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## “Keeping the Road Clear between Us”: Indigenous Infrastructure and the Potential for Transformative Design

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### Abstract

As scientists and science educators challenge the epistemological hegemony and cultural imperialism of Western modern science by insisting that definitions of science be expanded to include other scientific traditions including traditional ecological knowledge (Berkes 1988, 1993; Inglis, 1999; Warren 1997; Williams & Baines 1993; Snively & Corsigila 2000), we have not seen much of a co-equal movement in civil and natural resource engineering. The decolonization of Canadian cities must begin with the acknowledgement of the role engineering, architecture and urban planning has had in the perpetuation of colonialism. This paper works to identify directions for the decolonization of infrastructural systems through a reconsideration of pre-contact Indigenous architectural and infrastructural histories, a recognition of the ways in which infrastructure was often used as an instrument of colonial land claims, and the various ways in which Indigenous peoples, communities, and knowledges have contributed to the infrastructures that populate our contemporary geography. It is through an acknowledgment of infrastructure as actant in colonialism and the contributions Indigenous peoples and knowledges have had in the development and implementation of our infrastructural systems that we can begin to expand and deepen our understanding of the relationings between knowledge, infrastructure, ecosystems and Indigenous peoples. Finally, this paper considers the ways in which Indigenous design principles offer a great deal of potential in the creation of more environmentally and socially sustainable communities, and even regenerative design.

### Keywords

infrastructure, decolonization, indigenous knowledge, colonialism

### Introduction

As scientists and science educators challenge the epistemological hegemony and cultural imperialism of western modern science by insisting that definitions of science be expanded to include other scientific traditions including traditional ecological knowledge (Berkes, 1988, 1993; Inglis, 1999; Warren 1997; Williams & Baines 1993; Snively & Corsigila 2000), we have not seen much of a co-equal movement in civil and natural resource engineering. Masakata Ogawa argues that “every culture has its science ... something like its own way of thinking and/or its own worldview,” (1995, p.1437) just as different societies have developed distinctive infrastructural systems and built environments that allow for habitation in specific geographies and climates, as well as transportation and communication across distances. Decolonization demands more than acknowledgement and apologies for past wrongs to Indigenous peoples and communities; it involves that we interrogate the ideologies, narratives and relationings colonial capitalism has imposed upon people, the land all

of its inhabitants, human and non-human. Embedded within discourses of modernity and progress, infrastructure is an actant in colonial attempts to “rationalize” land, resources and economies while creating an economic structure that is dependent on the export of natural resources. It has also served colonial elites in the organization, production and exercise of political and administrative control (Graham & Marvin, 2001 p.82). The design and implementation of infrastructures have always been intertwined with the developmental agendas of colonial states (Graham & Marvin, 2001 p. 81), as well as discourses of progress and human control over nature that characterize Western modern science. Not unlike the ways in which Western modern science has used logical empiricism and its methodologies as “gatekeeper” for “Science” (Snively & Cosigilia, 2000 p.9), the engineering of infrastructure has been an actant in both establishing a “system of spatial apartheid” in which “natives” remain confined to non-networked and increasingly diminished areas of settlement (Balbo 1993) and effectively barring Indigenous people from contributing to and participating in the development and implementation of infrastructural systems.<sup>1</sup>

As biologists, geologists, agriculturists, climatologists and other working scientists are exploring traditional ecological knowledge (TEK) to understand and alleviate some of humankind’s impact on the environment they have been expanding the perimeters of what we have traditionally thought of as “science” (Berkes & Mackenzie, 1978; Inglis, 1993; Warren, 1997; Williams & Bains, 1993). Defined by Berkes, TEK is “a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment” (Berkes, 1999, p.8). As a knowledge-practice-belief complex, TEK has an explicitly ecological emphasis.<sup>2</sup> Broadening the scope of scientific inquiry to include traditional Indigenous knowledges offers a great deal of potential for solving critical social and ecological issues caused by poor infrastructure design and implementation, as well as the conception and realization of future infrastructural systems. I argue that to decolonize infrastructure, we need to expand and deepen our understanding of pre-contact infrastructure and architecture, recognize the crucial role infrastructure has had in colonization, and acknowledge the role and influence of Indigenous peoples and knowledges have had in the development of our infrastructural systems. In advancing a more comprehensive history of the relationships between infrastructure, colonization, and Indigenous peoples and knowledges, we can begin to decolonize engineering, architecture, and urban planning, and develop more just and ecologically appropriate infrastructural systems.

