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Subarctic Corridors in Northern Quebec: Is the Canadian Northern Corridor Concept Aligned with Quebec's Historical Development?

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ABSTRACT. Proposals for infrastructure development in Canada's North are gaining political traction, including a corridor connecting the northern regions of each of the country's provinces. Quebec is Canada's largest, northernmost province and would be pivotal in the construction of the corridor. Examining the historical phases of Quebec's northern development is crucial in assessing the challenges ahead. This paper groups Quebec's infrastructure developments into three main phases, synthesizes each phase, and critically compares them to the proposed Northern Corridor concept (NCC). No research has yet examined the NCC's complementarity with Quebec's history of northern infrastructure development. While previous phases could be categorized as intraprovincial penetration corridors linking northern to southern Quebec, the NCC aims to develop an interprovincial economic corridor for landlocked provinces to be able to gain better sea access. Obstacles arising from the conciliation of past developments with the NCC include the unfitness of using existing infrastructures in Quebec for a Pan-Canadian corridor and differing development trajectories at the provincial and federal levels. Three route options for the NCC in Quebec are presented in this study. More generally, this paper outlines difficulties specific to subarctic remote corridor development.

Key words: economic corridor; infrastructure; transportation; development; nordicity; Northern Corridor concept; subarctic; northern Quebec; Canadian federalism

RÉSUMÉ. Des propositions de projets d'infrastructure dans le Nord canadien gagnent du terrain parmi la classe politique, notamment celle d'un corridor reliant les régions nordiques de chacune des provinces du pays. Le Québec est la province la plus septentrionale et la plus vaste du Canada, ce qui la rend indispensable à la réalisation d'un tel corridor. L'étude des phases historiques de développement du nord du Québec est nécessaire afin d'évaluer les défis qu'engendra un projet de corridor nordique de ce genre. Cet article regroupe tous les développements en infrastructure du Québec nordique en trois grandes phases, les synthétise et les compare de façon critique au Concept de corridor nordique (CCN) proposé. Aucune étude ne fait état de cette comparaison à ce jour. Bien que les trois phases historiques de développement puissent être catégorisées comme étant des corridors de pénétration intraprovinciaux reliant le nord au sud du Québec, le CCN cherche plutôt à développer un corridor économique interprovincial facilitant l'accès maritime aux provinces intérieures du Canada. Parmi les obstacles tenant de la conciliation de développements historiques avec le CCN se retrouvent l'incapacité d'utiliser les infrastructures existantes au Québec dans le cadre d'un nouveau corridor pancanadien et des différences entre les visions du développement du gouvernement provincial et du gouvernement fédéral. Trois options potentielles pour le CCN au Québec sont présentées dans cette étude. Plus largement, cet article souligne les difficultés propres au développement de corridors subarctiques en régions éloignées.

Mots clés : corridor économique; infrastructure; transport; développement; nordicité; Concept de corridor nordique; subarctique; Nord du Québec; fédéralisme canadien

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INTRODUCTION

Canada's Great North has been the subject of much speculation as modern technology allows the sparsely populated region to become more accessible. Provinces and territories with a stake in the Great North have engaged in reflective public debates about how to develop their northern regions, while some have already proposed more comprehensive infrastructure projects, such as Ontario's Ring of Fire road planning (Ontario Chamber of Commerce, 2014), Yukon's Resource Gateway Program (Government of Yukon, 2021) or Canada's Arctic and Northern Policy Framework (CIRNAC, 2019). Quebec, in particular, has brought this debate to the forefront of its politics with the introduction of the province's Plan Nord in 2011, and in 2020 with the announcement of a new James

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Bay Region development project, "La Grande Alliance," proposing better maintenance of existing northern roads as well as the construction of new roads connecting southern transportation infrastructures to isolated towns.

Uniting the country through infrastructure development has a long history in Canada. A transcontinental railway was one of the conditions of the first constitution of Canada in 1867, the British North America Act. In the 1930s, the federal government contributed to the construction of highways by provinces by funding 50% of the expenditures. The goal was to build a road crossing the country without having to enter the United States. The construction of the Trans-Canada highway in the 1950s was driven by the federal government's will to construct a high-quality highway connecting both sides of the country in the shortest distance possible as well as its generous funding (Turgeon and Vaillancourt, 2002). Since the 1960s, the idea of a northern infrastructure corridor in Canada has been floated around as a new path to the country's development (Hopper, 2016). Imagined as a northern multimodal corridor spanning Canada from one coast to another, the concept has gained traction amongst members of Canada's political class (Provost, 2018). Sulzenko and Fellows (2016) formally presented their vision of the Canadian Northern Corridor concept (NCC), underlining the advantages and disadvantages of an economic corridor through Canada's North, spanning from British Columbia to Labrador and consisting of power lines, railways, roads, pipelines, and telecommunication cables. Canada's 2019 federal election brought forth a certain level of enthusiasm for a new energy corridor among politicians (Canadian Press, 2019) but also highlighted the divisiveness of new energy propositions in a political climate of environmental urgency (Barlow and Nadeau, 2019). The proposed multimodal corridor is a base model for territorial development that could be socially, economically, politically, and environmentally beneficial for Canada according to Fellows et al. (2020).

Since the post-war era, many projects to develop Quebec's North have been proposed. Some have been put into action to "colonize" (Duhaime et al., 2013) the North and exploit its plethora of natural resources, whether it be Hydro-Quebec's projects in the James Bay region or the more recent Plan Nord. Since Hydro-Québec's massive northern hydroelectric projects in the 1970s, there has been a political will among Quebec's elected officials to make northern Quebec more accessible to prospecting interests and inhabitants. The rollout of grand infrastructure projects to connect the sparsely populated North to the more densely populated South has been a result of this political will. In contrast, the NCC promotes communication between Quebec and its neighbouring provinces, Ontario and Newfoundland and Labrador (Sulzenko and Fellows, 2016).

A handful of researchers have pored over different facets of the proposed NCC. Sulzenko and Koch (2020) explored potential policy pathways for the project, while Wright (2020) established its legal environment in terms of Indigenous consultation. Rodrigue (2021) studied the corridor in the context of Canadian transport systems, and Pearce et al. (2020) attempted to evaluate the project's risks related to climate change. While existing literature has sought to effectively probe critical features of the NCC for all of Canada, no research has specifically touched upon northern Quebec and even less examined the complementarity between historical infrastructure development in Quebec and the proposed NCC. What infrastructures were built in northern Quebec? What northern development plans were put into place? Is the NCC aligned with Quebec's past northern infrastructure projects? Is the political vision of the NCC similar to that of past projects? Are the geographical outlines of existing infrastructures and proposed infrastructures reconcilable? Are there opportunities that could arise from the complementarity of historical projects and future projects?

In this article, we will attempt to answer these questions by defining "northern infrastructure," grouping these infrastructures into an original three-phase framework, and comparing major historical transportation infrastructure developments in northern Quebec to the infrastructure development proposed by the Canadian NCC. Further, we will propose three options for future corridor planning in the region.

METHODOLOGY

We define three original historical phases of large-scale transportation infrastructure development in northern Quebec as cases to be compared against the proposed Canadian NCC. For the purpose of this article, a "northern infrastructure" is defined as an infrastructure that connects two points (railways, roads, and high-voltage power lines) and either crosses or is above the limit between northern and southern Quebec as defined further.

We then systematically survey the existing infrastructures corresponding to the definition of a northern infrastructure. This enumeration was achieved by filtering all the existing infrastructures in Quebec by whether they abided by the above-prescribed definition. Using data from Université Laval's GéoIndex database and QGIS 3.18, we geographically determined which infrastructures were considered "northern" by mapping the coordinates of the infrastructures. Data points that have a latitude with a higher value than the North-South delimitation were considered to be northern. We then generated a map showing Quebec's northern infrastructures overlaid by the delimitation of the North and the South (Fig. 1). We also generated a map showing northern infrastructures overlaid by the proposed route of the NCC (Fig. 2). These representations are unique in that they visually identify and define Quebec's northern infrastructures using an empirical method to quantify nordicity. We generated a map showing three corridor options using existing infrastructures in northern Quebec (Fig. 3).

