

Perspectives on the Social, Economic and Environmental Impacts of All-Season Roads in
Two Remote First Nation Communities in Northern Ontario

By

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ABSTRACT

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Keywords: Access, all-season road, First Nation, impacts, northern Ontario, remote communities, social well-being, transportation

Remote Indigenous communities face a number of challenges associated with accessibility. The development of all-season road corridors promises to solve some of these problems. However, changes to transportation can create many challenges.

Surveys and interviews conducted in two remote First Nations communities and reported in this thesis reveal that community members are aware that both potential harms and benefits from all-season roads will alter the communities' social wellbeing. Concerns about negative potential impacts from all-season roads are triggered by past experiences and history. Fear may slow down progress of development in the Far North. These fears are associated with changes in the community and its surrounding landscape including accessibility to drugs and alcohol, destruction of the land and disrespect from non-Indigenous people. While First Nation participants acknowledge that all-season roads and increased access can produce or worsen negative impacts, they perceive the positive outcomes, such as employment and community-to-community interaction, to be worth the risks associated with all-season roads.

CHAPTER 1: INTRODUCTION

Change has come so suddenly. Not increments, just coming all at once (...) lots of changes that [have] happened due to transportation opening up, like airplanes, vehicles, stuff like that. There [are] lots of changes in our community due to those things being open. There [are] a lot of changes. There [are] so many changes in our social aspect of our community. In families, whatever we do (...). To where we are today and looking ahead, there might be a lot of changes in the community (...) because there's change already compared to where we [were] before compared to today. And looking ahead, there will be lots of changes.

–KIW2

Remote First Nations communities of northern Ontario encounter many challenges because of their isolation from the rest of Canada. The majority of these communities today rely on water, railway, airplane and/or winter roads, making intracommunity transportation limited. For the first time, all-season roads are under consideration and this transportation innovation may help remote communities raise living standards to levels comparable to that of the rest of Canada and allow communities to adapt sustainably to their changing environment (Jeffrey 2012). All-season road access can result in benefits such as economic development, increased availability of goods and services at lower costs, employment, and improved education and health services in remote communities (Andrew et al. 2011; Gannon and Lebo 1999; Fenley et al. 2007; Kanji 2012).

Some Indigenous people do not want development because of the negative social impacts that can occur in their communities (Timpson 2009). However, in this study, we went a step further and found that First Nation people of Muskrat Dam (MD) and Kitchenuhmaykoosib Inninuwig (KI) weigh the positive and negative impacts but focus on how developmental change will improve and maintain their community's social well-

being. Interview and survey results show that potential benefits of roads encourage the participating communities to proceed with development; however, there are fears of potential harms influenced by past experience and history. Overall, identified impacts due to a change in transportation have an effect on the social well-being of First Nation communities.

Recent research has identified that negative impacts can be minimized through planning and enforcement of roads, specifically in remote regions (Fenley et al. 2007). Various direct impacts can occur and have been addressed in previous research, yet the diversity of indirect impacts remains minimally addressed (Adam et al. 2012). A direct impact is initiated by one source onto a party without third party involvement, whereas an indirect impact is more complex, as it involves an intermediary third party (Moon 2010). For example, climate change affects the weather and climatic temperature (direct), while the changes in weather affect the freezing and melting of ice (indirect). In addition, planning in the Far North currently avoids approaching projects from a regional context without the consideration of cumulative effects (Lintner and Chetkiewicz 2014); impacts that result from a combination of changes from past to present (INAC 2010b). An understanding of the connectivity of impacts (social, economic and environmental) caused by roads, specifically all-season, is progressing. However, by integrating Indigenous and cross-cultural perspectives¹, which reflect the relationships between the people and land, will further this progression, especially in Ontario's Far North².

¹ Shaped by the interconnectedness of the land, spirit, language, kin, etc., which are inseparable from one another and Indigenous people's well-being (Kant et al. 2014;

² Areas including and North of Parry Sound municipality and Nipissing district (NOHFC 2012).

1.1. INDIGENOUS PEOPLES VIEWS

The land is vital to Indigenous people and their culture. It encompasses both living and non-living things within the environment (Dickason 2009), as well as providing the foundation for lessons, ancestry and the history of Indigenous cultures, which form their world and cultural views, values and beliefs (Dylan et al. 2013; Holst 1997). For Indigenous people, their well-being is dependent on the land, and the health of the land is also reliant on the people (Dragonfly Consulting Services Canada 2012; Booth 2011; Holst 1997; Jardine et al., 2009; Kant et al. 2014; Kingsley et al. 2009; Kingsley et al. 2013; Parlee et al. 2005; Sveiby 2009; Tam et al. 2013; Tobias and Richmond 2014). Much research neglects to address the interconnectedness of these elements by focusing only on a specific form or aspect of change (i.e. environmental disruption or forest degradation), even though all forms of social, economic and environmental changes influence one another and are equally crucial to sustainable development (Giddings 2002).

1.2. TRANSPORTATION IN THE FAR NORTH

Water transportation occurs only along the coast of James Bay and Hudson Bay; where shipments of goods occur approximately four times a year from Moosonee by Moosonee Transportation Limited to the Nishnawbe Aski Nation (NAN) communities of Fort Albany, Kashechewan, Attawapiskat, Peawanuck (Weenusk) and Fort Severn (MTL 2013). The railway system in the northern Indigenous communities of Ontario is sparse compared to the northern communities in other provinces such as Manitoba (Dillion Consulting 2001a, 2001b, 2001c, 2001d and 2001e). The Polar Bear Express runs between Cochrane and Moosonee, with the closest NAN community of Moose Factory still a ferry ride away. Rail and ferry services are provided by Ontario Northland Transportation Commission (ONTC) (ONTC 2015). In recent news, KWG Resources Inc. has proposed a rail link from the Ring of Fire³ to Aroland (Curry 2016; Hale 2016). While the potential for a railroad is currently being assessed, this mode of transportation will create access to mineral deposits, but not to surrounding NAN communities (Hale 2016).

The majority of remote NAN communities have only airplanes or winter roads as transport options. However, NAN water and railway accessible communities rely just as heavily upon airplanes and winter roads for transportation of bulk supplies. Airplanes are used year round, allowing remote communities to sustain themselves between the winter road seasons (Katz 2007; Reynolds 2011). A reliance on medium-sized airplanes increases the costs of travel and goods yet it is not practical to utilize larger aircraft even

³ A mineral rich arc shaped area in the James Bay Lowlands in northern Ontario (OCC 2016) located near four First Nation communities – Webequie, Nibinamik, Neskantage and Eabametoong (Sudol 2016).

though they could potentially be more cost effective over time (Homer 1978). While utilizing airplanes may not produce additional employment in the community, they do ensure that there are adequate goods and services provided (Homer 1978). On the other hand, winter roads provide more affordability for a bulk restock of goods, connectivity between communities, creation of seasonal maintenance jobs and lower costs of goods and services (Olsson 2009; Taylor and Parry 2014). The benefits provided by winter roads greatly improve social and economic well-being in the remote communities (Kuryk 2003; Taylor and Parry 2014), but the winter road itself changes the landscape which affects both the land and traditional culture of local Indigenous communities (Tam et al. 2013; Jardine et al. 2009). Although the benefits of winter roads are seen as being greater than their harms, the winter season is shortening due to climate change which decreases the reliability and amount of time winter roads can be used (Jeffrey 2012; Infrastructure Canada 2014; Modha 2013; Taylor and Parry 2014). Transportation is crucial for survival, but can create social and economic hardships (Jardine et al. 2009), making transportation choice vital in the Far North, since it must be reliable and sustainable.

1.2.1. Winter Roads

Winter roads, also known as ice roads, are seasonal land transportation methods used to connect remote Indigenous communities; approximately 30 NAN communities are able to directly link to southern hubs for up to twelve weeks by this form of transportation (Reynolds 2011; The Chronicle Journal 2014). The winter road systems allow for the transportation of heavy supplies needed for construction as well as restock of storage fuel and basic essentials (Gionet 2012; The Chronicle Journal 2014). There are more than 3,100 kilometers of winter roads in Ontario built annually over rivers, lakes

and muskeg (Katz 2007; The Chronicle Journal 2014). Winter roads rely on low temperatures and the continuation of cold weather (INAC 2010a). The compact snow and ice over frozen ground and thick ice over water provide the base for winter roads⁴ (INAC 2010a; Pihlainen 1963). Provincial land use permits indicate the snow depth needed and allotted time for winter roads to be accessible by vehicles, while guides provide the thickness of ice needed to allow access over water (INAC 2010a).

Winter roads present challenges which are more apparent now that there is an identified warming trend that has reduced the amount of travel time available by a couple of weeks, with this changing from year to year (Aboriginal Affairs Working Group n.d.; Katz 2007). Due to the reduction in the season, many communities, some with the help of the Ministry of Northern Development and Mines (MNDM) and the federal government, have either rerouted or begun rerouting the winter road system to higher ground to avoid bodies of water (Aboriginal Affairs Working Group n.d.). However, many systems still have to cross some form of waterway from time to time (Aboriginal Affairs Working Group n.d.; Katz 2007). Planning for constructing bridges over unavoidable water such as rivers has begun. It is presumed that \$50 million will be spent on these projects, with already over \$5 million contributed by the Northern Ontario Heritage Fund and the federal government (Aboriginal Affairs Working Group n.d.). The provincial government had made the decision to invest over \$4 million during the 2012–13 season and over \$5 million between the 2015–16 winter season to build and maintain these roads, allowing for more cost efficient and annual short-term access (Gionet 2012; MNDM 2013). With all this progress already established to prepare for the effects of climate change, including

⁴ Brush can also be used for fill and to support the winter road structure to prevent loss of permafrost (Pihlainen 1963).

remote First Nation communities having to wait for a longer period of time for annual restock, increasing costs to fly in needed supplies and making residents feel uncertain about travel safety (Katz 2007), it has been proposed that the NAN communities develop an all-season road system to avoid problems imposed by climate change, and develop opportunities to improve community livability (Jeffrey 2012; Modha 2013). Although all-season roads can improve remote community access, they also have the potential to create indirect impacts, including difficulties towards social and environmental well-being.

1.2.2. All-Season Roads

1.2.2.1. Building Roads in the Far North

In planning the construction of a road, its entire lifespan should be considered to minimize the environmental disturbance and maintenance as well as reduce the need for rebuilding a new road in the future. This includes identifying the most stable terrain with the best drainage and limited disruption by waterways and choosing the appropriate materials (INAC 2010a). Environmental impacts and conditions must be addressed before construction begins according to the recommendations of the specific road design and location (Government of Ontario 2014), and the transportation requirements such as weight and frequency of vehicles (INAC 2010a). In preparation for road construction, vegetation is removed to allow for safe building operations. However, in areas of permafrost not all vegetation is removed since it helps regulate the temperature to keep the permafrost maintained (INAC 2010a).

1.2.2.2. Issues and Challenges of All-Season Road Development in the North

Permafrost should be avoided when building all-season roads in the northern region since the construction process can cause it to melt. Melting permafrost can result in the ground sloping and other indirect environmental effects (INAC 2010a). Muskeg and peat are both necessary in maintaining the permafrost layer and should be avoided when possible (Pihlainen 1963). Muskeg itself presents problems when constructing roads because of its corrosive properties. Avoiding areas of permafrost and muskeg is optimal but not always possible, so proper drainage is the ideal solution (Pihlainen 1963). However, in areas where both permafrost and muskeg exist, drainage can be problematic because it can affect the water table and cause degradation, making this situation sensitive and critical. The terrain of the Far North and types of muskeg encountered are always different, so each situation requires a different approach (Pihlainen 1963). Depending on the type and capacity of the road, different techniques are used to construct over muskeg. Laying logs, brush and planks to create a layer that floats on the muskeg is a technique known as flotation. However, the techniques of removing or filling muskeg are more often used (Pihlainen 1963). For example, in the East Side Road Authority project currently underway in Manitoba, an all-season road system connecting numerous First Nation communities along the eastern border of the province is both removing peat and utilizing the rockfill technique which allows construction to occur in various weather conditions. In this project, peat is removed in areas where the layer is less than 0.6 meters and rockfill is then placed on top. In swamp areas, rockfill is placed on geotextiles⁵ during the winter season and allowed to consolidate. In addition, over building has been

⁵ A strong fabric, which mimics natural fibers, that is used to settle soils and minimize erosion during construction (Merriam-Webster n.d.a).

used due to the settling of peat. While in situations where there is a slope in the swamp area, grades are built on berms for stability (Manitoba East Side Road Authority, personal communication, April 22, 2016).

The Far North terrain is diverse, and while the many forms of waterways present short-term obstacles (Stewart 2007), climate change effects have become the greatest challenge when planning for construction or development. Canada is, and will continue to be, affected by the changes in the weather brought about by climate change (Harcourt and Harford 2016). All forms of development and infrastructure, including transportation, are at risk and ways to protect the old and plan appropriately for new forms are needed for resilience and sustainability for the future (Harcourt and Harford 2016). For example, in Whitehorse, Yukon, the residents raise funds through Local Improvement Charges which are used to maintain and improve existing infrastructure that is affected by climate change effects (Harcourt and Harford 2016). While climate change imposes many impacts, even to the economy, it can also create new opportunities (Harcourt and Harford 2016), such as all-season road construction. With a significant change, such as climate change or developmental changes like all-season roads, there is a need for government decision and policy changes (Harcourt and Harford 2016) which have now begun to unfold with the redirecting of winter road systems (ICC 2014).

1.2.2.3. Road Responsibilities in the Far North

In Ontario, all-season roads are used to access the land either for industrial (i.e. transportation of resources and materials) or nonindustrial purposes (i.e. trapping, tourism, resource gathering, or use of all-terrain vehicles) (INAC 2010a; Mihell 2010). Although First Nation communities construct and maintain their road systems on-reserve

and on Crown land (winter roads), there are still many ministries, organizations, guidelines and policies involved in the process. Local knowledge, perception, problems and collaborative measures are used to help understand infrastructure needs and capabilities of the local environment. In addition, decision-making is also an important tool in the planning and management of access (Gannon and Lebo 1999; Kirkup 2016).

All roads constructed on Crown land are required to have a land use permit through the Ontario Ministry of Natural Resources and Forestry (OMNRF), for which the purpose for access, building design and schedule, and environmental information including ways to minimize negative impacts, need to be indicated (OMNRF 2016; INAC 2010a). Developments near or on provincial highways need an additional permit and approval by the Ministry of Transportation (MTO). Specific branches or departments verify that the proposed development is in accordance to MTOs acts, policies and guidelines (MTO 2015). MTO also collaborates with MNDM and their affiliated organizations to monitor and confirm that procedures follow provincial guidelines and policies (INAC 2008a; MTO 2013). MNDM and MTO are responsible for transportation, specifically highways, in the northern region (MTO 2005).

Far North infrastructure and development are funded by the provincial and federal governments which are managed by Indigenous and Northern Affairs Canada (INAC) (federal) and MNDM (provincial) (Infrastructure Canada 2014; INAC 2008b; MNDM 2012a; Sudol 2015). INAC handles a number of infrastructure needs on-reserve lands (Infrastructure Canada 2014; INAC 2008a), while MNDM coordinates with ministries through the Northern Transportation Program and invests in organizations such as ONTC and Owen Sound Transportation Company to provide and maintain different forms of infrastructure, including roads and programs such as the Northern Highways Program,

and Local Roads Boards and Winter Roads (MNDM 2012).

All-season road development in northern Ontario is driven by the availability to access minerals and resources, while also needing to be justified economically (Paterson 1987; Ross 2012). There is an increasing financial need for infrastructure, including transportation, in the North. In recent years, the federal and provincial governments have invested more money into the winter road systems because of its need. In addition, they have jointly invested approximately \$800,000 into the building of all-season roads from four First Nation communities and the Ring of Fire to the provincial highway (Sudol 2015).

1.2.2.4. Sustainability of Far North Roads

Sustainable road development is a balance of design and transport requirements, economic means and social needs, with minimal environmental impact (Gannon and Lebo 1999). A well-designed road should not only minimally disrupt the local environment, but should also have an established plan for safety such as speed limits (Gannon and Lebo 1999) and access (Mihell 2010). Access, at times, can cause conflicts between users and managers of roads, mainly towards protection, control, and implemented decisions and disrespect of those decisions (Hunt et al. 2009); making the management of roads a difficult task at times.

1.3. RESEARCH STUDY AND OBJECTIVES

The goal of this study is to identify the perceived impacts of all-season road development by First Nation community members through conversational interviews and survey questionnaires in the two remote First Nations communities of MD and KI First Nations. The influences on their perspectives and the most commonly mentioned impacts will be examined to understand development from a First Nation point of view using a mixed methods approach.

The thesis will present both the combined perspective of, and the similarities and differences between, both participating communities. The combined perspectives will be used to understand if First Nation people want all-season roads, as well as address the preparatory needs for Ontario First Nation communities.

