THE BUILT ENVIRONMENT:

Understanding how physical environments influence the health and well-being of First Nations peoples living on-reserve

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EMERGING PRIORITIES

Acknowledgements

CONTENTS

...*Indigenous peoples in Canada deliberately planned and designed their communities so as to thrive within their territories prior to colonization.*

1.0 INTRODUCTION

Every aspect of urban life has been designed to accommodate human needs. Cities and towns are composed of neighbourhoods, homes, schools, businesses, shopping districts, parks, recreation centres, and transportation networks. All of these places and spaces make up the built environment, or the "human-made or modified physical surroundings in which people live, work and play" (Cheadle & Tugwell, 2014, p. 2). Simply put, the built environment includes surroundings "for humans, by humans, and to be used for human activity" (Visual Arts and the Built Environment, n.d., para. 1).

There is mounting evidence and recognition that the built environment influences the safety, health and well-being of individuals and communities (Canadian Journal of Public Health [CJPH], 2012; Canadian Medical Association [CMA], 2013; Centers for Disease Control and Prevention, 2010; Heart and Stroke Foundation, n.d.; Jackson, 2003; Lees, Redman, & Berland, 2010; Muhajarine, 2012; Williams, 2013). Healthy built environments lead to increased physical activity while lowering rates of obesity, asthma and respiratory infections, injuries and unintentional fatalities, and heat exposure (CMA, 2013, pp. 2-3). For example, access to local supermarkets can provide residents with greater choice and options around food and nutrition (Hanson & Stout, 2011), and people are more likely to walk to purchase groceries and other items (Heart and Stroke Foundation, n.d.). Communities with designated bike lanes promote active transportation and commuting which help lower levels of obesity, chronic diseases, and certain types of cancers (Winnipeg Regional Health Authority, 2013). The Canadian Journal of Public Health's [CJPH] Special Supplement on the built environment and health in Canada shows how built environments of neighbourhoods and schools can be drivers of childhood obesity, particularly in urban settings. This can have detrimental health implications across the life course.

While publications such as those of the CMA and the CJPH touch upon vulnerable and rural populations, neither mentions how the built environment influences the health and well-being of Indigenous[1] peoples living in urban, rural, remote, northern or isolated communities.[2] This paper aims to fill this gap by describing how the built environment influences the health and well-being of First Nations reserve communities. Although the built environment is large in scope (including health, business, education, recycling, and garbage disposal facilities and infrastructure, to name a few), this paper focuses specifically on only five elements of the built environment:

1) housing;
2) water and wastewater management;
3) food security;
4) active living; and
5) transportation.

Each of these elements, if poorly funded, maintained or absent, has an impact on human safety, health and well-being.

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[1] For this paper, the terms 'Indigenous' and 'Indigenous peoples' will be used to represent all First Nations, Inuit, and Métis peoples inclusively. 'Aboriginal' and 'Aboriginal peoples' are used when reflected in the literature under discussion. Wherever possible, culturally specific names are used.

[2] We recognize that the built environment impacts Inuit and Métis communities as well; however, these impacts must be the focus of future papers.

The paper begins by introducing how Indigenous peoples in Canada deliberately planned and designed their communities so as to thrive within their territories prior to colonization. It will then turn to how colonization altered Indigenous peoples' home and community environments. As will be shown, present-day First Nations communities across Canada are rooted in colonial policies and processes, and the imposition of western built environments has contributed to many of the ongoing social and health inequities they currently experience. The paper concludes with some possible opportunities for action to counter the present situations faced by many communities.

Publications included in this paper were limited to those with multiple and overlapping aspects of the built environment in First Nations on-reserve communities falling within a determinants of health framework. Although this paper did not include a systematic review process, publications were initially identified through a search of CINAHL; Native Health Databases; MEDLINE; EMBASE; EBM Reviews (including Cochrane); PubMed; PubMed Central, Google; Google Scholar; OpenDOAR; Health Sciences Online; Turning Research into Practice; OAISter; National Aboriginal Health Organization; National Aboriginal Community Controlled Health Organization; and Indigenous and Northern Affairs. Terms utilized included "Aboriginal/First Nation/ Indigenous/Indians/ native peoples/ + "built environment/ supportive environment/health/environment/ ecological survey/man-made space/

human modified space." Search terms were expanded to include "housing/homes/households", "infrastructure", "water", "waste management", "food/food security/ food insecurity/nutrition", "physical activity/inactivity/recreation/ obesity", "transportation/roads/ winter roads"/ "Indigenous architecture"/ "design"/ "planning." Additional literature was identified from the bibliographies of relevant publications. The search included peer and non-peer reviewed publications spanning from 1995 to 2016. Publications were deemed relevant if they focused on First Nations on-reserve communities and the impact of some element of the built environment on health and well-being. In a few cases, other relevant literature and examples from Indigenous perspectives from the United States were included as well.

1.1 Demographics

First Nations are one of the three Indigenous groups recognized under the Canadian Constitution of 1982. According to the most recent data, Indigenous peoples comprise 1,673,785 or 4.9% of the total Canadian population (Statistics Canada, 2017a). Of this total, 58.4% (977,230) identify as First Nations. Almost a half (44.2%) of registered First Nations people reside on reserve (Statistics Canada, 2017a). There are 617 First Nation Bands/ communities recognized by the federal government (Indigenous and Northern Affairs Canada [INAC], 2014). Amongst these communities is great cultural, linguistic, economic, infrastructural, and geographic diversity. Many First Nations reserves are small and

considered rural, remote, isolated or northern. Indigenous and Northern Affairs Canada includes four geographic zones in which First Nations communities are located:

- Urban (Zone 1): within 50 km of the nearest service centre with a year-round road access
- Rural (Zone 2): between 50-350 km from the nearest service centre with a year-round road access
- Remote (Zone 3): over 350 km from the nearest service centre with year-round road access
- Special Access (Zone 4): no year-round road access to a service centre (Leclair, 2016).

Close to one fifth, or 17.3%, of First Nations communities are considered to fall under "special access", while 3.7% are considered remote, 44% rural and 34.4% urban (Leclair, 2016, slide 11). As will be discussed in later sections of this paper, the health and well-being of communities considered "special access" are profoundly impacted by housing, infrastructure, and food security issues.

2.0 COMMUNITIES PLANNED THROUGH INDIGENOUS DESIGN AND KNOWLEDGE

This section will provide a brief overview of the continuum of how Indigenous peoples planned, designed and modified their local landscapes and communities for millennia. It will then discuss how, through colonization and forced relocation to reserves, the federal government imposed western-based designs and planning by way of built environments.

Prior to colonization, it is estimated that anywhere between 500,000 and 2 million First Nations peoples lived across Canada (Dickason, 2002). As in other parts of the Americas, First Nations peoples thrived in territories where communities and community structures were ingeniously planned and designed to be responsive to local geographies and climates (Nabokov & Easton, 1989). Architectural structures throughout the Americas, too varied and numerous to list in full, included long, plank or pit houses, wigwams, temple-pyramids, igloos, earthlodges, and tipis. All of these reflected the needs of diverse practical, social and ceremonial activities, such as "sleeping, working, worshipping, meditating, playing, dancing, lounging, giving birth, decision-making, cleansing, storing or preparing food, caring for animals and honoring the dead" (Nabakov & Easton, 1989, p. 12).