Addressing the social and environmental injustices embedded within our infrastructural systems is becoming increasingly imperative as we witness the havoc human activity has had on the planet. Engineers play a vital role in developing approaches to mitigate the harm caused by natural resource extraction, transport of resources, and expansion of cities and suburbs. The word engineer is from Latin *ingenium*’ that means nature, native talent, skill (*in + gignere*’ which is to beget or produce). The broadness of Latin root of the term allows for us to question the narrow understanding we tend to have of engineering, that of a highly specialized and technical profession. Modern conceptions of infrastructure often focus almost exclusively on large technical systems that are often costly, complex and multilayered. Engaging with the Latin root of the term, Indigenous infrastructures can be positioned within tradition of engineering. While few North American Indigenous populations engaged in large infrastructural projects, many modified their environments to facilitate the use of natural resources, transportation, and communication. From building weirs to capture schooling fish to the development of overland trails to the mining of cryptocrystalline materials such as flint and obsidian from stone quarries, Indigenous peoples developed sophisticated technologies and knowledges that allowed for them to inhabit and flourish in often challenging climates and geographies.

Snively and Corsiglia (2000) suggest that TEK “represents experience acquired over thousands of years of direct human contact with the environment,” (2000, p.11) and this knowledge is of great value to scientists, not only because traditional peoples spent generations living and learning about life in a specific geographical location, but because it is infused with an understanding of “the world as an interconnected whole” (p.12). They offer the example of the Nisga’a people of British Columbia who have detailed and sophisticated knowledge of “animal and plant life cycles, topography, seasonal changes and mineral resources” (p.13) that allowed for a Nisga’a fisherman to detect the illegal dumping of heavy metal tailings from a molybdenum mine through the observation of Dungeness crabs in 1982 (p.19). The Earth, writes Leroy Littlebear, “cannot be separated from the actual beings of Indians” (2000, p.78) and all things are in relation. The Aboriginal philosophy articulated by Littlebear is process-oriented, holistic and always grounded in a specific geography. Indigenous knowledge, philosophy, and sciences have historically been dismissed, ignored, or repudiated by western modern science, including engineering and architecture. The decolonization of engineering, architecture and urban planning would allow for a re-relating with the entities that compose and inhabit ecosystems. It would allow for us to move past discourses that position man as the conqueror of nature, to one in which traditional knowledge systems facilitate more complex understandings of the interconnectedness of ecosystems and human activity, and thus engage in participatory and regenerative design of the built environment.

### **Pre-contact Infrastructure**

Traditional ecological knowledges have highly detailed and complex information about agriculture, agroforestry, taxonomy, soil fertilization, pest management, and physical phenomena (Agrawal 1995, p.421). Many TEK, such as the Gitxaala model of resource management structure a balance between community needs and ecosystem health. At the core, its approach is a social view that locates humans in relation with other entities, “the Gitxaala people have been taught by their *symgugyet* to take only what they need and not to overexploit the natural resources” (Menziés, 2013 p. 184). This understanding and approach is shared by the Iroquoian people. Research into Haudenosaunee pre-contact settlements has revealed complex knowledges and use-practices of geographical elements and natural resources. Indigenous peoples of North America had developed both sophisticated knowledge of the natural environment and practices that allowed for them to use natural infrastructures<sup>3</sup> as a means to enhance modes of transportation, communication, as well as establish food security and access to fresh water.

The site settlements indicate sophisticated assessments of proximity of transportation routes (Hasenstab, 1996; Engelbrecht 2003; Jones 2010), as well as conditions favourable to agriculture production (Hart et al. 2007; Jones 2010), adjacency to hardwood growth (Jones 2007), and geography conducive to effective defence (Hasenstab 1996; Warrick, 2007). Hasenstab (1996) conducted a study of factors that influenced settlement locations of several Northern Iroquoian cultures and hypothesized that the Haudenosaunee “would have placed their villages strategically with respect to both access to natural resources and protection from their enemies” (1996, p. 224). His study, primarily focusing on agriculture, hunting, and waterway transportation routes, found that the most influential variable for settlements in the Haudenosaunee territory was distance from canoe navigable waterways and the second was soil productivity (1996). This gestures to both the Iroquoian as strong river navigators and agriculturalists, but it also is indicative of the strong diplomatic ties the Iroquoian peoples had developed with one another.