1.3.1. Thesis Organization

The following chapter, Chapter 2, reviews the literature available to date on roads and remote communities/regions, where specific gaps are identified and applied to this research's objectives. Chapter 3 presents background information on the participating communities. Chapter 4 presents the methodologies used. Chapter 5 presents the most prominently perceived impacts, as well as the underlying emergent themes of why people perceive these impacts to occur from all-season road development from conversational interviews and survey questionnaires. Chapter 6 provides a concluding summary of the study results, as well as limitations and recommendations for future research on this topic.

CHAPTER 2: LITERATURE REVIEW

2.1. INTRODUCTION

Transportation connects locations and people. It minimizes isolation and allows for various opportunities including social and economic development (Government of Canada 2014; Infrastructure Canada 2014; Kanji 2012; Zacharias et al. 2011). Transportation costs play a critical role in the lives of Indigenous peoples living in remote regions as they rely on air, water and/or land forms to provide for their basic survival needs (Modha 2013). The types of transportation used by remote communities depend on their needs and locations (Jeffrey 2012; Modha 2013). Although all modes of transportation affect the lives and landscapes of remote and rural regions (Kanji 2012; Zacharias et al. 2011), the social, economic and environmental impacts of roads are much greater than those of air or water transport as roads allow for greater affordability, mobility and access (Fenley et al. 2007; Jeffrey 2012; Modha 2013). As literature is constantly evolving, a comprehensive review is required to address the progression and connectivity of impacts of all-season roads in remote locations. Therefore, the objective of this chapter is to examine the existing literature related to social, economic and environmental impacts of roads and remote communities/regions and to what extent roads create change.

2.2. METHODS

Keyword searches were performed in ISI Web of Science to look for scholarly and peer-reviewed publications. Web of Science's database is interdisciplinary, up-to-date, and universally used (Berrang-Ford et al. 2011). The words "remote communities" were used as key topics and resulted in 8,686 articles, then refined with the keyword "roads" with 165 results. The publication dates were set from 1994 to 2015 to broaden the search and identify possible research trends.

The title and abstract of the articles were reviewed to identify which were appropriate for the final review. At times, the full-text was examined to discern whether the article would be included or excluded from the final review. Exclusion criteria included articles that: (1) bear no relevance to roads and remote communities (mainly addressing costs of municipal development, conservation practices, recreational activities, nature such as floods or medicinal plants, violence, or urban locations) (2) discuss aspects of transportation (off-road vehicles, travel time, and injury) and advancing technologies (imagery and detection of roads) where roads were a main part of the objective, yet do not discuss remote communities/regions, and/or impacts; and (3) briefly mention roads but are not significant to the research or results including alternative developments (mining, tourism, housing, smelting, and electricity), medical/health (hospital/maternity services, nutrition, and home care methods), and other (resilience, population dynamics, general access, and archaeology).

Articles selected for the final review were those that discussed roads and remote communities/regions including research that examined positive and negative impacts, improving road conditions and maintenance, and development affecting social, economic

and/or environmental prosperity.

Table 1. Description of publications chosen for final review.

Author and Publication Date	Methodology	General Research Topic
Andrew, Wulder and Coops (2011)	Quantitative	Anthropogenic pressures and protected areas
Arevalo et al. (2010)	Quantitative	Roads and flora diversity
Barber, Crooks and Fristrup (2010)	Literature review	Effects of noise from anthropogenic pressures on wildlife
Bell and Ashenden (1997)	Quantitative	Nitrogen Dioxide change from roads and its affects on flora
Benfield, Guzman and Mair (2005)	Quantitative	Anthropogenic pressures on the growth of mangroves
Bi, Wang and Zhou (2011)	Quantitative	Landscape affects the design, construction and location of road development
Buerli, Aw-Hassan and Rachidi (2008)	Mixed	Access to markets and its impact on livelihoods
Byg, A., Vormisto, J. and Balslev, H. (2007)	Mixed	Influences on the use of palm
Campbell and Bergeron (2012)	Quantitative	Roads and flora regrowth
Cercarelli, et al. (2000)	Qualitative	Perspectives on road safety
Dalle, Pulido, and de Blois (2011)	Mixed	Agriculture and land cover use change from access
Dobson et al. (2014)	Quantitative	Road management and improvement
Eisenberg et al. (2006)	Quantitative	Pathogens and access
Eisenberg et al. (2012)	Quantitative	Pathogen resistance and access

Far et al. (2013)	Quantitative	Improving roads with chemical compounds
Ferreira, Messias and Maida (2006)	Literature review	Participatory management and development
Gannon and Lebo (1999)	Literature review	Design standards and social, economic and geographical impacts
Giraldo, Chaudhari and Schulz (2012)	Quantitative	Land use change and its impact on health
Gonzalez, Kroll and Vargas (2014)	Quantitative	Carbon change due to deforestation from road development
Goosem (2007)	Literature review	Fragmentation impacts from roads
Hayes, Sader and Schwartz (2002)	Mixed	Land cover and land use change from access
Hitztaler (2013)	Mixed	Roads and its impact on flora harvesting and diversity
Hunt, Lemelin and Saunders (2009)	Quantitative	Conflict and access
Hunt and Lester (2009)	Quantitative	Access and environmental (i.e. fishing) and economic impacts
Kanji et al. (2012)	Qualitative	Roads and community well-being
Levang, Sitorus and Dounias (2007)	Qualitative	Roads and change in the perception of well-being
Ling et al. (2003)	Quantitative	Roads and habitat fragmentation impacts
Merenlender, Heise and Brooks (1998)	Quantitative	Change in biodiversity from habitat fragmentation due to roads

Munro, Evans and Saarenketo (2007)	Mixed	Sharing road improvement techniques
Peres and Lake (2003)	Quantitative	Access and wildlife density
Piya, Maharjan and Joshi (2013)	Qualitative	Anthropogenic pressures and adaptation choices
Rudel (2006)	Literature Review	Road density affects on forests and management
Schmitt and Kramer (2009)	Qualitative	Road impacts on local markets
Shanley, Kofinas and Pyare (2013)	Mixed	Road change affects on wildlife density and hunting
Southworth and Tucker (2001)	Quantitative	Social and environmental changes from road access
Tran, Marincioni and Shaw (2010)	Mixed	Land use change and floods
Vigilante et al. (2004)	Quantitative	Fire burning and road access
Visser and Hall (2003)	Quantitative	Improving road design
Watson et al. (2015)	Mixed	Road development impact on population of settlements and wildlife
Wyman and Stein (2010)	Mixed	Forest changes and road access

A total of 40 (24%) articles were selected for final review (Table 1). First, the year of publication, global location of the study and methodology were recorded and analyzed. Second, the articles were examined for (i) social, economic and/or environmental relevance, (ii) the presence of roads as the cause of impacts and change in remote communities/regions, (iii) the presence of influences that alter the results of

impacts from roads, and (iv) recommended research, including gaps in analysis toward sustainable planning and development of roads and remote communities.

The objectives and criteria for each final review article were recorded. This information was manually coded and categorized to reveal any trends between the articles. The R program, an open access, statistical and graphic computer software program (The R Foundation n.d.), was used for quantitative and graphical analysis display, while Microsoft Office was used to compile charts and tables.

2.3. SUMMARY OF THE LITERATURE

The trends identified through reading and manually coding the final review articles are presented in results which includes the number of articles to date and their geographical distribution, topic themes and methods, impacts and other influences that create change, and recommendations for sustainable and complex research.

2.3.1. Minimal Research on Roads in Remote Communities

Publications on roads and remote communities/regions have increased since 2006, with 30 of the 40 articles reviewed published between 2006 and 2015. The increase in number of publications coincides with the increase in research using qualitative and mixed methodologies. The change from the prominent use of quantitative methods towards increased inclusion of qualitative and mixed methodologies has moved research away from natural sciences toward social sciences. The methodological transitions also moves research away from isolated topics, such as fragmentation effects on flora biodiversity and towards interdisciplinary topics, such as understanding the complexity of road development. Interdisciplinary topics both fill gaps and create new ones in this research area.

2.3.2. Global Distribution of Articles that Examine Roads and Remote Communities

The global distribution of research on this topic can be seen in Figure 1. A graded scale was used to indicate the number of articles classified by country rather than by specific location due to the limitation of articles and, at times, lack of specified location (i.e. South Africa): 1) North America: Canada (4), USA (5), and Mexico (2); 2) South

America: Brazil (2), Ecuador (3), Peru (1); 3) Central America: Belize (1), Guatemala (1), Honduras (1), Nicaragua (2), and Panama (1); and, 4) Others: Africa (3), Afghanistan (1), Australia (2), China (2), Europe (2), Indonesia (1), Malaysia (1), Nepal (1), Russia (1), Spain (1), and Vietnam (1).

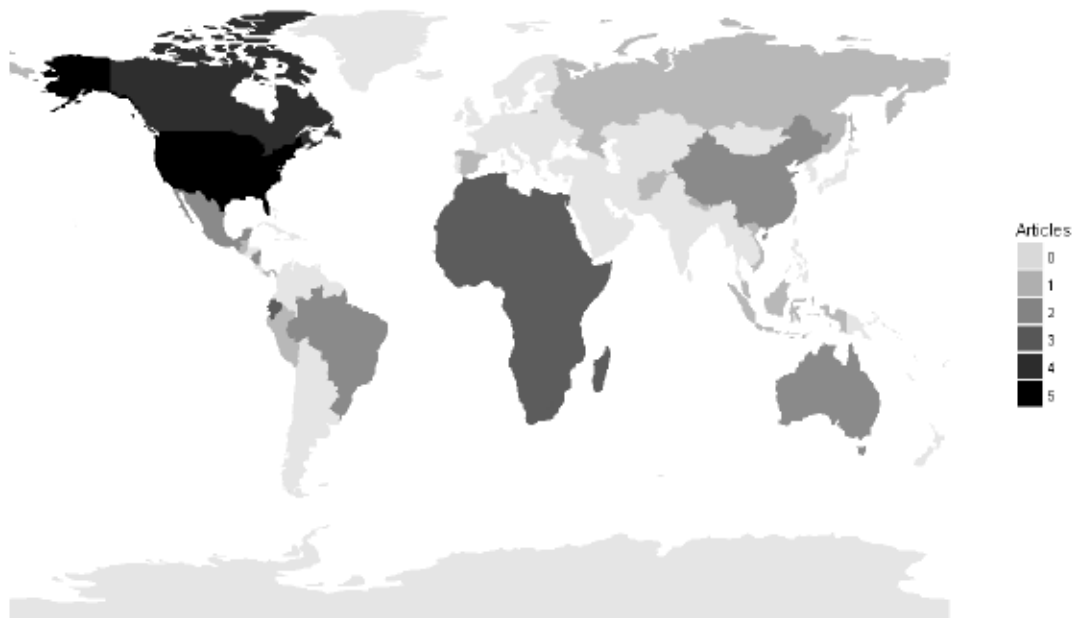


Figure 1. Geographic location of the number of road and remoteness studies. Retrieved from Natural Earth <http://www.naturalearthdata.com>.

2.3.2.1. Topic Theme Trends

Articles with research done in the same country and/or continent were compared to reveal commonalities in topic themes and methodologies chosen. Themes and their relevance to social, economic and environmental impacts were analyzed, showing the variability within each country and continent. While this analysis reveals that globally environmental aspects were addressed more often, research on the social aspects of roads and remote communities have become addressed more frequently (Buerli et al. 2008; Byg et al. 2007; Cercarelli, et al. 2000; Dalle et al. 2011; Eisenberg et al. 2006; Gannon

and Lebo 1999; Giraldo et al. 2012; Hitztaler 2013; Hunt et al. 2009; Kanji et al. 2012; Levang et al. 2007; Merenlender et al. 1998; Munro et al. 2007; Peres and Lake 2003; Piya et al. 2013; Schmitt and Kramer 2009; Southworth and Tucker 2001; Watson et al. 2015), at times combining a social focus with environmental aspects (Dalle et al. 2011; Eisenberg et al. 2006; Giraldo et al. 2012; Hitztaler 2013; Peres and Lake 2003). As seen in Table 2, land cover change has been the focus of most environmental research, whereas impacts on local community members have been commonly addressed in social research. The economic aspects of remote roads were not a main focus in these articles; however, at times, they were addressed alongside environmental and/or social aspects to create a better understanding of the complexities of specific situations (Barber et al. 2010; Buerli et al. 2008; Byg et al. 2007; Dalle et al. 2007; Eisenberg et al. 2006; Far et al. 2013; Giraldo et al. 2012; Gonzalez et al. 2014; Goosem 2007; Kanji et al. 2012; Levang et al. 2007; Merenlender et al. 1998; Peres and Lakes 2003; Rudel 2006; Schmitt and Kramer 2009; Shanley et al. 2013; Tran et al. 2010; Visser and Hall 2003). Although the common themes of social, economic or environmental impacts were identifiable by country and/or continent, there were still limitations to this assessment because of the lack of research done on roads and remote communities/regions globally, as seen by the number of countries having only one article on the topic (Figure 1).

The majority of articles discussed only one aspect of road impacts, which was evident in the themes. While the majority of articles that addressed two aspects (social and environmental) used an approach that does not recognize the connectedness between all three pillars (Ferreira et al. 2006; Hayes et al. 2002; Hunt and Lester 2009; Ling et al. 2003; Piya et al. 2013; Watson et al. 2015; Wyman and Stein 2010; Andrew et al. 2011; Arevalo et al. 2010; Bell and Ashenden 1997; Benfield et al. 2005; Bi et al. 2011;

Campbell and Bergeron 2012; Cercarelli et al. 2000; Dobson et al. 2014). Three articles did discuss all three impacts (social, economic and environmental), but they did not use the same methodological approach, with one using qualitative analysis, one using quantitative analysis, and the other being a literature review (Gannon and Lebo 1999; Munro et al. 2007; Southworth and Tucker 2001).

Table 2. Research topic trends by geographic location.

Location (country or continent)	Common road impact topic by location	General impact by location
North America		
Canada	Effects from an increase and/or decrease in access	Environmental
Mexico	Land use and land-cover change	
Central America		
All countries	Deforestation and land-cover change	Environmental
South America		
Ecuador	Health and disease	Social and environmental impacts, with a major focus on environmental economics
Other		
China	Land changes	Environmental
Europe	Road development effects and maintenance	Social and environmental
Australia	Effects on Indigenous communities	Social

2.3.2.2. Methodology Trends

The methodologies followed in the 40 reviewed articles were examined and identified as using quantitative, qualitative or mixed method approaches. The methods and the methodological criteria identified during the review of the final articles are presented in Table 3. Twenty (50%) of the 40 used quantitative methods while five (12.5%) used qualitative methods and ten (25%) used mixed methods. Additionally, five (12.5%) articles did not fall within either category because they were literature reviews. This analysis shows that research has favoured quantitative methods. Quantitative methods were also favoured in the analysis of methodologies by country, which is predictable due to the dominant use of quantitative methods. The methodologies were also examined by publication date, which revealed that quantitative approaches were solely used up to 1999, but after that, qualitative and mixed methods started to emerge. Between 2006 and 2013, there was an increase in the use of qualitative and mixed methods, coinciding with the timeframe when most research was done on this topic.

Table 3. Criteria of the different methods used in the final review documents.

Methods	Criteria
Quantitative	✓ Mathematics/statistics
	✓ Modeling
	✓ Data from sampling, testing, field surveying, laboratory analysis, remote sensing/aerial photographs, and GIS mapping
Qualitative	✓ Questionnaires/surveys
	✓ Interviews
	✓ Focus groups
	✓ Oral communication and field observations
Mixed	✓ Combination of any of the qualitative and quantitative techniques/tools

2.3.3. Changes and Degrees of Change Associated with Road Impacts.

Presented below are results from the literature examined that show roads cause direct and indirect changes to social, economic and environmental aspects in remote communities/regions. Changes that occur within social, economic and environmental aspects can also affect one another. Furthermore, changes can be cumulative and cause positive feedback loops that can create different outcomes.

2.3.3.1. Environmental Impacts

Road development leads to an increase in impacts that change the amount and variability of environmental effects such as access and land fragmentation. Land fragmentation cuts and divides the landscape (Goosem 2007) while access allows for entry and mobility into areas that were once inaccessible (Arevalo et al. 2010). Both

types of impacts disrupt the natural terrain as well as the flora and fauna in different ways and to different degrees, resulting in alterations to an ecosystem's biodiversity (Arevalo et al. 2010; Byg et al. 2007; Campbell and Bergeron 2012; Gonzalez et al. 2014; Goosem 2007; Hitztaler 2013; Merenlender et al. 1998). The literature presents that the effects resulting from road development cause a decrease in biodiversity of both flora and fauna species. For example, land fragmentation causes an edge effect (Goosem 2007) that creates a change in the local climate in which many local flora are incapable of surviving (Campbell and Bergeron 2012). Fragmentation also alters the age distribution and diversity of flora, resulting in more abundant natural resources to be further from the road (Byg et al. 2007; Gonzalez et al. 2014; Hitztaler 2013; Merenlender et al. 1998). In addition, exotic species can be transported, affecting the homogeneity of local flora (Arevalo et al. 2010; Hayes et al. 2002).

