack of access to safe-drinking water, and issues of food insecurity (Allan & Smylie, 2015; King et al., 2009).

From an Indigenous environmental justice perspective, the injustice is not just to the people itself but to the animals, plants, land, water and Creation. These relationships that Indigenous people hold sacred was evident in the discussion with participants from Whitefish River First Nation that were worried about the wildlife, the land and the impacts of climate change on their relationship with Creation. The changes they were witnessing was affecting Elders as they spoke of feeling nostalgic of their environments which had changed a lot of when they were young. There is no justification for the challenges brought on by climate change that Indigenous peoples must endure. Given that only 20 percent of the world’s population has contributed the majority of the historic greenhouse gas emissions (Sandberg & Sandberg, 2011), which Indigenous people were not part of, why is it then that they must deal with the consequences of a problem which they did not create?

Adapting to Climate Change

Many of the initiatives proposed included mitigation and adaptation efforts that the community could implement locally and participants discussed changes that they would like to see take place in the community to be more environmentally-cautious and efficient. Beckford, Jacobs, Williams and Nahdee in their analysis of research with Walpole Island First Nation found that “there is a high level of environmental consciousness and respect for the environment among the people, yet also an acknowledgement that the Nation faces many environmental challenges, and that economic pressures have environmental consequences” (2010, p. 247). Walpole Island First Nation like Whitefish River First Nation is part of the Great Lakes basin, and many communities are not only dealing with the impacts of climate change but also must cope with environmental challenges present in this region.

Beckford et al. in their analysis on research with Walpole Island First Nation stated that “a decline in traditional values and culture has led to adverse environmental impacts” (2010, p. 247). Elders from Whitefish River First Nation talked about the benefits of connecting youth to the land and the need for that to start at a young age. Other scholars have talked about this similar concept of the benefits of connecting youth to the land (Big-Canoe & Richmond, 2014). Big-Canoe and Richmond (2014) discuss environmental dispossession and how removing and disconnecting Indigenous peoples from their traditional lands has had huge negative impacts on communities’ health and well-being. Instead Big-Canoe and Richmond state that environmental repossession is a way to move forward and address these negative impacts. Environmental repossession is described as “the social, cultural and political processes by which Indigenous peoples and communities are reclaiming their traditional lands and ways of life. This concept is rooted centrally in the idea that Indigenous peoples’ health, ways of living, and Indigenous knowledge systems are dependent on access to their traditional lands and territories” (Big-Canoe & Richmond, 2014, p. 133).

The challenge lies however not only with trying to engage youth to connect with the land and learn about practices such as hunting, but in doing so in an environment that is drastically changing from what their ancestors and parents knew. For example, in talking with participant in this study, they spoke of ways in which their traditional ecological knowledge and not being able

to rely on what they had lived with for many generations. The impacts to the maple syrup harvest and blueberries is a key example of how their understanding of the land was changing as a result of climate change. This is where greater awareness and knowledge sharing can provide the community with the information they need to address climate change impacts and creative effective adaptation or mitigation strategies.

The impacts that were addressed by participants in this study demonstrated many ways in which their livelihoods, health and well-being was being affected. Whyte describes collective continuance as “a community’s capacity to be adaptive in ways sufficient for the livelihoods of its members to flourish into the future.” (Whyte, 2013, p. 518). From this and the concerns shared by members of Whitefish River First Nation, the lack of information available for communities in the Great Lakes region prevents them from having the necessary tools to adapt to their changing environments. Whyte discusses incorporating traditional ecological knowledge in research. Whyte states “the inclusion of traditional ecological knowledge in adaptation, management and stewardship strategies is actually about respecting systems of responsibilities. It means creating inclusive research practices that are not only about sharing stores of knowledge, but about sharing understanding of a host of responsibilities that should play integral roles in adaptation, management and stewardship strategies”(Whyte, 2013, p. 527). Whyte describes systems of responsibilities as “the actual schemes of roles and relationships that serve as the background against which particular responsibilities stand out as meaningful and binding” (2013, p. 519). If various stakeholders can come together based on shared interest to protect the Great Lakes it would allow for an exchange of knowledge about the state of the region and how to address climate change issues. This was discussed by many participants in the study where they hoped that bringing different agencies and groups in the Manitoulin region together to tackle climate change issues would be beneficial because the water connects them all and they each have a vested interest in maintaining the Great Lakes.

Chapter 6: Recommendations

This chapter addresses possible recommendations based on the analysis and discussion chapters of this study. Many community members that participated in this study put forth unique and effective strategies that would work to help the community adapt to the impacts of climate change. Some of these recommendations that came from the communities also included mitigation strategies to make the community more efficient and reduce their own emissions. This chapter will highlight ways to move forward and describe some recommendations on what initiatives or strategies need to take place to ensure that communities in the Great Lakes region and other Indigenous communities further south of the Arctic circle can adapt to the impacts of climate change.

Traditional Ecological Knowledge

Embedded in the discussions with community members of Whitefish River First Nation was traditional ecological knowledge. Many participants framed the changes in relation to traditional ecological knowledge and used it as a marker for understanding how much has changed in their environment. For example, when participants spoke about the changes they had seen in the maple syrup harvest, they drew on their traditional ecological knowledge and understanding of the usual timeframe for harvest and how that traditional marker was no longer reliable as a result of climate change and the impact it was having on the time the sap tended to run. Elders also drew on traditional teaching to explain the changes they were experiencing to help understand the impacts on their environment. One elder spoke of the lack of thunderstorms and drew on the traditional story of the relationship between snakes and the Thunder Beings and stated the lack of thunderstorms was impacting the snake population in the region. Another impact was the changes to medicinal plants like sweetgrass and blueberries that many Elders said they had grown up collecting easily in their environment but were now much harder to find and pick. Based on traditional knowledge and experiences of the land, they were able to draw on many impacts that they had noticed within their lifetime and the experiences that were shared by their parents and grandparents. By comparing their traditional ecological knowledge to their more recent observations, they were able to speak to the changes that they had seen and had to adapt to such as unreliable lake ice conditions and inability to hunt smaller rodents.