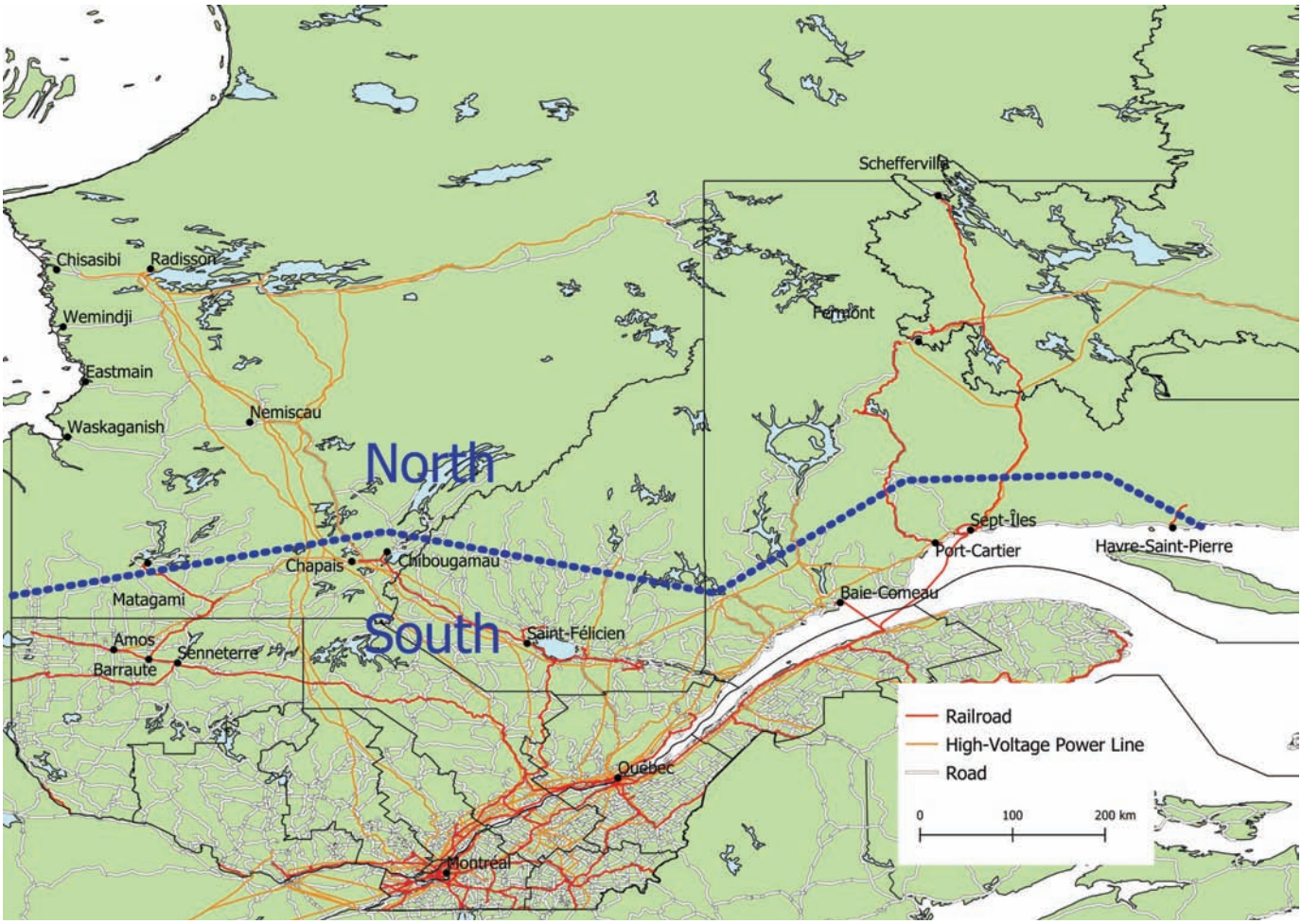

FIG. 1. Map of existing infrastructures in northern Quebec with the delimitation of the "North" as per Hamelin's 2000 VAPO boundary.

To this day, there is no clear delimitation or definition in the literature of the phases of infrastructure development in northern Quebec. We address this gap by dividing Quebec's northern infrastructures into three distinct phases. We use purposeful sampling to select the historical cases. This nonprobability selection method employs specific criteria to create a sample of objects sharing predefined traits (Patton, 1990). We chose to define each case as a group of northern infrastructure projects that together form a phase of infrastructure development in Quebec's history. Each phase is defined by the time frame in which the infrastructures were built and common objectives shared by the aggregated infrastructure projects of a grouping. The common objective criteria are the types of infrastructures built, the types of resources extracted, the level of involvement of Quebec's government in the construction, and the ownership of the infrastructures. Geographical progression into more northern territories was also taken into account. New infrastructure developments are typically adjacent to existing networks. Thus, when analyzing infrastructure development chronologically, newer infrastructures tend to further penetrate the North than their predecessors. We primarily use the time frame criterion to separate the broad periods of Quebec northern infrastructure development sharing common traits. We group together infrastructures that were built in the same time period while having certain common objectives. The phases and periods could overlap by a few years, but each had to represent a novel and distinct phase in Quebec's northern infrastructure development that could easily be distinguishable from the other phases. After clustering the master list of enumerated infrastructures using the criterion of each construction, we created three tables (Tables 1, 2, and 3). The NCC would represent a hypothetical novel phase of development for the Province of Quebec if the proposal was carried out and was considered as such in the analysis.

We make the comparison between Quebec's history of development and the proposed corridor by using two frameworks defining the stages of a transportation corridor or economic corridor. A transportation corridor is "a coordinated bundle of transport and logistics infrastructure and services that facilitates trade and transport flows between major centers of economic activity" (Kunaka and Carruthers, 2014:1) On the other hand, an economic corridor "connects economic agents along a defined geography" and is "integral to the economic fabric and the economic actors surrounding it" (Brunner, 2013:1) Both definitions complement each other, the first underlining the role of

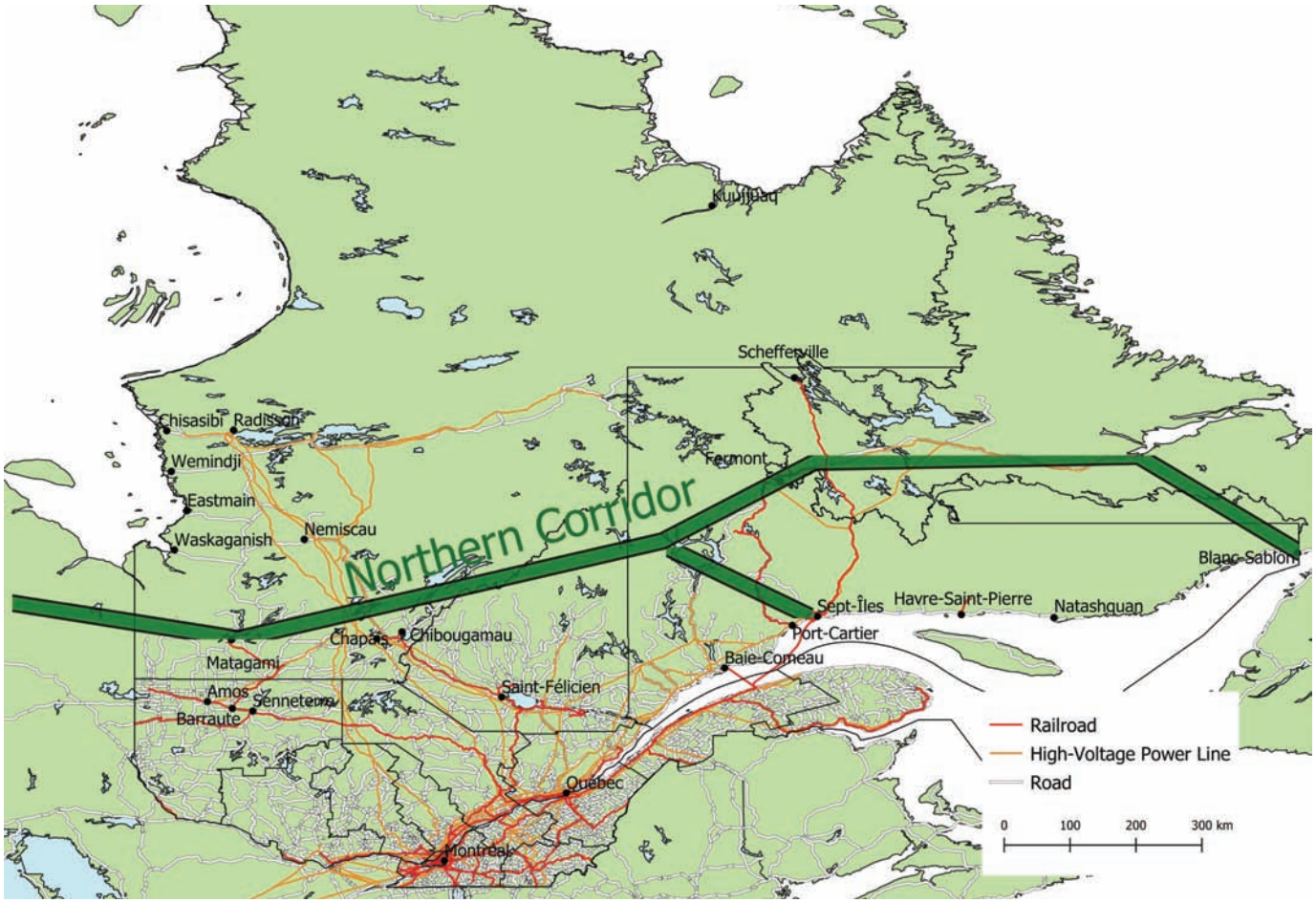

FIG. 2. Map of existing infrastructures in northern Quebec and the preliminary outline of the Canadian Northern Corridor concept.

infrastructures and the second the economic dimension. Each of the four phases of development is categorized according to two concurring corridor frameworks to reflect this complementary approach: Comtois's (2012:69) classification of transportation corridors and Banomyong's (2013:88–91) stages of economic corridor development.