Faunal biodiversity is also altered due to land fragmentation and access from roads and road development (Barber et al. 2010; Goosem 2007; Peres and Lake 2003). These pressures result in changes to the environment such as floral distribution, creation of larger open areas, increases in noise and traffic (Barber et al. 2010; Goosem 2007; Peres and Lake 2003), and an influx in large game hunters (Shanley et al. 2013), all of which reduce the presence of large fauna near roads. Additionally, these changes alter the migration patterns and behaviours of local wildlife including successful reproduction (Barber et al. 2010). Furthermore, mortality within species can be increased through predation and road accidents (Cercarelli et al. 2000). Behavioural effects from roads can be seen in current wildlife adult populations, as well as future juveniles, which can lead to an entire population change, reduction or eradication of a species (Hunt and Lester 2009). Alternatively, populations of small fauna have a greater presence near roads,

showing that roads have dual effects on biodiversity (Goosem 2007). However, there is limited information on small fauna impacts in comparison to that of the large fauna, indicating that even though environmental aspects are the most commonly researched on roads and remote communities/regions, there is still much more to be addressed.

Roads not only bring changes to local floral and faunal species but also to entire ecosystems. The examples used above address the changes that occur to the environment near roads; however, research has proven that both aquatic and terrestrial impacts that begin at initial disturbance sites have the ability to radiate out across an entire ecosystem (Bell and Ashenden 1997). For example, leaching of chemicals and toxins can poison the waterways and plant life, which further affects wildlife health, additionally resulting in harm to the local human population. Access has been acknowledged as creating only negative impacts, since it causes environmental changes that affect the original socio-economic and environmental balance of a region. However, access can also provide social harms and benefits (Hayes et al. 2002).

2.3.3.2. Social and Economic Impacts

Socio-economically, road access provides the ability to transport goods and services more easily to and from a community, allowing the opportunity for an improvement in both the economy and infrastructure (Bi 2011; Buerli et al. 2008; Schmitt and Kramer 2009). Access to the land is correlated to the economy. For example, selling locally harvested products can reduce the amount of natural resources used by a community for subsistence lifestyle, but harvesting activity increases since products can be sold for a profit at local markets (Byg et al. 2007; Hitztaler 2013). Even though road access can improve the economy of remote communities, it can also negatively alter

health and social well-being (Eisenberg et al. 2006; Eisenberg et al. 2012; Giraldo et al. 2012; Levang et al. 2007). For example, increased access allows a person to use vehicles for travel without needing to walk long distances that encourages less physical activity. As well, a decrease in the practice of a subsistence lifestyle accompanied by consumption of processed foods results in poor nutrition, so diseases such as diabetes have become a problem in many remote communities (Giraldo et al. 2012). Access can further compromise the health of people in remote communities because of an increased interaction with non-local people that can lead to the introduction of new pathogens as well as the development of antibiotic resistant bacteria (Eisenberg et al. 2012). On the other hand, road development and access increases sanitation, hygiene and health care services that can help prevent epidemics in newly accessible communities (Eisenberg et al. 2006; Kanji 2012; Levang et al. 2007).

The health and well-being of remote community members can be further impaired by poor road safety practices and vehicular accidents (Cercarelli et al. 2000). While safety is not recognized as being important to most members in remote communities in comparison to other road-related problems, the occurrence of an accidental death on a road will affect the involved community's well-being (Cercarelli et al. 2000). Besides the physical well-being of the remote communities being affected by roads, there are also mental transformations identified in the literature leading to changes to social behavior (Kanji 2012). For example, remote communities have had members who are trusting and trustworthy, with unity and support in the community (Levang et al. 2006). However, community members can lose these characteristics along with their cultural values once interactions with non-locals increase through access. These changes may be caused by the introduction of, or an increase in, drug and alcohol addiction because of road access

(Levang et al. 2006). Research shows that social impacts from roads are very complex with situations being similar but varying according to location and context. The reviewed articles demonstrate a growth in understanding the dynamics of social aspects around roads and remote communities/regions, but few articles conduct discussions to address remote community members perspectives of road impacts (Buerli et al. 2008; Byg et al. 2007; Cercarelli et al. 2000; Kanji et al. 2012; Tran et al. 2010). The majority of remote communities tend to be Indigenous populations, but there is no comprehensive review that addresses road development impacts and how to manage them from the perspective of Indigenous culture and worldviews.

2.3.4. Factors, in Addition to Roads, that Alter Social, Economic and Environmental Changes and Outcomes

To be discussed are the examples in literature that show how socio-economic aspects can greatly affect environmental integrity, caused by roads alone as well as by other factors. Roads present an opportunity for economic change, yet the economy relies on environmental and/or social aspects of a specific location. Numerous changes are initiated by road development such as population growth, which includes direct and indirect impacts, as well as positive feedback loops (Andrew et al. 2011; Buerli et al. 2008; Cercarelli et al. 2000; Eisenberg et al. 2006; Eisenberg et al. 2012; Giraldo et al. 2012; Kanji 2012; Levang et al. 2006; and Schmitt and Kramer 2009). Population growth (Andrew et al. 2011; Fenley et al. 2007; Gonzalez et al. 2014; Levang et al. 2006) and cost (Hunt and Lester 2009) have been identified as major factors that alter the potential impacts of roads and remote communities/region, yet other factors such as proper road design and development (Fenley et al. 2007) can also alter road impacts and change the

outcome (Andrew et al. 2011; Fenley et al. 2007; Gonzalez et al. 2014; Levang et al. 2006). Even though roads have the potential to contribute to economic gains in remote communities, sometimes there are no economic changes and unemployment continues (Levang et al. 2006).

Cost has been identified as being both influenced and influencing road impacts. For example, road development causes costs of transportation and necessities to decrease; first, by improving the communities' livability and, second, by changing the local economy (Fenley et al. 2007; Gannon and Lebo 1999). Exploitation of natural resources usually can increase local and regional economic opportunities and growth, but also affects local biodiversity (Hunt and Lester 2009). Cost and an improved economy influence both pre and post road development results, which also indirectly impact environmental and social aspects within the remote communities/regions. Cost and the economy can be unpredictable, fluctuating depending on the demand for a product, local competition, traveling distance, and road conditions (Cercarelli et al. 2000; Schmitt and Kramer 2009). Cost is also a dominant factor in both protective efforts and for optimal road development (Fenley et al. 2007; Munro et al. 2007; Piya 2013) because cost can control, enforce and improve areas with access problems that can prevent deforestation and degradation (Davenport 2006; Gonzalez et al. 2014; Peres and Lake 2003). There is a need to understand cost through the implementation of financial planning for road development, potential impacts, unpredictable changes and numerous other factors that can alter the outcome of road development. While research has begun to address the complexity of the impacts of roads on remote communities/regions, there is still much to be understood.

2.3.5. Implementing and Creating Sustainability of Roads and Road Development in Remote Communities

The literature acknowledges that roads produce short- and long-term effects, but also that the procedures and planning for sustainably managing these effects has become a challenge (Fenley et al. 2007). To encourage sustainability, short-term benefits should be overlooked while short-term planning should be emphasized since it allows for realistic preparation and management goals towards environmental protection and appropriate development (Kanji 2012; Tran et al. 2010; Watson et al. 2015). Long-term goals should focus on sustainability for the future by balancing social, economic and environmental trade-offs (losses and gains) as well as emphasize the importance of communication in decision-making (El-Gafy et al. 2011; Tran et al. 2010). More research needs to address sustainability in road development planning (Gannon and Lebo 1999; Southworth and Tucker 2001). These dynamics are finally being addressed and understood at the local and regional levels (Arevalo et al. 2010; Eisenberg et al. 2006; Kanji 2012; Watson et al. 2015), yet there are gaps in comparing spatial and temporal scales such as changes over time of remoteness depending on situations and locations (Eisenberg et al. 2006). By recognizing these literature gaps and others such as climate change, which greatly influences the decisions on where to build roads (Bi 2011; Gannon and Lebo 1999; Kanji 2012), road construction procedures (Campbell and Bergeron, 2012), local ecological balance, and protection in naturally productive areas, adaptive and protective measures can be formulated and implemented into resource and development management, practices and plans (Barber et al. 2010). These dynamics present challenges and many authors have emphasized the need for research to move in this direction, which requires a joint evaluation of social, economic and environmental changes. With more

research exploring the complexity of interactions, preventative and preparatory measures can be identified and implemented to improve roads and road development in remote communities/regions through design and planning, management and changes to policy (Southworth and Tucker 2001). As the research has acknowledged, for sustainable practices to be implemented there must be organization, strength and cohesion between involved parties before steps towards a sustainable future can be taken. For changes to be sustainable, they must begin with the people, both at a governmental level and between decision-making parties (Buerli et al. 2008; Watson et al. 2015).

2.4. DISCUSSION AND CONCLUSION

The review of peer-reviewed literature on roads and road development in remote communities/regions revealed beneficial and harmful social, economic and environmental of roads. Even with the limited literature available there were observable trends in publication dates, study location, methodology, and topic of research. However, a more in-depth analysis of the articles could be conducted to identify gaps in the literature.

There appears to have been a change in the mid-2000s on the areas addressed and methodologies used, showing a progression in the use of mixed methods analysis for environmental-economic, socio-economic and socio-environmental studies, and an increase in qualitative approaches with social studies. In addition, the more recently used methodologies have created a greater knowledge and understanding about how roads alter the social, economic and environmental aspects of remote communities/regions.

The existing literature documents a wide variety of changes that are a result of new road construction in remote regions and a small section of that literature deals with social impacts. This literature forms the background for our examinations of the views of two remote First Nation communities to understand the impending changes. Literature on roads in remote communities has mainly sought to address the direct impacts with minimal acknowledgement of indirect ones, even though indirect effects can be harmful or beneficial and varied (Adam 2012). While the literature has begun discussing indirect and cumulative impacts, it does not adequately address these within planning and decision-making. Both indirect and cumulative impacts need to be further understood (Adam 2012), since it is now being recognized that influences such as cost, accessibility

and population growth can change outcomes for remote communities in the short and long-terms (Fenley et al. 2007). Existing literature tends to focus on a single type of change, neglecting the connection between social, economic and environmental areas.

Research on this topic has identified many common impacts that allow opportunities for implementing preventative and preparatory measures. Knowledge can be used to address the harms that exist in remote or rural road-accessible communities as well as plan for potential harms in communities/regions preparing for access. Benefits can be identified and developed for particular locations and situations including economic gains and conservation management to help enhance the positive aspects of road development. Further research in this area can lead to understanding the complexities of road impacts and how to manage impacts in real-world scenarios. A comprehensive review is required to address the progression and connectivity of the impacts of all-season roads in remote communities from an Indigenous people's perspective.

Research has only begun to identify and address the gaps on this topic. It is crucial for future research to address the interplay of factors, as well as guide appropriate planning and development procedures to minimize harmful outcomes, especially since many developing countries, and developing remote areas, utilize research in their planning and policy changes. The most recent literature has begun to focus on some of these gaps, with authors addressing and recommending future research directions towards sustainable practices, conservation/environmental protection, and appropriate management. We have come some distance in understanding the dynamics of developmental change in a short time; now, more than ever, we need to take the necessary steps towards cross-cultural sustainable planning for the future.

CHAPTER 3: COMMUNITY BACKGROUND

3.1. CASE STUDY: PARTICIPATING COMMUNITIES

The two First Nation- communities involved with this study—Muskrat Dam (MD) and Kitchenuhmaykoosib Inninuwug (KI) First Nation—are reserves, areas of land established and made available for an Indian bands sole use under the Indian Act and in treaty agreements (Hanson 2009b), in northwestern Ontario. In addition, being remote they are only accessible by air transport and winter roads. Geographically, the territories of these First Nations are located between the 50° and 55° latitude (INAC 2015), as well as being within the realm of the Far North (OMNRF 2014). Figure 8 shows the boundary of the Far North in the province of Ontario, as well as the location of both participating communities within the Far North boundary.

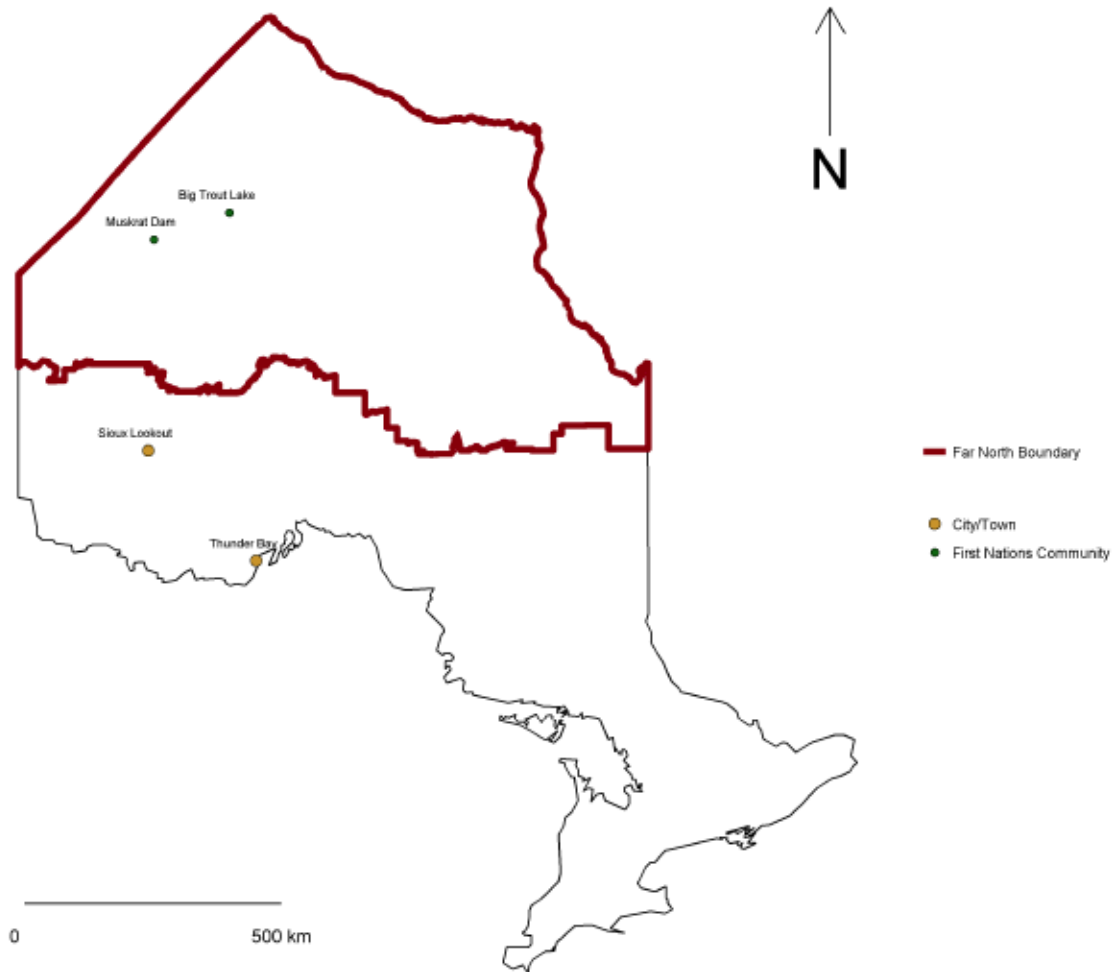


Figure 2. Far North boundary and the location of participating communities and southern centers. Far North and provincial boundary retrieved from the province of Ontario website <https://www.ontario.ca> and First Nation, City and Town locations retrieved from <https://www.google.ca>.

The communities of MD and KI are signatories of Treaty #9, to which they adhered in 1929. Figure 9 shows the change in Treaty #9 territory from 1905-06 and 1929-30. The Treaty #9 of 1929 brought Wunnumin Lake and Kingfisher Lake into the Big Trout Lake Band, while still remaining within their traditional territory- (The Kayahna Tribal Area Council 1985). KI, however, does not affiliate with NAN; instead, they are an independent First Nations group that handle their own governmental affairs. Treaty #9 also has a number of Tribal Councils, political organizations that oversee

political affairs and may or may not manage programs and services for Indigenous communities, while also not being referred to in the Indian Act (INAC 2013; Joseph 2015). In the Treaty #9 area the Tribal Councils include IFNA, Keewaytinook Okimakanak, Matawa First Nations, Mushkegowuk Council, Shibogama First Nations Council, and Windigo First Nation Council. Not all of the communities that affiliate with these Tribal Councils reside in the Treaty #9 territory (NAN 2016a). Both MD and KI are affiliated with the IFNA Tribal Council (IFNA 2016), which also includes Pikangikum, Lac Seul, and Whitesand First Nations.