Bell and Lock (2000) suggest that ideological factors are often strong influences in regard to the relationship between settlements and the mobility of people, goods and information. That transpor-

tation routes are not merely the means to move from point A to point B, but serve as ways of organizing important social, economic and political purposes (Jones, 2007). The development of political bodies, legal apparatuses and diplomacy is often attributed to the establishment of transportation and communication networks. The Haudensaunee Confederacy was to maintain peace between nations and to protect the Iroquoian peoples from outside enemies, and these functions would have required easy communication between nations (Engelbrecht 2003; Jones 2007). "Keeping the road clear between us" was a diplomatic phrase that was used in the 16th and 17th century by Iroquoian peoples (Engelbrecht 2003, p.139), emphasizing the importance of efficient and unobstructed transportation routes. Well-maintained overland trails and established water routes would have provided clear avenues for communication so that political ties between nations in the confederacy could be maintained.

Transportation routes were also used for the trade of luxury goods; there is a great deal of evidence to suggest that exchange across and within the interior mid-Atlantic region was extensive and common. For example native copper originating in Lake Superior region, and of marine shell emanating from mid-Atlantic coast and from Chesapeake Bay region was found throughout the mid-Atlantic region, both along the coastline, as well as deep into the interior of the continent (Hamell, 2007, p. 315). Jones suggests that pre-contact trade was "largely based on reciprocal exchange, not desire for material wealth or prestige" (2007, p.14). The circulation of the goods would have been extensive, but the volume of goods was small. Northern Iroquoian cultures emphasized symbolically charged items such as marine shell, native copper and exotic lithics (Hamell, 2007). The volume of goods circulating through the transportation networks increased after the arrival of European materials, and items traveled through more specific corridors that corresponded to the fur trade (Hamell, 2007). There is more research to be done in regard to pre-contact transportation infrastructure; there has been little work on the spatial correlations of settlements and transportation corridors, as well as the establishment and maintenance of waterways and overland trails as natural infrastructure.

Just as First Nations peoples were active and adroit traders and diplomats, they were astute observers of geography and climate. In an analysis of the factors that influenced Haudensaunee settlements, Jones suggests that a complex ecology of settlement sites was developed (2007). As the Iroquoian peoples practiced a mixed subsistence approach that included agriculture of maize, beans and squash, knowledge of soil type and climate was crucial to raising successful and productive crops. Jones found that the length of the growing season was a significant determinant in regard to site location. Haudensaunee living at the most northern boundaries of maize agriculture located their settlements in "thermal belts" that provided the greatest number of frost-free days every year (Jones, 2007). Hasenstab's study of Haudensaunee settlements found that distance from canoe navigable waterways was the most influential variable followed by soil productivity (1996). Maize prefers well-drained soil, so proximity of settlements to this soil type was preferred. Hasenstab's research indicates that 82% of Mohawk villages were located in well-drained soil while only 57% of the Mohawk territory was comprised of that soil type.

Archaeological research has also indicated that pre-contact Iroquoian cultures used swidden agricultural methods, and modified the environment around settlements. There is evidence of the clearing of trees and bush around settlement sites so that useful animals and plants such as raspberry canes and deer would be attracted to the area (Jones, 2007). Other factors that influenced settlement sites were proximity to stone material for tools, potable water sources and wetlands, and hardwood tree species that provided firewood and nuts (Hasenstab, 1996; Jones, 2007; Warrick, 2007). While it is difficult to determine all of the various contingencies that led to the establishment of settlements, it is evident that complex ecology of interdependence between the environment and

the peoples who lived in it was established. This ecology extended beyond the rivers and tributaries, wetlands and marshes, forests and fields, but involved a profound spiritual relationship with the land. It represents a green or natural infrastructural system that is inextricably woven into social and cultural beliefs and practices. Benedict Kawennotakie writes “our relationship with the land is fundamental to our cultural survival. We say that the land is our mother. We are born of her and are returned to her. We consider our relationship with the land to be a sacred one” (2007, p.124).