Many, though not all, First Nations were seminomadic and moved seasonally to follow food sources or warmer climates (Adelson, 2002). Teegee (2015) writes:

> Our people had traditional territories. We travelled in those areas to access the caribou or to access fish in the waterways. Western society's interpretation was, '[o]h, they're nomadic, they had no real home.' To us, it was by design. We knew, our ancestors knew, through thousands and thousands of years that this is the cycle of our lives, this is the cycle of Mother Earth and this is how we sustained ourselves." (p. 122)

The deliberate design, organization and location of communities can be observed across Canada. According to Nabokov and Easton (1989), the "three hundred or so tribal groups who lived in North America when Christopher Columbus arrived built their homes and arranged their settlements according to singular patterns and principles passed on from generation to generation" (p. 12). In other words, decisions on where to live and how to build dwellings were not arbitrary or simple decisions. Indigenous peoples in Canada, as elsewhere, used local materials and actively altered their environments as needed, through such means as building settled communities, practicing slash-burn agriculture, or through using controlled fires. According to Matunga (2013), pre-colonial planning involved "interconnections between humans and their environment, and the importance of planning within and for the natural world" (p. 10). Oral stories and place-naming, for example, told how communities came to be, where sources of water, food and medicines were to be found, and how to uphold the collective well-being and survival of communities. In his work with the Apache of New Mexico, Basso (1996) explores the profound significance of place-naming as a link to ancestral ecological, social, and ethical knowledge and spaces. He states, "place-names are called upon to serve as vehicles of ancestral authority… and place-names provide Apache people with symbolic reference points for the moral imagination and its practical bearing on the actualities of their lives – the landscape in which the people dwell can be said to dwell in them" (pp. 101-102). Similarly, Adelson (2002) found in her work with the Cree Nation of Whapmagoostui that a "hilltop or wooded area may be named for someone who was born or died there, or for a special or supernatural event that took place on that spot. In other words, the history of the people and history of the land do not simply correspond to each other – they are one and the same" (p. 29).

Dickason (2002) wrote that First Nations used sophisticated ecosystem knowledge in the establishment of their communities and that sedentary and semi-sedentary camps and villages were located in places where food sources and natural resources were available. The Northwest Coast of British Columbia, for example, was populated by communities which, due to plentiful marine and forest resources, could establish sedentary coastal villages. In the late 18th century, the imposing cedar plank houses along the Northwest Coast were described as the "most sophisticated wood architecture in North America" (Nabokov & Easton, 1989, p. 227). Cedar was the choice material for structures along the Canadian west coast given its particular characteristic firmness, straight-grain, and longevity in the damp climate. In addition, research points to how these coastal communities practiced traditional management of their marine ecosystems through the practice of clam gardening. Dating

back between 1,000 to 3,000 years, this gardening is one example from the region of environmental modification to meet human nutritional needs (Lepofsky et al., 2015).

The Siouan word "tipi" translates as "used to dwell" (Nabokov & Easton, 1989). When the Spanish explorer Don Juan de Oñate first saw these structures in the southern United States, he described them as being "built as skillfully as any house in Italy" (Nabakov & Easton, 1989, p. 150). Like cedar structures of the west coast of Canada, tipis were designed of local materials, including wood and multiple buffalo hides. These portable dwellings included systems for heating, cooling, ventilation and insulation (Nabakov & Easton, 1989). Hundreds of

tipi rings can still be observed throughout Alberta. In particular, many of these are found at lookouts where buffalo would have been hunted (Dickason, 2002).

First Nations who depended on buffalo for nutrition and resources used the existing geography to practice the highly organized buffalo drives and jumps such as Heads-Smashed-In in southern Alberta (Dickason, 2002). As part of this practice, hunters purposefully built rock drive lanes in which sticks and other organic matter would be placed to appear human-like. These lanes would funnel the buffalo towards the jumps or pounds for slaughter. According to archaeologist Jack Brink (2008), "those who manufactured this arrangement were not simple buffalo hunters…

[t]hey were ancient architects of the landscape" (p. 79). Impounding, corralling, and the use of controlled fire were also noted as means by which the First Nations modified landscapes to gain access to food resources, such as buffalo.

Further east, however, agriculture, in addition to hunting and gathering, was well underway amongst the Huron and Iroquois nations around the Great Lakes region. The climate permitted for the practice of large scale slash-burn agriculture to flourish. Dickason (2002) noted that by the 17th century the Huron had 7,000 acres under cultivation producing the "three sisters" of corn, beans and squash, as well as tobacco. Successful food production allowed for the development of larger sedentary communities with

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(Nabokov & Easton, 1989, p. 227)

upwards of 1,500 residents residing in multiple longhouses. In 1634, a Dutch visitor observed the town-like characteristics of a Mohawk and Oneida community with its "36 houses, in rows like streets" (Nabakov & Easton, 1989, p. 81).

While this section provided a very basic introduction and sampling of precolonial landscapes, it shows the degree of sophistication to which First Nations communities adapted to and modified their environments to meet their needs. The land was not seen as a space to exploit but rather as a place to live upon well. As observed by Adelson (2002) in one Cree community, well-being is "synonymous with the Cree way of life, and is inseparable from being able to hunt, pursue traditional activities, live well in the bush, eat the right foods, keep warm, and provide for oneself and others" (p.97). It is achieved when they are "unencumbered by whiteman's interferences, foods, and illnesses" (p. 97). First Nations' self-determination over community design and planning was completely disrupted following the imposition of the reserve system.

Colonization and assimilationist policies of the Indian Act (1876) laid the foundation for present day reserve communities. Patrick (2011) refers to Indian Reserves as "place-making'…or institutional 'islands' of forced settlement" (p. 387). According to Dion Stout (2012), the terms *tipahaskan* (measured lot) and *iskonikun* (leftover plot) are common Cree words used in reference to a reserve and speak to the marginalization of these allotted spaces. The expansion of settler communities, farming and western economic development was made possible through the forced removal and relocation of First Nations peoples. Matunga (2013) expresses that "Indigenous peoples were either structured out of existence or, if they survived, herded to rural or urban wastelands away from the gaze of the settler state and its beneficiaries" (p. 11). Territorial displacement, environmental dispossession,

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The health impacts and inequities resulting from colonization are profound and ongoing. The shift from active to sedentary lifestyles and the transition from nutrient rich to nutrient poor diets are "pivotal determinants of obesity, diabetes and many other chronic diseases that plague… community members at near epidemic rates"

(Richmond & Ross, 2012, p. 410)
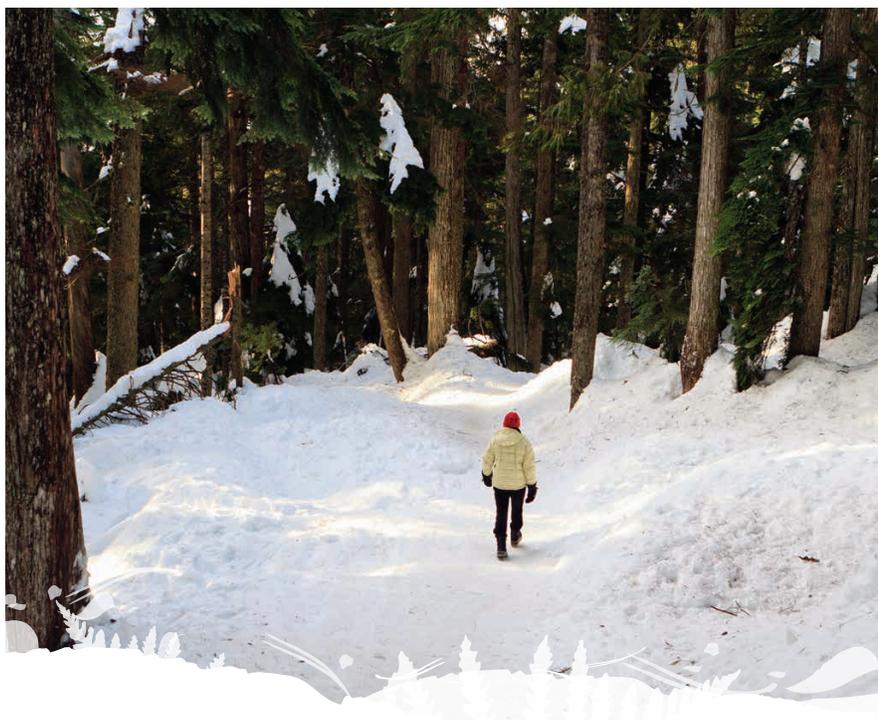
residential schooling, and other colonial policies, disrupted First Nations peoples' mobility, land-based knowledge and practices, traditional hunting and harvesting activities and practices, ceremonial and governance systems, and intergenerational relationships and communications (Bickford, 2011; Mascarenhas, 2007; Richmond & Ross, 2009; Williams & Mumtaz, 2007; Willows, Hanley, & Delormier, 2012; Wilson & Peters, 2005).