The examples shared in this the study highlight the importance of traditional ecological knowledge for Indigenous peoples to better understand the magnitude of climate change impacts on their community. Traditional ecological knowledge is also widely being incorporated in research related to climate change (Pearce et al., 2015) because it provides a basis for understanding how different environments are experiencing impacts of climate change as traditional ecological knowledge provides a reference for how things used to be. Pearce et al. (2015) highlights the benefits of traditional ecological knowledge for creating effective adaptation strategies and building resilience within communities. Traditional ecological knowledge can help prepare for impacts of climate change and avoid potential disasters. For example in Arctic Canada, Inuit peoples use traditional ecological knowledge to help determine when the sea ice is safer to use for travel and with climate change, knowledge of the land and understanding when conditions are not safe is vital for the community's health and well-being (Pearce et al., 2015). This was discussed by Whitefish River First Nation participants as well, that have noticed the changes in their environment with unreliable lake ice conditions in relation to their traditional ecological knowledge and are more aware of the dangers on traversing or skating across the ice. Traditional ecological knowledge is vital for understanding how environments are changing as a result of climate change and for ensuring that communities can plan and create effective adaptation strategies (Pearce et al., 2015).

Recommendations

There were many strong recommendations that came from the community members. One of the recommendations voiced by multiple participants including Elders was initiatives that are aimed at increasing awareness within the community about climate change issues and ways to mitigate or adapt to the impacts in the region. Creating partnerships or reaching out to other organizations, groups, stakeholders, or communities that have a shared and vested interest in tackling climate change issues in the Great Lakes region can help to collectively address key issues (Whyte, 2013). This can also ensure that First Nations communities are part of the discussions on issues that concern them and can help educate people, for example the neighbours of Whitefish River First Nation about the community and their efforts to protect the environment, land and water.

Elders also spoke about the benefits of connecting youth in the community to the land, which is a concept that Big-Canoe and Richmond (2014) refer to as environmental repossession. Connecting youth to the land can help build greater awareness of traditional knowledge and climate change issues. Traditional ecological knowledge would be important for building resilience in the community to future impacts of climate change and could help increase preparedness and awareness of any potential hazards (Pearce et al., 2015), especially for youth in the community that can better understand how the environment has changed from what their parents and grandparents had experienced. Another recommendation that emerged from the community was the need for more data on the impact of tourism in the area to determine how that was affecting the community's health and well-being in order to better address issues of pollution and water quality in the region.

Although climate change is a global issue, many participants spoke about making changes for themselves to mitigate their contribution to emissions. From making small behavioural changes such as organizing carpooling trips to get supplies in the neighbouring town of Espanola to reducing the use of disposable Styrofoam plates for community events and meetings, participants spoke of many ways that they could reduce their own emissions. Ostrom discusses the polycentric approach to addressing climate change as it allows for mitigation and adaptation efforts at multiple scales with different actors. Describing the benefits of local efforts, Ostrom states,

local discussions and meetings generate information about the unrecognized costs of individual, family, and business activities as well as potentially lead to a change in the preferences of individuals involved and about the expected behavior of others. As a result of this communication, some actors adopt a sense of ethical responsibility for their own carbon footprint... individuals may recognize that they can achieve benefits as a result of taking costly actions that combine with the actions of others to reduce the threat faced by all (Ostrom, 2010, p. 555).

This was reflected in the focus group discussions with Whitefish River First Nation community members as participants felt that they needed to increase awareness within the community to reduce their own carbon footprint.

As Ostrom states,

the advantage of a polycentric approach is that it encourages experimentation by multiple actors, as well as the development of methods for assessing the benefits and costs of particular strategies adopted in one setting and comparing these with results obtained in other settings. A strong commitment to finding ways of reducing individual emissions is an important element for coping with climate change. Building such a commitment, and trusting that others are also taking responsibility, can be more effectively undertaken in small- to medium-scale units that are linked together through diverse information networks (2010, pp. 555–556).

Climate change requires local strategies to be implemented at the community-level, which was raised by participants in this study as well. Climate change cannot be addressed with simply a global agreement, but requires multiple actors at different scales from the global to the local (Ostrom, 2010). Understanding how a community is being impacted is key for developing effective adaptation strategies that cater to the needs of the community.

From this study, something that stood out was the need for more community inclusive and community-based research related to climate change as this type of research allows for a better understanding on how communities are impacted by climate change. Localizing the research and focusing on communities allows for a cultural lens and an analysis of different experiences of climate change. There is also a need for more tools and resources that empower Indigenous communities to tackle climate changes issues themselves and allows for communities to employ a culturally-specific framework in climate change research and initiatives. It is necessary to better understand how vulnerable communities will be impacted and the changes that will need to be made to help adapt to climate change. Also, as Turner and Clifton (2009) state, if done ethically, by working with indigenous communities, traditional ecological knowledge can help address climate change issues and more research incorporating traditional ecological knowledge and Indigenous people is needed.

Chapter 7: Conclusion

Climate change may be a global problem, but how communities experience the impacts of climate change differ immensely. Many communities vulnerable to the impacts of climate change have contributed the least to global greenhouse gas emissions yet they must deal with the brunt of the consequences. Whitefish River First Nation is already experiencing the impacts of climate change but the community needs more resources and information to understand how climate change will impact the Great Lakes Basin. Communities are ready to address climate change and adapt to the impacts, but as with the case in Whitefish River First Nation more information is needed before they can do so. Moving forward, research that works with communities to assess climate change impacts is necessary to gauge the many ways in which peoples' health, well-being, and livelihoods are being affected.

This research emerged from a need to address the knowledge gap around how climate change is impacting First Nations communities' health and well-being in the Great Lakes region. By working with the Whitefish River First Nation community, this research study gathered a wealth of information on the impacts to the environment and the community's health and well-being by bringing together the knowledge and perceptions of changes using focus groups and key informant interviews. Through discussions with community members it is evident that the community is already being impacted by climate change and it is affecting their physical, mental, and spiritual health and well-being. Many recommendations to adapt to climate change emerged from community members. Whitefish First Nation community members used traditional ecological knowledge to make sense of the drastic changes they have observed in their lifetime. They also drew on traditional ecological knowledge to identify adaptation strategies that would help address the impacts of climate change on the community.