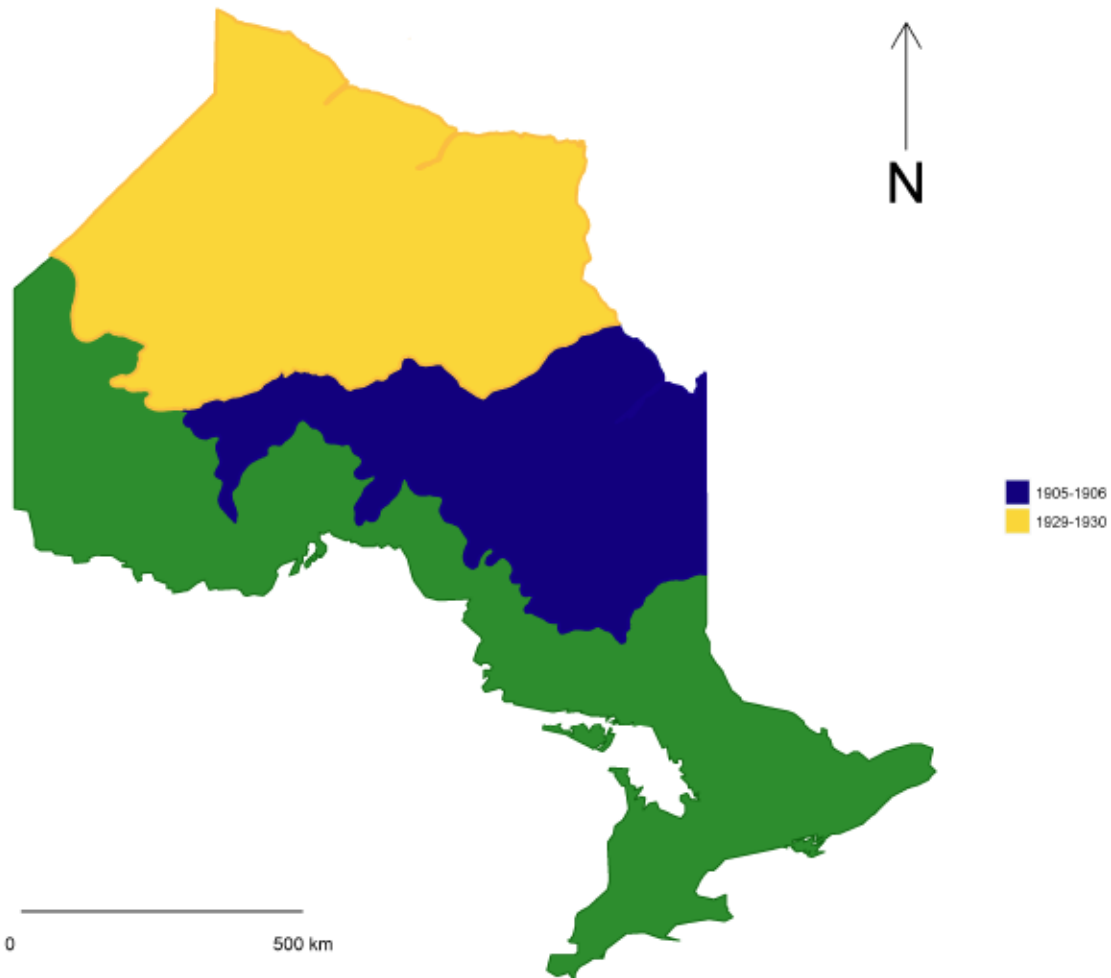


Figure 3. Treaty #9 territorial changes. Provincial boundary retrieved from province of Ontario website <https://www.ontario.ca> and Treaty #9 territorial boundaries were retrieved from Data Basin <https://databasin.org>. Note: The colours chosen represent the treaty commitment, as long as the: Sun shines (yellow), water flows (blue), and grass grows (green).

The two communities are separated by a flight distance of approximately 130 km (AirCalculator 2016). Year-round air travel provides access to Sioux Lookout, which is a main service center, and is located 370 km south of MD (IFNA 2016; Wolfe and Lindley 1983) and approximately 435 km southwest of KI (IFNA 2016; KI 2015). Most community members travel by air to Thunder Bay for medical or business purposes; however, during the winter season they travel by winter road. Interviewees mentioned

that it takes approximately 12 hours to get to Thunder Bay from MD, approximately 17 hours to get to Thunder Bay on a good day, and up to 30 hours in bad weather from KI. Once they reach the southern hub, community members then participate in business or leisure activities and buy essential household goods at a cheaper cost, which helps get them through the times when there are no winter roads available. The communities connect to one another through Bearskin Lake First Nation during the winter road season. Pickle Lake, with a year round gravel road, provides a common attachment to the south where community members can continue on to Sioux Lookout, Thunder Bay, or elsewhere. Figure 10 shows the road system of the Far North and the First Nation communities.

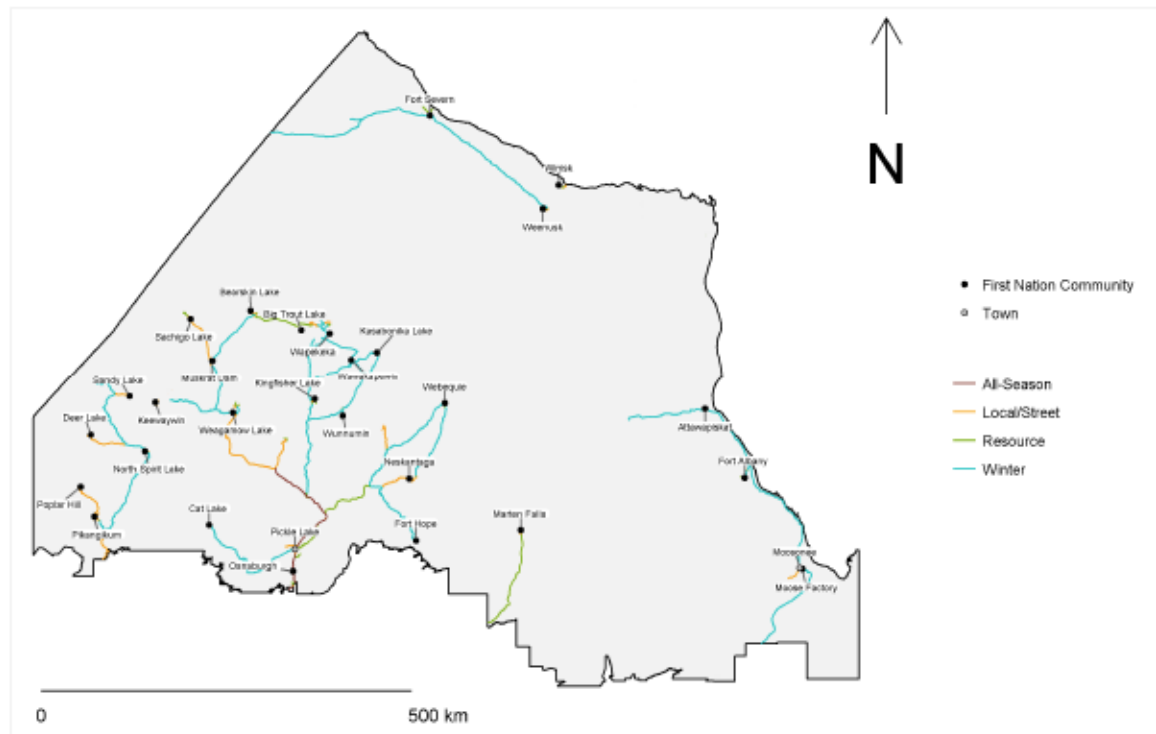


Figure 4. Road system and First Nation communities of the Far North. Ontario Far North boundary, winter road systems and First Nation reserve retrieved from Ontario <https://www.ontario.ca>

3.1.1. Communities' Political Systems and NAN

These two First Nations are recognized Bands under the federal government's Indian Act and operate their governance in accordance to it, with an election every two years for the Chief, Deputy Chief and Council. However, they differ in the number of Council members elected (MD has three Council members and KI has six Council Members) (Lakehead Social Planning Council 2015a and 2015b) due to their significant size difference, both in territory and population. Both communities speak the traditional languages of Anishinabemowin or OjiCree with different dialects and cultural norms. OjiCree, itself, is a dialect of Ojibwe, but also utilizes the Cree vocabulary (Long 2010).

NAN has assessed the potential for all-season road corridor systems through the

identification of previous and current winter road systems. As well, NAN has proposed and supports First Nation communities' development a process of connecting First Nation communities with one another and to the South. Currently, this includes all-season roads to Pikangikum, the Windigo road from Weagamow to Bearskin, and the mining road to the Ring of Fire. In addition, this study is meant to address NAN First Nation communities' thoughts about all-season roads and if they agree with development. According to the NAN Chiefs in Assembly Resolution: 12/68 (2012), ownership, planning, development, construction, maintenance and investment into all-season roads (or highway or railway) by First Nations is needed for the future of remote communities. More so, responsibilities, ownership and participation will be shared equally amongst First Nation communities. While First Nations communities are represented and have their needs advocated for by NAN, the communities hold an independent voice. Therefore, the communities consented to this study because they were interested in finding out more about what their community members think. Participation in this study as well as sharing of the results was consented to by the participating First Nation communities. In addition, any future movement forward with developing all-season roads, or any project that requires assessments or change in policy, would involve and incorporate all the NAN communities input.

3.1.2. Muskrat Dam (MD) First Nation

MD First Nation is located on a peninsula on the western shore of the Severn River system (Wolfe and Lindley 1983). It is a young reserve, approximately 50 years old. The people of MD are linked to those of Bearskin Lake because originally five

families from Bearskin Lake relocated to create the new settlement of MD (Hartt 1977; Ontario Native Affairs Secretariat and Ministry of Citizenship 1992). As mentioned by community members, Chief Sampson Beardy of Bearskin Lake First Nation asked community members to settle on his traditional lands (IFNA 2016), a summer fishing camp (Wolfe and Lindley 1983), which then formed into MD First Nation in 1966 (Wolfe and Lindley 1983; Hartt 1977). Relocation occurred because of the pressures on natural resources, including hunting, trapping and water quality (Wolfe and Lindley 1983; Hartt 1977). MD received reserve status in 1976 (IFNA 2016; Lakehead Social Planning Council 2015), and they were then provided with government funding, a school and nursing clinic (Wolfe and Lindley 1983). Previous to this, they were identified as a satellite community of the Big Trout Lake Band (Hartt 1977; Ontario Native Affairs Secretariat and Ministry of Citizenship 1992) where they lived solely off the land, and log cabins built by the people themselves (Hartt 1977) The First Nation's boundaries (approximately 2000 hectares) are the same as those mentioned in the James Bay Treaty of 1905 (IFNA 2016; Hartt 1977; Ontario Native Affairs Secretariat and Ministry of Citizenship 1992; StatsCan 2007a). However, the boundaries indicated are not completely reflective of the traditional territories of MD and surrounding communities, which can create contradictions, especially with Sandy Lake First Nation (IFNA 2016). The reserve population by the federal government in 2011 was 260, with 203 members living off-reserve (INAC 2015). In contrast, community members report there are between 200 to 250 members living on reserve and 100 members off-reserve.

According to Statistics Canada (2008c), 160 community members of MD completed the 2006 census. One-hundred and ten participants stated that they had no certificate, diploma or degree, 10 individuals acquired a high school certificate, 15

individuals received a non-university certificate of diploma (i.e. college), and 10 individuals have a post-secondary certificate or degree. Out of the 160 census responses, 120 individuals identified themselves as being in the labour force, with 115 being employed, and 45 identifying they were not a part of the labour force (StatsCan 2008c).

The winter road provides economic opportunities for MD because both Sachigo Lake and Bearskin Lake First Nation members travel through MD on their way to Pickle Lake. This makes MD a vital stop for gas and travel necessities for other communities. Besides annual economic gain from other communities, MD has limited economic development opportunities, and so the community had a decreasing employment rate of 7.4% in 2011 (INAC 2015). According to the Government of Canada 2005 statistics, the average earnings of full-time employed MD community members was \$27,712, while in Ontario it was \$44,748. In addition, 79.9% of MD community members' income came from their earnings and 18.1% is from government transfer funds, whereas, 77.4% of Ontario residents income came from earnings and 9.8% came from the government (StatsCan 2007b).

3.1.3. Kitchenuhmaykoosib Inninuwug (Big Trout Lake) First Nation

Kitchenuhmaykoosib Inninuwug (KI) First Nation is located on the shores of Big Trout Lake, which is a large lake in northwestern Ontario that drains into the Severn River (Hiebert et al. 2007; KI 2015). KI lies on the edge of the boreal⁶ forest, approximately 100 km from Hudson Bay (Hiebert et al. 2007). The territorial area of the KI reserve is approximately 29,938 hectares (INAC 2015). The reserve itself is made up

⁶ Supports and sustains residing First Nation peoples culture and well-being (Dylan et al. 2013; Holst 1997).

of both the mainland as well as an island, which are connected by a land strip (KI 2015). Many communities across the NAN territory view KI as their home away from their traditional territory, including Wunnimun Lake, Kingfisher Lake, Weagamow Lake, Kasabonika, Wapekeka, Bearskin Lake and Sachigo Lake. These communities relocated, for a time, to KI since it possessed a school, nursing station, northern store, airstrip and administrative services when their communities did not have access to these, as well as being the signing of the 1929 Treaty #9 (The Kayahna Tribal Area Council 1985). When services became more available, the communities left KI to settle in their traditional trapping and hunting lands to improve sustenance, reduce the amount of time travelling for sustenance (The Kayahna Tribal Area Council 1985), and acquire their own reserve statuses. KI is also the only NAN territory and Treaty #9 community that has declared independence from NAN, since this allows them to have direct dealings with the Government of Canada (IFNA 2016). KI and NAN have signed a Memorandum of Understanding on their political relationship that allows KI to return to the Chiefs' Assemblies to partake in discussion making, but also allows KI to remain autonomous unless NAN is requested to collaborate on Aboriginal and treaty rights issues (KI and NAN 2016). The registered population according to the 2011 census is 1657, with 509 members living off the reserve. According to community members, there are about 1250 people living in the community. Five hundred and ninety community members completed the 2006 census: 495 participants stated that they had no certificate, diploma or degree, whereas 30 individuals acquired a high school certificate, 20 individuals gained a trades certificate, 40 individuals received a non-university certificate of diploma (i.e. college), and 10 individuals have a university certificate or degree below a bachelor level (StatsCan 2008b). Out of the 595 census responses of the labour section, 290 individuals

identified themselves as being a part of the labour force, with 250 being employed, whereas 305 were not a part of the labour force (StatsCan 2008b).

The winter roads help people financially due to lower prices in the South, but provide limited economic opportunities within the community. However, because of the recent connection between KI and Wepakeka, the communities are able to support one another and their local economies. The unemployment rate for KI in 2011 was 23.5% with the majority of the income coming from government payments (INAC 2015). The average earnings of full-time employees, according to 2005 statistics, was \$33,800 in KI, while in comparison to Indigenous identified residents of Ontario was \$41,761. In addition, KI community members' income came from 69.7% earnings and 30.0% government transfer, whereas, across Ontario, residents' incomes came from 77.2% earnings and 16.6% government (StatsCan 2008a).

While there is little difference between MD and KI's economic and social standards, the two communities differ greatly in size, population and territory. Moreover, their location and separation creates unique cultures and linguistics. It must be recognized that communities differ history and cultural beliefs and practices that should be taken into consideration when implementing changes. The values and world views of the two communities have shown to be similar, especially in relation to what they need to survive for their social well-being. The similarities are presented in the Results and Discussion section. These values include the First Nation pillars of connecting to the Creator, maintaining relationships and respecting the land.

CHAPTER 4: RESEARCH APPROACH

4.1. METHODOLOGY

This research employs a mixed methods approach, with specific use of the concurrent triangulation strategy. The data collection was done using both qualitative (interviews and open-ended survey questions) and quantitative (survey questionnaires) methods that allows for validation, reliability and strengthening of information accumulated (Creswell 2003). While both methods are used for analysis, in this study, the qualitative method takes priority because qualitative information encompasses observations, documents, and analysis that include the identification of patterns and emergent themes. More importantly, qualitative research methods incorporate peoples' lived experiences, resulting in more complex understanding (MacDonald 2012). The qualitative approach of mixed methods proceeds with the use of Indigenous Methodology (IM) that allows for the transfer of knowledge in a holistic way through storytelling and conversation (Bennett 2012); where the voices of the Indigenous people are heard (Blodgett and Schinke 2011), and the accumulated knowledge is about the people, and for the people and their needs (Bennett 2012). Importantly, this research approach is done by the people and with the people, and not on them (Blodgett and Schinke 2011; Koster et al. 2012). IM was chosen as the base-line methodology for the project because it provides beneficial results from an Indigenous perspective (Bennett 2012), and also transforms the researcher in search of new understanding (Hart 2010). Two forms of IM are Capacity-Building, Respect, Equity and Empowerment (CREE) and Participatory

Action Research (PAR) methods, which is supported but not fully applied.

CREE is a research approach from an Indigenous perspective (Lemelin et al. 2010), and is used to manage the researcher and the information given by Indigenous communities to the researcher, while imposing responsibility, clearness and clarity (Lemelin and Linkers 2004). Capacity building necessitates that the researcher understands differing perspectives, specifically of historical and cultural beliefs and their effects. Respect requires the removal of stereotypes and the adoption of Indigenous systems. Equity includes financial, employment or the use of knowledge systems (Lemelin and Linker 2004) such as Indigenous knowledge transfer (Hart 2010). Empowerment promotes self-reliance by creating capacity and new actions (Lemelin and Linker 2004).