Comtois (2012) defines three types of transportation corridors:

- Penetration corridor: "Construction of an infrastructure connecting two points with a goal of transporting goods, equipment and manpower between those two points."
- Chain corridor: "Sequence of transportation corridors in which the entrance to one is the exit of another in an itinerary of many destinations."
- Centrifugal corridor: "Agglomeration of corridors using different modes of transportation which connect hubs along an axial belt. Integration of infrastructures in production, transformation and consumption of goods."

Banomyong (2013) defines four phases in economic corridor development:

- Transport corridor: "Corridor that physically links an area or region."
- Multimodal Transport corridor: "Corridor that physically links an area or region through the integration of various modes of transport."
- Logistics corridor: "Corridor that not only physically links an area or a region but also harmonizes the corridor's institutional framework to facilitate the efficient movement and storage of freight, people, and related information."
- Economic corridor: "Corridor that is able to attract investment and generate economic activities along the less developed area or region. Physical linkages and logistics facilitation must first be in place."

These two frameworks allow for a better categorization of the types of development projects that have already taken place in juxtaposition with the NCC proposal.

This article's research design can be considered a mixed research design, both qualitative and quantitative. It is mostly qualitative because of the case study approach utilized. It also has quantitative components due to the use of geographic software to determine if an infrastructure is considered "northern." A multi-case approach comparing three historical phases to the NCC was preferred over a two-case design (i.e., one that compares the NCC to Quebec's history as a whole), because it singles out certain

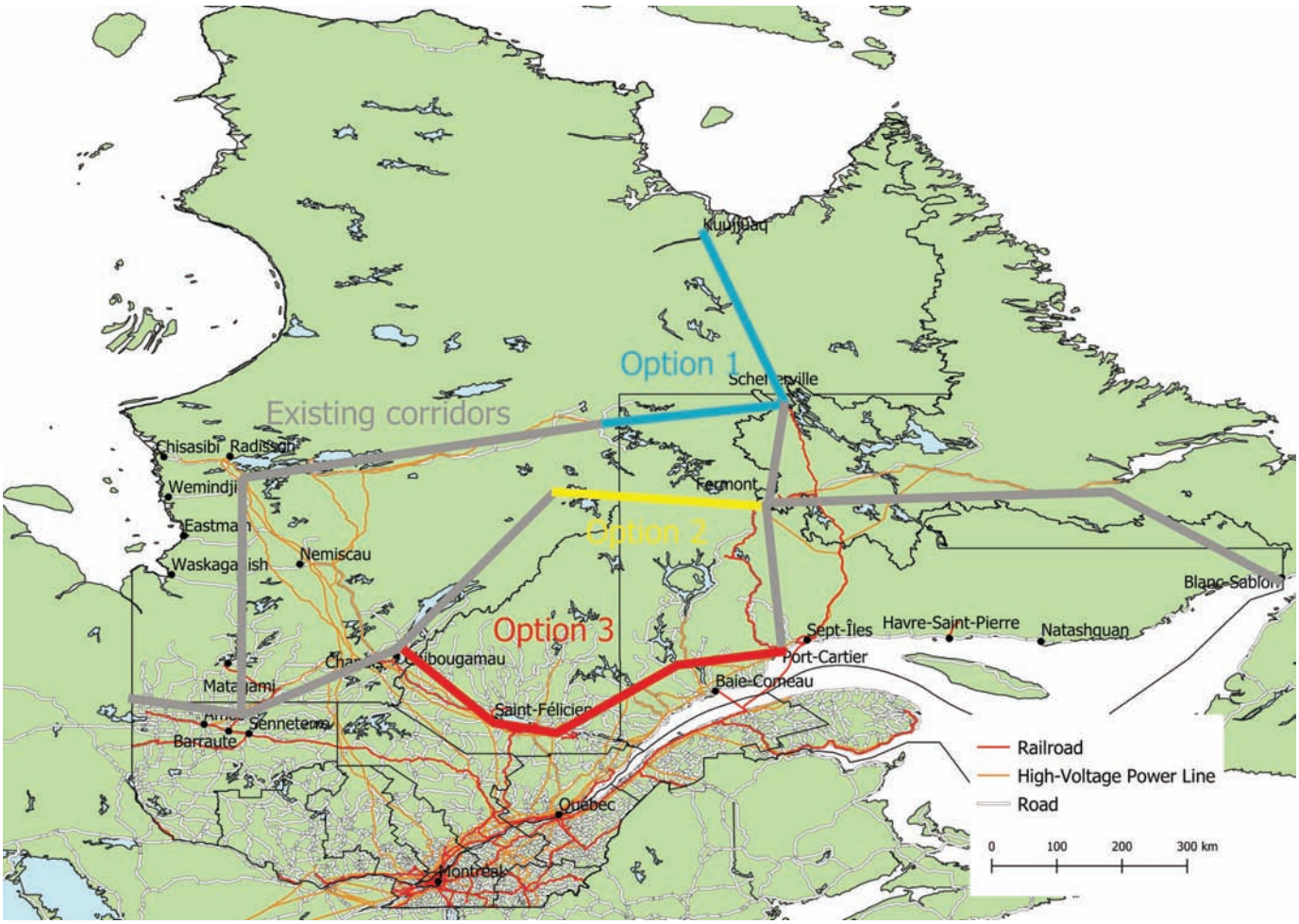

FIG. 3. Map of existing infrastructures in northern Quebec and three potential options for the Canadian Northern Corridor concept.

components from the history of infrastructure development in northern Quebec. For this research design, we preferred purposeful sampling over probability sampling because one of our objectives is to only examine infrastructure that fits certain criteria rather than all infrastructures in Quebec across all time periods.

Data needed for the comparative case studies analysis were collected from archival sources. Maps of the current electrical, rail, and road infrastructures were used to draw a list of existing infrastructures, and coordinates and geographic data were collected on the GéoIndex platform. Specific information pertaining to the list entries were collected through a documentation study of Quebec's Ministry of Transportation's archives and Hydro-Quebec's public records, consulted at Bibliothèque et Archives nationales du Québec in Montreal.

NORDICITY IN QUEBEC

To analyze the different projects that have been proposed to develop Quebec's North, it is important to first define the North as objectively as possible. The definition of what constitutes Quebec's North has evolved with time. The province of Quebec's geographical delimitations changed in 1898 with the province's enlargement up to the James Bay (Province of Quebec, 1898), in 1912 with the addition of present-day Nunavik (Province of Quebec, 1912), and in 1927 with the redefinition of the borders of Labrador (Judicial Committee of the Privy Council, 1927). These changes also modified the definition of the province's North. Until the start of northern infrastructure development in the second half of the 20th century, Quebec's North could be loosely defined as the northern Laurentians, the Abitibi Lowlands, the Lac-Saint-Jean region, and anything further septentrional (Duhaime et al., 2013; Simard, 2017a). Nowadays, this definition is largely outdated in determining what truly constitutes the "North," as most of these regions have developed economically and technologically, distancing them semantically from what would be considered the vast uncharted territories more commonly referred to as "northern Quebec." To define the North in the context of the proposed NCC, we use a more contemporary definition.

Simard (2017b) chronologically compared four different ways of defining what constitutes Quebec's North according to four different researchers who studied Quebec nordicity. He examined the different conceptions of the North and

compared them, discussing the geographical, sociological, and anthropological implications of each perspective. He noted the value of each approach and tried to decipher the intent or ideology behind each one. This article will only take into account the more objective and geographical methods explicated by Simard. These methods will draft a clearer path towards identifying which infrastructures can be considered as genuinely northern with the least ideological bias possible and reliably based on palpable scientific measurements. Simard (2017b) suggested that Louis-Edmond Hamelin's (1968, 1975, 2000) work, together with that of Jules Dufour (1993, 1996, 2012), is possibly the most pertinent in establishing an objective framework as to what constitutes Quebec's North based on geographic and socioeconomic data. This suggestion resonates with Graham's (1990) findings on the different methods used to delineate Canada's North and her conclusion that Hamelin's method remains very useful in delimiting what constitutes the North (Graham, 1990). Furthermore, McNiven and Puderer (2000) used many of the same criteria as Hamelin in their delineation of the Canadian North, and Vaguet et al. (2018) judged Hamelin's method to be relevant in delineating the North at a global scale. It is also important to note that Dufour's work mostly built off of Hamelin's. Given the legacy of Hamelin's method in the existing literature and its loyalty to an objective indicator, we focus on Hamelin's definition of the North.