Through framing the issue of the impacts of climate change on the Whitefish River First Nation community through an Indigenous Environmental Justice approach, the magnitude in which a community experiences climate change is made to be more evident. The impacts of climate change on the community's health and well-being is inextricably linked to their histories, culture, identities, traditions, and environments. For many Indigenous communities, their health and

well-being is tied to their relationship with the land, wildlife and Creation. This is reflected in the experiences and knowledge shared by the Whitefish River First Nation community. Speaking with community members of Whitefish River First Nation, this research highlights the need for greater attention focused on communities' experiences with climate change. In order to understand how a community experiences climate change and how it impacts their health and well-being, it must come from the community itself.

In closing, this research demonstrated the importance of local community knowledge and participation in understanding climate change impacts. In order to address the knowledge gap that exists on how climate change will affect Indigenous communities in the Great Lakes region, further research must be conducted that is rooted within these communities.

References

- Allan, B., & Smylie, J. (2015). *First Peoples, second class treatment: The role of racism in the health and well-being of Indigenous peoples in Canada*. Toronto, ON: The Wellesley Institute. Retrieved from <http://www.wellesleyinstitute.com/wp-content/uploads/2015/02/Summary-First-Peoples-Second-Class-Treatment-Final.pdf>
- Assembly of First Nations. (2007). First Nations Regional Longitudinal Health Survey (RHS) 2002/03: The Peoples' Report. Retrieved from http://fnigc.ca/sites/default/files/ENpdf/RHS_2002/rhs2002-03-the_peoples_report_afn.pdf
- Assembly of First Nations. (2011). Impacts of Pollution on Great Lakes Fisheries Discussion Paper. Retrieved April 12, 2017, from http://www.afn.ca/uploads/files/env/great_lakes_considerations_paper.pdf
- Basch, C. (1987). Focus Group Interview: An Underutilized Research Technique for Improving Theory and Practice in Health Education. *Health Education & Behavior*, 14(4), 411–448. <https://doi.org/10.1177/109019818701400404>
- Baskin, C. (2016). Spirituality: The Core of Healing and Social Justice from an Indigenous Perspective. *New Directions for Adult and Continuing Education*, 2016(152), 51–60. <https://doi.org/10.1002/ace.20212>
- Beckford, C. L., Jacobs, C., Williams, N., & Nahdee, R. (2010). Aboriginal Environmental Wisdom, Stewardship, and Sustainability: Lessons From the Walpole Island First Nations, Ontario, Canada. *The Journal of Environmental Education*, 41(4), 239–248. <https://doi.org/10.1080/00958961003676314>
- Berkes, F. (2009). Indigenous ways of knowing and the study of environmental change. *Journal of the Royal Society of New Zealand*, 39(4), 151–156. <https://doi.org/10.1080/03014220909510568>

- Berry, H., Bowen, K., & Kjellstrom, T. (2010). Climate change and mental health: a causal pathways framework. *International Journal of Public Health, 55*(2), 123–132.
<https://doi.org/10.1007/s00038-009-0112-0>
- Bertrand, J., Brown, J., & Ward, V. (1992). Techniques for Analyzing Focus Group Data. *Evaluation Review, 16*(2), 198–209. <https://doi.org/10.1177/0193841X9201600206>
- Big-Canoe, K., & Richmond, C. A. M. (2014). Anishinabe youth perceptions about community health: Toward environmental repossession, *26*(Complete), 127–135.
<https://doi.org/10.1016/j.healthplace.2013.12.013>
- Borgerson, S. G. (2008). Arctic Meltdown: The Economic and Security Implications of Global Warming. *Foreign Affairs, 87*(2), 63–77.
- Carmichael, W. W., & Boyer, G. L. (2016). Health impacts from cyanobacteria harmful algae blooms: Implications for the North American Great Lakes, *54*, 194–212.
<https://doi.org/10.1016/j.hal.2016.02.002>
- Cohen, S., Koshida, G., & Mortsch, L. (2015). Climate and water availability indicators in Canada: Challenges and a way forward. Part III – Future scenarios. *Canadian Water Resources Journal / Revue Canadienne Des Ressources Hydriques, 40*(2), 160–172.
<https://doi.org/10.1080/07011784.2015.1006021>
- Costello, A., Abbas, M., Allen, A., Ball, S., Bell, S., Bellamy, R., ... Patterson, C. (2009). Managing the health effects of climate change. *The Lancet, 373*(9676), 1693–1733.
[https://doi.org/10.1016/S0140-6736\(09\)60935-1](https://doi.org/10.1016/S0140-6736(09)60935-1)
- Cunsolo Willox, A., Harper, S. L., Ford, J. D., Landman, K., Houle, K., & Edge, V. L. (2012). “From this place and of this place:” Climate change, sense of place, and health in Nunatsiavut, Canada, *75*(3), 538–547. <https://doi.org/10.1016/j.socscimed.2012.03.043>