Different from CREE, PAR is the engagement and equal participation from the participants and the researcher, with both acknowledging the others' perspective (Blodgett 2011; Ritchie et al. 2013). PAR uses information about peoples lived experiences to create practical knowledge, which is then meant to create newly derived actions or goals. PARs method allows the researcher to continuously research and collect information, reflect on information retrieved, and make and take necessary action (MacDonald 2012).

Both NAN and the researcher supported CREE and PAR in phases of this study. Before and during the data collection phase, aspects of PAR were provided through the involvement of NAN in question making, engaging with and acquiring free, prior and informed consent (FPIC) to visit communities, establishing a contact person, providing a translator and arranging meetings with community members. While the researcher utilized PAR during the data collection phase, it was also continued with updates with the

Chiefs of the participating communities on results orally and/or written, the submission of a final report to the Band Councils and summaries to participants, and presenting the findings during the return visit to both MD and KI.

These methodologies and the instruments used for data collection were approved by the Lakehead University Research Ethics Board (REB) and our research partner, NAN, and meet the ethical conduct requirements of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans, but more specifically Chapter 9: Research Involving the First Nations, Inuit and Metis Peoples of Canada that ensures respectful and collaborative relationships through research (Interagency Advisory Panel 2016). All research participants gave FPIC for this project and they were given the ability to withdraw their participation at any time they chose.

This study was undertaken to assess whether a larger and a smaller First Nation community held similar perspectives on the impacts of all-season roads, so as to identify the pros and cons of establishing all-season roads in the remote north at a regional and provincial level. This research is a small, preliminary impact study that will be applied to a larger, future study involving the remaining remote NAN communities. Even though KI is independent from NAN, they are affiliated, impacted by, connected to and a part of the decision to build all-season road corridors.

4.1.1. Data Collection

The data were collected through semi-structured interviews and survey questionnaires (see Appendix A and B) in the summer of 2015, and while the researcher was staying in the First Nation communities of MD and KI. Participants were sought out in public locations including roadways, places of work, grocery stores, and public events

and gathering sites. Signs were also placed in popular facilities, and radio and television announcements were made. Potential research participants were approached by the researcher and sparse sampling was used. No specific qualifications, other than being above the age of 18, were required to participate in the research study, which ensures that the information from participants represents the community perspective and diversity (gender, age, education level, employment and number of years living within the community) (See Appendix C). To maintain participant variation, the researcher mingled daily within the community and, through local knowledge, identified where certain age groups would be located. As individuals were approached, the researcher introduced herself and briefly discussed the purpose of the study. If individuals were interested, the researcher explained the use of interviews and surveys, while giving the individual the choice to participate in both, one or neither. If interested in an interview, a day, time and location was arranged, where they could complete the survey questionnaire at that moment or after the interview; if they chose to complete one at all. If the individual wanted to participate in only the survey questionnaire, they took a moment to complete it at that time, and the researcher remained close by in case of any questions or clarification.

Interviews were semi-structured and open-ended, with some questions predetermined and reviewed by the Lakehead University REB and NAN to ensure appropriate language and elimination of jargon (Loosemore et al. 2007). Questions mainly pertained to community changes both from past transportation and towards potential all-season road development. The semi-structured interviews were conducted as participatory and informal conversations that allowed for flexibility in the discussion as well as in the topics and questions addressed. In addition, probing was used as a

technique to acquire more insight about an interesting remark (The CORE Group n.d.). At times, sharing circles were used for discussion that allowed for open contributions of knowledge, where all participants were equally heard, which created a more dynamic conversation (Socha 2012). In this study, two sharing circles in total were used, one in each community which varied from two to three individuals from the community. The location of the conversational interview was determined by the participants to maintain the same flexibility and comfort level (The CORE Group n.d.), and, in most instances, included their place of work, residence or the researcher's accommodations.

A total of 18 interviews were completed in MD, and 24 in KI. All interviews were audio recorded unless the participant opposed it, in which case notes were taken during the interview. A community translator provided translations during the interview if the participant spoke the traditional language. Approximately 20 hours of interviews were recorded, with over 40 hours of transcription occurring to prepare for further analysis. Notes were taken during interviews to document patterns and keywords that were then reflected upon during data analysis.

All participants signed a consent form before beginning an interview and indicated whether they would want to remain anonymous. Codes were assigned to represent participants and were used for representing personal quotes. Personal information and knowledge shared by the participants was filed separately if the individual chose to remain anonymous. All information was kept in password-protected locations. Participants were asked to indicate if they wished to receive a typed transcription of their interview as well as summary of the final report. In addition to this, a poster of the final results will be given to each community to display in their Band Office, and the information will remain accessible to them through the NAN office in

Thunder Bay, Ontario.

In addition to interviews, brief survey questionnaires, consisting of numerical (an interval scale used to understand the degree of agreement, where 1 represents extremely disagree, up to 5 which represents extremely agree), and text based questions (open-ended, opinion questions), were conducted after each interview, if agreed to by the participant. As well, community members who did not want to participate in the interview process had the option of completing the survey questionnaire. A total of 50 surveys were completed in MD and 58 in KI. The survey requirements were the same as that of the interviews, where participants needed to be 18 years or older. The questions for the survey addressed aspects regarding the all season road and included ranking systems to indicate important aspects and values of community members, and invited open opinions. The surveys were constructed in such a way as to allow information to be used quantitatively and qualitatively; hence, the data collected from the survey added perspective as well as gave supporting evidence to the interview results.

4.1.2. Data Analysis

The interview data collected from the two communities were transcribed using Microsoft Office Word, and then reviewed against the audio recording to confirm accuracy before being imported into NVivo 10, a Computer Assisted Qualitative Data Analysis Software (Saldana 2009). Each interview was initially coded (Saldana, 2009) using general categories established by the research questions. Coding began with general themes, where parts of interviews were assessed and next developed into coding of complex overlaps, patterns and frequencies (Saldana 2009). The interviews were read and re-read until the information was exhausted which allowed connections and insights to be

developed in NVivo 10 (Saldana 2009). Once the first coding cycle was complete, the codes were placed into hierarchies (QSR International 2015) and categories were further reorganized following the criteria for Sustainable Forest Management (Table 4), with the addition of impact influences (general or transportation based).

The Sustainable Forest Management table was chosen and utilized for the emergent categories to be more easily managed and allow them to be assessed within the categories established in the research objective — social, economic and environmental impacts. This table uses a sustainable framework with the addition of culture, because culture is as important to Indigenous people as the three pillars of sustainability (Smith 2005). While presenting past and present understanding of Indigenous community development, the growth of the sustainable framework, such as the addition of culture, allows for the inclusion of Indigenous perspective. Even though it was developed for sustainable forestry, Far North development including transportation, proceeding with a sustainable framework makes for more reliable results, with longevity and an increase in development success (Smith 2005; WCS and EcoJustice 2011). The Sustainable Forest Management table also encompasses many important concepts at both a local and provincial level, which is necessary to acknowledge when proceeding with development in Indigenous communities such as Indigenous rights and community member well-being. The inclusion of these concepts encourages the joining of Indigenous people with new institutions (Smith 2005). The table promotes flexibility that suits the sustainable framework needed for a specific development, allowing for the addition of the two categories within this study, i.e. the two impact influences categories. The table also presents non-renewable resources within the environmental impacts, being within the critical building blocks of sustainable and successful development of Indigenous

communities.

Table 4. Criteria used to categories identified themes in NVivo 10 (Smith 2005)

OUTCOME: COMMUNITY WELL-BEING/SATISFACTION Basic needs (food, shelter, clothing), self-sufficiency, self-governance, adequate standard of living, high employment, fair distribution of economic benefits across households, cultural integrity, human health, education, political stability, access to lands and resources			
SUSTAINABLE FOREST MANAGEMENT ELEMENTS			
ENVIRONMENTAL	ECONOMIC	SOCIAL	CULTURAL
<ul style="list-style-type: none"> • Condition of forest • Sustainable extraction of renewable resources (amount and rate of extraction) • Maintenance of habitat for all users, including wildlife 	<ul style="list-style-type: none"> • Jobs, income and profit • Revenue-sharing • Mixed economy with both traditional land uses and cash economy 	<ul style="list-style-type: none"> • Capacity-building (education and skills, ability to hire resource managers long-term) • Increased community stability Improved individual and community health 	<ul style="list-style-type: none"> • Maintenance of way of life • Language retention • Cultural learning
THE FOUNDATION			
INDIGENOUS RIGHTS		INSTITUTIONS	
<ul style="list-style-type: none"> • Recognition, respect, protection and accommodation of Aboriginal and treaty rights = sovereignty or self-government • Rights are inherent, cannot be extinguished and so apply to all areas: historic treaties, modern land claims, title or ownership 		<ul style="list-style-type: none"> • Shared decision-making (ranging from advisory to consent and control, including joint decision-making or co-management) • Conflicts resolution • Assessment and monitoring 	

The categories of social, cultural, environmental, economic, and both impact influences categories (influences directly from transportation and those not) were separately assessed using NVivo 10's Word Frequency. The 20 most prominently mentioned words, with a limited letter count of 4 from each category as well as those that overlapped between categories were assessed using NVivo 10's Text Search, which included the stem words. The text search allowed all interview statements having that

specific word to be reviewed to create further connections between the data. Emergent themes were then assessed for number of sources and frequency of use by participants, as well as the connection between identified themes. Interview results were firstly analyzed for each community to identify commonalities and differences, and as results presented cohesion, they were addressed cumulatively. Summary results of themes for Chapter 4 are presented in Table 5.

Table 5. Most mentioned interview themes: (i) dark grey highlighting are main categories; and (ii) light grey highlighting are themes that will be further discussed in results.

Interview response themes	Source	Frequency
Past experiences		
History	17	53
Other communities	20	50
Negative impacts	31	168
Fear (mentioned specifically)	15	29
Drugs and alcohol	35	92
The land	31	62
Non-Indigenous people	30	56
General economic	3	3
Hindering nature	13	15
Influx of people	18	34
Resource use and developers	24	46
Positive impacts	38	151
Education improvements	6	9
Employment	22	32
General economic	9	14
General travel	25	52
Health	7	12
Lower cost/ cheaper	31	80
Relationships	25	70
Community-to-community	18	34

The survey questionnaires were analyzed using SPSS for quantitative information, and using NVivo 10 for qualitative information. The data from the spreadsheets were

imported into SPSS. Since the opinions of community members from the survey data did not differ greatly, they were assessed together through bar graphs to see the emerging patterns, which were compared with interview results. The overlapping evidence between the survey and interview data is presented in the results. The text data were imported and sorted by common themes to indicate information most prominently addressed. The source and frequency of the presented themes were then recorded and compared to the graphs and interview results. The additional themes that emerged from in-depth interviews, as well as those reflective of survey information, are presented in the results through direct quotes. The data from the two communities were initially analyzed separately, so that the separate values and perspectives were discernible (Christensen et al. 2010). However, the communities' responses were then assessed cumulatively, since they addressed the same themes, making them more robust, valid and reliable and the data more visually representative of northern First Nations communities' perspectives. A summary of the results for Chapter 4 can be seen in Tables 6 and Table 7.

Table 6 and 7 present results from text based questions from the survey questionnaire that seek to identify the top three benefits (i.e. positive themes from question 11 in Table 6) and top three drawbacks (i.e. negative themes from question 12 in Table 7) that are perceived to occur from an all-season road. The positive themes are the improvements or enhancements that can occur for the lives of the community members, while the negative themes reflect harms, consequences and unwanted changes that can result from having an all-season road in their community. As indicated in the tables, while only three were asked for, it resulted in numerous responses; yet, still the top three benefits and top three harms cumulatively will be furthered discussed, with graphical displays, in the results section. Themes to be discussed within the Results and Discussion

are those that are most prominently mentioned and overlap between interview and survey responses.

Table 6. Themes highlighted in survey questionnaire from question 11: (i) dark grey highlighting are main categories; and (ii) light grey highlighting are themes that will be further discussed in results.

Survey Question 11	Frequency
Positive themes	188
Cultural impact	2
Economic impacts	114
Employment	30
Lower costs	89
Environmental impacts	60
Economic opportunities	3
General development	14
Infrastructure	8
Social impacts	23
Education	4
Health care	10
Housing	3
General social improvements	6
Access	51
Travel	25
Community-to-community interaction	14

Table 7. Themes highlighted in the survey questionnaire from question 12: (i) dark grey highlighting are main categories; and (ii) light grey highlighting are themes that will be further discussed in results.

Survey Question 12	Frequency
Negative themes	161
Cultural impacts	22
Cause to community and family change	7
Culture	8
Impact on social change	8
Traditions	2
Environmental impacts	44
Destruction to the land	32
Disrupting wildlife	7
Pollution	9
Resource development impacts	5
Social impacts	70
Crime	3
Drugs and alcohol	59
Non-Indigenous people	24
Non-Indigenous citizens	11
Resource developers	14
Youth	6

CHAPTER 5: OPPORTUNITIES AND CHALLENGES OF PROPOSED ALL-SEASON ROADS FOR REMOTE FIRST NATION COMMUNITIES IN NORTHERN ONTARIO

5.1. INTRODUCTION

Transportation routes connect people and locations, minimize isolation, and serve as an important aspect to social development and economic stability (Government of Canada 2014; Infrastructure Canada 2014; Kanji 2012; Zacharias et al. 2011). Although this is true from a global perspective, facilitating travel is even more crucial for remote regions, where remote fly-in Indigenous communities rely on air, water and/or terrestrial forms of transportation (Modha 2013; Murray 2014). While transportation infrastructure may differ from community to community, the type depends on which mode best sustains the community socially and economically (Jeffrey 2012). In northern Ontario, culturally diverse First Nation peoples of both Cree and Ojibwa origin make their home within the boreal forest ecosystem (Berkes and Davidson-Hunt 2006), where terrestrial infrastructure is limited (Finlay et al. 2010; Jeffrey 2012). Communities rely on airplanes for local and distant travel and community sustainment for the majority of the year. Seasonally, winter roads allow inter-community transportation, basic and essential needs, and promote improved social and economic well-being; since winter roads create access and mobility that allows for community members' leisure, connection to relations, financial savings and employment opportunities (Kuryk 2003; Olsson 2009; Taylor and Parry, 2014). On the other hand, winter roads also result in infrastructural change that has an impact on the land and culture (Tam et al. 2013; Jardine et al. 2009). Unfortunately, both airplane and winter road transportation modes are affected by changes in weather and weather events due to global warming and climate change (Natural Resource Canada

2014; Transport Canada 2012).

Current winter road infrastructure is unsustainable (LaFlamme et al. 2009; Transport Canada 2012) and is becoming less reliable because of fluctuating temperatures and ice levels, which has decreased the reliability and availability (Jeffrey 2012; Natural Resource Canada 2014; Modha 2013; Taylor and Parry 2014). This environmental change affects the social development and economic stability of remote communities because they rely heavily on winter roads for annual resupply of goods, access and traditional uses. In northern Ontario, remote communities have relocated or are currently relocating winter road systems away from lakes, rivers and muskeg, onto solid land to make them less reliant on the formation of ice (Kuryk 2003; Taylor and Parry 2014) and to minimize the problems associated with climate change. However, to an extent lakes and rivers still need to be crossed; hence, the proposition for developing all-season roads. All-season roads can improve the quality of life in remote communities (Modha 2013) by enhancing social needs such as employment opportunities (Jeffrey 2012). All-season roads can also pose problems for community well-being, since they can have social and environmental impacts; hence, cultural views and understandings of Indigenous people should be taken into account (Ministry of Infrastructure and Ministry of Northern Development and Mines, and Forestry 2011). The objective of this result section is to identify the underlying importance of participants' responses about impacts and influences of all-season road access, as well as ways for the socio-economic development of the First Nation communities and preparing them to enjoy the benefit from changes to transportation.

5.2. RESULTS AND DISCUSSION

5.2.1. Changes in Transportation and Their Impacts

Beginning in the 1970s, a transformation has occurred in the transportation systems linking remote northern Ontario Indigenous communities. A quick transition, over the past 20 years, from canoes to dogsleds, skidoos, tractor trains, to the current use of airplanes and winter road system has resulted in numerous changes to the participating First Nation communities' social and economic viability. Table 8 presents the number of interviewees (source) and the amount of times (frequency) a change in transportation is associated with changes in the participating communities. The extent of change and Indigenous people's adaptability to it vary between communities and cultures (Lemelin and Beaulieu 2013). However, in this study, participants associated many changes in their community to changes in transportation. While each type of transportation had an impact, they varied in degree making the changes "good in some parts, and really bad in some parts" (MDM1). More specifically, participants view significant changes coinciding with the winter road system. While many participants view the winter road as "an improvement" (MDM7), Table 9 displays the reception of the negative impacts that have been triggered by winter roads, as well as changes in transportation:

Yes, we do have positive impacts ... saving a little bit of finances through transporting bulk material on the winter roads. As well we have negative impacts such as, you know, alcohol being brought in, drugs, and some other undesirable substance. (MDM5)

Table 8. Results from interview responses on changes associated with transportation.

Themes	Sources	Frequency
Transportation changes	39	178
Winter road	30	97
Airplane	12	23

Table 9. Results from NVivo 10 Matrix Query. Negative impact themes that overlap with transportation changes, winter road and airplanes.