Hamelin is a pioneer concerning Quebec's North, and the study of nordicity worldwide. He defines the word "nordicity" in the Canadian context as the polar level of a location in the Northern Hemisphere, measurable and evolutive in time (Hamelin, 1975). He also created a tangible and empirical definition for the measure of nordicity. He created a polar value indicator or "VAPO" that can measure the nordicity of a town or locality by generating a score of 1000, where 0 is "least northern" and 1000 is "most northern." The sum of 10 criteria that make up the indicator each evaluated on scales of 1 to 100 equals the score on 1000. Six of the ten criteria are strictly geospatial or biophysical (latitude, number of summer days, annual freezing days, level of permafrost, levels of precipitation, vegetation) and four out of 10 criteria are socioeconomic (access by road or boat, access by plane, population density, economic activity) (Hamelin, 1968). Much like a topographic altitude map, Hamelin's VAPO indicator allows for the creation of what he called "Isonords" or lines on a map delimiting the zones of a given VAPO score. From a score of 200 to 300, he considered the zone to be the "Lower Middle North," from 300 to 500, the "Upper Middle North," and above 500, the "Great North" (Hamelin, 2000).

Taking into account these criteria, it is evident that his model underlines the evolutive nature of his definition of nordicity (Vaguet et al., 2018). The environmental criteria could change progressively and may change more and more rapidly due to climate change. Still, the socioeconomic criteria have the biggest potential for change due to the possibility of a rapid decrease in the criteria from any form of economic development in the concerned regions. This is an important point to underline when qualifying infrastructures as "northern" with this measuring system. According to this scale, the very construction of a proposed northern infrastructure project could lower the nordicity level of the region in which it is built. Economic activity, access (air, road or rail), and population tend to fluctuate positively with the arrival of large infrastructure projects in a region. The VAPO scores would have to be updated periodically for them to stay accurate over time. Any update would most probably push the limit of the Lower Middle North northbound incrementally, proportionately to the northern infrastructure projects constructed over time. Furthermore, Hamelin's methodology could also serve as a way to empirically track the progress of northern infrastructure development by recalculating the VAPO score for different localities over time. The evolutive aspect of this measurement scale does not inherently discredit this tool as a way to determine what is North and what it isn't, but it is important to keep in mind that what is considered "northern" today may not be tomorrow.

Nonetheless, for the objectives of this article, Hamelin's scale is currently the most accurate tool to be able to judge if a town or locality is considered northern based on factors that are measurable through obtainable data. The spatial and physical nature of the infrastructures examined in this article justifies the need for a measuring tool that takes into account these qualities. The infrastructures that will be considered as northern in the following parts of this article will be those that cross the 200 VAPO isonord or are fully located above it (Hamelin, 2000). This theoretical border between the North and the South is shown in Figure 1.

EXISTING TRANSPORTATION INFRASTRUCTURES IN NORTHERN QUEBEC

The infrastructures that cross the 200 VAPO isonord or are above it are relatively few compared to the totality of infrastructures in Quebec. Previous literature has sought to divide existing infrastructures by northern region or type of infrastructure (Paquet, 2001; Brisson, 2014). These categorizations do not take into account the historical background of infrastructure development or the geographical progression of infrastructures into more northern regions. Consequently, the data we collected were used to generate three distinct groupings of infrastructures based on when they were constructed and the objectives set during planning.

The groupings take into account the chronology of infrastructure developments in northern Quebec as well as the objectives and stakeholders driving these developments. The first grouping includes infrastructures that were built primarily to serve private interests before Hydro-Quebec's rise. Because of the sheer quantity of infrastructure projects, the state enterprise initiated, and the circumstantial monopoly the organization had on

northern development for many years, Hydro-Quebec can be considered to have played a pivotal role in developing Quebec's Middle North. As such, there is a substantial concentration of infrastructure development in the years marking the crown corporation's expansion. The second grouping includes the infrastructures related to these Hydro-Quebec projects. Northern Quebec infrastructure development experienced a hiatus following the Hydro-Quebec golden age, with no infrastructure projects proposed or brought to fruition between 2001 and 2011, the latter in which the Plan Nord was proposed. The third grouping comprises all the infrastructures built following the Plan Nord proposal.

The first group (Table 1) encompasses the infrastructures constructed from 1949 to 1963 that were mostly used for the transportation of minerals from the Lower Middle North to southern Quebec. Private companies were predominantly involved in the construction and operation of the infrastructures, the majority of which were railways. The second group (Table 2) includes the infrastructures related to Hydro-Quebec's hydroelectric infrastructure projects in the Middle North from 1953 to 2001. Since Hydro-Quebec is a state-owned company, the infrastructures constructed in this period benefited from a high level of government involvement. The third group (Table 3) consists of the infrastructures built more recently as part of the Plan Nord development scheme, which was a collaboration between government and private interests. The only determining factor in grouping these infrastructures is their affiliation with the Plan Nord. In the following section, each infrastructure group is broached as a historical case study

THREE PHASES IN THE DEVELOPMENT OF NORTHERN QUEBEC

Since the 1950s, government agencies as well as private interests have sought to develop resource-rich northern Quebec by planning infrastructure projects that facilitate the extraction of its bountiful natural resources. Minerals and hydroelectricity have been the main drivers of development, requiring the construction of railways, roads, and power lines to connect the resource extraction points to the South's infrastructures.

Phase 1: Mining in Northern Quebec: From Pre-North to Mid-North

Prior to the development of northern infrastructures, regions in the periphery of what can be considered the North were colonized, including Lac-Saint-Jean, Abitibi, and Côte-Nord. This colonization was accompanied by several infrastructure projects that constituted the first incursions into the Lower Middle North.

The first permanent settlements in the Lac-Saint-Jean region were established in the first half of the 19th century (Girard et al., 2012). By 1869, the first railway connecting Quebec City to the region was built. In the early 1900s, mining companies and prospectors started evaluating the geological content of the regions beyond the Saint-Jean Lake, notably near Lake Chibougamau, farther northwest. Narrow and rustic winter roads were built as early as 1910 to link Saint-Félicien in Lac-Saint-Jean to the Lake Chibougamau region. The main purpose of these roads was to cater to the needs of the expansive wood industry. By 1938, several mining companies were exploiting mineral deposits near Chibougamau, but the capacity of the existing transportation infrastructures wasn't sufficient to justify large-scale mining operations. In 1949, the first gravel road connecting Saint-Félicien to Chibougamau was completed to better serve the mining companies with titles in the region. In 1957, the construction of a railway from Barraute in Abitibi to Chibougamau was completed to facilitate the transportation of mined metals to refining plants in Abitibi. Two years later, in 1959, a railway was built to connect Chibougamau to Saint-Félicien, forming a rail loop connecting Abitibi to Lac-Saint-Jean. The portion of the railway between Abitibi and Chibougamau has since closed, but the other portions of the railways mentioned above are still in operation.

In Abitibi, modern infrastructure developments date back to the beginning of the 20th century. Following the redefinition of Quebec's borders in 1898 (Province of Quebec, 1898), Abitibi went through several waves of colonization driven by the provincial government's economic policies. Because of its dense forests and rich gold deposits, the region experienced an industrial boom that incited the creation of towns along the Cadillac fault. The Transcontinental Railway, finished in 1913, was the first to connect Montreal to the Abitibi region. The Quebec government's 1934 Vautrin Plan, named after the then-Minister of Colonization Irénée Vautrin, intensified colonization efforts and generated population growth in the region. At the time, the Ministry of Colonization was mandated with making land suitable for agriculture. In the context of the Great Depression, there was a strong back-to-the-land movement, which renewed this Ministry's importance. Jobs were plentiful in rural areas and city dwellers left urban centers for Abitibi with the promise of newfound wealth. By the 1950s, mining promoters in the region wanted to develop regions farther north, aware of substantial mineral deposits near the present-day town of Matagami. The road connecting Matagami to Amos, one of the cities bordering the Transcontinental Railway, was completed in 1961. The town was also connected by railway to the rest of Canadian National's network in 1963 by a diversion at the Franquet junction on the Barraute-Chibougamau railway (Gourd, 2007). The infrastructure projects to Matagami and Chibougamau mark the beginning of infrastructure development in the James Bay region, also known as "Jamésie" in French.

The Côte-Nord region's economy was mostly driven by commercial fishing until the 1920s when the pulp and paper industry developed coastal fishing villages such as

TABLE 1. First group of infrastructures: Mining in northern Quebec.

Infrastructure name	Owner	Northern region of Quebec	Type of infrastructure	Year of original construction	Southernmost point	Northernmost point	Length (km)
Romaine River Railway	Rio Tinto, Iron & Titanium Inc.	Côte-Nord	Rail	1949	Havre-Saint-Pierre	Lac-Allard	43
Quebec Route 167	Ministry of Transportation of Quebec	Jamésie	Road	1949	Saint-Félicien	Chibougamau	202
Quebec North Shore and Labrador Railway	Iron Ore Company of Canada[1] Tshiuetin Rail Transportation Inc[2]	Côte-Nord	Rail	1954	Sept-Îles	Schefferville	578
Barraute-Franquet Railway	Canadian National	Jamésie	Rail	1955	Barraute	Franquet	126
Chapais-Chibougamau Railway	Canadian National	Jamésie	Rail	1957	Chapais	Chibougamau	37
Saint-Félicien-Chibougamau Railway	Canadian National	Jamésie	Rail	1959	Saint-Félicien	Chibougamau	229
Port-Cartier-Mount Wright Railway	Arcelormittal Infrastructure Canada SENC	Côte-Nord	Rail	1960[3] and 1977[4]	Port-Cartier	Mount Wright	420
Quebec Route 113	Ministry of Transportation of Quebec	Jamésie	Road	1960	Senneterre	Chibougamau	341
Quebec Route 109	Ministry of Transportation of Quebec	Jamésie	Road	1961	Amos	Matagami	223
Franquet-Matagami Railway	Canadian National	Jamésie	Rail	1963	Franquet	Matagami	99

[1] Owner from Sept-Îles to Emeril Junction
[2] Owner from Emeril Junction to Schefferville
[3] Date of construction from Port-Cartier to Gagnon
[4] Date of construction from Gagnon to Mount Wright

TABLE 2. Second group of infrastructures: Hydro-Quebec.