- Cunsolo Willox, A., Stephenson, E., Allen, J., Bourque, F., Drossos, A., Elgarøy, S., ... Wexler, L. (2015). Examining relationships between climate change and mental health in the Circumpolar North. *Regional Environmental Change*, *15*(1), 169–182. <https://doi.org/10.1007/s10113-014-0630-z>
- Dudley, J., Hoberg, E., Jenkins, E., & Parkinson, A. (2015). Climate Change in the North American Arctic: A One Health Perspective. *EcoHealth*, *12*(4), 713–725. <https://doi.org/10.1007/s10393-015-1036-1>
- Dupont, D., Waldner, C., Bharadwaj, L., Plummer, R., Carter, B., Cave, K., & Zagozewski, R. (2014). Drinking Water Management: Health Risk Perceptions and Choices in First Nations and Non-First Nations Communities in Canada. *International Journal of Environmental Research and Public Health*, *11*(6), 5889–5903. <https://doi.org/10.3390/ijerph110605889>
- Durkalec, A., Furgal, C., Skinner, M. W., & Sheldon, T. (2015). Climate change influences on environment as a determinant of Indigenous health: Relationships to place, sea ice, and health in an Inuit community, *126–137(Complete)*, 17–26. <https://doi.org/10.1016/j.socscimed.2015.04.026>
- Ebi, K. L., & Semenza, J. C. (2008). Community-Based Adaptation to the Health Impacts of Climate Change. *American Journal of Preventive Medicine*, *35*(5), 501–507. <https://doi.org/10.1016/j.amepre.2008.08.018>
- First National People of Colour Environmental Leadership Summit. (1991). Principles of Environmental Justice. Retrieved April 12, 2017, from <http://www.ejnet.org/ej/principles.html>
- Flannery, T. (2015). *Atmosphere of Hope*. Toronto, Canada: HarperCollins Publishers Ltd.
- Ford, J. D., Berrang-Ford, L., King, M., & Furgal, C. (2010). Vulnerability of Aboriginal health systems in Canada to climate change. *Global Environmental Change*, *20*(4), 668–680. <https://doi.org/10.1016/j.gloenvcha.2010.05.003>
- Ford, J. D., Pearce, T., Duerden, F., Furgal, C., & Smit, B. (2010). Climate change policy responses for Canada's Inuit population: The importance of and opportunities for adaptation. *Global Environmental Change*, *20*(1), 177–191. <https://doi.org/10.1016/j.gloenvcha.2009.10.008>

- Ford, J. D., Smit, B., & Wandel, J. (2006). Vulnerability to climate change in the Arctic: A case study from Arctic Bay, Canada. *Global Environmental Change*, 16(2), 145–160.
<https://doi.org/10.1016/j.gloenvcha.2005.11.007>
- Galway, L. P. (2016). Boiling over: A Descriptive Analysis of Drinking Water Advisories in First Nations Communities in Ontario, Canada. *International Journal of Environmental Research and Public Health*, 13(5), 505. <https://doi.org/10.3390/ijerph13050505>
- Golden, D. M., Audet, C., & Smith, M. A. (Peggy). (2015). “Blue-ice”: framing climate change and reframing climate change adaptation from the indigenous peoples’ perspective in the northern boreal forest of Ontario, Canada. *Climate and Development*, 7(5), 401–413.
<https://doi.org/10.1080/17565529.2014.966048>
- Gosine, A., & Teelucksingh, C. (2008). *Environmental Justice and Racism in Canada: An Introduction*. Toronto, Canada: Edmond Montgomery Publications Limited.
- Gough, W., Anderson, V., & Herod, K. (2016). *Ontario Climate Change and Health Modelling Study* (pp. 1–30). Government of Ontario. Retrieved from
http://www.health.gov.on.ca/en/common/ministry/publications/reports/climate_change_toolkit/climate_change_health_modelling_study.pdf
- Government of Canada. (2012a). Household Food Insecurity In Canada in 2007-2008: Key Statistics and Graphics. Retrieved from <https://www.canada.ca/en/health-canada/services/food-nutrition/food-nutrition-surveillance/health-nutrition-surveys/canadian-community-health-survey-cchs/household-food-insecurity-canada-overview/household-food-insecurity-canada-2007-2008-key-statistics-graphics-food-nutrition-surveillance-health-canada.html>
- Government of Canada. (2012b, May 25). Impact of climate change on Canadian agriculture [contact information]. Retrieved June 8, 2017, from <http://www.agr.gc.ca/eng/science-and->

innovation/agricultural-practices/agriculture-and-climate/future-outlook/impact-of-climate-change-on-canadian-agriculture/?id=1329321987305

Government of Canada. (2013). Diabetes. Retrieved November 27, 2017, from

<https://www.canada.ca/en/health-canada/services/first-nations-inuit-health/diseases-health-conditions/diabetes.html>

Government of Canada. (2017a). First Nation Adapt Program [promotional material]. Retrieved October

22, 2017, from <http://www.aadnc-aandc.gc.ca/eng/1481305681144/1481305709311>

Government of Canada. (2017b). Great Lakes drainage basin map [maps]. Retrieved November 19, 2017,

from <https://www.canada.ca/en/environment-climate-change/services/great-lakes-protection/maps/drainage-basin.html>

Government of Canada. (2017c). United Nations Declaration on the Rights of Indigenous Peoples

[administrative page; reference material; resource list]. Retrieved October 21, 2017, from

<https://www.aadnc-aandc.gc.ca/eng/1309374407406/1309374458958>

Government of Ontario. (2007). Climate change (regions and districts). Text, Queen's Printer for Ontario.

Retrieved from <https://www.ontario.ca/environment-and-energy/climate-change-regions-and-districts>

Government of Ontario. (2016a). Ministry of the Environment and Climate Change: Minister's Annual

Report on Drinking Water 2016. Retrieved April 12, 2017, from

<https://www.ontario.ca/page/ministry-environment-and-climate-change-ministers-annual-report-drinking-water-2016#section-2>

Government of Ontario. (2016b). Ontario's Great Lakes Strategy 2016 Progress Report | Ontario.ca.

Retrieved from <https://www.ontario.ca/page/ontarios-great-lakes-strategy-2016-progress-report>

- Guyot, M., Dickson, C., Paci, C., Furgal, C., & Chan, H. M. (2006). Local observations of climate change and impacts on traditional food security in two northern Aboriginal communities. *International Journal of Circumpolar Health*, 65(5), 403–415. <https://doi.org/10.3402/ijch.v65i5.18135>
- Haines, A., Kovats, R. S., Campbell-Lendrum, D., & Corvalan, C. (2006). Climate change and human health: Impacts, vulnerability and public health. *Public Health*, 120(7), 585–596. <https://doi.org/10.1016/j.puhe.2006.01.002>
- Haluza-Delay, R. (2007). Environmental Justice in Canada. *Local Environment*, 12(6), 557–564. <https://doi.org/10.1080/13549830701657323>
- Harrington, A. R. (2010). Citizens of the World. *Proceedings of the Annual Meeting (American Society of International Law)*, 104, 55–57. <https://doi.org/10.5305/procanmeetasil.104.0055>
- Healey, G. K., Magner, K. M., Ritter, R., Kamookak, R., Aningmiuq, A., Issaluk, B., ... Moffit, P. (2011). Community Perspectives on the Impact of Climate Change on Health in Nunavut, Canada. *Arctic*, 64(1), 89–97.
- IPCC. (2007). *Climate Change 2007: Synthesis Report Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)). Geneva, Switzerland: IPCC. Retrieved from http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf
- IPCC. (2014a). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* ([Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. Geneva, Switzerland. Retrieved from https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_All_Topics.pdf
- IPCC. (2014b). *Climate Change 2014: Synthesis Report Summary for Policymakers*. Geneva, Switzerland. Retrieved from https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf