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stress is associated with rapid assimilation, including "expulsion from their home" (Boutilier, 2013, p. 44). Furthermore, the imposition of reserve communities has resulted in a "legacy of poverty, family violence and dysfunction, alcohol and drug abuse, suicide and a loss of self-identity" (Bickford, 2011, p. 2).

Currently, Indigenous peoples have the lowest life expectancy in Canada and suffer poorer health in comparison to non-Indigenous Canadians (Reading, 2015). In fact, Indigenous peoples in Canada have been found to experience epidemic rates of chronic diseases that mirror those of developing countries (Reading, 2009). Rates of cardiovascular disease, diabetes, and obesity are greater amongst the Indigenous compared to the non-Indigenous population, and many are on the rise (British Columbia Provincial Health Officer, 2009;

Gionet & Roshanafsha, 2013; Public Health Agency of Canada, 2011).

In sum, Indigenous health outcomes need to be understood as situated within the economic, social, geographic and physical environments in which Indigenous people live. Reading (2015) states:

if we search deeper still for the determinants responsible for shaping these conditions, we discover the root of the problem – a colonial structure – fashioned from the centralization of Aboriginal peoples into remote communities and reserves, the oppressive nature of the Indian Act, the damaging legacy of residential schools, racial discrimination in social environments and the labour market, as well as lack of public or private investment in economic development for Aboriginal communities." (p. 11)

Euro-centric housing designs and materials do not take into account the diversity of cultural activities or the climates in which First Nations people live

(Dawson, 1995; Lee & Morris, 2005).

3.0 BUILDING ENVIRONMENTS ON-RESERVES – FAILURES IN DESIGN
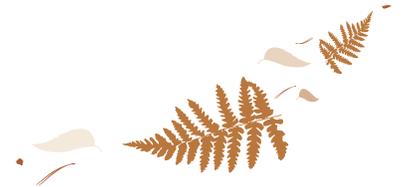
The following sections provide a snapshot of several aspects of the built environment and how these have impacted the health and well-being of First Nations living on reserve, namely housing, water and wastewater management, food security, active living, and transportation. There is a general absence of information specific to First Nations priorities and perspectives on the built environments of reserve communities. However, the literature points out how on-reserve infrastructure, or lack thereof, is associated with poorer health outcomes.

3.1 The built environment and housing on reserve [3]

The Standing Senate Committee on Aboriginal Peoples (SSCAP) conducted a cross-Canada study of housing and infrastructure on First Nations reserves. Their 2015 interim report concluded that First Nations housing is in a "state of crisis" (p. 3). Similarly MacTavish and colleagues (2012) note that First Nations homes are, "severely inadequate in both quantity and quality" and that this is attributable to a number of intersecting factors, namely "rapid population growth, inadequate funding, restrictive government policies, lack of home ownership, and culturally inappropriate housing designs" (p. 208). While the exact figures are unknown, it is estimated that anywhere between 35,000 to 85,000 new homes on reserve are needed to meet the current shortfalls (SSCAP, 2015). In addition to these shortfalls, close to half (44.2%) of on-reserve homes are currently in need of major repairs, in contrast to 6% of Canadian households (Statistics Canada, 2017b). The First Nations Information Governance Centre [FNIGC] (2012) adds that more than two-thirds (70.8%) of all on-reserve homes need some level of repair.

Exacerbating these shortfalls and disrepairs are the "culturally inappropriate housing designs" which were imposed upon First Nations communities (MacTavish, et al., 2012, p. 208). Euro-centric housing designs and materials do not take into account the diversity of cultural activities or the climates in which First Nations people live (Dawson, 1995; Lee & Morris, 2005). As Moffat (2013) writes, "houses are often federally designed and constructed, which has resulted in cookie-cutter homes which may not be appropriate for all Canadian climates" (p. 37). Adelson (2002) notes that the Cree of Whapmagoostui viewed the imposition of housing as an example of "whiteman's encroachment" and that "despite the conveniences

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[3] For an in-depth discussion on Indigenous housing as a determinant of health, see https://www.ccnsa-nccah.ca/docs/determinants/FS-Housing-SDOH2017-EN.pdf

associated with them, some individuals consider[ed] the new dwelling completely unsatisfactory" (p. 104). Durbin (2009) remarks that the "high prevalence of mould on reserves is likely because between the 1960s and 1980s most reserve housing was centrally designed and delivered by the federal government. Many of the houses, schools, and workplaces were built on wood frames which are prone to mould" (p.186). On-reserve houses, especially in northern regions, often lack appropriate and effective heating and ventilation systems, and are too small to accommodate the size and structure of Indigenous families (Clark, Riben, & Nowgesic, 2002; Kovesi, 2012; Larcombe et al., 2011; MacTavish et al., 2012; Osterberg, 2009; Weichenthal et al., 2013). An argument can be made that the lack of cultural elements is a "potential cause of housing failures, undermining sense of ownership and subsequent responsibility for the home" (Kyser, 2011, p. 6).

The 2011 Report of the Office of the Auditor General showed that homes on reserve deteriorate at a faster rate than other Canadian homes. This was based in large part on "substandard construction practices or materials" used for building the homes and a "lack of proper maintenance" once the homes were built (p. 18). With an increasing population and housing supply not meeting the current need, many households are overcrowded (Durbin, 2009; FNIGC, 2012; MacTavish et al., 2012; Office of the Auditor General of Canada, 2011). Furthermore, the federal government's funding cap of 2% for on-reserve programs and services, which has been in place for two

decades, fails to meet infrastructure needs like housing, as well as rising costs associated with inflation (SSCAP, 2015). The literature makes clear that the built environment on reserve includes substandard housing, which leads to poor health outcomes (Durbin, 2009; FNIGC, 2012; MacTavish et al., 2012; Office of the Auditor General of Canada, 2011; Palmater, 2011).

Some potential health implications

Overcrowding, combined with poor ventilation and the growth of mold and mildew, may lead to elevated levels of pulmonary diseases, such as tuberculosis, pneumonia, bronchitis, and asthma (Boutilier, 2013; Clark et al., 2002; Durbin, 2009; FNIGC, 2012; Kovesi, 2012; Larcombe et al., 2011; MacDonald, Hébert, & Stanbrook, 2011; Moffatt, Long, & Mayan, 2013; Office of the Auditor General of Canada, 2011; Weichenthal et al., 2013). As well, overcrowding has been linked to sleep disruption and deprivation, and weakened immune system response when exposed to airborne pathogens and illnesses like influenza (Moffatt et al., 2013).

Studies show that a lack of autonomy and control over housing, coupled with the imposed western-centric housing design, contributes to psychological stress (Dawson, 1995; Moffatt et al., 2013). Similarly, the lack of home ownership has been linked to a lowered incentive to maintain or repair the structure (National Association of Realtors [NAR], 2012), which can lead to an increased "prevalence of mold, dust, water intrusion and dampness, or poor ventilation…all conditions

which have been linked directly or indirectly to [tuberculosis], or have been shown to decrease the body's immune response to TB" (Moffatt et al., 2013, p. 560). There is also strong evidence that home ownership fosters individual well-being, through increased self-esteem and control over one's life, and provides positive social benefits, including "boost[ing] the educational performance of children, induc[ing] higher participation in civic and volunteering activity …, [and] lower[ing] crime rates and lessen[ing] welfare dependency." (NAR, 2012) These benefits, in turn, contribute to community health and well-being.

3.2 The built environment and water and sanitation on-reserve

The vast majority of urban populations across Canada enjoy access to clean and safe drinking water and sanitation. This is not the case for all First Nations living on reserve throughout Canada, especially for First Nations living in more remote communities. As recently as January 31, 2018, there were approximately 137 drinking water advisories in effect in First Nations communities across Canada.[4] According to Health Canada, drinking water advisories

are "preventive measures put in place to protect public health from drinking water that could be contaminated" (Health Canada, 2016, What is a drinking water advisory?, para. 1). The majority of drinking water advisories for First Nations communities are located in Ontario, some of which have been under these advisories for years or even decades (Lui, 2015).