Infrastructure name	Owner	Northern region of Quebec	Type of unfrastructure	Year of original construction	Southernmost point	Northernmost point	Length (km)
Bersimis Complex HVPL[1]	Hydro-Quebec	Côte-Nord	Power Line	1953	Montreal	Bersimis-1 Power Station	≈600
Quebec Route 389	Ministry of Transportation of Quebec	Côte-Nord	Road	1961	Baie-Comeau	Labrador City	567
Churchill Falls HVPL	Hydro-Quebec	Côte-Nord	Power Line	1971	Baie-Comeau	Churchill Falls	412
Manic-Outardes Complex HVPL	Hydro-Quebec	Côte-Nord	Power Line	1971	Quebec City	Manic-5 Power Station	974
James Bay Road	Hydro-Quebec	Jamésie	Road	1974	Matagami	Chisasibi	620
Quebec Route 138	Ministry of Transportation of Quebec	Côte-Nord	Road	1976	Sept-Îles	Havre-Saint-Pierre	218
Transtaïga Road	Hydro-Quebec	Jamésie	Road	1979	Radisson	Caniapiscau Reservoir	666
James Bay Transportation Netwirk (Phase 1)	Hydro-Quebec	Jamésie	Power Line	1984	La Grande Hydroelectric Complex	Montreal	≈1000
Wemindji Road	Ministry of Transportation of Quebec	Jamésie	Road	1992	Wemindji	Junction with James Bay Road	96
North Road	Ministry of Transportation of Quebec	Jamésie	Road	1993	Junction with Quebec Route 167	Junction with James Bay Road	406
Eastmain Road	Ministry of Transportation of Quebec	Jamésie	Road	1994	Junction with James Bay Road	Eastmain	103
Quebec Route 138	Ministry of Transportation of Quebec	Côte-Nord	Road	1996	Havre-Saint-Pierre	Natashquan	151
James Bay Transportation Netwirk (Phase 2)	Hydro-Quebec	Jamésie	Power Line	1996	La Grande Hydroelectric Complex	Montreal	≈1000
Waskaganish Road	Ministry of Transportation of Quebec	Jamésie	Road	2001	Junction with James Bay Road	Waskaganish	102

[1] HVPL = High Voltage Power Lines

TABLE 3. Third group of infrastructures: Plan Nord.

Infrastructure name	Owner	Northern region of Quebec	Type of infrastructure	Year of original construction	Southernmost point	Northernmost point	Length (km)
La Romaine Complex Power Lines	Hydro-Quebec	Côte-Nord	Power Line	2012	Havre-Saint-Pierre	La Romaine Complex	262
Quebec Route 138	Ministry of Transportation of Quebec	Côte-Nord	Road	2013	Nastashquan	Kegashka	40
Quebec Route 167	Ministry of Transportation of Quebec	Jamésie	Road	2013	Témiscamie	Stornoway Renard Diamond Mine	240

Baie-Comeau or Sept-Îles into small industrialized cities. Most of the economic activity was concentrated around the coast. The mineral-rich Labrador fault, for which the southernmost point is located in the northern part of the Côte-Nord region, was mostly unexploited and uninhabited. In 1948, Quebec Iron and Titanium started investing in a mine north of Havre-Saint-Pierre. A year later, in 1949, a 43 km railway was built to connect the mine to the town on the riverside of La Romaine River. In 1950, the construction of an ambitious project, a railway that would connect the coast to mines in Labrador, commenced. Polar weather and the 578 km of tracks through treacherous terrain dragged the construction of the railway over four years. In 1954, the railway known as the Quebec North Shore and Labrador Railway was completed, connecting Sept-Îles with Schefferville, a mining town founded the same year, located on the border of Quebec and northern Labrador. In 1960, a third railway was built, stretching from Port-Cartier on the coast to the town of Gagnonville (Leclerc, 1988). All three railways were built to bring iron ore from the north to the sea and are still in operation today. The port installations of the maritime access points that act as the southern ends of the railways developed infrastructures to process and load the iron ore onto ships, creating jobs and economic activity.

The totality of the infrastructures developed for mining was meant to connect the more densely populated South to the resource-rich North. Most of the transportation infrastructures mentioned above are directly or indirectly linked to growth in Quebec's mining sector following the Second World War. Although an important phase of infrastructure development, there was no cohesive plan by the government or a single private interest in this phase. Each infrastructure project was more or less stand-alone, with singular objectives specific to the infrastructure being built. Private companies had infrastructures built to service the demands of extraction sites in the Lower Middle North. Northern Quebec's plentiful mineral resources undoubtedly played an important role in the territory's early infrastructure development.

Railways characterize this era of northern resource exploitation. They are the remnants of the railway's glory days in the first half of the 20th century, but are still ubiquitously used for mining applications in northern Quebec to this day. Quebec's first phase of northern development could be characterized as a period of extractivism, which is defined as removing natural resources in large quantities before transformation, usually to be exported (Acosta, 2013). While many of the extracted resources transported by railways financed by mining companies were meant for use in southern Quebec, they weren't processed or transformed in northern regions. The extractivism practiced in northern Quebec, while offering the provincial mining industry a competitive advantage by enhancing the means of transportation and economies of scale, has not always yielded perennial benefits for northern communities. Many mining towns established with the construction of these railways experienced severe economic downturn following the closing of each's nearby mine. For example, Gagnonville in Côte-Nord was once a booming mining town attracting inhabitants and investments but is now a deserted ghost town barely on the map. The infrastructure planning in this phase of development was profit-driven and sought out financial opportunities from the North in the short-term, with no other real goal but to access the resources as efficiently and cheaply as possible (Duhaime et al., 2013).

Phase 2: Hydro-Quebec: Up the Middle North's Rivers

Hydro-Quebec, the state-owned electricity utility of the Government of Quebec, was instrumental in developing northern Quebec's infrastructures. Hydro-Quebec's rapid expansion in the 1960s and its large dams are a symbol of Quebec nationalism and the economic growth of the province. Many of the rivers that are used to produce electricity are located in remote regions of northern Quebec. The grand-scale production of electricity by way of hydroelectric dams required the construction of service roads and high-voltage electrical lines to connect the dams with southern Quebec, where most of the electricity is consumed. The crown corporation's projects in the James Bay region and the upper Côte-Nord region helped build a big part of the northern infrastructures that are in use today.

The Bersimis-1 and Bersimis-2 hydroelectric generating stations were built in 1953 and 1959 along the Betsiamites River in the Lower Côte-Nord region (Bélanger and Comeau, 1995). While both stations are not quite located in what Hamelin considers to be the Lower Middle North, the Betsiamites River project was different from previous generating station projects in that the facilities were built over 600 km away from Montreal in a mostly inaccessible region.

The electrical lines linking the stations to Montreal were a substantial challenge for Hydro-Quebec's engineers. To lose the least amount of energy possible and construct fewer lines over such distances, it was desirable for the cables to be serviced with a very high voltage. Jean-Jacques Archambault, a young engineer working for Hydro-Quebec at the time, convinced senior engineers that the power lines could be run at 315 kV rather than the era's standard of 120 kV. In 1960, he developed the technology to run power lines at 735 kV (Archambault, 1984). Such advancements in energy transportation gave Hydro-Quebec the confidence to propose projects farther north, thus paving the way for the development of northern infrastructures.

The 1960s marked the start of Hydro-Quebec's venture into Quebec's North. The Manic-Outardes project, for which the planning started in 1955, set out to utilize the hydroelectric potential of the Manicouagan and Outardes Rivers in the Côte-Nord region. A total of seven power stations were built from 1964 to 1978, the largest and northernmost being the Daniel-Johnson Dam and power station built in 1964 (Bolduc et al., 1989). Three power lines each spanning 974 km at a voltage of 735 kV were built to connect the power stations to Montreal. Archambault's technology proved itself to be efficient to transport electricity over such distances (Paradis, 1967). In 1969, Hydro-Quebec agreed to buy the electricity generated from the Churchill Falls generating station located in Labrador. This station was one of the biggest hydroelectric projects of its time, financed in part by the Newfoundland government, the Rothschilds and other prominent British financiers (Bolduc et al., 1989). To honour the agreement, in 1971 the public utility built three 735 kV power lines connecting the station in Labrador to the southernly coastal power lines (Coté, 1972).