- Isaak, C. A., & Marchessault, G. (2008). Meaning of Health: The Perspectives of Aboriginal Adults and Youth in a Northern Manitoba First Nations Community, *32*(2), 114–122.
[https://doi.org/10.1016/S1499-2671\(08\)22008-3](https://doi.org/10.1016/S1499-2671(08)22008-3)
- Khedun, C., & Singh, V. (2014). Climate Change, Water, and Health: A Review of Regional Challenges. *Water Quality, Exposure and Health*, *6*(1–2), 7–17. <https://doi.org/10.1007/s12403-013-0107-1>
- Kidd, P., & Parshall, M. (2000). Getting the Focus and the Group: Enhancing Analytical Rigor in Focus Group Research. *Qualitative Health Research*, *10*(3), 293–308.
<https://doi.org/10.1177/104973200129118453>
- King, M., Smith, A., & Gracey, M. (2009). Indigenous health part 2: the underlying causes of the health gap. *The Lancet*, *374*(9683), 76–85. [https://doi.org/10.1016/S0140-6736\(09\)60827-8](https://doi.org/10.1016/S0140-6736(09)60827-8)
- Kitzinger, J. (1995). Introducing Focus Groups. *BMJ: British Medical Journal*, *311*(7000), 299–302.
- Klein, N. (2014). *This Changes Everything: Capitalism vs. the Climate*. Toronto, Canada: Knopf Canada.
- Kovach, M. (2009). *Indigenous Methodologies: Characteristics, Conversations, and Contexts*. Toronto, Canada: University of Toronto Press.
- Lake, I. R., Hooper, L., Abdelhamid, A., Bentham, G., Boxall, A. B. A., Draper, A., ... Waldron, K. W. (2012). Climate Change and Food Security: Health Impacts in Developed Countries. *Environmental Health Perspectives*, *120*(11), 1520–1526. <https://doi.org/10.1289/ehp.1104424>
- Lavallee, L. (2008). Balancing the Medicine Wheel Through Physical Activity. National Aboriginal Health Organization. Retrieved from http://www.naho.ca/jah/english/jah04_01/09MedicineWheel_64-71.pdf
- Lavallee, L., & Poole, J. (2010). Beyond Recovery: Colonization, Health and Healing for Indigenous People in Canada. *International Journal of Mental Health and Addiction*, *8*(2), 271–281.
<https://doi.org/10.1007/s11469-009-9239-8>

- Maar, M. A., Lightfoot, N. E., Sutherland, M. E., Strasser, R. P., Wilson, K. J., Lidstone-Jones, C. M., ... Williamson, P. (2011). Thinking outside the box: Aboriginal people's suggestions for conducting health studies with Aboriginal communities. *Public Health, 125*(11), 747–753.
<https://doi.org/10.1016/j.puhe.2011.08.006>
- MacDonald, J. P., Ford, J., Willox, A. C., & Mitchell, C. (2015). Youth-Led Participatory Video as a Strategy to Enhance Inuit Youth Adaptive Capacities for Dealing with Climate Change. *Arctic, 68*(4), 486–499.
- Marshall, M. (1996). The key informant technique. *Family Practice, 13*(1), 92–97.
<https://doi.org/10.1093/fampra/13.1.92>
- McDermid, J. L., Dickin, S. K., Winsborough, C. L., Switzman, H., Barr, S., Gleeson, J. A., ... Gray, P. A. (2015). State of Climate Change Science in the Great Lakes Basin: A Focus on Climatological, Hydrological and Ecological Effects. Prepared jointly by the Ontario Climate Consortium and Ontario Ministry of Natural Resources and Forestry to advise Annex 9 - Climate Change Impacts under the Great Lakes Water Quality Agreement, October 2015. Retrieved from
<https://climateconnections.ca/our-work/great-lakes-basin/>
- McGregor, D. (2004). Coming Full Circle: Indigenous Knowledge, Environment, and Our Future. *American Indian Quarterly, 28*(3/4), 385–410.
- McGregor, D. (2009). Honoring Our Relations: An Anishinaabe Perspective on Environmental Justice. In J. Agyeman, P. Cole, R. Haluza-DeLay, & P. O'Riley (Eds.), *Speaking for Ourselves: Environmental Justice in Canada*. Vancouver, BC, Canada: UBC Press. Retrieved from
<http://www.ubcpres.ca/books/pdf/chapters/2009/SpeakingforOurselves.pdf>
- McGregor, D., Bayha, W., & Simmons, D. (2010). "Our responsibility to keep the land alive": voices of Northern Indigenous researchers, *8*, 101–123.