Boil water advisories are issued when there are "disease-causing bacteria, viruses or parasites … found in the drinking water system" (Health Canada, 2016, Types of drinking water advisories, para. 1). According to Patrick (2011), boil water advisories are "2.5 times more frequent" for First Nations communities than for other Canadians (p. 386). As well, unlike urban boil advisories such as that issued for the City of Winnipeg in January 2015, which lasted three days, the average length of boil advisories for First Nations communities between 1995 and 2007 was 343 days (Patrick, 2011). By way of example, the Ontario communities of Neskantaga First Nation and Shoal Lake 40 First Nation have been under boil water advisories since 1995 and 1997 respectively (Human Rights Watch, 2016), while the communities of Kitigan Zibi

(Quebec), God's Lake First Nation (Manitoba), Pinaymootang First Nation (Manitoba), Kahkewistahaw (Saskatchewan), and Shoal Lake First Nation (Saskatchewan) are under "do not consume" orders (Lui, 2015). Kitigan Zibi and Shoal Lake First Nations have been under these orders since 1999 (Lui, 2015).

A "do not consume" order is put in place by Health Canada when boiling water will not remove contaminants, such as uranium, gasoline or Trihalomethane, from tap water (Health Canada, 2016). In these cases, the federal government urges the discontinuation of using tap water for "drinking; brushing … teeth; cooking; washing fruits and vegetables; making infant formula or other drinks, soups or ice cubes; for bathing infants and toddlers or feeding pets" (Health Canada, 2016, Types of drinking water advisories, para. 2). Nevertheless, despite the fact that First Nations may perceive tap water as being unsafe, a 2007 survey found they may continue to use the water for a "wide range of everyday applications, such as toothbrushing, food preparation and cooking" (EKOS Research Associates, Inc., 2007, p. 6).

In addition to drinking water advisories, a small yet unacceptable number of First Nations continue

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[4] The Government of Canada does not report on all drinking water advisories in First Nations communities across Canada in the same location. As a result, the total number of drinking water advisories were calculated by the author using data derived from three sources. The First Nations Health Authority [FNHA] reports on the number of boil water and do not consume advisories for First Nations communities in British Columbia. As of February 28, 2018, there were 19 drinking water advisories and 3 do not consume advisories for a total of 19 advisories in effect in 17 First Nations communities in BC (FNHA, n.d.). The Government of Canada (2018) reports on short term drinking water advisories in First Nations communities south of 60 degrees. As of January 31, 2018, there were 37 short-term drinking water advisories in place in First Nations communities south of 60 degrees. The Department of Indigenous and Northern Affairs reports on the number of long-term drinking water advisories. As of January 23, 2018, there were 81 long-term drinking water advisories in effect in First Nations communities (Indigenous and Northern Affairs Canada, 2018).

to lack some level of water in their households "such as hot running water (3.4%), cold running water (2.1%), and flush toilets (2.7%)" (FNIGC, 2012, p. 50). Furthermore, a 2011 national assessment of First Nations water systems found that of 807 systems serving 560 First Nations communities, 72% of households had their water piped, 13.5% were on truck delivery, 13% were serviced by individual wells, and 1.5% had no water service provision (Neegan Burnside Ltd., 2011). As Boutilier (2013) states, "[t]hat Canada continues to remain home to people who do not have running water – no longer a privilege but a universal human right [United Nations General Assembly, 2010] – is an alarming reality entirely on its own" (p. 117). A more recent federal report on 699 First Nations water systems requiring inspections in 2014-2015 indicated that while improvements have been made since the previous assessment, 18% of the water systems continue to be classified at high risk of producing unsafe drinking water in the event of a problem, and a further 37% are classified as medium risk (Environment and Climate Change Canada, 2016).

Wastewater systems are also often inadequate in First Nations on-reserve communities. The 2011 National Assessment of First Nations Water and Wastewater Systems found that of the 532 wastewater systems serving 418 First Nations communities, 54% of the households had access to piped wastewater systems, 8% were on truck haul, 36% were serviced by individual water systems, and 2% had no service (Neegan Burnside Ltd., 2011). A more recent federal report on 446 First Nations wastewater systems requiring inspections in 2014-2015 shows that despite considerable improvements since the last assessment, 6% of First Nations wastewater systems continue to be at high risk of releasing poorly treated wastewater in the event of a problem, and a further 41% are considered to be at medium risk (Environment and Climate Change Canada, 2016)

Because First Nations communities fall under the jurisdiction of the Department of Indigenous and Northern Affairs, the strict provincial and territorial regulations, laws and protections that ensure safe drinking water and wastewater management for all Canadians do not apply to on-reserve communities (Human Rights Watch, 2016).

...Human Rights Watch (2016) and the 2011 Report of the Office of the Auditor General have strongly criticized the lack of legislation for drinking water on-reserves. Human Rights Watch (2016) has stated that there is a "water crisis" in First Nations communities (p. 29). This crisis has resulted in poor health outcomes experienced by on-reserve communities.

Indeed, Human Rights Watch (2016) and the 2011 Report of the Office of the Auditor General have strongly criticized the lack of legislation for drinking water on-reserves. Human Rights Watch (2016) has stated that there is a "water crisis" in First Nations communities (p. 29). This crisis has resulted in poor health outcomes experienced by on-reserve communities.

Some potential health implications

The lack of adequate, accessible, available, and safe water systems puts First Nations at increased risk for developing infectious diseases and illnesses, including community-acquired Methicillin-resistant Staphylococcus aureus (MRSA), shigellosis, Hepatitis A, *Helicobacter pylori*, whooping cough, skin infections (such as impetigo), and gastrointestinal and urinary infections, to name a few (Boutilier, 2013; Boyd, 2011; Harden & Levalliant, 2008). There is also evidence of elevated stress when First Nations communities are faced with hardships in meeting basic requirements for hygiene and food preparation, either through the use of contaminated water or costly bottled sources (Human Rights Watch, 2016).

3.3 The built environment and challenges to accessing healthy foods on reserve

First Nations communities vary across Canada in size, location, economic development and infrastructure across Canada. There is no definitive data on how many First Nations communities have

ready access to grocery stores. While it would be reasonable to assume that those located closer to southern or urban centres would have better access than those living in rural and remote locations, this is not always the case. For example, a 2012 survey of food costs in Saskatchewan found there were "no on-reserve stores in the southern part of the province that qualified as grocery stores," and these communities "appear[ed] to rely on food available at gas stations, convenience stores or local general stores" (Saskatchewan Food Costing Task Group, 2012, p. 16). Of the 14 northern Manitoban communities studied by Thompson, Gulrukh, Alam, and Wiebe (2012), "13… ha[d] either no grocery store or [had] only one grocery store that stocks mainly high-calorie, high-fat, low-nutrient food" (p. 57). The authors noted that only Berens River First Nation was equipped with three grocers due to a year round barge.

Grocery and convenience stores in many rural, remote, northern and isolated First Nations communities depend largely on costly food shipments by road, ice-road, train, waterways or by air (Enrg Research Group, 2015; Manitoba Food Charter, 2009; Thompson et al., 2012). Long distance shipping often decreases the quality and quantity of fresh, perishable items while the cost of these and other market foods, with the exception of high sugar and high fat foods and drinks, are markedly higher (Fieldhouse & Thompson, 2012; FNIGC, 2012; Joseph et al., 2012; Rudolph & McLachlan, 2013; Skinner, Hanning, Desjardins, & Tsuji, 2013a; Stroink, & Nelson, 2012). Willows (2005) notes that in remote First Nations, an "individual store manager's stock

management practices, and personal beliefs and attitudes about stocking healthful foods may be major determinants of the availability of nutritious foods" (p. S34). Such was the finding in a study of a northern Saskatchewan First Nation, where fresh and nutrient rich foods, such as vegetables, fruit and meat, were often more expensive and therefore purchased less often than processed foods, like macaroni and cheese, chips, and pop (Bruner, & Chad, 2014). In this community, the costs of fresh produce at the local community grocery store were double that of the closest urban centre, 500 kilometers to the south.