While the Manic-Outardes and Churchill Falls projects were able to supply electricity to Quebec's inhabitants in 1970, Hydro-Quebec was predicting that by 1980 their output wouldn't be sufficient. The government was at a crossroads—it needed to decide if more hydroelectricity projects were a better option than increasingly efficient nuclear energy production (Bolduc, 2000). In 1972, after evaluating the hydroelectric potential of many bodies of water in northern Quebec, the Government of Quebec decided to build generating stations along La Grande River in the James Bay region (Bolduc et al., 1989). This marked the start of what was named the "James Bay Project." The infrastructure developments outlined for La Grande River in 1972 would be later known as Phase 1 of the James Bay Project. A narrow temporary service road was first constructed connecting the town of Matagami to the mouth of La Grande River to kickstart the construction of the hydroelectric complex. The permanent road, known as the James Bay Road, was completed two years later in 1974. In 1979, a second road, known as the Transtaïga Road, was built from the mouth of La Grande River to the Caniapiscau reservoir 554 km east. From 1973 to 1984, three power generating stations were built along La Grande River. To connect these stations to Montreal and Quebec City, five 735 kV power lines were built spanning over 1000 km each (SEBJ, 1987).

Phase 2 of the James Bay Project commenced in 1988 and consisted of the construction of two new power generation stations on La Grande River as well as the addition of two more power lines to connect the generating stations to the south, which were finally completed in 1996 (SEBJ, 1996). Roads connecting the small coastal towns of James Bay to the James Bay Road were built from 1992 to 2001. Meanwhile, the government announced the Grande-Baleine Project, which involved the construction of more generating stations on the Grande Rivière de la Baleine, Petite Rivière de la Baleine, and the Coast River, located in Nunavik, north of La Grande River. However, after a series of conflicts with the local Cree community, the project was cancelled (Dufour, 1996). It would have been the first major infrastructure project in the Nunavik region, and the northernmost hydroelectric project in Quebec to this day.

Hydro-Quebec's vast hydroelectric projects contributed to developing roads and power lines in northern Quebec. The communities on the coast of the James Bay would have otherwise been isolated from any road access. Harnessing the hydroelectric capacity of Quebec's mighty rivers assuredly incentivized the development of Quebec's North.

Hydro-Quebec's objective was to help the province gain autonomy through a plan of nationalization of natural resources. The sheer size of the projects constructed in the North became a symbol of Quebec's success following the Quiet Revolution. To this day, the celebration of this success is still a part of the province's collective consciousness and identity (Perron, 2003). Hydro-Quebec's role in Quebec society is larger than that of only being a state-run utility. The James Bay Project has had a lasting impact on the way southern inhabitants of Quebec view northern Quebec. The projects the corporation undertook shaped the common thinking of Quebeckers and forced Quebec to take stock of certain issues head-on such as Indigenous issues (Savard, 2009). Cooperation with Indigenous communities in the James Bay region wasn't easy throughout this phase of development, but it was nonetheless improved, culminating in "The Peace of the Braves" (Paix des Braves) agreement in 2002 between Cree nations and the Quebec government (Secrétariat aux affaires autochtones, 2002). The agreement ensured that revenues from forestry, mining, and hydroelectricity were shared equally with inhabitants of the Cree lands from which resources were exploited.

Phase 3: Plan Nord: Unfinished Business

The end of the 1990s saw a slowdown of important northern infrastructure developments in Quebec. To this day, no infrastructure projects of the magnitude of Hydro-Quebec's James Bay Project have been completed. The cancellation of the Grande-Baleine Project and greater concern for the territorial rights of Indigenous communities made the planning of infrastructure projects in the North

slightly more contentious and politically hazardous (Brun et al., 2017).

Nonetheless, the question of transportation infrastructure to connect the Nunavik region to the south was seen as the next frontier of Quebec's northern development. Nunavik, the portion of Quebec traditionally inhabited by the Inuit north of the 55th parallel, spans part of the Upper Middle North and the Great North. The Great North had yet to become accessible. Nunavik's remoteness and low population density made it difficult to justify the construction of infrastructures. However, in 1997, the Ministry of Transportation of Quebec mandated a group of its experts to evaluate the feasibility of a road or rail link connecting the town of Kuujjuaq near Ungava Bay to the rest of Quebec's infrastructure network. The study proposed two different routes: 1) Schefferville to Kuujjuaq and 2) the end tip of the Transtaïga Road to Kuujjuaq. The authors of the study preferred the Schefferville option to the Caniapiscau option, even if the latter would be less expensive to build (MTQ, 1997). Ultimately, the study didn't lead to the construction of a road or railway, and no projects connecting Kuujjuaq to the south were initiated.

In 2011, the Government of Quebec announced a large-scale northern economic and social development plan. The Plan Nord earmarked 80 billion dollars in public and private funds to develop a multitude of projects as well as predicting the creation of 20,000 new jobs in northern Quebec (Canadian Press, 2011). The projects proposed were far-ranging: transportation infrastructure projects, mining partnerships with private firms, and hydroelectric projects with Hydro-Quebec. The Plan Nord was touted as a comprehensive development project of the North, creating jobs for Indigenous communities and generating overwhelmingly positive and perennial economic activity to localities that had experienced economic hardship. Private companies were meant to invest in infrastructure projects that would create economic activity as well as make remote parts of northern Quebec accessible. Of the transportation infrastructure projects proposed in Plan Nord's documentation, the following projects are those that suggested the construction of new infrastructures (Brisson, 2014):

- prolonging Quebec Route 138 in Côte-Nord from Natashquan to Blanc-Sablon,
- prolonging the James Bay Road from Radisson to Kuujjuarapik in Nunavik,
- prolonging Quebec Route 167 from Témiscamie to join the Transtaïga Road,
- constructing power lines leading to the Romaine hydroelectric power stations, and
- prolonging the Quebec North Shore and Labrador Railway from Schefferville to Kuujjuaq.

Some of these projects were put into action, others weren't. Route 138 was prolonged in 2013 to Kegashka. Currently, construction for the portion linking Kegashka to La Romaine is underway, and feasibility studies to evaluate the costs of a road to Blanc-Sablon are being done (Société du Plan Nord, 2017). The project to prolong the James Bay Road was axed from the Plan Nord's infrastructure priorities and is not planned any time soon (Secrétariat au Plan Nord, 2015). Route 167 was extended to the Stornoway Renard Diamond Mine in 2013, but connecting the mine to the Transtaïga Road is no longer on the table. Power lines connecting the Romaine generating stations were built in 2013 by Hydro-Quebec. The railway expansion to Kuujjuaq was subject to a pre-feasibility study in 2011 (Genivar, 2011) before being subsequently abandoned.

The Plan Nord was supposed to be a great leap forward in Quebec's northern development. By 2015, the public's expectations were already much lower than those of 2011 and the plan's objectives were less ambitious. Many mining companies that had spoken of investing in projects included in the Plan Nord had pulled out of the development plan before 2015 because of crashing commodity prices on the global markets. The infrastructure projects that were supposed to rejuvenate and develop remote communities were more or less abandoned because of lack of interest (Brun et al., 2017). Ultimately, the only infrastructure projects that were built were ones that were already planned prior to 2011, those of Hydro-Quebec and Route 138, as well as the prolongation of Route 167, built essentially to serve a private company's diamond mine. The Plan Nord could hardly be considered a comprehensive northern development plan.

THE CANADIAN NORTHERN CORRIDOR'S PROPOSED QUEBEC PORTION

In 2016, the University of Calgary's Policy School researchers Andrei Sulzenko and Kent Fellows published an article outlining a proposal for what they call the "Northern Corridor concept" (Sulzenko and Fellows, 2016). This article and a subsequent article specifying this proposal (Fellows et al., 2020) compare the project to previous projects that cross the whole country. In the past, the federal government of Canada has fostered large-scale transportation infrastructure projects connecting different provinces, such as the Canadian National Railway, the Canadian Pacific Railway, the St. Lawrence Seaway, and the Trans-Canada Highway. These four projects have all depended on the cooperation of provinces including that of Quebec. Since the late 1960s, there has been little interest in constructing Pan-Canadian infrastructures, with most large infrastructure projects in Canada being organized at the provincial or municipal level (Fellows et al., 2020). While enthusiasm for Pan-Canadian projects may have diminished, enthusiasm for large infrastructure projects in general continued. Quebec's northern infrastructure boom in the 1960s, 1970s, and 1980s, in part caused by Hydro-Québec's success, is a direct result of this continued enthusiasm. Because of how monumental a development

program of the likes of the NCC is, it would become a completely new phase of infrastructure development in northern Quebec. To better identify the implications of this proposal, it is important to understand what it suggests in terms of Quebec's northern development.