## Indigenous Architecture

Wallace Coffey and Rebecca Tsosie (2001) insist that it is time for “a reappraisal of the tribal sovereignty” (p.191) and move from a model that understands sovereignty as a strategy to maintain culture, to a model that understands culture as living, as continually transforming, and thus as capable of providing a foundation for the exercise of autonomy and survival of Indigenous peoples. Edmunds suggests that a “shift to cultural sovereignty as framework for tribal design is not about a return to static tradition or some defined set of aesthetic principles or cultural practices,” (2013, p. 806) but rather it should involve rearticulations of social, cultural, and political aims that involve the traditional values, knowledges, and philosophies while being capable of responding to changing political and economic contexts. That the design of contemporary tribal housing has a responsibility to maintain traditional concepts of relatedness that extend beyond humans (Edmunds, 2013 p. 821) while acknowledging obligations to future citizens by assessing sustainability. While this is worthy position, as John Borrows (2002) suggests the disruption of Indigenous land use by European colonization and subsequent displacement of First Nations people has often led to fragmented knowledge of land use and traditions. As such, a more comprehensive history of Indigenous architecture must be undertaken.

Jeffrey Cook’s study of the Inuit igloo is one of a very few accounts of Indigenous architecture that recognizes it as “a fascinating and complex high performance system of construction and operation” (1996, p.282). Indeed, the aerodynamic architectural form of the igloo not only provides thermal advantage to its inhabitants, reduces erosion of building surfaces, but has served as inspiration for many modern buildings. As he notes, there is much to be learned from traditional Indigenous architecture. As the creative expression of knowledge and intimate relationship with the land, Indigenous architecture developed through continual and consistent modification and adjustments. With few descriptions of pre-contact Iroquoian architecture, I turn to Jacques Cartier’s well-known description of the Hochelaga village:

And in the middle of these fields is situated and stands the village of Hochelaga, near and adjacent to a mountain, the slopes of which are fertile and cultivated, and from the top of which one can see for a long distance. We named this mountain “Mount Royal”. The village is circular and is completely enclosed by a wooden palisade in three tiers like a pyramid. (...) There is only one gate and entrance to this village, and that can be barred up. Over this gate and in many places about the enclosure are species of galleries with ladders for mounting to them, which galleries are provided with rocks and stones for the defence and protection of the place. There are some fifty houses in this village, (...) built completely of wood and covered in and bordered up with large pieces of the bark and rind of trees, as broad as a table, which are well and cunningly lashed after their manner. And inside these houses are many rooms and chambers, and in the middle is a large space without a floor, where they light their fire and live together in common. From: *The voyages of Jacques Cartier*

(Trigger & Pendergast, 1967, p.333-334)

Cartier's observations of the Hochelaga village illustrate a settlement that is well situated, fertile, effectively protected from enemies, and well populated. It is an image that is at once dynamic and stagnant. One has a sense of the ingenuity and culture of the people who built this village, yet at the same time it obscures the history of Indigenous architecture and engineering. Like any society in the world, when a population undergoes environmental, socio-political and cultural shifts such as a changing climate or depleted resources, population growth or decline, the development of new technologies, evolving philosophies and ideologies, new civic or military alliances the built environment adapts, changes, and transforms.

Warrick (2007) makes a compelling argument that the longhouses Cartier saw and wrote about in 1535 had begun to develop in the Uren historical period (AD 1300-1330). Uren was a period of rapid cultural change, marked by population growth, the amalgamation of villages and the formalization of matrimony and matrilocality (Warrick, 2007, p.149). It was during this time that longhouses with semi subterranean sweathouses appeared along with ossuary burial. The Middleport period (1330-1420) had a significant population increase that resulted in the growth of villages, and increased immigration in previously unsettled areas. It also saw a substantial shift in longhouse architecture. Not only did they grow longer, (often with extensions that added 18 meters) (Warrick, 2007, p.152) but with the growing complexity of socio-political units, the floor plans became more complicated (Kapches 2007, p.180). Baffles were added, more support posts became necessary, as well as there was an increase in the number of interior fire pits, storage partitions, and doorways (Kapches, 2007, p.180-185). The design of the longhouses evolved as the social and cultural dynamics shifted with changes in demographics. Iroquoian architecture was not immutable; it changed with various internal and external forces. Just as European architecture changed over time in response to diverse cultural and social shifts, so did Native architecture (Kapches, 2007, p.187). While there has been some research done in Indigenous architecture, there is still much to be done. Historical studies of the architectural and engineering responses to the consolidation of matrilocality, the confederation of the League of Iroquois, and evolving ceremonial and political functions to name a few, would contribute to a richer understanding of pre-contact Indigenous infrastructure and architecture.