- McPherson, M., Garcia-Garcia, A., Cuesta-Valero, F. J., Beltrami, H., Hansen-Ketchum, P., MacDougall, D., & Ogden, N. H. (2017). Expansion of the Lyme Disease Vector *Ixodes scapularis* in Canada Inferred from CMIP5 Climate Projections, *125*(5), 1–9. <https://doi.org/10.1289/EHP57>
- Ostrom, E. (2010). Polycentric systems for coping with collective action and global environmental change, *20*(4), 550–557. <https://doi.org/10.1016/j.gloenvcha.2010.07.004>
- Parkinson, A. J. (2010). Sustainable development, climate change and human health in the arctic. *International Journal of Circumpolar Health*, *69*(1), 99–105. <https://doi.org/10.3402/ijch.v69i1.17428>
- Patz, J. A., Gibbs, H. K., Foley, J. A., Rogers, J. V., & Smith, K. R. (2007). Climate Change and Global Health: Quantifying a Growing Ethical Crisis. *EcoHealth*, *4*(4), 397–405. <https://doi.org/10.1007/s10393-007-0141-1>
- Peace, D. M., & Myers, E. (2012). Community-based Participatory Process – Climate Change and Health Adaptation Program for Northern First Nations and Inuit in Canada. *International Journal of Circumpolar Health*, *71*(1), 18412. <https://doi.org/10.3402/ijch.v71i0.18412>
- Pearce, T. D., Ford, J. D., Laidler, G. J., Smit, B., Duerden, F., Allarut, M., ... Wandel, J. (2009). Community collaboration and climate change research in the Canadian Arctic. *Polar Research*, *28*(1), 10–27. <https://doi.org/10.1111/j.1751-8369.2008.00094.x>
- Pearce, T., Ford, J., Cunsolo Willox, A., & Smit, B. (2015). Inuit traditional ecological knowledge (TEK), subsistence hunting and adaptation to climate change in the Canadian Arctic, *68*(2), 233–245. <https://doi.org/http://dx.doi.org.ezproxy.library.yorku.ca/10.14430/arctic4475>
- Pennesi, K., Arokium, J., & McBean, G. (2012). Integrating local and scientific weather knowledge as a strategy for adaptation to climate change in the Arctic. *Mitigation and Adaptation Strategies for Global Change*, *17*(8), 897–922. <https://doi.org/10.1007/s11027-011-9351-5>

- Petrasek MacDonald, J., Harper, S. L., Cunsolo Willox, A., Edge, V. L., & Rigolet Inuit Community Government. (2013). A necessary voice: Climate change and lived experiences of youth in Rigolet, Nunatsiavut, Canada, *23*(1), 360–371. <https://doi.org/10.1016/j.gloenvcha.2012.07.010>
- Plummer, R., de Grosbois, D., Armitage, D., & de Loë, R. C. (2013). An integrative assessment of water vulnerability in First Nation communities in Southern Ontario, Canada, *23*(4), 749–763. <https://doi.org/10.1016/j.gloenvcha.2013.03.005>
- Richmond, C. A. M., & Ross, N. A. (2009). The determinants of First Nation and Inuit health: A critical population health approach. *Health and Place, 15*(2), 403–411. <https://doi.org/10.1016/j.healthplace.2008.07.004>
- Romero-Lankao, P., Smith, J. B., Davidson, N. J., Diffenbaugh, N. S., Kinney, P. L., Kirshen, P., ... Villers Ruiz, L. (2014). *2014: North America. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (No. Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)) (pp. 1439–1498). Cambridge, United Kingdom: Cambridge University Press.
- Rosol, R., Powell-Hellyer, S., & Chan, H. M. (2016). Impacts of decline harvest of country food on nutrient intake among Inuit in Arctic Canada: impact of climate change and possible adaptation plan. *International Journal of Circumpolar Health, 75*. <https://doi.org/10.3402/ijch.v75.31127>
- Sandberg, L. A., & Sandberg, T. (2011). *Climate Change - Who's Carrying the Burden? The chilly climates of the global environmental dilemma* (Vol. 3). Ottawa, Canada: Canadian Centre for Policy Alternatives.
- Schlosberg, D., & Carruthers, D. (2010). Indigenous Struggles, Environmental Justice, and Community Capabilities. *Global Environmental Politics, 10*(4), 12–35.

- Skinner, K., Hanning, R. M., Desjardins, E., & Tsuji, L. J. (2013). Giving voice to food insecurity in a remote indigenous community in subarctic Ontario, Canada: traditional ways, ways to cope, ways forward. *BMC Public Health*, *13*, 427. <https://doi.org/10.1186/1471-2458-13-427>
- Smith, E. (2017, June 7). Tracking ticks: New study forecasts spread of Lyme disease in Eastern Canada. *CBC News*. Retrieved from <http://www.cbc.ca/news/canada/nova-scotia/lyme-disease-black-legged-ticks-spread-1.4149826>
- Smith, K. R., Woodward, A., Campbell-Lendrum, D., Chadee, D. D., Honda, Y., Lui, Q., ... Sauerborn, R. (2014). *2014: Human health: impacts, adaptation, and co-benefits*. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)) (pp. 709–754). Cambridge, United Kingdom: Cambridge University Press. Retrieved from http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap11_FINAL.pdf
- Statistics Canada. (2015). Life Expectancy. Retrieved from <https://www.statcan.gc.ca/pub/89-645-x/2010001/life-expectancy-esperance-vie-eng.htm>
- Statistics Canada. (2016). Census of Population, 2016; hydrography from National Geographic Database. Retrieved from <http://www12.statcan.gc.ca/census-recensement/geo/maps-cartes/pdf//alternative-eng.cfm?dguid=2016A00053551040>
- Statistics Canada. (2017). Whitefish River (Part) 4, IRI [Census subdivision], Ontario and Manitoulin, DIS [Census division], Ontario (table). Census Profile. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001. Ottawa. Retrieved October 25, 2017, from <http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E>

- Tam, B. Y., Gough, W. A., Edwards, V., & Tsuji, L. J. S. (2013). The impact of climate change on the well-being and lifestyle of a First Nation community in the western James Bay region, *57*(4), 441–456. <https://doi.org/10.1111/j.1541-0064.2013.12033.x>
- Tobias, J. K., & Richmond, C. A. M. (2014). “That land means everything to us as Anishinaabe....”: Environmental dispossession and resilience on the North Shore of Lake Superior, *29*(Complete), 26–33. <https://doi.org/10.1016/j.healthplace.2014.05.008>
- Turner, N. J., & Clifton, H. (2009). “It’s so different today”: Climate change and indigenous lifeways in British Columbia, Canada. *Global Environmental Change*, *19*(2), 180–190. <https://doi.org/10.1016/j.gloenvcha.2009.01.005>
- United Nations. (1992). United Nations Framework Convention on Climate Change. Retrieved from https://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf
- United Nations. (2008). United Nations Declaration on the Rights of Indigenous Peoples. Retrieved from http://www.un.org/esa/socdev/unpfii/documents/DRIPS_en.pdf
- Wang, J., Bai, X., Hu, H., Clites, A., Colton, M., & Lofgren, B. (2011). Temporal and Spatial Variability of Great Lakes Ice Cover, 1973–2010. *Journal of Climate*, *25*(4), 1318–1329. <https://doi.org/10.1175/2011JCLI4066.1>
- Wang, X., Huang, G., & Liu, J. (2016). Observed regional climatic changes over Ontario, Canada, in response to global warming. *Meteorological Applications*, *23*(1), 140–149. <https://doi.org/10.1002/met.1541>
- Whitefish River First Nation. (2017). Whitefish River First Nation. Retrieved from <http://www.whitefishriver.ca/>
- Whyte, K. (2013). Justice forward: Tribes, climate adaptation and responsibility. *Climatic Change*, *120*(3), 517–530. <https://doi.org/10.1007/s10584-013-0743-2>