Themes	Frequency		
	Transportation changes	Winter road	Airplanes
Access	8	5	--
Drugs and alcohol	18	3	1
The land	3	2	--

Changes from increased access by winter roads have participants being mindful of the potential negative impacts of all-season roads: “Winter roads have impacted our communities (...) because of increased machinery people have brought in (...) [A] larger and a high number of machinery would destroy our environment quicker than before” (KIM15). In the community member’s perspectives, the winter road has created a large negative impact. From their past experiences and history, they fear that transitioning from winter roads to all-season roads will worsen areas that are already of concern to them such as increased access of drugs and alcohol, as well as create new problems such as degradation of the land, and the influx of non-Indigenous people into the communities. However, the many benefits experienced from winter roads are what people suggest will

only increase from all-season roads including lower costs of goods and services, employment and community-to-community interaction. In addition, it has emerged that whichever all-season road effect participant's mention it is driven by the consideration of and aim for community social well-being. The emerging results from our discussions (Table 5) with community members are further elaborated in the categories of: fear for the future, potential perceived harms from all-season roads and perceived benefits from all-season roads.

5.2.2. Fear for the Future

Past research has identified that culture and perspective play a significant role in the way people view and respond to the world, in addition, we found that context and situation also critically influence the opinions of community members. With the potential for an increase in familiar problems and the threat of new harms, community members expressed concern for developing all-season roads. As well, some participants acknowledge this fear amongst their own community members: "They're stuck in the mentality of fear. That fear kills. They're scared to have a road. They're scared for new things to come up here" (MDW9). The three most commonly discussed negative impacts—drugs and alcohol, the land and an influx of non-Indigenous people including citizens (or general public) and industry (resource developers)—reveal that road access affects community social well-being by "what's going to come in, [and] who's going to come in" (KIM4).

5.2.3. Potential Perceived Harms from All-Season Roads

4.2.3.1. Drugs and Alcohol

Drugs and alcohol are seen to be the main concern of the people (Table 5 and Table 7). Concerns about drugs and alcohol are common among studies conducted with Indigenous people (Christensen et al. 2010; Dockery 2010; Finlay et al. 2010; Reading and Halseth 2013; Reid 2015). However, we found that the fear towards drugs and alcohol is linked to past history and experiences from changes in transportation and access: “About 50 years ago, we didn’t have all those things, we didn’t have drugs” (MDW9).

Drug and alcohol use, over time, has increased with the increase in access. Contraband is transported into the community in various ways, yet participants minimally address the methods of transport. However, when specified, winter roads are identified as being the main form of transportation used to transport contraband, more so than airplanes, which can be seen in Table 9: “The winter road makes it simpler for transportation because even though we have what they call checkpoints, these are not effective. These are effective in terms of alcohol, but not in terms of drugs” (KIM1). Both First Nation communities that are involved in this study are dry communities, so community safety road checkpoints were introduced to minimize risk and trafficking of drugs and alcohol. However, trafficking and use of drugs and alcohol are social problems in these communities. Participants are concerned about the increasing impact drugs and alcohol will have on the community’s well-being because use by individuals affects families and in turn interferes with the well-being of the entire community: “Alcohol and drug use would come in and affect the families, affect the community” (KIM8). Access

does not only allow for things to be brought into communities, but may also result in various environmental and social impacts.

5.2.3.2. The Land

When asked in the survey to rank the importance of five different community aspects –the land, culture, values, money, and development and infrastructure, the land was ranked the most important. Additionally, culture and values were also ranked highly in importance because of the relationship and interconnectedness they have with the land as seen in the survey question results. When participants of the survey were asked whether protecting the land is more important than saving money on fuel and groceries, the majority agreed (54%), but some agreed more than others; approximately 31% strongly agreed, and 23% agreed. However, approximately 37% of the people valued both equally, which shows the importance of balancing environmental and economic aspects for community self-sufficiency.

The interrelatedness and connection that Indigenous people have with the land creates a responsibility and obligation towards respecting, preserving and “protect[ing] the land because [it’s their] well-being” (MDM5) (Brubacher et al. 2002; Kingsley et al. 2009; Parlee et al. 2005; RCAP 1996a; Timpson 2009). Presently, there are differing views as to how the winter roads affect the land, with some responses referring to nature’s resilience:

Every year, every spring time, even though the road is used in the winter time, every spring there’s a flower, or whatever that sprouts up right in the middle (...) and regenerates itself every year (...) then animals are able to eat off of it and not worry about anything else. (KIM10) (Appendix D)

Since the winter road is not graded or maintained year round, during the off-

season it is reclaimed by the flora and fauna species. Others see the negative environmental effects of winter roads: "What I see when I drive the winter road is that we're going across people's trap lines, and we're going really close to people's trap lines (...) we're invading the area of the animals because they migrate" (MDM9).

Developing all-season roads means there will be no vegetation regeneration because the roads will be in use year round, which also has potential for greater invasion as well as effect on traditional hunting and trapping lands. The impact of the wildlife in the region will also affect the survival and culture of the people (Dragonfly Consulting Services Canada 2012; Rigby et al. 2011). The potential intensification of land and resource use from all-season road development triggers fear within First Nation people because it threatens their connection to the land (Jardine et al. 2009). As well, First Nation people see the destruction of the land as a potential impact from all-season roads because of what they have witnessed in more southerly First Nation communities: "I can see the harm it can do when I drive round down south" (KIM3). The relationship among all life forms from the Indigenous perspective is evident: "If the land is healthy, the animals are healthy, it makes the people healthy, but if the animals don't have habitat then that means the land and people are sick" (Kingsley et al. 2009:296).

5.2.3.3. Influx of Non-Indigenous People

As expressed by the participants, "one of the fears, the original fears of the people (...) [is] the influx of foreigners" (KIM4), as well as the treatment of the land by them: "Influx of people (...) land would be destroyed. [An] increase of activity on our lands would pollute our environment faster" (KIM15). Approximately 73% of participants viewed an increase in the number of non-Indigenous people to be a negative impact of

increased access in regards to disrespect and misuse of the land and confrontation with people. As shown in Table 5, these concerns are associated with past experiences of the communities as transportation changed and access increased. In many Indigenous communities, this experience has influenced opposition and resistance of development since it can disturb the land, including traditional and sacred sites (Dragonfly Consulting Services Canada 2012) by non-Indigenous people, especially without prior Indigenous engagement. Approximately 17% of participants viewed an increase in non-Indigenous people as a positive impact because of the ability to help the economy, both through present local businesses and the development of new ones. However, the acknowledgement of potential benefits that can occur from an influx of non-Indigenous people does not minimize the concern of the participants who perceive the increase as being a negative impact: “Like if they just want a vacation or see the land, then it would be all great, but if they’re coming here for other purposes (...)” (KIM3). The theme of influx in non-Indigenous people has been divided into two categories, non-Indigenous citizens and non-Indigenous resource developers, because while both categories address impacts by non-Indigenous people towards the land the potential impacts differ in degree and outcome.

5.2.3.3.1. Non-Indigenous Citizens.

Past studies have shown a connection between population growth and deforestation (Far North Science Advisory 2010; Gonzalez et al. 2014) and adoption of inappropriate land management practices (Perz et al. 2012), which present the potential for impacts on the environment in the North. Research has also shown that road development is associated with an increase in hunting in traditional territories that can

result in competition over natural resources between traditional users and new users (Adam et al. 2012; Sumi et al. 2001). An increase in the use of these areas can result in exploitation and degradation of natural resources (Sumi et al. 2001): “A lot more hunting and fishing (...) they’d come up and (...) over do it” (MDW10). With the current modes of transportation, the communities have very few non-Indigenous visitors, except for those who travel for employment purposes such as semi-truck drivers, nurses, teachers and government administrators, but all-season roads allow the territory to be more accessible. Access can intensify hunting (Far North Science Advisory 2010), having it go unregulated, and at times, result in illegal activities such as poaching (Adam et al. 2012): “The Americans come up (here) during moose hunting season and they stop wherever they want to stop. And that’s not the way it’s supposed to be. There [are] people who are responsible for that territory” (MDM6).

Non-Indigenous people have a lack of respect not only the land, but also the people: “We may have some people encroaching up on our traditional territories without permission. And those kind of people don’t care (...) without our permission or consultation” (KIM4). The potential for open access that allows anyone onto traditional land is a negative result of all-season roads because the people can lose the ability to monitor activities on their territory. While this effect has the potential to occur between neighboring First Nation communities, participants stressed this concern towards non-Indigenous people. Confrontation between Indigenous and non-Indigenous people can evolve if permission for access to the land for resource activities is not requested or granted. However, more worrisome to participants is “that once an all-weather road comes in, there’s going to be an influx of people that want to develop the North” (MDM5). Confrontations, potentially at a much greater scale, may result because of

legalities such as transportation policies and differing views on party responsibilities and approvals of development. For example, MD and KI have begun development of forest harvesting trails (Appendix D); however, it initiates land jurisdiction conflict with the OMNRF since the communities do not recognize or follow the protocols and guidelines recommended for development outside of reserve boundaries by the province. While Indigenous communities have the right to develop roads within their community without provincial interference, legislation indicates that they cannot develop and are not responsible for approving development outside of their reserve. While the province sees off-reserve land as belonging to them, the communities view the same land as being a part of their land (Sudol 2015), which is why participants address a need “to start preparing to control (...) [and] start laying those controls in place” (MDM2).

5.2.3.3.2. Non-Indigenous Resource Developers.

KI, unlike MD, has had direct experience with environmental impact from the misuse of the land by southern companies even with limited access: “They come already, they fly in” (MDW4). In 2006, KI community members confronted the mining company Platinex about its exploration of their territory, since the company did not previously consult with the community. While this problem initially arose from staking claims acquired by Platinex in the 1960’s and through the purchasing of mining claims in 1999, KI asked the company to leave their land. Platinex sued the community of KI for \$10 billion for loss of opportunity, and KI countersued both the province and Platinex for their failure to consult the community. Platinex also sued the province of Ontario for their lack in participation and consultation, which ended their alliance. After a number of court cases, six KI Council members were jailed on March 17th, 2008, yet on May 28th of the

same year the province issued their release since they felt the punishment was too harsh. Although this confrontational lesson led to the amendment of the Mining Act, which now identifies that Aboriginal and treaty rights must be addressed before mining development can occur (Ariss and Cutfeet 2011; Ariss and Cutfeet 2012; Peerla 2012), participants still fear that situations like this may arise with other resource developing companies once there are all-season roads and greater access: “Come up and take over. It’s happened before with Platinex” (KIM7).

MD has less experience with resource development confrontation and to a much smaller degree. Between 1986 and 1988, the resource development company Eldor Resources Ltd. (currently CAMECO, a Canadian mining and energy corporation) began exploration and staking claims (Atkinson and Storey 1989) off the Windigo River, approximately 7 km South of the MD reserve. This exploration was a joint venture with Canadian Occidental Petroleum Limited (Panagapko 1986). However, it needs to be recognized that other companies had also been exploring in MD territory at this time, but Eldor Resources Ltd. was the only company that submitted a report. The company used the winter road system to access these areas. The community members asked the non-Indigenous people to leave once they were spotted, and since have not seen anyone or any further exploration or development in their territory.

While the situation in MD was less severe than that experienced in KI, it is still significant. Both past experiences present the lack of FPIC and involvement of First Nation communities. It must be noted that at the time of these confrontations, treaties were viewed to extinguish Aboriginal rights of land allowing for free access (Hanson 2009a). Though recent changes to protocols and relationships have occurred between

Indigenous communities, and governments and developers, to the First Nation communities these circumstances play an important role in their perspectives and their fear of resource development once all-season roads are built: “When there’s a road (...) it would be a lot easier for them” (MDW4).

The Far North, where these First Nation communities are located, is full of potential for natural resource development (Reading and Halseth 2013; Sudol 2015), and is why many resource-developing companies look for opportunities in these areas of limited access (Reading and Halseth 2013; Sumi et al. 2001): “There’s a lot of economic opportunities to be made up north, whereas down South, it’s been overdeveloped” (MDM5). Natural resource development presents many negative impacts, with the majority being environmental resulting from mining (Sumi et al. 2001). However, any development results in a change to the land, which affects communities. Currently, with limited access to these locations—“there’s no access to the places [the resource companies] wish to go” (KIM8)—, but if all-season roads are built there will be an increase in access to these locations, meaning an opening up of the land to industry: “Companies come in and take. They will just destroy it. That’s [my] main concern, [my] main fear” (KIW2).

Not only does an all-season road have the potential to affect the ecosystem, but it may also lead to a continual opening up of the region through developing more roads (Sumi et al. 2001). Research has identified that deforestation is closely correlated with transportation, specifically roads (Fenley et al. 2007), with the areas also becoming more vulnerable to overharvesting (Sumi et al. 2001). Many participants fear the potential negative effects resource development can have on the land: “The land, the water, the

fish, the other animals, it's going to be destroyed because they're going to harvest everything, the land, the resource companies are going to come in and everything's going to be destroy[ed]" (KIW3). Their concerns are also towards the cumulative impacts of resource development since affects can be up to thousands of kilometers from the site of a direct impact, which can result in disturbance to soils, vegetation and wildlife (Sumi et al. 2001). Cumulative impact have been both experienced and witnessed:

We have 13 identified sites already in this community alone where the land has been contaminated and nobody is cleaning it up (...) where Bearskin Oasis started from, and several other airlines. If you go walk around in the bush, you'll see all the old equipment... where their diesel generating station was. I remember the land around it was just soaked with oil, and gas, and fuel, and there is a little creek that used to go down to the lake (...) it still has an impact on us and Bearskin Oasis is long gone, and it still has a direct impact on us and it hasn't been cleaned up, and we can't use the land. (KIM2)

Open access from all-season roads reflects the issues that can emerge from resource development from the community perspective, as well as how it may affect the people who are "trying to protect their land" (MDW9). Through protecting the land they are also protecting themselves because many participants addressed the issue that resource development "wouldn't be good for their community" (KIM12). Furthermore, allowing resource development to happen without proper planning, mitigation and consent can directly affect social well-being even before development affects the land.

In many situations, Indigenous people vocalize that they are willing to share the land if proper agreements are met and localized control is established (Dragonfly Consulting Services Canada 2012), which was also discussed by the participating First Nations. This includes the precondition of how development occurs and post condition of use of access. As is evident in interviews, participants acknowledged the potential benefits of resource development for economic growth, but vocalize the need for proper

land use planning, agreements and partnerships before development would be negotiated.

5.2.4. Perceived Benefits from All-Season Roads

The word “access” and its stem words in NVivo 10 coincide with both positive and negative remarks about all-season roads in interview discussions. However, in survey questionnaires, more often than not, “access” was associated with the potential for positive impacts: “Access to other communities, lower transportation and freight cost” (KIW8). The majority of benefits mentioned by participants have to do with their positive experiences from transportation including lower costs, employment and community-to-community interaction. Tables 5 and Table 6 show the frequency of the most prominent positive impacts mentioned in interview and survey results, while Table 10 highlights the frequency of these positive impacts in relation to transportation in interview responses.

Table 10. Results from NVivo 10 Matrix Query. Positive impact themes that overlap with transportation changes, winter road and airplanes.

Themes	Frequency		
	Transportation changes	Winter road	Airplanes
Costs	8	11	14
Relationships	8	4	--

5.2.4.1. Lower Costs

The most frequently mentioned positive impact was lower costs including services and goods, something that participants presently experience during the winter road season: “It’s easy having a winter road for us to shop whatever we need, because when you live in a reserve everything costs so much, so you need to have a road” (MDW9). Costs of necessities in a remote community, specifically groceries, can be almost three to four times more expensive than the same items in southern Ontario (Finlay et al. 2010; Government of Canada 2014). For example, in the community of KI gas costs \$2.15 per liter (see Appendix D) in comparison to Thunder Bay, which fluctuates between \$0.90 and \$1.45. Research has revealed that an increase in access and better road infrastructure lowers both the costs of basic necessities and costs of transportation (Fenley et al. 2007; Levang et al. 2007). Participants perceive these benefits to also result from all-season roads, but on a year round basis: “Cheaper travel, freight, the food, cost of living will be cheaper. That’s the most important one” (MDW10). Approximately 75% of survey participants believe that an all-season road will improve costs of everyday necessities, such as fuel and groceries; with 40% perceiving it to extremely improve, and 35% perceiving it to very much improve. All-season roads not only reduce costs, but roads can also improve economic returns through transportation and freight (Fenley et al. 2007), which can enhance the standard of living in the community: “The cost of living wouldn’t be so high, it would be a little bit lower, and that would definitely benefit everybody” (KIM2). Since lower costs create opportunities to save money within the community and provide additional and improved current services, economic improvement can help communities towards being self-sufficient.