Fellows et al. (2020) drew a rough outline of what the corridor would look like on a map. The outline for the corridor utilizes existing infrastructures to conceive an infrastructure framework that would cover many unserved regions of Canada while connecting transport hubs and junctions to sea access. As shown in Figure 2, the rough outline connects northern Ontario to what can be made out as Matagami in Jamésie. The corridor then runs north to a remote point in the Nord-du-Québec administrative region that could best be described as the extremity of the Manicouagan Reservoir. At this point, the corridor splits into two lanes, one culminating in Blanc-Sablon at the Labrador and Quebec border and the other at Sept-Îles in Côte-Nord. Both lanes allow for the northern corridor to connect to the St. Lawrence Seaway and the Atlantic Ocean. It is interesting to note that the outline of the northern corridor as proposed by Fellows et al. (2020) and shown in Figure 2 closely resembles the delimitation of the North and South in Figure 1. The proposal connects several towns located directly above or below this delimitation, which are commonly seen as gateways to the North, such as Matagami, Chibougamau, and Sept-Îles. This route indicates that the northern corridor is less of a vehicle to reach new remote locations in northern Quebec, but rather a new way for locations that are already connected to the southern road network to communicate with each other.

If one of the objectives of the northern corridor is to make use of existing infrastructures in northern Quebec (Sulzenko and Fellows, 2016), new roads connecting existing roads or railways would likely be the most plausible and least costly way to roughly attain Fellows et al.'s (2020) outline. Three distinct opportunities for the Quebec segment of the NCC could constitute potential options for the project's stakeholders. These options are shown in Figure 3 (grey denotes existing infrastructure corridors). The first option, as proposed by the Ministère des Transports du Québec (MTQ, 1997), is that of connecting Caniapiscau to Schefferville and Schefferville to Kuujjuaq by prolonging the Transtaïga road (extension marked in blue). The second option would be to extend route 167 beyond the Stornoway Diamond Mine, all the way to Fermont, connecting it to Labrador's highway network (extension marked in yellow). The third option (in red) is a corridor that closely follows the border between the North and the South as shown in Figure 1. This corridor would essentially reuse existing infrastructures connecting Abitibi to Lac-Saint-Jean, Lac-Saint-Jean to Port-Cartier and Port-Cartier to Fermont. Rather than build new roads, Option 3 would seek to augment the capacity of existing roads and would possibly increase the performance of the new corridor. All three options feature a connection with Labrador. The second option would be the closest to the NCC outlined by Fellows et al. (2020), while the first option is the least in line with it. The first option offers a connection to Nunavik, a region that currently has no road infrastructure, while the second and third options are more focused on an east-west connection. The objectives of the corridor would have to be clearly defined to choose between these three options.

DISCUSSION

Quebec's northern development history is almost exclusively based on the notion that there is a plethora of resources to be extracted and brought south for transformation and commerce. Each phase of Quebec's northern development sought to create penetration corridors, as defined in Comtois's (2012) classification. All of the infrastructures built or planned during the three phases of northern infrastructure development in Quebec were meant to connect the peripheral regions of southern Quebec to the resource-rich northern regions to transport the resources for consumption or transformation in the south (Proulx, 2014). In Banomyong's (2013) classification of corridors, the three phases would be considered transport corridors. While the Hydro-Quebec and Plan Nord phases opt for multimodal options within its proposed corridors, the exploratory nature of the projects involved does not allow the corridors created to graduate to the rank of a logistics corridor or economic corridor.

The NCC: A New Type of Corridor in Québec's Middle North

The Canadian NCC seeks to attain many different objectives—improving economic outcomes for the country, improving standards of living in northern Canada, streamlining environmental protection, safeguarding Indigenous agency, and promoting Canada's global and strategic significance (Fellows et al., 2020). These objectives would mostly be achieved by way of country-wide integration of northern transportation networks to maximize the economic impact of infrastructure investments while reducing the negative environmental and social externalities.

However, given the magnitude of the investments needs and the trade growth sought after, the principal objective of the Canadian northern corridor is the pursuit of economic growth for the country as a whole. The rationale for the corridor is largely driven from the gains to be made in the extraction and trade of natural resources, still accounting for roughly 20% of Canada's gross domestic product. Canada still has important infrastructure bottlenecks, namely overcrowded ports in big cities and too few reliable roads in remote areas (Rodrigue, 2021). To this day, the extraction of resources in remote areas and international trading of those resources remain costly and logistically complicated because of the lack of infrastructure in

northern Canada. Landlocked resource-rich provinces could export their resources to coastal provinces to access the international market. However, apart from an increase in trade, it is not clear that Quebec stands to directly benefit from such an arrangement, as the province already has access to the St. Lawrence Seaway to efficiently export resources.

Table 4 shows northern Quebec's three phases of development compared to the NCC. The NCC is meant to create a different type of corridor. In Comtois's (2012) classification, the northern corridor would be more akin to a "chain corridor." The NCC seeks to promote trade between provinces (Sulzenko and Fellows, 2016). This objective is different from the penetration corridors previously employed in northern Quebec, where the interprovincial trade component was inexistent, and the idea of many locations connected to each other to form a network was secondary.

According to Banomyong's classification (2013), the northern corridor as currently described is an economic corridor. Whether this is a realistic expectation is questionable, but what is clear is that the NCC espouses an ideal of national economic development, rejuvenating small towns through the attraction of investments, and connecting rural areas to Canada's greater transportation network. This concept is arguably also very different from Quebec's previous northern development plans, which promoted extractivism and did very little to create perennial and economically developed communities.

The NCC in Québec: A Complex Undertaking

The introduction of a new type of corridor in northern Quebec could be beneficial, considering enhanced trade with the rest of Canada and the development of the rural areas the corridor would cross. In this sense, the NCC captures an opportunity and sets out to do something that has never been done in the province. Exporting hydroelectricity to Ontario and connecting the existing penetration corridors transversally have merit. However, Quebec's history of choosing resource-extraction corridors for northern Quebec may be a testament to the complexity in undertaking projects such as the NCC.

Existing infrastructures in northern Quebec can, with difficulty, be used in the conception of a northern corridor in respect to the Fellows et al. (2020) outline. A way to limit costs is to build off what has already been built, which could allow the corridor to become functional quickly and connect existing towns and economic centers to the new infrastructure project. The proposed route cuts across Quebec from west to east, almost perpendicularly to existing infrastructures. This isn't so much bad planning as an illustration of the reality of Quebec's existing infrastructures, which more or less follow a north-south axis. Any corridor to Nunavik would be extremely costly and would keep following a north-south axis while also making a sizeable detour using the Transtaïga road. If anything, the two corridors that could accommodate the trans-provincial ambitions of the NCC are that of Route 167 connecting to Fermont (Option 2 in Fig. 3) and the pre-existing infrastructures connecting the St. Lawrence Seaway to Labrador (Option 3 in Fig. 3). The former would still require huge investments to make a suboptimally long road functional while the latter forces the northern corridor to dip south to reach the St. Lawrence Seaway. This route would mean that the proposed corridor would either involve the construction of a new road through completely uncharted territories at a hefty price tag or be a corridor that wouldn't be "northern" the whole way. Both Comtois's and Banomyong's classifications outline a gradation of interconnection and economic involvement leading to a type of high-intensity corridor. Proposing a full-blown economic corridor with little consideration for the directionality and geographic reality of existing corridors bypasses these steps and puts any economic corridor project in peril.

Firstly, the corridor concept's socioeconomic goals are possibly more in line with the provincial government's recent objectives. A better quality of life for northern communities and respect and reconciliation in regards to the Indigenous peoples of Quebec are part of the current provincial government's Grande Alliance plan (Government of Québec, 2020). Construction of infrastructures to connect remote areas to more populated centers has been shown to reduce poverty rates (Fan and Chan-Kang, 2005; Khandker et al., 2009) and improve access to schooling, healthcare (Asher and Novosad, 2018), and employment (Olsson, 2009). In that respect, the NCC has the potential to achieve its quality-of-life goal. It is less clear how successful the NCC will be in safeguarding Indigenous agency. While not a proposal for the construction of specific infrastructures at specific locations, the NCC proposal describes the constitution of a right-of-way

TABLE 4. Comparison of historical periods of northern infrastructure development in Quebec with the Northern Corridor concept.

Case	Time period	Type of corridor proposed		Modes of transportation planned	Type of financing
		Comtois classification	Banomyong classification		
Mining in Northern Quebec	1949–63	Penetration corridor	Transport corridor	Railways, roads	Private
Hydro-Quebec	1953–2001	Penetration corridor	Multimodal transport corridor	Roads, power lines	Public
Plan Nord	2011–present	Penetration corridor	Multimodal transport corridor	Roads, power lines, railways	Public/private
Northern Corridor concept	N/A	Chain corridor	Economic corridor	Roads, power lines, railways, pipelines	Public/private

in a predetermined geographical corridor in northern Canada. Federal and provincial governments would create an environment to facilitate private infrastructure investments within the corridor, thus mitigating risks associated with large-scale projects and lowering the barriers for subsequent investment (Sulzenko and Fellows, 2016). While a proper governance framework has yet to be established, Sulzenko and Koch (2020) have explored the different policy framework options that could be put to use. Within the proposed frameworks, the decision on a precise corridor route and the review of a route proposal are unquestionable steps in the process. The consultation of Indigenous peoples would most likely fit itself into these steps. Wright (2020) eloquently argues that the vagueness of the NCC as to which types of infrastructures would be built at which locations presents a serious issue in the consultation of the Indigenous communities whose treaty lands would be affected. For the government to meaningfully consult a community regarding a project, the consultation has to touch upon a specific proposed activity in a specific context. The fact that the corridor concept remains an abstract concept for which it is difficult to predict exactly what infrastructures would be built makes productive consultations problematic. Wright's analysis is especially relevant to Quebec, where there are six distinct Indigenous nations spanning a vast territory. During consultations for the Plan Nord, only four of those six nations were consulted. A divide-and-conquer strategy was adopted by the provincial government, pitting communities within nations against each other to advance its political agenda. Roads were built in northern regions, but the resulting infrastructure construction was arguably more for the benefit of mining companies rather than the proximal Indigenous communities (Asselin, 2011). Consultations for the northern corridor would have to be more inclusive and less focused on partner corporations of mining projects.