- Whyte, K. P. (2013). On the role of traditional ecological knowledge as a collaborative concept: a philosophical study. *Ecological Processes*, 2(1), 7. <https://doi.org/10.1186/2192-1709-2-7>
- Whyte, K. P. (2014). Indigenous Women, Climate Change Impacts, and Collective Action. *Hypatia*, 29(3), 599–616. <https://doi.org/10.1111/hypa.12089>
- Wilkinson, P., Smith, K. R., Joffe, M., & Haines, A. (2007). A global perspective on energy: health effects and injustices. *The Lancet*, 370(9591), 965–978. [https://doi.org/10.1016/S0140-6736\(07\)61252-5](https://doi.org/10.1016/S0140-6736(07)61252-5)
- Wotton, B. M., Martell, D. L., & Logan, K. A. (2003). Climate Change and People-Caused Forest Fire Occurrence in Ontario. *Climatic Change*, 60(3), 275–295.

Appendices

Appendix A: Key Informant Interview Questions

- How is climate change affecting the Whitefish River First Nation community?
- How is the health of the community being impacted by climate change?
- How has climate change impacted traditional foods?
- How is climate change impacting the community's livelihood?
- Is climate change impacting traditional practices/ceremonies?
- Is climate change having an impact on the local water system/watershed?
 - Have there been any changes to water levels, or water quality?
 - Have there been any changes to aquatic species? Abundance?
- Are there changes that you or the community has had to implement to adapt to climate change/the changing environment?
 - What are some initiatives or strategies that have been implemented to cope with the impacts of climate change?
 - What adaptation strategies do you think could be implemented to adapt to the impacts of climate change in the community?

Appendix B: Focus Group Questions

- Have you seen changes in the natural environment that you think may be tied to climate change?
 - Any changes to the land?
 - Water quality? Water levels?
 - Species abundance?
- Is climate change having an impact on the community?
 - How has climate change impacted your health/well-being or that of the community?
 - Is climate change impacting traditional practices? Traditional ceremonies?
 - Has climate change effected traditional food sources or growing periods?
- In terms of water quality/water levels or abundance of aquatic species, have you noticed any changes within your community?
 - What challenges/concerns do you have in respect to water scarcity and climate change?
- Have there been any changes that you or the community has made to cope or adapt to the changing environment? (e.g. community garden program, water strategy/plan)
 - What adaptation strategies do you think could be implemented to adapt to the impacts of climate change in the community?

Appendix C: Key Informant Informed Consent Form

Date: March 8, 2017

Study Name: The Impacts of Climate Change on the Health and Well-being of the Peoples of Whitefish River First Nation, Ontario

Researcher: Mahisha Sritharan
137 Health, Nursing & Environmental Studies Building
4700 Keele Street
Toronto, ON
Canada M3J 1P3

mahishas@yorku.ca
647-627-9815

Purpose of the Research: The purpose of this research is to better understand how climate change is impacting the health and well-being of the Whitefish River First Nation community. Climate change research in Canada has focused on how it is impacting communities to the North and this project's objective is to understand the health impacts of climate change in a First Nations community in South of the Arctic Circle. To understand how the environment is changing, this research will draw on lived-experiences and traditional ecological knowledge of community members. This research can be helpful in identifying ways to adapt to the impacts of climate change.

What You Will Be Asked to Do in the Research: As a participant, you will be asked to take part in an interview on climate change, health and the environment. The key informant interview will take approximately 1 to 2 hours and you will be required to answer questions related to climate change and health in the community of Whitefish River First Nation. The interview will be conducted by the researcher.

Risks and Discomforts: We do not foresee any risks or discomfort from your participation in the research.

Benefits of the Research and Benefits to You: This research will help to better understand how climate change is impacting the health and well-being of First Nations communities in Southern Canada. Also, this research can help inform other communities about climate change issues.

Voluntary Participation and Withdrawal: Your participation in the study is completely voluntary and you may choose to stop participating at any time. Your decision not to volunteer, to stop participating, or to refuse to answer particular questions will not influence the nature of the ongoing relationship you may have with the researchers or study staff or nature of your relationship with York University either now, or in the future. Should you wish to withdraw after the study, you will have the option to also withdraw your data up until the analysis is complete.

Confidentiality: All information you supply during the research will be held in confidence and unless you specifically indicate your consent, your name will not appear in any report or publication of the research. The data will be audio recorded. Your data will be safely stored in a locked facility and audio recording will be stored securely on a laptop with password encryption, and only research staff/research team members will have access to this information. The audio recording will be stored until September 2019, and it will be destroyed after the study. Confidentiality will be provided to the fullest extent possible by law.

Data Available to Community: Transcripts of the interview will be handed over to the community in line with OCAP principles through the Health Department at Whitefish River First Nation. If you choose to not consent to having your name appear in the research, transcripts will be anonymized.

Use of the Data for Future Research Purposes: The data collected in this research project may be used – in an anonymized form - by members of the research team in subsequent research investigations exploring similar lines of inquiry. Subsequent research investigators must seek approval from the Whitefish River First Nation community to access and use the transcripts data and then must also undergo an ethics review from the Research Ethics Board. Such projects will still undergo ethics review by the HPRC, our institutional REB. Any secondary use of anonymized data by the research team will be treated with the same degree of confidentiality and anonymity as in the original research project.