### **Infrastructure and Urban Design as Colonialist Tools**

The notion of the city as unitary and orderly allowed for conceptions of Western infrastructural and disciplinary power to be adapted, established and enforced over colonized civilizations (Crang and Thrift, 2000, p.10). As an attempt to "rationalize" land and natural resources (Graham & Marvin, 2001), urban and resource management planning has been "imbued with Western cultural assumptions that inevitably reproduce paternalistic colonial mentalities" (Fawcett, Walker & Greene, 2015 p. 162) that ultimately reinforces and reproduces Indigenous dispossession and marginalization (Porter, 2010). Infrastructures thus became intertwined with the developmental agendas of the colonial and postcolonial states (Graham and Marvin, 2001, p.81) and were agents in the attempt to both make "order" of non-western societies and gave rise to what Rudolf Mrárek describes as the "sensing of colonial modernity" (2002). That is, the phenomenal lived experiences of colonial cities that are shaped by their histories and a colonial logic of rule. The sensate experience is one that involves complex interactions, mingling of, and tensions that arise as the subject moves through spaces in which power is enacted through structures of technology and science (Larkin, 2008, p.43). This logic cannot be reduced a single political or ideological motive, nor can infrastructures, rather they arise from complex interactions, and the mingling of various intensions and tensions (Levine,

2015). As such, there is no singular ideological or political whole that organizes our social world; our experience of “colonial modernity” emerges from multiple political forms and actions. So while Indigenous people were ignored and often deemed illegal, their settlements and infrastructures destroyed in the name of modernization (Bhabah, 1994), the processes of colonization are complex and varied. The sensate experience of moving through Montréal is one that is comprised of a myriad of tensions, practices, and collisions of forms.

The ways in which infrastructure enacted colonialism was varied, whether it involved the appropriation of pre-contact settlement sites and trade routes, or the plunder of resources. Larkin argues that the use of technological and infrastructural systems were instrumental in the creation of the “colonial sublime” (2004). The colonial sublime was an effort by colonialist to use technology as part of their political rule and as evidence of European technological civilization. As a sublime force, infrastructure projects were meant to represent an overwhelming sense of grandeur and awe in the service of colonial power, as well as manifest a split between those who understood and controlled technologies and those who did not (Larkin, 2004). Infrastructural projects and the ideological needs of the state are bound up together and colonial rule was enacted through structures of technology, science, and technical workings of new machineries. Technological organization of society through roads and rail, telegraph networks and phone lines is a political means of subjection, and what has been term by James Scott as “techno-politics” (1987). Scott suggests that techno-politics functions through invisibility; that the systems that organize the city are understood as technical and outside of processes, thus they remain outside of our political awareness. They are also rarely addressed in discourses of decolonization.

As I have suggested decolonization of our cities and infrastructure involves developing a deeper understanding and respect for pre-contact Indigenous infrastructure and architecture. It also demands that we think about the ways in which Indigenous cultures, peoples, and knowledges have informed and participated in the building of modern infrastructure, as well as how infrastructure projects have influenced the rise of Indigenous post-colonial political subjectivity. Given the restraints of this paper, I have only the time to briefly explore two cases: the Kahnawake steel workers and the St. Lawrence Seaway.

### **Indigenous People Building Modern Infrastructure (Skywalkers)**

In 1886 when CP Rail began the planning to build a cantilever bridge across the St. Lawrence from the village of Lachine on the North shore to a point just below the Kahnawake village on the South shore, the men of Kahnawake began a tradition of steel work. As part of the negotiation between CP Rail, the bridge general contractor, Dominion Bridge Company and the Mohawks of Kahnawake, the First Nations men were promised work in exchange for permission to build the bridge abutment on Mohawk reservation land. Joseph writes that the “Mohawk workers were far more interested in the working on the bridge than they were in unloading materials for the bridge. The foremen noticed the agility, grace, and apparent disregard of heights of the men when they were walking on bridge spans” (Joseph, 2013, n.pg.). In Mitchell’s collection of stories, *Up in the Old Hotel and Other Stories*, a Dominion Bridge Company official recounts of the Mohawk men in a letter (1938/1992, p. 275):