Limited access to grocery stores and high costs for local groceries have meant that some First Nations must travel to and from the nearest urban centre for their groceries. In some cases, this is not only dangerous but also very costly. For example, the two northern Manitoba communities of Garden Hill and Wasagamack First Nations must cross open water to reach the adjacent community for their groceries. This trip is particularly perilous in the fall and spring when ice is either forming or breaking up. During these periods, people must charter helicopters or rent boat taxis (Thompson et al., 2012).

The transition from nutrient and protein rich traditional foods, found within the surrounding territories, to a dependency on imported, often high-cost, nutritionally poor market foods, affects the "health, social, economic and cultural wellbeing" of First Nations (Lees et al.; Power, 2008; Stroink & Nelson, 2012; Willows, 2011). It also disables prior land and food-based economies

and knowledges where gathering and harvesting traditional foods for shared meals and feasts connected families and communities to one another and their environment (Food Matters Manitoba, 2013). Indeed, as Stroink and Nelson (2012) note, there are "spiritual aspects of food gathering, preparation, and ceremony" amongst First Nations communities and cultures (p.66). Willows (2011) extends this view by stating that traditional diets not only provide "sufficient energy and micronutrients" but also nourish "the mind and spirit," all of which contribute to the promotion of holistic health (p. 6). Yet the consumption of traditional foods has been threatened in some regions due to a growing preference for western foods, concerns over environmental contamination of traditional food sources, and climate change (Bruner & Chad, 2014; Elliott, Jayatilaka, Brown, Varley, & Corbett, 2012; Jacobs et al., 2010; Power, 2008; Socha, Zahaf, Chambers, Abraham, & Fiddler, 2012; Willows, 2005). It is also hindered by the high cost of hunting equipment and fuel, food processing and storage, and skills development across the generations (Food Matters Manitoba, 2013;

Pal, Haman, & Robidoux, 2013; Thompson et al., 2012).

Canada has endorsed the World Food Summit Plan of Action's definition of food security which states that "all people, at all times, have physical and economic access to sufficient, safe, nutritious food" (Food and Agriculture Organization [FAO] of the United Nations, 1996, para. 1). Yet there is a growing body of evidence of elevated food insecurity amongst First Nations peoples (Egeland, Pacey, Cao, & Sobol, 2010; Elliott et al., 2012; FNIGC, 2012; Kerpan, Humbert, & Henry, 2015; Rudolph & McLachlan, 2013; Skinner, Hanning, & Tsuji, 2013b; Power, 2008). While rates of food insecurity vary among First Nation communities, the incidence and severity of food insecurity increases for remote communities (Thompson et al., 2012; Veeraraghavan et al., 2016). On average, the FNIGC (2012) reports that 54.2% of First Nation households on reserve experience moderate to severe food insecurity. These rates can be even higher in different parts of the country. For example, some First Nations in Manitoba experience food

insecurity at a rate of 73% compared to national Canadian rate of 8% (Fieldhouse & Thompson, 2012). Fieldhouse and Thompson (2012) point out that food security is part of a larger crisis of disadvantage in on-reserve communities. They state, "First Nations reserves are typically Canada's most remote and poorest communities. They are frequently economically marginalised, and commonly lack adequate infrastructure for food processing, food production and safe drinking water, as well as poor transport networks all of which are factors that make these communities vulnerable to food insecurity" (p. 218).

Some potential health implications

There is ample evidence that food insecurity and inadequate nutrition are linked to poor health outcomes including diabetes, obesity and heart disease (Elliott et al., 2012; Fieldhouse & Thompson, 2012; Lees et al.; Pal et al., 2013; Rudolph & McLachlan, 2013; Willows, 2011). In addition, research shows that food insecurity lowers immunity while increasing the incidence of dental caries and anemia (Fieldhouse

& Thompson, 2012). Socha and colleagues' (2012) report on the linkages between inadequate nutrition with "poor learning outcomes, development delays, low birth weights, depression, anxiety, and suicide" (p. 7). They recognize that while food security is not a cure-all to these health issues, they argue that affordable and accessible nutritious foods are "necessary to improve the lives of Aboriginal peoples" (p. 3).

3.4 The built environment and challenges to active living on-reserve

The built and physical environments of communities contribute to levels of physical activity (Joseph et al., 2012; Kirby, Lévesque, Wabano, & Robertson-Wilson, 2007b; Pearce & Maddison, 2011; Standing Committee on Health, 2007). Prior to the settlement of First Nations communities, living off the land meant that First Nations people were physically active "as their lifestyle demanded it. Physical activity meant more to people than just physical exertion; it meant survival" (Kirby, Lévesque, & Wabano, 2007a, p. 11).

While the built environments of rural and on-reserve communities vary greatly from urban centres, they have yet to be fully explored in the literature (Barnidge et al., 2013; Joseph et al., 2012; Kirby et al., 2007a). Existing studies suggest that First Nations communities may not have built environments that are conducive to active living. Joseph and colleagues (2012) indicate, for example, that "[i]n Aboriginal communities, formative research has identified environmental factors, such as loose dogs, poor roads, safety and lack of facilities, as potential barriers to physical activity" (p. 3). Walking has been identified as the most common physical activity amongst First Nations adults (FNIGC, 2012). Using on-reserve roadways for walking is not always safe or desirable. Of those surveyed in the community of Six Nations, the built environment was perceived as "unfavorable to walking… having low street connectivity, poor aesthetics, and a higher potential for crime and traffic safety concerns" (Joseph et al., 2012, p. 4). Likewise, rural residents contend with greater priority given to vehicular traffic over human traffic (Barnidge et al., 2013). Rural First Nations may

have limited options for walking beyond a rural highway, which is not conducive to pedestrian traffic due to the high speed of vehicles, lack of adequate shoulders on the roadways, and poor lighting (Shinstine, Denzer, & Ksaibati, 2015). In addition, road safety and potential run-ins with aggressive dogs or bears, among other factors, were cited as barriers to walking for Cree women in Moose Factory (Kirby et al., 2007a/b).

For First Nations children and youth, the ability to participate in physical activity is hampered by the lack of infrastructure within local schools and physical environments. The Chiefs Assembly on Education (2012) reported that less than half (46%) of the 515 schools on reserve had a fully equipped gym and fewer still (37%) had a fully equipped playground or outdoor playing field. Youth from Ontario participating in the 1997 Regional Health Survey identified a community swimming pool, arena, drop-in centre, outdoor rink and playground equipment as the most important facility needs within their community (First Nations Centre, 2004). Asset mapping with children and youth

Obesity can lead to a number of long-term negative health outcomes, including epidemic levels of hypertension, osteoporosis, diabetes, cardiovascular disease, and cancer (Bickford, 2011; FNIGC, 2012; Pigford, Sanou, Ball, Fehderau, & Willows, 2011; Willows et al., 2012). Elevated risks associated with being overweight and obese include "sleep apnea, breast, colon and endometrial cancer… [and] mental health problems such as low self-esteem, and depression" (Bickford, 2011, p. 5). Physical activity is linked to lower levels of anxiety, stress, depression and tension (FNIGC, 2012). Amongst First Nations children, physical inactivity and obesity have been linked to early onset type 2 diabetes (Skinner et al., 2012).

3.5 The built environment, transportation, and road safety on reserve

Transportation networks are critical for day-to-day activities such as getting to "work, getting groceries and supplies, participating in community or civic functions, seeking entertainment or social inclusion, or accessing healthcare and other social services" (Marr, 2015, p. 100). Currently, there is relatively little information on roads, road conditions, and transportation networks for on-reserve communities.