5.2.4.2. Employment

Employment is seen to be a main opportunity once there is access from all-season roads: “I think it would create a lot more jobs (...) it’s generally hard to find a job in the community right now, and I think if we had an all-season road, it would create a lot more jobs, and people just can work” (KIM7). Approximately 56% of survey participants agree that an all-season road will provide new employment opportunities. According to the Aboriginal Labour Bulletin (Employment and Social Development Canada 2013), 13.4% of the Indigenous population was unemployed in 2013, a 2.6% increase from the previous year. At present, unemployment is common in First Nation communities, since there are not many ways to generate jobs, and not many opportunities in construction and maintenance of year round community and winter roads (Natural Resource Canada 2014). While transportation and winter roads create employment, even if minimal, all-season roads allow for year round access to external opportunities, even though increased access has the potential for negative impacts. Participants also perceive the possibility for greater opportunities within their community through the creation of short and long-term employment in construction and maintenance, as well as entrepreneurial ventures and small businesses from all-season roads, which can help get them “out of the cycle of poverty” (MDM8) that their community is currently struggling with. In addition, the ability and increased opportunity for employment allows for “more opportunity for personal growth and well-being” (KIW8). Research has shown that unemployment can affect people mentally and emotionally, and can cause health problems (Kingsley et al. 2013; Reading and Halseth 2013; Wingert 2013). Increasing income and opportunities improve individual and community health, which further enhances individual and

community social well-being.

5.2.4.3. Community-to-Community Interaction

Participants view travel as a positive outcome of all-season roads. Although travel was mentioned both in general terms, and in regard to mobility to and from the South, over half (56%) of the participants associated travel with the ability to visit nearby and surrounding communities. As transportation progressed in the communities, so did the ability to travel amongst the communities. Airplane travel costs were originally cheaper for inter community flights, but “I guess the faster the airplane, the bigger the aircraft, and more on [the] ticket prices” (KIM10). Although communities are naturally connected by waterways, they rarely utilize this way of access because of “the schedule... [which] doesn’t work with the old lifestyle” (MDW1). Community members do not visit other neighboring communities as often: “It’s only [in the] wintertime that [they get to] go visit amongst each other. So [they] take full advantage of trying to visit [their] cousins, or [their] relations” (MDM10). Through the development of winter roads, the communities were able to visit more often during the winter months: “During winter road season the social aspect of communities’ increases, where community members of all sorts (...) travel to community to community for visits, jamborees, events, those are the main aspects of changes” (KIM12).

Because communities have experienced “more community-to-community interaction” (MDW10) and social changes from seasonal access (Taylor and Parry 2014), they perceive that, with all-season roads these circumstances will only further improve: “The benefits would be greater, more interaction. We could build stronger bonds with the surrounding reserves” (KIM9). Furthermore, all-season roads “promote strong family

ties. It brings people together. It brings sports, competition, and so on and so forth” (MDM5), which, in turn, improves communities’ social well-being (Kant et al. 2014; Kingsley et al. 2013).

5.2.5. Are All-Season Roads a Go?

Survey results show that people agree (approximately 30% strongly agree, and 44% agree) on moving forward on the development of all-season roads. The majority of participants (41%) also agree that all-season roads would be overall more beneficial. Even though there are fears that coincide with the potential negative impacts, the communities see positive changes as being greater than the negative consequences they may encounter.

Potential perceived harms such as drugs and alcohol, destruction of the land and fear itself have been addressed in previous research. More so, past research has identified the significance of acknowledging the local history (Christensen et al. 2010) and the importance and perception of the environment to Indigenous culture to understanding developmental change (Adam et al. 2012). However, this study has contributed that community members perceive changes and impacts due to past experiences and history. Past research and current policies have also placed significant focus on the economic benefits of development (Kant et al. 2014), yet this study, while emphasizing the importance of and need to address multiple impacts of development, identified the importance of understanding social well-being. Through a better understanding of First Nation perspectives, all-season roads can be developed more sustainably for the Far North ecosystem and the residing communities, which in turn, provide the ability and opportunities for communities to become self-sufficient.

5.3. CONCLUSION

All-season road corridors present an opportunity for NAN First Nation communities to prepare for increasing effects of climate change (an aspect not heavily discussed among participants), as well as potential economic development. Yet, for the communities to be able to benefit from all-season roads, potential impacts need to be identified and understood from their perspective. Both the interview and survey data reveal that participants recognize the potential for both positive and negative impacts from the development of all-season roads, and that their perspective on potential impacts are influenced by past experiences and history from changes in transportation. Lower costs, employment and community-to-community interaction are the most prominently mentioned positive impacts, whereas drugs and alcohol, destruction of the land, and an influx of non-Indigenous people are the most prominently mentioned negative impacts that also present an emergent theme of a fear for the future. Fears about an influx of non-Indigenous people, including resource developers, reveal the need for equal and respectful treatment for both the land and the people, which should be addressed and implemented in transportation and public policies and legislation. Benefits discussed reflect the importance of economic change and opportunity, but participants reinforced the need and value for the people and protection of the land for community well-being. The emergent theme of social well-being has been identified within each positive and negative impact discussed that presents the interconnectedness of relationships and importance of understanding developmental impacts from multiple aspects, including that of First Nation people and the land. This further reflects the need for planning and developing sustainably for the future and future generations. Overall, because of the potential positive effects from all-season roads, many of the First Nation people agreed

that their community should move forward with an all-season road development, even though negative impacts can potentially worsen existing challenges or create new ones.

However, the issues within First Nation communities are not theirs alone, but belong to all of Canada. Therefore, decisions made must be done collectively to rebuild unity and provide sustainable growth and prosperity for the future of Canada (Government of Canada 2014; Jeffrey 2012; Puxley 2015; Sumi et al. 2001).

CHAPTER 6: CONCLUSION AND RESEARCH LIMITATIONS AND RECOMMENDATIONS

6.1. CONCLUSION

In Ontario, NAN has proposed First Nation reserves assess the potential of developing all-season road systems in remote communities in the Far North to enable a defence against climate change and to create social and economic opportunities for communities. Members from the two remote communities of MD and KI gave their knowledge through semi-structured interviews and survey questionnaires to understand their perspectives on potential impacts, and their influences, from all-season road development. The researcher sought out as many participants as possible during the time frame allotted and any member of the community above the age of 18 years could participate, which allowed for diversity in community perspectives through age, gender, employment, etc. However, there were few differences found between the perspectives of the two differently sized First Nation communities (one small and one large), highlighting the potential for developing a cumulative, regional preparatory framework that can then be altered as needed. This study used concurrent triangulation mixed methods approach, where qualitative methods took priority. More specifically, the qualitative method of Indigenous Methodology (IM), including inspiration from Capacity-building, Respect, Equity and Empowerment (CREE) and Participatory Action Research (PAR) was used throughout this study to acquire collaboration and knowledge exchange in a holistic manner to allow results to be meaningful and applicable to

Indigenous communities.

Through data collection procedures (interviews and surveys) and the data analysis process (SPSS and NVivo), the participants' most prominently mentioned impacts were identified and include the top positive impacts – lower costs, employment and community-to-community interactions, and potential negative impacts – drugs and alcohol, destruction to the land, and influx of non-Indigenous people; including citizens and resource developers that come into communities and access the land and resources without consent. In addition, from the discussions involving negative impacts, the First Nation people mentioned a fear for the future because all-season roads and increased access can potentially worsen current community challenges and/or create new ones. Importantly, the results presented First Nation people's perceptions of positive and negative impacts influenced by past experiences and history associated with changes in transportation, with more emphasis being placed on winter road access. Furthermore, the importance that First Nation people place on social well-being was identified in both positive and negative impact themes, which included that community members initially aim for social cohesion, over economic wealth opportunities. While participants expressed concerns toward developing all-season roads, the majority agreed that construction should move forward because it will increase community benefits. However, in turn, participants also addressed a need for proper preparation for communities to fully benefit from increased access.

The information received by participants through this study can be used to support Indigenous communities in planning and preparing for all-season road development as well as in other future developmental. The emergent themes of this study can be utilized by non-Indigenous people to better understand First Nation perspectives and values in

regard to development, as well as how to approach developmental changes within remote communities. While all-season roads have the potential to bring benefits and cause harms, First Nation people acknowledge the potential opportunities for their communities even with the associated risks. However, participants addressed that for development to be successful, appropriate steps need to be taken with their full involvement. Overall, all-season road development in the Far North is not currently a reachable goal, but it is something that will both positively and negatively affect northern communities, as well as create a significant change for Ontario. It is vital that First Nation communities prepare for transportation change; only then will they be able to form social well-being and acquire long-term benefits from all-season roads. In addition, for real change to occur and for First Nation people to benefits to be enhanced, these factors must be taken into consideration when implementing new legislation, policy and guidelines.

6.2. LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

People approached to participate in the study were either within a workplace, at the local store, at a gathering, or walking on the road, which resulted in the majority of participants being employed. House-to-house research was not conducted for data collection, which could have resulted in a better representative sample of the community. Although, the community members were aware of the researcher conducting the study, the researcher realized there was a lack of awareness about the study within the community, so promotional techniques such as radio broadcasting and posters were used to inform the communities. While this was efficient in MD, it was challenging in KI since it is a large reserve. The time spent promoting the study, given a short time frame spent in the communities, resulted in a slightly skewed and limited sample size. In spite of the limitations, there was a significant amount of participation within the allotted time. Future research in this area should encourage notification of community members about the study before arriving and allow for a longer period of time spent within the communities or more frequent trips to collect data.

This research was conducted as a preliminary study and used to collect general information from the First Nation communities about the potential and prominent impacts of an all-season road development. Additional studies should focus on issues raised in the results of this study. In addition, the perspectives of communities that are developing and/or have developed all-season roads should be included to identify changes seen during and after the development process. The results from the research showed more commonality between the communities that allowed for cumulative data analysis approach. However, it needs to be noted that different locations, culture, history and

experience can significantly influence local perspectives. Therefore, these factors must be taken into consideration when implementing new legislation, policy and guidelines.

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GLOSSARY

Aboriginal rights: Are collective Indigenous rights that address use and occupation of the land and resources by Indigenous people, and are protected under the Constitution Act Section 35 (Coyle 2008; McLeod et al. 2015; Nadasdy 2002).

Aboriginal title: Indigenous inherent right to land and resources established through ancestry and relationships (Hanson 2009a; INAC 2011; RCAP 1996b) that remains so unless negotiated in a treaty (McLeod et al. 2015; Royal Proclamation 2009), as well as the practice of culture and spirituality, and self-government (McLeod et al. 2015; RCAP 1996b).

Far North Act: Provincial legislation that went into effect in 2010 and recognizes Aboriginal and treaty rights in the Constitution Act, section 35 (Government of Ontario 2014b; Lemelin et al. 2012). The legislations intention was for Indigenous and non-Indigenous people to work collaboratively through community-based land use planning, and collectively identify areas to protect and develop in support of environmental, social and economic objectives in Ontario's Far North (Government of Ontario 2014b; Lemelin et al. 2012).

Free, Prior and Informed Consent: Allows Indigenous people to have self-determination over lands and resources, and having to acquire their permission of access, and acceptance of decision-making procedures (Portalewska 2012).

Nishnawbe Aski Nation: A political territorial organization established in 1973 that represents the northern Ontario First Nation communities for the Treaty #5 and Treaty #9 territories (NAN 2016b).

Sustainability: An idea on how human civilization and activities can meet current needs, while also planning and considering social, economic and environmental (three pillars) balance and ideals for the future (McGill Senate 2007).

Sustainable: Something that can be used, but not be completely drained or ruined beyond recovery (Merriam-Webster n.d.b).

APPENDIX A: QUESTIONS FOR INDIVIDUAL CONVERSATIONAL, SEMI-STRUCTURED, OPEN-ENDED INTERVIEWS

1. How has transportation changed over time in your community?
2. Do you travel by air? If yes, how often? For what purpose? If no, why not?
Prompt: Health and education services, and cheaper goods
3. Do you travel by winter roads? If yes, how often? For what purpose? If no, why not?
Prompt: Health and education services, and cheaper goods. If they have a vehicle and/or can drive.
4. Between airplanes and winter roads, which form of transportation do you prefer? Why?
5. What do you know about the proposed all-weather road corridor?
 6. a) Do you think an all-weather road will be good for your community? If yes, why? If no, why not?
b) Who do you think will benefit from an all-weather road? Who may be harmed by an all-weather road?
c) What else may benefit? What else may be harmed?
Prompt: The forest? The land? Your life? The lives of the people within the community? The lives of the people in neighbouring communities? The accessibility (monitoring use and (dis)respect for the land)? Land use planning? Conflicts (with the government; opinions between youth and Elders)? Safety (maintenance, should the roads be paved)? Recreational activities? Traditional practices and culture?
7. a) In your view, what does the community in general think about an all-weather road?
b) What are community concerns about building an all-weather road?
8. Out of everything we have discussed, what do you think are the most important positive impacts? The most important negative impacts?
9. What do you think could be done to lower the harmful impacts of all-weather roads

APPENDIX B: QUESTIONNAIRE

By completing this survey, it signifies your consent to participate in this research. Note, that as a participant, you have a choice to answer any question.

Demographics

10. What is your gender? Male Female

2. In which category does your age fall into?

18-24	25-34	35-44	45-54	55-64	65-74	75+
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3. What is your education level?

Employed for wages	Self-employed	Out of work and looking for work	Out of work but not currently looking for work	A Homemaker	A Student	Retired	Unable to work
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4. What is your employment status?

No Schooling Completed	Nursery School to Grade 8	Some High School, No Diploma	High School Graduate	Some College, No Diploma	College Diploma	Trade or Technical Training	Associate Degree	Bachelor's Degree	Master's Degree	Doctorate Degree
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5. How many years have you lived in this community for?

Less than 1	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	40 or Higher
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Please circle the number or column that is closest to your opinion about the questions being asked.

1. Should your community build an all-weather road?

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
1	2	3	4	5

2. How supportive is your community of an all-weather road?

Not at all	A little	Moderate	A lot	Extremely
1	2	3	4	5

3. Will an all-weather road be beneficial for your community?

Not at all	A little	Moderately	A lot	Extremely
1	2	3	4	5

4. Will an all-weather road improve the costs of everyday necessities, such as fuel and groceries?

Not at all	A little	Moderately	A lot	Extremely
1	2	3	4	5

5. How much do think the changes to the land by an all-weather road will affect your culture?

Not at all	Slightly	Moderately	Very	Extremely
1	2	3	4	5

6. Is protecting the land more important than saving money on fuel and groceries?

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
1	2	3	4	5

7. Is saving money on fuel and groceries more important than maintaining your community's culture?

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
1	2	3	4	5

8. Will an all-weather road change the values of community members?

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
1	2	3	4	5

9. Will an all-weather road provide new employment opportunities?

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
1	2	3	4	5

10. Please rate the importance of each from 1 to 5, using each number only once (1 being the least important and 5 being the most important).

A)

The Land	Culture	Values	Money	Development & Infrastructure

B)

Traditional Practices	Health Care & Services	Education & Educational Facilities	Employment Opportunities	Road Safety & Maintenance

C)

Health & Well-being	Tradition	Road Accessibility & Transport	Employment	Costs of Goods

11. What do you think will be the top three benefits of an all-weather road?

1) _____

2) _____

3) _____

12. What do you think will be the top three drawbacks of an all-weather road?

1) _____

2) _____

3) _____

13. Do you have any other suggestions for lowering the potential harmful impacts of an all-weather road?

14. Do you have any other comments about all-weather road access?

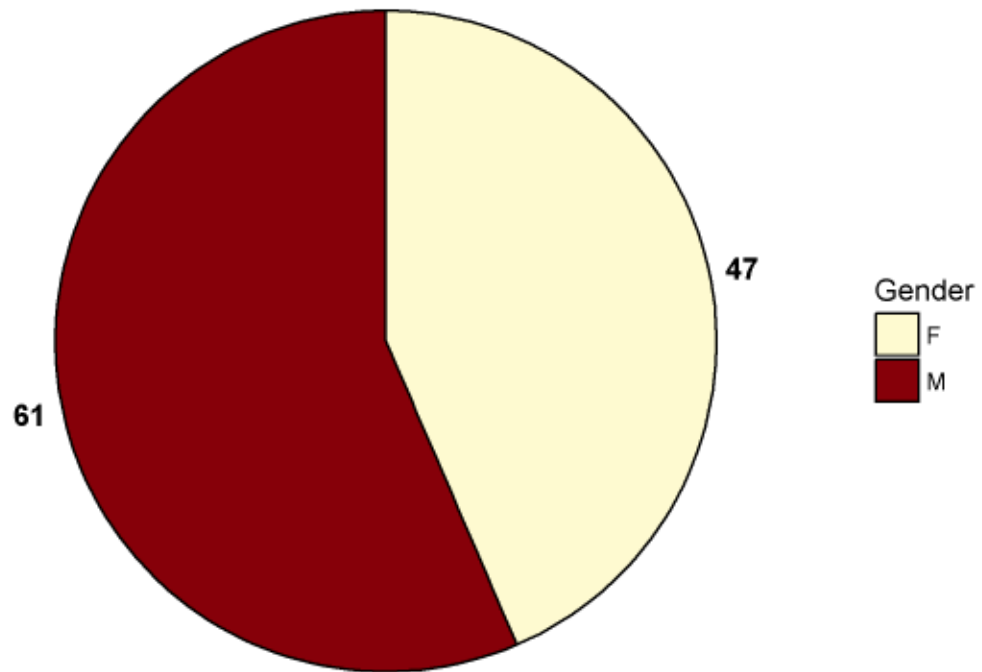
I wish to be acknowledged.