They would climb up into the spans and walk around up there as cool and collected as the toughest of our riveters [...] They would walk a narrow beam high up in the air with nothing below them but the river, which is rough there [...] and it wouldn’t mean any more to them than walking on the solid ground. They seemed immune to the noise of the riveting, which goes right through you and is often enough in itself to make newcomers to construction feel

sick and dizzy. They were inquisitive about the riveting and were continually bothering our foreman by requesting that they be to take a crack at it. This happens to be the most dangerous work in all construction, and the highest paid [...] We decided it would be mutually advantageous to see what these Indians could do [...] they were natural-born bridgemen”.

In the 1930s when Mitchell was working as a journalist in New York, upwards of 650 Kahnawake men were working in cities and towns all over the United States (Mitchell, 1938, p.267). When the Dominion Bridge Company finished the Canadian Pacific Bridge, they began to work on the Soo Bridge that crosses two canals and a river and connects the cities of Sault St. Marie, Ontario and Sault St. Marie, Michigan. The Kahnawake riveting gangs went straight from the CP job to the Soo job, and brought apprentices (Mitchell, 1938, p.277). Quoting an elder of the band, Mr. Jacobs, Mitchell writes: “The Indian boys turned the Soo Bridge into a college for themselves. The way they worked it, as soon as one apprentice was trained, they’d send back to the reservation for another one. By and by, there’d be enough men for a new Indian gang” (1938, p.277). By 1907 there were over 70 skilled bridgemen in Kahnawake, in the same year on August 29th, 96 men, 35 from Kahnawake were killed during the erection of the Quebec City Bridge. They left behind 24 widows and dozens of children (CBC News, 2007). Women of the community responded by managing the placement of the steelworker gangs to ensure that not all of the gangs worked on the same structure.

Mohawk men continued to work high steel; they went onto build many of the bridges, factories, powerhouses, piers, and other steel structures in Eastern Canada, Buffalo, Cleveland and Detroit (Mitchell, 1938, p.278). In New York Mohawk high-steel men worked as riveting gangs on the Empire State and Chrysler Buildings, the RCA and Madison Square, the Washington and Hell’s Gate Bridges to name only a few. Hundreds of Mohawks, from Kahnawake and Akwesasne worked on the World Trade Center from 1966 to 1974, and again the months after Sept. 11, 2001, when they volunteered to help in the dismantling and clearing away the buildings they had helped to erect. The tradition of Kahnawake steel workers, men and more recently women, travelling to work in New York each week continues to this day, however the Quebec disaster has not been forgotten. In 2007, a memorial, a steel replica of the bridge, was placed in Kahnawake.

## **St. Lawrence Seaway**

The Mohawk word *Kahnawq:ke* means “the place of the rapids” (Alfred, 1995). While many scholars have suggested that the name was given the site after the Mohawks of upper New York state moved to what was also known as the Seigneurie Du Sault-Saint-Louis, a 40,320 acre territory that the French Crown had granted to the Jesuits in 1680, the name reflects a relationship between the people of Kahnawake and the river over a period of centuries. In typical paternalistic fashion, the French Crown and the Jesuits sought to “protect” and “nurture” Mohawks newly converted to Catholicism. It was at the end of the Seven Years’ War, that the British negotiated the assistance or neutrality of the Seven Nations of Canada, including the Iroquois of Kahnawake. This shift in allegiance was accomplished at Oswegatchie in August 1760 and confirmed at a council in Caughnawaga and Montreal in September 1760, a week after the signing of the Articles of Capitulation (Holmes, 2006, p.iv). British officials involved in these councils repeatedly referred to the proceed-



ings and agreement as a treaty. The British promised to protect lands inhabited by the Seven Nations at the August and September treaty conferences.