As noted earlier, the majority of First Nations communities are located in rural, remote and special access zones. Communities categorized as "special access" are profoundly impacted by lack of road access to neighbouring and southern communities. Garden Hill

from Fort Alexander, Manitoba indicated that physical activity at outdoor ice rinks, basketball courts and playgrounds was hampered due to a lack of safety, poor maintenance, and broken down and vandalized structures and spaces (DyckFehderau, Holt, Ball, & Willows, 2013). For them, ideally their community would include "a leisure centre with an indoor rink, weight room, pool, gym, ice hockey rink, rollerblading rink, and exercise room." (p. 6). Certainly, it would not be a stretch to state that many rural and remote reserve communities do not have access to such recreational centres and opportunities.

Some potential health implications

The rapid transition away from traditional diets and lifestyles has contributed to a growing epidemic of obesity and obesity-related diseases, such as diabetes and cardiovascular disease, among First Nations populations in Canada (FNIGC, 2012; Kirby et al., 2007b). In fact, the Heart and Stroke Foundation (2010) cautions that Indigenous people are in a "full-blown cardiovascular crisis" (p. 2). According to the FNIGC (2012), rates for overweight and obese First Nations children 2-11 years of age are on the rise (from 58.5% in 2002/03 to 62.5% in 2008/10). Amongst First Nations youth, 12-17 years old, almost half (42.7%) are reportedly overweight or obese (FNIGC, 2012). This contrasts with the 30.1% of non-First Nations children and youth in this same age range who were considered to be overweight and obese in the 2009-2011 Canadian Health Measures Survey (Roberts, Shields, de Groh, Aziz, & Gilbert, 2012). Furthermore, physical inactivity increases with age.

First Nation, located in northern Manitoba, is an example of a "special access" community. For a short span of ninety days over the winter months, community members are able to use winter roads to connect to Thompson, Nelson House and Winnipeg, in addition to having a years' worth of supplies delivered via semi-trailers. Roads within the community are bumpy and often muddy, and could benefit from regular maintenance (Collinson, Hildebrand, & Rempel, 2011).

Because of their rural, remote, or isolated locations, most on-reserve residents, like their non-Indigenous counterparts in similar geographic regions, must rely primarily on personal vehicles, including cars, trucks, snowmobiles and all-terrain vehicles. In the general context of rural Ontario, Marr (2015) describes individuals without access to personal transportation as "'transportation' disadvantaged as they lack the mobility necessary to access the activities and services essential for their quality of life" (p. 100). According to a U.S. study on livability and transportation on American Indian reservations, Shinstine and colleagues (2015) indicate that the lack of transportation choices and options is commonplace, making travel both within and beyond Indigenous communities a challenge. The authors speak indirectly to the built environment of many reservations as having dispersed and disconnected centres and services, which make it

difficult for those without vehicles to get to them.

Lack of public transportation can lead to increased hitchhiking, with its associated safety issues,[5] be a barrier to receiving appropriate health care and, coupled with the need to travel long distances on high speed roads, increase the risk of injury or mortality resulting from motor vehicle collisions (MVCs). This latter issue has received some recent attention as a public health issue (Desapriya, Fujiwara, Verma, Babul, & Pike, 2011; Short, Mushquash, & Bédard., 2014). Desapriya and colleagues (2011) looked at on-reserve MVCs that had occurred in Saskatchewan. Their study showed that most MVCs happened between 8:00 a.m. and 4:00 p.m. and that poor road surfaces, such as "loose snow, slush, packed snow/ ice, loose gravel/sand, and muddy road[s]" (p. 1009) posed additional risks, as did "intersections with rural roads, streets, private roads, or alleys… and domestic animal interaction" (p. 1011).

Relatively small improvements to on-reserve roads can significantly improve transportation safety (Desapriya et al, 2011; Short, Mushquash, & Bédard, 2014). Resurfacing and filling potholes to improve road conditions and increasing visibility through signage at high risk intersections (i.e. rural/ private roads/streets/alleys) could result in lower MVCs and reduced rates of premature loss of life

(Desapriya et al., 2011; Short et al., 2014). Shinstine et al. (2015) and Desapriya et al. (2011) advocate for alternative road use which would include the development of public transportation systems or roadway infrastructures to encourage walking and cycling. One U.S. example of a successful partnership for rural/ on-reserve transportation is between the Menominee Indian Reservation (Wisconsin), the College of the Menominee Nation, and local schools and services. This alternative rural transit system assists those without vehicles and "makes over 80,000 trips a year" (Shinstine et al., 2015, p. 29). It meets the needs of over 90% of the Menominee Indian Reservation, many of whom do not have their own vehicle.

Some potential health implications

While not all on-reserve roads are the same, collision rates are reportedly higher for on-reserve roads versus off-reserve roads and on roads in the territories over those of the provinces (Desapriya et al., 2011; Short et al., 2014). First Nations people living on reserve are twice as likely as non-First Nations people to be injured, hospitalized or die as a result of MVCs (Desapriya et al., 2011; Short et al., 2014). Poor maintenance, conditions, and location of on-reserve roadways are major contributing factors to these rates (Desapriya, et al., 2011; Short et al., 2014).

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[5] See for example the Highway of Tears, a notorious stretch of highway in northern British Columbia, stretching from Prince Rupert to Prince George, which has seen a series of murders and disappearances of mainly Indigenous women who turned to hitchhiking as a form of transit due to poverty and a lack of public transportation. For more information, please refer to the Highway of Tears Symposium Recommendations Report, http://www.turtleisland.org/healing/highwayoftears.pdf.
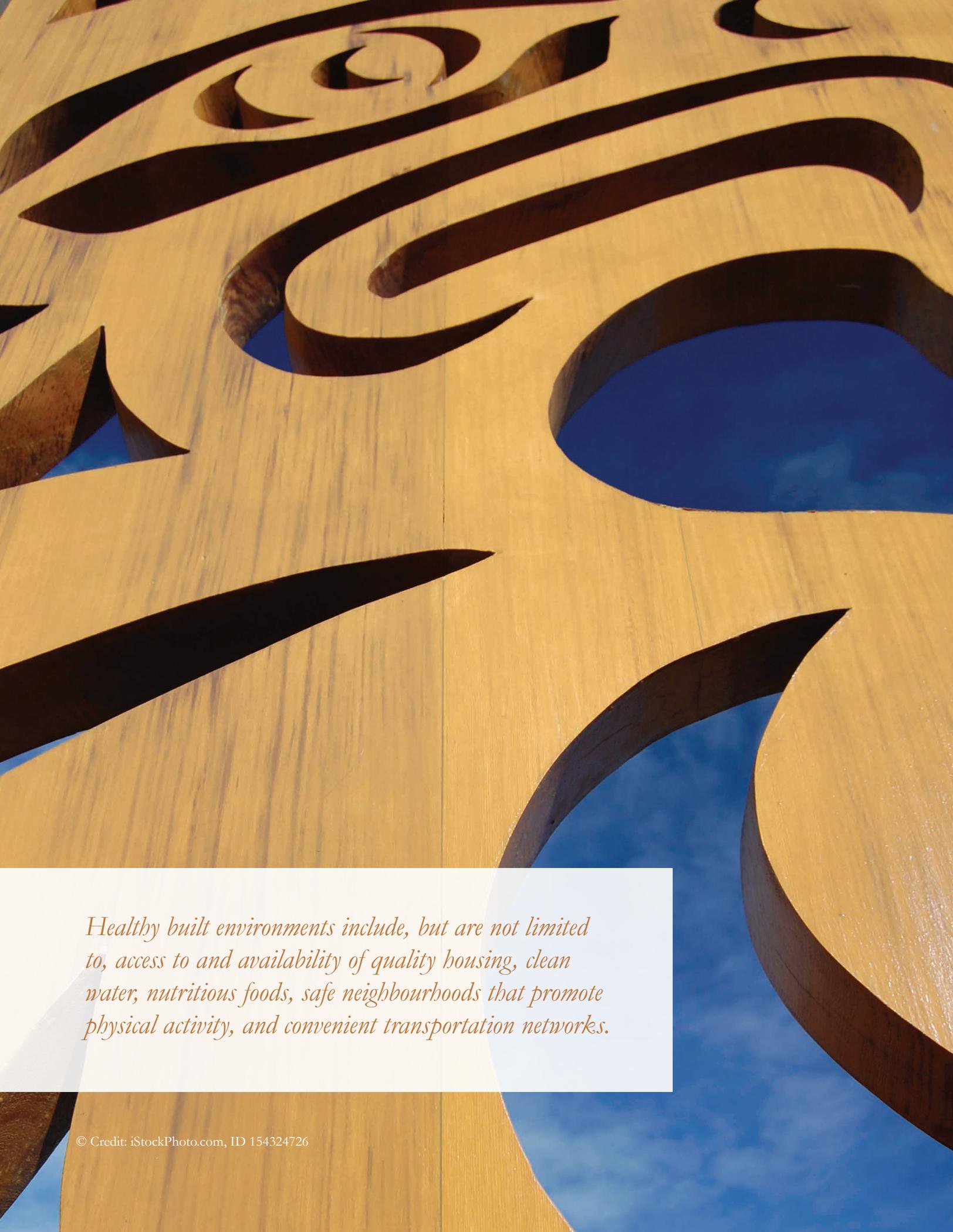
Healthy built environments include, but are not limited to, access to and availability of quality housing, clean water, nutritious foods, safe neighbourhoods that promote physical activity, and convenient transportation networks.