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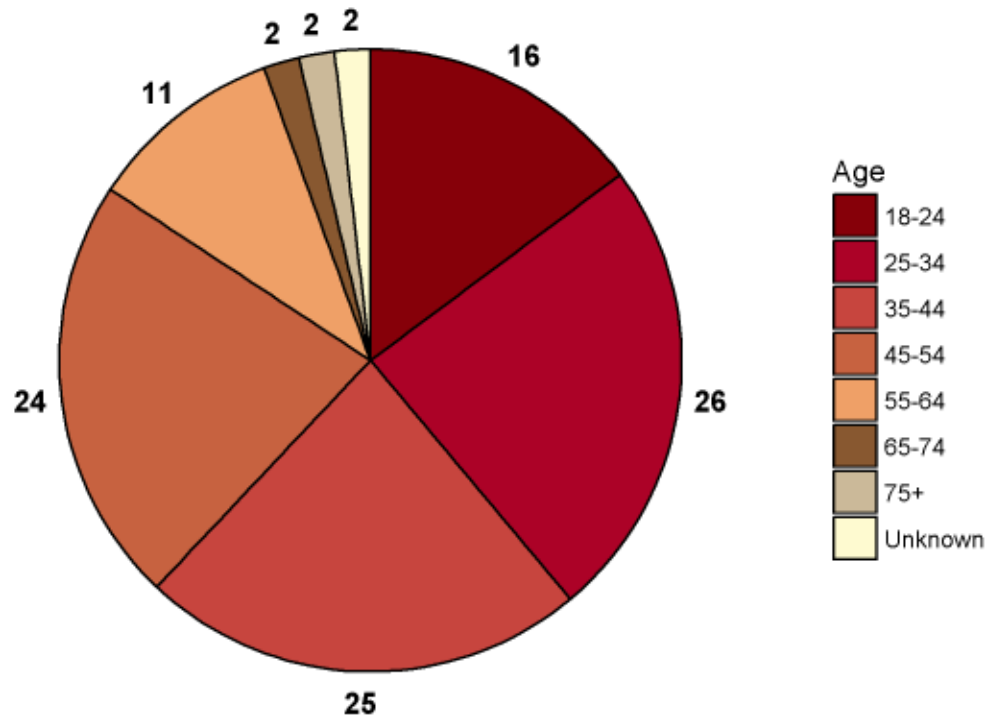
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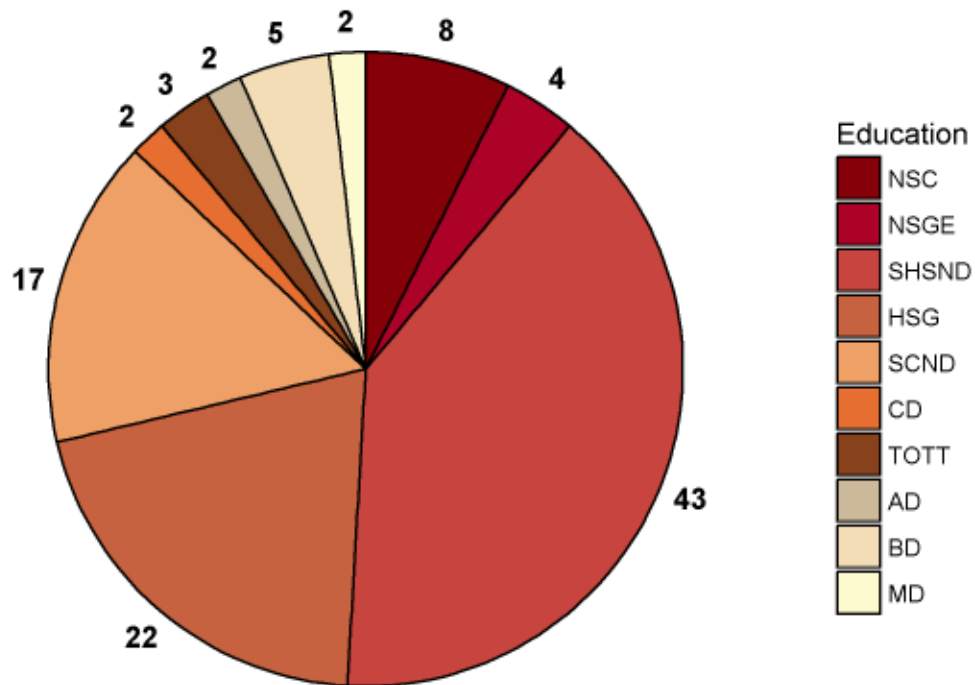
APPENDIX C: DEMOGRAPHIC INFORMATION RESULTS



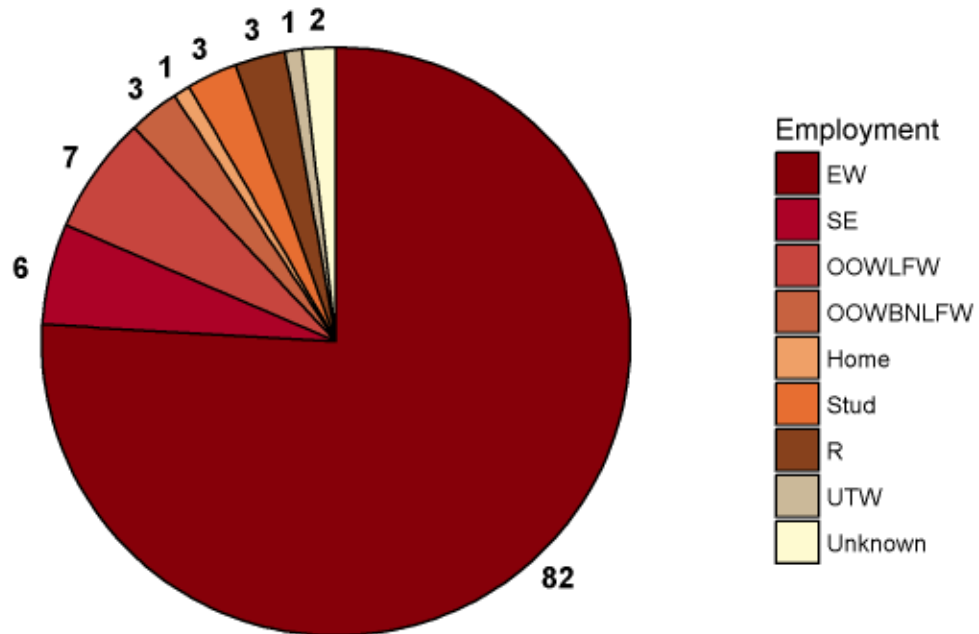
Appendix C1: Number of survey participants that are male and female



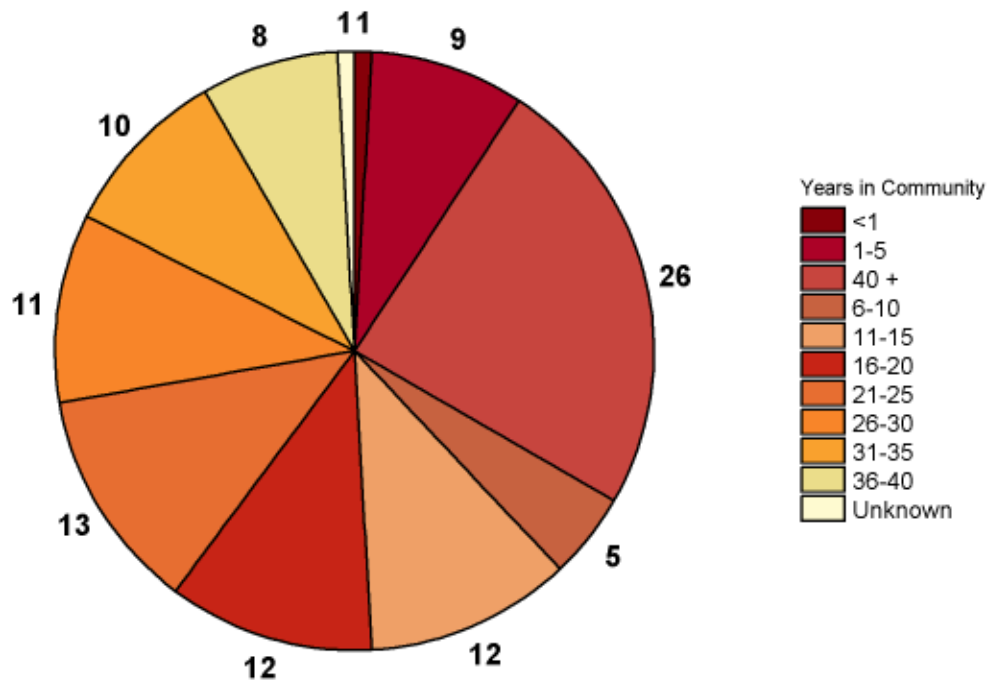
Appendix C2: Number of survey participants within each age category.



Appendix C3: Level of education of survey participants. Expansions of label abbreviations are as follows: No Schooling Completed (NSC), Nursery School to Grade 8 (NSGE), Some High School, No Diploma (SHSND), High School Graduate (HSG), Some College, No Diploma (SCND), College Diploma (CD), Trade or Technical Training (TOTT), Associate Degree (AD), Bachelor's Degree (BD), and Master's Degree (MD).



Appendix C4: Employment status of survey participants. Expansions of label abbreviations are as follows: Employed for wages (EW), Self-employed (SE), Out of work and looking for work (OOWLFW), Out of work but not currently looking for work (OOWBNLFW), A Homemaker (Home), A Student (Stud), Retired (R), and Unable to work (UTW).



Appendix C5: Number of years living within the community indicated by survey participants.

APPENDIX D: IMAGES

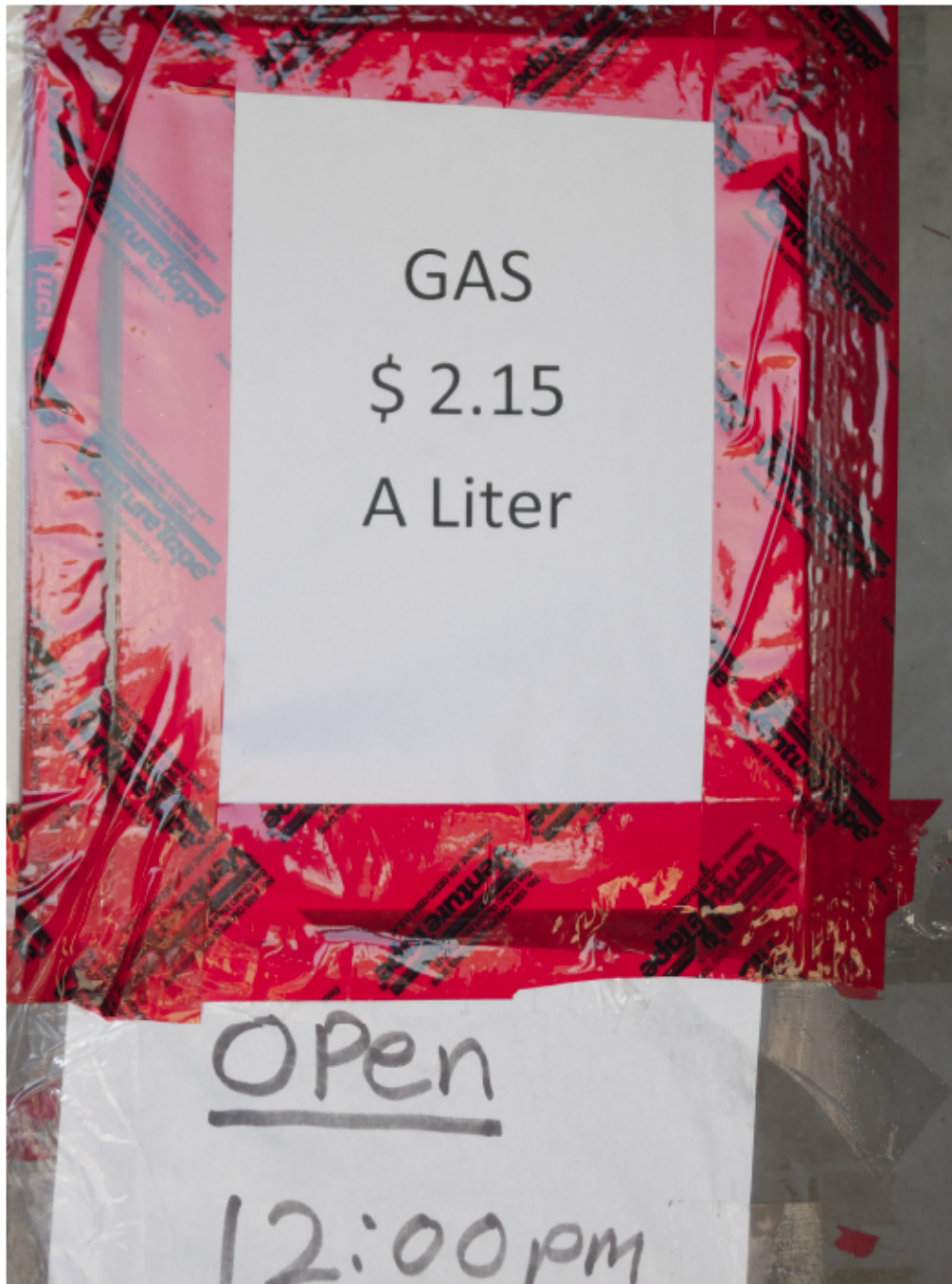


Image 1: Gas price in KI First Nation Reserve.

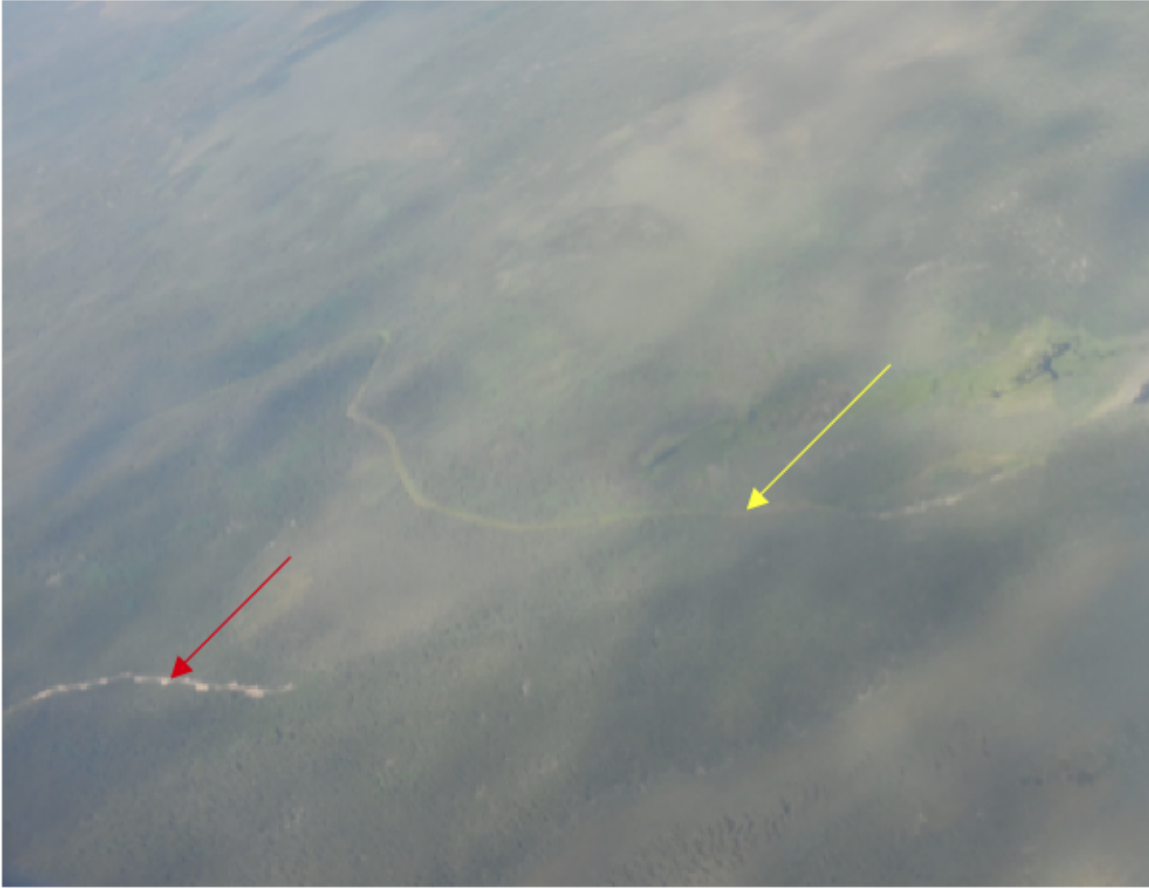


Image 2: MD Territory. (i) yellow arrow is the current winter road system, and (ii) red arrow is the beginning of the harvesting trail towards Bearskin Lake.