The first proposals of the St. Lawrence Seaway were floated in the 1890s, but they couldn't gain enough political support. Opposition came from interests that represented existing harbours on the Atlantic and Gulf coasts, as well as railway companies. It was in 1951 during Prime Minister Louis St. Laurent's tenure that the International Joint Commission issued an order of approval for the joint construction between the U.S. and Canada of the Seaway. Gerald Taiaiake Alfred charts some of the acts of resistance the Kahanawake band took to halt the Seaway project. Following the Order-in-Council issue, the band began to launch a number of legal challenges and worked to petition every level of the government within the existing colonial power structure (Alfred, 1995, p.159). After receiving little to no response from federal government, the band turned to the law and tried to deal with the issue through enforcing trespass by-laws on reserve lands, (Alfred, 1995, p.159) and later challenged the legitimacy of the Order-in-Council. Their argument was that the Indian Act had established a relationship of wardship that was predicated on a trust responsibility towards Indian bands by the federal government. Thus approval of the Seaway was "a flagrant breach of trust on the part of the Government of Canada" (Alfred, 1995, 160). All efforts to "oppose the shameful invasion and disgraceful slicing away of the Caughnawaga Reservation" (160) were exhausted and met with failure. Ghobashy asserts that there was no legal basis for the Canadian appropriation of land (1961) and MacFarlane characterizes the Canadian state was particularly motivated by its role as "a client of the business community" (2014, p.222). He also suggests that the St. Lawrence Seaway project was a "spectacle to demonstrate [Canadian National] power and prove its legitimacy to its citizens" (2014, p.223).

The Seaway project was very much bound up with both high modernist ideologies of the city and mobilities, as well as the Cold War initiatives to bring Canadians and Americans together to galvanize economic and military strategic goals (Wynn 2014, p.xvi). MacFarlane offers an extraordinarily detailed description of the ways in which a large-scale infrastructural project works usher in a range of technological, political, economic, societal and environmental issues (2014). Through an analysis that includes the print, radio, and television documentation of the project MacFarlane illustrates the ways in which the project captured the public imagination as "one of the most challenging engineering feats in history" (2014, p.xv). Narratives around the Seaway construction co-opted earlier discourse and portrayals of the St. Lawrence River as at the "heart of Canadian history" (Creighton, 1937). As an iconic place in the Canadian national imaginary, the St. Lawrence has played a role in the configuration of Canadian national identity, and the Seaway in the development of a modern Canadian identity.

If the Seaway represented Canada's entry into high modernity à la Robert Moses for the state and settler population, it had a very different resonance for the Mohawk people of Kahnawake. In the documentary film, "Kahnawà:ke Re-visited" Audra Simpson says the project had "the stain of disrespect" and as "river-taming people" their "whole identity [was] taken." It was an identity that incorporated not only the community's proximity to the river, but generations of Kahnawake people that had become known for running the Lachine Rapids in the St. Lawrence timber industry in the 19th and 20th centuries. The Seaway disrupted social relationships, contributed to the loss of economic control, and centuries old traditional practices and a symbolic and material relationship to the river.

The final statement of the Kahnawake council on the Seaway expropriations is clear about the community's perception of the project and appropriation of their lands: the lands of Kahnawake:

have never been ceded, sold or surrendered and belong to the Band of Caughnawaga Indians as a whole, regardless of any rights, alleged or pretended of Conquest, Expropriation or otherwise. We cannot conceive of how any non-Indians can have the audacity to pretend claim to any lands occupied by Indians, when we Indians are the primordial inhabitants placed here by the Great Spirit and universally recognized as the only true Citizens of North America. Humanity blushes at the events of this period of Colonial History and Dictatorship, and Usurpation.

(Alfred, 1995, p.161)

If the project sowed seeds of deep mistrust among the Kahnawake community, it also gave rise to a socio-political consciousness that worked to resist any further encroachments on Mohawk territory. After the massive land expropriation, destruction of land and homes, the Kahnawake spoke of going “back to the woods” (Alfred, 1995, p.67). “Back to the woods” had connotations of returned to an older and alternative ideology that was based on basic assertions of independent nationhood (Alfred, 1995, p.67). It was the beginning of change, of a political and national identity that arose from the activism of the Longhouse and Warrior Society (Alfred, 1995). In the documentary film, “Kahnawà:ke Re-visited” Taiaiake Alfred spoke about how the St. Lawrence River is symbolic of the socio-political well-being of his community. That as a child the banks of the river in his community looked like a barren parking lot with little life, and over the years the river has slowly been becoming back to life, just as the political culture of Kahnawake has flourished in recent years and there has been a reformation of political goals and identity (Alfred, 1995, p.20-21). Infrastructure, thus can function as a tool of colonial oppression, but it can also incite political activism and the formation of new political identities.