4.0 ADVANCES AND SUCCESSES IN IMPROVING THE BUILT ENVIRONMENTS OF ON-RESERVE COMMUNITIES

The federal government primarily determines the built environment of reserve communities. Funding for built environment projects on reserve, which has until recently been capped at a 2% increase annually, has been inadequate and has not kept pace with either the demographic realities of First Nations communities, nor the costs of program delivery. Healthy built environments include, but are not limited to, access to and availability of quality housing, clean water, nutritious foods, safe neighbourhoods that promote physical activity, and convenient transportation networks. Many First Nations communities across Canada do not have these basic elements in place to make them healthy built environments. This has contributed to health and safety burdens disproportionately experienced by many individuals and families living on reserve. There are, however, steps that can be taken to address infrastructural inequities.

4.1 Indigenous planning

While Indigenous planning is an emerging and growing field of study, the concepts and principles embedded in it, as was discussed in an earlier section of this paper, have been used by Indigenous peoples and communities for millennia (Jojola, 2000; Matunga, 2013). Indigenous planning is not only a method or practice, but rather it is a "political strategy aimed at improving the lives and environments of Indigenous peoples" (Matunga, 2013, p. 5). As such, it encompasses collective, collaborative, cooperative, reciprocal, iterative, and communal processes and worldviews. Furthermore, according to Albuquerque and colleagues (2011), "this approach enables empowerment and opposes notions of power over others" (p. ii). Equally, Indigenous planners recognize that each community is confronted with unique circumstances, challenges and opportunities, and that the distinct experiences of community members need to be front and center within any planning process (Albuquerque et al., 2011).

For over a decade, the Canadian Institute of Planners (CIP) has actively supported and promoted Indigenous community planning through the establishment of an Indigenous Peoples' Planners (Sub) Committee (IPPC). As a forward looking practice, the IPPC has signed land management agreements and memorandums, conducted workshops on comprehensive community planning, created a listing of Indigenous planners, participated and presented in planner's fora, and advanced research and knowledge on Indigenous planning. Most recently, the CIP/IPPC published a special edition of their magazine, Plan Canada (2013), on Indigenous Planning/Planning to Indigenize.

On the ground, Indigenous planners are being called upon to revitalize and redesign public spaces. One example involves Indigenous designers in Winnipeg who have been asked to develop the new Indigenous Peoples' Garden as part of the city's Assiniboine Park. Cheyenne Thomas, a graduate of the University of Manitoba's environmental design program who has begun work on the garden stated, "Indigenous design is modern, it's sustainable, it's our values that are still there as Indigenous people. It's ownership to all of these deep rooted connections with the land" (Monkman, 2016, para. 6). Ultimately, Indigenous planning entails the decolonization of planning processes. In practice, this means "planners become allies in the pursuit of justice and reconciliation" (Erfan & Hemphill, 2013, p. 18).

4.2 Addressing the housing crisis on-reserve

All evidence points to the urgency for addressing the housing crisis across First Nations communities in Canada. As part of the 2016 Federal Budget, a total investment of $554.3 million was committed to meeting housing needs as well as retrofitting and renovating existing housing on reserve. As a second phase to this work, the federal government committed to work with First Nations communities on a sustainable and long-term plan to address the housing supply within the development of a National Housing Framework (Morneau, 2016).

Ideally, on-reserve housing would move away from federally imposed prefabricated housing to those built according to the diversity of cultural and traditional activities of First Nations communities. In addition, housing materials should be locally sourced and energy responsive to meet the specific weather conditions and geographies in which First Nations are located (Boutilier, 2013; SSCAP, 2015). The Yale First Nation in BC, for example, has entered into collaboration with Britco, a modular building company, in order to provide alternative housing to the wood-frame "B.C. box houses" which have typically not withstood the particularly wet weather conditions in the region. They have now built ten "passive homes" which are designed as net-zero or high efficient homes, which will cut utility costs by 80% (Hyslop, 2017). Fisher River Builders, located at Fisher River First Nations, provides another example of a community

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Ideally, on-reserve housing would move away from federally imposed prefabricated housing to those built according to the diversity of cultural and traditional activities of First Nations communities. In addition, housing materials should be locally sourced and energy responsive to meet the specific weather conditions and geographies in which First Nations are located

(Boutilier, 2013; SSCAP, 2015).

moving towards self-sufficiency and energy independence, running one of the largest residential social enterprise geothermal companies in Western Canada (Aki Energy, 2015). They have now retrofitted over 175 homes within their community, reducing heating and cooling costs by 75% (Loney, 2016, p.44).

Initiatives that promote First Nations home ownership offer the potential to enhance individual and community well-being. As of December 2015, there were 202 First Nations communities who have partnered with an innovative credit for loans program called the First Nations Market Housing Fund (FNMHF). Originating as part of the Kelowna Accord, the FNHMF "is the first national fund created to support financing arrangements for housing on reserve and settlement lands," and "supports market-based housing on reserve by providing easier access to homeownership, rental and renovation loans in First Nations communities" (FNHMF, 2012, p.20). At last count, there were approximately 5,500 homes backed by the FNHMF.

4.3 Bringing home drinking water

That there continue to be First Nations communities who have lived for decades under boil water advisories and do not consume orders in Canada is a travesty. As a start, in order to advance the safety, health and well-being of First Nations, the 2016 Federal Budget has committed to a five year investment of $1.8 million to "ensure proper facility operation and maintenance, and end long term

boil water advisories on reserves" (Morneau, 2016, p. 144). While this may address funding barriers, the jurisdictional and structural barriers that continue to challenge water quality on reserves must be eliminated. Immediate action needs to be taken by responsible government agencies to provide clean and piped water and proper wastewater management to all First Nations communities across Canada. As well, waterways that pass through or are used by First Nations communities for traditional food resources must be protected and free of environmental contaminants. Human rights advocates have pressured the federal government to adopt a National Water Policy that among other elements would implement "national enforceable drinking water standards; recognize water as a human right; respect Indigenous water rights…[and] invest in water and wastewater infrastructure, particularly in First Nations communities" (Lui, 2015, p. 20).

On March 1, 2017 the Primate's World Relief and Development Fund (PWRDF) announced a partnership with Habitat for Humanity Manitoba (HFHM) to address the poor water and sanitation conditions for the fly-in community of Pikangikum First Nation. Located in northwestern Ontario, the community has been under a boil water advisory since 2006. Of the 450 homes on reserve, 415 are not supplied with water or sanitation, nor are they structurally equipped for these services. The partnership will endeavor to retrofit 10 homes with clean, potable water.

4.4 Countering Food Insecurity

Continuing to gather baseline evidence, through conversations and available data sources, will show how the built environment can be modified to improve food security, food quality, and food options and choices in rural, remote, northern, and isolated First Nations communities. Advancing food security requires multiple levels of community and governmental action in areas including addressing poverty; improving transportation of perishable foods (including the building of all-season roads); expanding current grocery stores (or creating alternative grocery options); embracing food alternatives such as greenhouses, agriculture, and community gardens; promoting the revival of traditional food-based practices and food sharing networks; and ensuring that traditional food resources are protected from environmental contaminants (Pal et al., 2013; Skinner et al., 2013a).