Questions About the Research? If you have questions about the research in general or about your role in the study, please feel free to contact Mahisha Sritharan either by telephone at (647) 627-9815 or by e-mail mahishas@yorku.ca. This research has received ethics review and approval by the Human Participants Review Sub-Committee, York University's Ethics Review Board and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact the Sr. Manager & Policy Advisor for the Office of Research Ethics, 5th Floor, Kaneff Tower, York University (telephone 416-736-5914 or e-mail ore@yorku.ca).

Legal Rights and Signatures:

I _____, consent to participate in **“The Impacts of Climate Change on the Health and Well-being of the Peoples of Whitefish River First Nation, Ontario”** conducted by Mahisha Sritharan. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent.

Signature _____
Participant

Date _____

Signature _____
Principal Investigator

Date _____

I consent to have the interview recorded _____

I consent to having comments I made during the interview be attributed by name

I consent to the use of the data for future research purposes _____

Appendix D: Focus Group Informed Consent Form

Date: March 8, 2017

Study Name: The Impacts of Climate Change on the Health and Well-being of the Peoples of Whitefish River First Nation, Ontario

Researcher: Mahisha Sritharan
137 Health, Nursing & Environmental Studies Building
4700 Keele Street
Toronto, ON
Canada M3J 1P3

mahishas@yorku.ca

Purpose of the Research: The purpose of this research is to better understand how climate change is impacting the health and well-being of the Whitefish River First Nation community. Climate change research in Canada has focused on how it is impacting communities to the North and this project's objective is to understand the health impacts of climate change in a First Nations community in South of the Arctic Circle. To understand how the environment is changing, this research will draw on lived-experiences and traditional ecological knowledge of community members. This research can be helpful in identifying ways to adapt to the impacts of climate change.

What You Will Be Asked to Do in the Research: As a participant you will be asked to take part in a focus group discussion related to climate change, health and the environment. The focus groups will be semi-structured with some discussion questions and free-ranging discussions. The focus group will take approximately two hours.

Risks and Discomforts: We do not foresee any risks or discomfort from your participation in the research.

Benefits of the Research and Benefits to You: This research will help to better understand how climate change is impacting the health and well-being of First Nations communities in Southern Canada. Also, this research can help inform other communities about climate change issues.

Voluntary Participation and Withdrawal: Your participation in the study is completely voluntary and you may choose to stop participating at any time. Your decision not to volunteer, to stop participating, or to refuse to answer particular questions will not influence nature of the ongoing relationship you may have with the researchers or study staff or nature of your relationship with York University either now, or in the future. Should you wish to withdraw after the study, you will have the option to also withdraw your data up until the analysis is complete.

Confidentiality: All information you supply during the research will be held in confidence and unless you specifically indicate your consent, your name will not appear in any report or publication of the research. The data will be audio-recorded. Your data will be safely stored in a locked facility and audio recording will be stored securely on a laptop with password encryption, and only research staff/research team members will have access to this information. The audio recording will be stored until September 2018, after it will be destroyed after the study. Confidentiality will be provided to the fullest extent possible by law.

Data Available to Community: Transcripts of the focus group will be handed over to the community in line with OCAP principles through the Health Department at Whitefish River First Nation. If you choose to not consent to having your name appear in the research, transcripts will be anonymized.

Use of the Data for Future Research Purposes: The data collected in this research project may be used – in an anonymized form - by members of the research team in subsequent research investigations

exploring similar lines of inquiry. Subsequent research investigators must seek approval from the Whitefish River First Nation community to access and use the transcripts data and then must also undergo an ethics review from the Research Ethics Board. Such projects will still undergo ethics review by the HPRC, our institutional REB. Any secondary use of anonymized data by the research team will be treated with the same degree of confidentiality and anonymity as in the original research project.

Questions About the Research? If you have questions about the research in general or about your role in the study, please feel free to contact Mahisha Sritharan either by telephone at (647) 627-9815 or by e-mail mahishas@yorku.ca. This research has received ethics review and approval by the Human Participants Review Sub-Committee, York University's Ethics Review Board and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact the Sr. Manager & Policy Advisor for the Office of Research Ethics, 5th Floor, Kaneff Tower, York University (telephone 416-736-5914 or e-mail ore@yorku.ca).

Legal Rights and Signatures:

I _____, consent to participate in "**The Impacts of Climate Change on the Health and Well-being of the Peoples of Whitefish River First Nation, Ontario**" conducted by Mahisha Sritharan. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent.

Signature _____
Participant

Date _____

Signature _____
Principal Investigator

Date _____

I consent to have the focus group discussion recorded _____

I consent to having comments I made during the interview be attributed by name _____

I consent to the use of the data for future research purposes _____

Appendix E: Sample of Focus Group Recruitment Poster

PARTICIPANTS NEEDED FOR RESEARCH ON CLIMATE CHANGE AND HEALTH

“THE IMPACTS OF CLIMATE CHANGE ON THE HEALTH AND WELL-BEING
OF THE PEOPLES OF WHITEFISH RIVER FIRST NATION, ONTARIO”

Date:

Youth Session 18-29: Monday July 10th at 6:00pm

Adult Session 30-59: Tuesday July 11th at 6:00pm

Elders Session 60+: Wednesday July 12th at 12:00pm

Location:

We are looking for participants from Whitefish River First Nation who are 18 years or older to take part in a study on climate change and health.

The purpose of this study is to understand how the environment is changing and how climate change is impacting the community's health and well-being.

As a participant in this study, you will take part in a focus group where you would be asked to share your experiences and knowledge on how climate change is impacting the community of Whitefish River First Nation. The focus group will take 1 to 2 hours and you will be asked to answer questions related to how climate change is impacting the community. Discussion topics will include health and well-being, the environment, and traditional foods.

For more information about this study, please contact Mahisha Sritharan, Masters in Environmental Studies Candidate – York University, at mahishas@yorku.ca or the Health Department at Whitefish River First Nation, Leslie McGregor at lmcgregor@whitefishriver.ca.

This study has received ethics through the Research Ethics Board at York University (416-736-5914 or ore@yorku.ca) and the Manitoulin Anishinaabek Research Review Committee (705-368-2182).