### **Indigenous Design as Regenerative Design**

Coffey and Tsosie’s concept of “cultural sovereignty” (2001) is one in which the values, everyday practices, social norms and cultural traditions guide political decisions. It is also one in which design of habitats arise from “specific histories and social, political and cultural trajectories that simultaneously involve core values and philosophies and rearticulations of these ideas in a changing political-economic context” (Edmunds et al., 2013, p.806). Coffey and Tsosie understand cultural sovereignty as the articulation of a distinctive history that includes political and social experiences, an engagement with a specific environment, evolving practices and ideologies, as well as agency in the shaping of the world (Edmunds et al., 2013, p. 810-11). First Nations tribes and bands have knowledges of natural process, as well as economics, technologies, materials, global climate, and other scientific fields that can contribute to the environmental and social challenges our contemporary world faces. They suggest that “‘traditional’ and ‘nontraditional’ knowledges are not coherent wholes that must be maintained analytically or practically separate” but rather we can draw knowledge from multiple sources “in order to solve practical problems and advance stated goals” such as self-sufficiency, environmental impact, and social inequalities (Edmunds et al., 2013, p.809).

In his analysis of the systematic efforts of governments “to stabilize the symbolic logic of infrastructure” Brian Larkin examines the relation between infrastructural technologies and modes of rule (2008, p.3). That while infrastructural projects are always bound up with ideological needs of the state, there is always the possibility for infrastructures to “generate possibilities for their own corruption” (Larkin, 2008, p.219). The potential for “creative corruption” of infrastructure allows for ways in which we can envision the ways in which contemporary power structures are riddled with fissures, gaps and openings that allow for the contestation of power. In shifting our gaze from

the mechanism that oppresses, what if we were to look for ways to challenge and transform existing institutions and infrastructures?

As Tully (2004), Laclau and Mouffe (2001) suggest every configuration of social relations occurs with reference and embedded within “master signifiers” that cannot be transcended. The question becomes how can we break through oppressive practices if they are embedded within the very structures of our ways of living? How can we challenge the ideologies and inequalities that are built into the infrastructural systems that we depend on in our daily lives?

As outlined in the beginning of this paper, Indigenous peoples in North America have long engaged in infrastructure and architecture design. A number of scholars have pointed out pre-contact Indigenous architecture reflects highly evolved building forms that are perfectly suited to their environments and to the social and cultural needs. The challenge, as Matunga suggests, is for First Nations peoples to “claim” or “name” Indigenous planning, (2013, p.5) and to contest the colonization of design and planning fields. Matunga outlines four components of Indigenous planning that include: the existence of a tribe or nation that is linked by ancestry and kinship; a strong connection to traditionally ascribed custodial territories such as lands, waters, and resources; a knowledge system about the ecology of the place, as well as values and ethics for managing the environment; and the existence of a culturally distinct set of practices and approaches including decision making processes (2013, p.6). The central tenets of Indigenous planning are built around understandings of community and kinship, as well as being a sophisticated response to the natural environment. It is here that we perhaps find the potential for transformative planning. That Indigenous epistemologies, traditional and contemporary knowledges, geographical insights and ancient forms of diplomacy can work to rupture colonial institutions and infrastructure. Like the flora that has rooted on the banks of the St. Lawrence Seaway, Indigenous planning philosophies, knowledges and practices can find hospitable conditions in the growing fractures and fissures of colonialism. That perhaps we can respond to environmental concerns, water quality, biodiversity through a genuine attempt at recognizing the rich legacy of Indigenous design and planning offers us.

## Notes

1. Scholars such as Leroy Littlebear (2017) argue that traditional knowledge of Aboriginal people has never been taken seriously because it is usually categorized as superstition or folklore.
2. TEK differs from Indigenous knowledge as the latter tends to refer to the local knowledge of Indigenous peoples or particular socio-cultural groups (Warren et al., 1995). Some scholars suggest TEK is a subcategory of IK.
3. Natural infrastructure is defined as a “strategically planned and managed network of natural lands, such as forests and wetlands, working landscapes, and other open spaces that conserves or enhances values and functions and provides associated benefits to human populations” (Benedict & McMahon, 2006). Ozment, DiFrancesco and Gartner contend that natural infrastructures “can provide many of the same services as built infrastructure” (2015, p.5) and are increasingly favoured strategies to secure water, food and energy.

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