First Nations on-reserve communities are responding to food insecurity and the high costs of imported foods through community garden projects. The Abegweit First Nation in Prince Edward Island has started a community garden, called Epekwitk Gardens and Preserves, in order to make fresh produce available for community members through the local Epekwitk Gas Bar. This project began through a partnership with a local non-Indigenous farmer who mentored community members on the process of planting, maintaining and harvesting a garden. There are now twenty community members working on the garden and they are looking to expand to include "an

apple orchard and some grapes, and getting more customers off reserve, including custom growing for restaurants, and possibly even adding a greenhouse" (Chapin, 2016, para. 16). In the Northwest Territories, the Small Scale Foods Program, initiated in 2006, has supported the development of community garden sites across the Territory, some of which have grown to incorporate greenhouses (Northwest Territories Industry, Tourism and Investment and Health Canada, 2011).

First Nations communities are also responding to food insecurity through innovative and traditional food projects. Food Matters Manitoba (2013) documented a number of such initiatives taking place in northern First Nation communities. Their scan revealed how land-based, community-driven, and multi-generational projects help to ensure the maintenance and survival of traditional food harvesting and skills. For example, the Northlands Community Freezer Program, located in Lac Brochet, Manitoba, ensures that three full-sized freezers are filled with traditional meats like caribou, with the help of local hunters and trappers. This meat is distributed to those in need but is also used for community feasts, cook-outs, and educational and nutritional programs as part of the Aboriginal Diabetes Initiative (Food Matters Manitoba, 2013, p.12). Since 2014 Meechim Inc., a local social enterprise created in Garden Hill First Nations, has provided locally produced fruit, vegetables, poultry, and fish to residents. As part of this innovative project, the "market is held at the local TV station with live Oji-Cree language broadcast of what is available" (Loney, 2016, p. 33).

4.5 Improving on-reserve infrastructure to promote physical activity

According to the federal government, "cultural and recreational infrastructure can provide an important focal point for community activities" on reserve (Morneau, 2016, p. 143). As such, they have earmarked $76.9 million over a two-year period for the development of such infrastructure.

Asset mapping and comprehensive community planning are processes that bring to the fore the voices, perspectives and priorities of populations. For First Nations communities who have participated in such processes, being able to exercise in one's community may involve the renovation to, or development of, safe environments and aesthetically pleasing indoor and outdoor spaces for playing, tobogganing, hockey, basketball, baseball, or dance and other aerobic activities etc. (Collinson et al., 2011). For example, in an asset mapping exercise with Alexander First Nation, the youth shared the ways they thought that:

> places and spaces could be enhanced or used in different ways to improve healthy living…. The outdoor ice rink was one place that could be modified to increase physical activity. Youth suggested fixing the basketball nets located in the rink for use over the summer months, cleaning the surrounding area of glass and garbage, fencing the rink to keep balls and pucks inside, turning on the lights at night so the rink surface could be played on, flooding the surface with water for skating and hockey in winter, [and] opening the rink shack to keep

people warm during winter activities." (DyckFehderau et al., 2013, p. 5)

Similarly, developing hiking and walking trails, along with establishing walking groups to promote safety, have been identified and/or instituted by communities to promote physical activity (DyckFehderau et al., 2013; Joseph et al., 2012; Kirby et al. 2007a/b). Culturally-based physical activities already underway in First Nations communities across Canada include traditional games and sports such as lacrosse; powwow dancing; and activities on the land such as berry picking, hunting, fishing, gardening, or harvesting traditional medicines. Cultural activities that involve the whole family are not only ways of improving healthy physical activity, but are also "way[s] to spend time together and strengthen the family" (Bickford, 2011, p. 52).

Community-based organizations, such as Sandy Lake Health and Diabetes Project (SLHDP) and the Kahnawake Schools Diabetes Prevention Project (KSDPP), have been active in the promotion of physical activity to counter the high rates of diabetes. For example, in addition to other localized health interventions, the SLHDP promoted a community-wide walking trail. One of the health interventions made by the KSDPP was to alter the physical environments of the school and community so as to promote better eating habits and lifestyles. Both of these programs have been longstanding and successful, likely given that they are community-driven and controlled (Macaulay et al., 2006; Salsberg, et al., 2007). Without doubt, there is the need to engage public health professionals, planners, educators, dieticians, and community members of all ages in the development of long-term, culturally based, obesity prevention strategies, preventative health care messages, pedestrian safety plans, exercise, fitness, and wellness opportunities, and activities around diet and nutrition.

4.6 Improving road safety

There is limited information about roads, road conditions and the transportation challenges, needs and opportunities of First Nation peoples living on reserve. What is known is that there is a higher incidence of MVCs on reserve, and that there is an immediate need for action to improve road conditions to curb the loss of life, hospitalizations and injuries resulting from MVCs. The Federal Budget 2016 acknowledges that investments need to be made to failing infrastructures on reserve, including roads. They have committed part of the $255 million of the First Nation Infrastructure Fund to improving roads in First Nations communities over the next two years (Morneau, 2016).

According to Short and colleagues (2014), an updated needs assessment of on-reserve roads is due, given that the last one was done over a decade ago. They argue that interventions for road safety must target four sets of factors including "human, vehicle/equipment, physical environment, [and] social environment… and should include outcome measures to evaluate changes in each" (Short et al., 2014, p. E304). This could include interventions which target vehicle/equipment factors by promoting the maintenance of vehicles (providing service checks and repairs) and interventions which focus on the physical environment such as modifying road conditions (fixing potholes).

Research highlighted through this paper suggests there are direct linkages between the health and well-being of First Nations peoples and their experiences with deterritorialization and imposed western development, which rapidly transitioned them away from traditional lifestyles and significantly altered their landscapes, foodscapes, and fitscapes.

5.0 CONCLUDING REMARKS

This paper provides an overview of some of the elements of the built environment in First Nations communities, based on the current information available. While it began by showing how Indigenous peoples had mastered knowledge around the specific environments in which they lived and had designed sustainable communities, livelihoods, and harvesting practices, these ways of knowing and living were greatly altered through colonization. Research highlighted through this paper suggests there are direct linkages between the health and well-being of First Nations peoples and their experiences with deterritorialization and imposed western development, which rapidly transitioned them away from traditional lifestyles and significantly altered their landscapes, foodscapes, and fitscapes. Given the westernization of Indigenous communities, this paper has sought to understand some elements that define a healthy western built environment and whether the same standards are enjoyed by First Nations peoples living on reserve. The findings in this paper highlight that the built environment of First Nations communities falls well below these standards and, in fact, there is an on-going crisis in terms of housing shortfalls and disrepair, contaminated water systems, food insecurity, and challenges to active living and transportation.

These five areas of the built environment, coupled with the scope of the diversity of perspectives, experiences and priorities of the 600+ First Nations communities across Canada, have yet to be fully understood. Indeed, to garner a more complete understanding, First Nations peoples and communities from various regions need to be asked for their direct input on how the built environments of rural, remote, northern, isolated and urban environments impact their health and well-being. What are other areas of the built environment that affect them? There are other research gaps including the built environments of Inuit, off-reserve and Métis communities. For example, what does the built environment look like in urban centres where there is a high density of Indigenous peoples? Do they have access to affordable housing? Are they food secure? Are neighbourhoods walkable? Finally, though many communities are challenged with infrastructural inadequacies, it would also be worthwhile to hear how First Nations are modifying their environments to better meet their needs.

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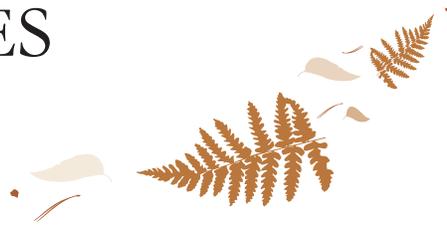
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