Secondly, for the corridor's environmental components, much has yet to be researched. Rodrigue (2021) examined the challenges the environment presents to transport grids in the context of the Canadian northern corridor, while Pearce et al. (2020) cited the impacts of climate change on the construction, operation, and maintenance of the corridor. Sulzenko and Koch (2020) underlined the importance of environmental impact assessments in the governance policy framework of the corridor. However, no such assessment has yet been completed. The rationale highlighted by Fellows et al. (2020) is one of limiting environmental damage by focalizing the infrastructure development along a limited surface area across great distances. The lack of literature pertaining to environmental impacts of the corridor is a problem, especially in the Quebec context where public acceptance of new large-scale projects is largely dependent on sustainability and eco-friendliness.

Lastly, Canadian federalism isn't always a political stance that gets a lot of traction in Quebec. Hydro-Quebec's projects are widely regarded as a first step in the emancipation of the province as well as the most popular accomplishments of northern development projects. French-speaking Quebeckers, once economically downtrodden, attribute a part of the economic success of the province to state involvement in natural resource extraction. The Hydro-Quebec phase of northern development also coincided with two referendums to gain autonomy from the centralized federal government or separate unilaterally from Canada. Since then, any form of involvement on the part of Canada's federal government in the province's affairs is subject to additional scrutiny. All three previous phases of development in Quebec sought to attain provincial objectives rather than federal ones. It is safe to say that the NCC is enmeshed in a vision of interprovincial cooperation. It is not unimaginable that a federally funded economic corridor seeking to exploit northern Quebec and sell Western provinces' resources through Quebec's ports could be perceived as a form of erosion of Quebec's autonomy.

The mode of financing proposed in the NCC has somewhat of a bad track record in Quebec. A framework for private financing with some public financing was an ingredient in the recipe for certain of the Plan Nord's shortcomings. The moment mining companies saw their potential earnings crumble through changes in the global commodity market, the provincial government was caught funding the ongoing infrastructure projects and was no longer able to fully deliver on its socioeconomic objectives. The unrealized opportunity of the Plan Nord due to losses incurred by changing commodity prices is a testament to the importance of economic diversity. The northern setting is characterized by a few industries that have a high level of economic dependence on global demand of natural resources. In turn, the lack of economic diversity in northern regions makes northern infrastructure projects fragile and puts undue pressure on stakeholders involved. If risk is not properly distributed between stakeholders or codified prior to the start of the project, project failure is a possibility. The situation as experienced by the Plan Nord developers could certainly reproduce itself in a manifold project such as the NCC. which involves several public and private interests in a dozen Canadian provinces and territories. Penetration corridors with objectives of resource extraction in Quebec seem to have fared better with single stakeholders and clear ambitions. Promoters of remote and extractive corridors in Quebec should be cautious when opting for private/public models of financing. Caution and better risk allocation are inevitably conducive to reaching the NCC's main objectives.

CONCLUSION

This study compares the Canadian NCC to the history of northern infrastructure development in Quebec. No specific information pertaining to Quebec's northern infrastructure development in relation to the NCC has previously been published. Quebec is the second most populous province of Canada, is the largest one by area, and is one of the two only

provinces to have an Arctic region. Understanding how the NCC contrasts with previous corridor developments in northern Quebec is essential in evaluating the feasibility of the corridor in a pan-Canadian context. Previous literature had not addressed this historical comparison in any way. Examining the way past corridor developments and the corridor that is currently proposed intersect, both literally and figuratively, offers necessary information for provincial northern development government stakeholders. Further, this study defines what a northern infrastructure is in the Canadian context, which had not previously been done. It comprehensively traces back the history of infrastructure development in northern Quebec. It outlines a novel intuitive framework to categorize the phases of infrastructure development in northern Quebec, which is not only useful to stakeholders in the Canadian northern corridor project, but also to scholars of many disciplines who will undoubtedly study the region's development over the next decades as northern Canada opens up to trade. Finally, this study proposes route options that can make use of existing infrastructures in northern Quebec.

This article makes an important contribution to the shallow body of literature pertaining to the future of Quebec's northern infrastructure development. While not approving or disapproving the idea of a northern corridor, we demonstrate that the NCC differs from previous phases of northern development in the province. Financing, geography, and political climate remain important challenges ahead and will assuredly influence the project's outcome. During the last century, northern development in Quebec has mutated from extractivism in the Lower Middle North to state-run renewable energy development plans to failed private/public infrastructure development partnerships. The NCC may or may not be the next installment of Quebec's northern development. The three options presented in this study map out the opportunities available for this installment.

As the NCC becomes clearer with growing input from its stakeholders, the solutions to the challenges presented by Quebec's unique northern infrastructure development context will become discoverable. For the time being, researchers must focus on the conciliation of Quebec's existing infrastructures with those proposed by the NCC. Any concrete proposition for infrastructure development in northern Quebec must take into account the political history of the province and the motivations behind previous infrastructure developments. This political history includes the relationship between Quebec and Canadian federalism, which has driven pan-Canadian infrastructure development in the past. Environmental impact studies must be conducted to ensure the ecological integrity of Quebec's pulchritudinous wilderness. Finally, Indigenous communities whose lands would be affected by the construction of infrastructures resulting from the NCC have to be thoroughly consulted and given the chance to participate in all stages of the development project.

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REFERENCES

Acosta, A. 2013. Extractivism and neoextractivism: Two sides of the same curse. Beyond development. In: Lang, M., and Mokrani, D., eds. Beyond development: Alternative visions from Latin America. Quito, Ecuador: Fundación Luxemburg; Amsterdams, The Netherlands: Transnational Institute. 61–86. https://www.tni.org/files/download/beyonddevelopment_extractivism.pdf

Archambault, J.-J. 1984. Une technologie maîtrisée. In : Couture, M., ed. Hydro-Québec – Des premiers défis à l'aube de l'an 2000. Société d'édition de la revue Forces. Montreal, Québec: Libre Expression. 125–137.

Asher, S., and Novosad, P. 2018. Rural roads and local economic development. Policy Research Working Paper 8466. Washington, D.C.: Development Research Group, World Bank Group. https://doi.org/10.1596/1813-9450-8466

Asselin, H. 2011. Plan Nord: Les Autochtones laissés en plan. Recherches amérindiennes au Québec 41(1):37–46. https://doi.org/10.7202/1012702ar

Banomyong, R. 2013. Comparing corridor development in the Greater Mekong Subregion and the Indonesia–Malaysia–Thailand growth triangle. In: Fau, N., Khonthapane, S., and Taillard, C., eds. Transnational dynamics in Southeast Asia: The Greater Mekong Subregion and Malacca Straits economic corridors. Singapore: ISEAS–Yusof Ishak Institute. 84–104. https://doi.org/10.1355/9789814517904-010

Barlow, J., and Nadeau, J.-B. 2019. Le corridor énergétique existe déjà. *Le Devoir*, October 17. https://www.ledevoir.com/opinion/idees/564967/le-corridor-energetique-existe-deja

Belanger, Y., and Comeau, R. 1995. Hydro-Québec : Autres temps, autres défis. Sainte-Foy: Presses de l'Université du Québec. 352 p.

Bolduc, A. 2000. Du génie au pouvoir : Robert A. Boyd, à la gouverne d'Hydro-Québec aux années glorieuses. Montréal, Québec: Libre Expression. 259 p.

Bolduc, A., Hogue, C., and Larouche, D. 1989. Hydro-Québec, l'héritage d'un siècle d'électricité. Montreal, Québec: Libre Expression / Forces. 341 p.

Brisson, P. 2014. Le Plan Nord du gouvernement du Québec : analyse du design, du positionnement et de la planification stratégique des projets d'infrastructures de transport. MA thesis, l'Université de Montréal, Montréal, Québec.

Brun, A., Harbour-Marsan, È., Lasserre, F., et Mottet, É. 2017. Le Plan Nord : enjeux géopolitiques actuels au regard des « Plans Nord » passés. Recherches sociographiques. 58(2):297–335. https://doi.org/10.7202/1042165ar

Brunner, H.-P.W. 2013. What is economic corridor development and what can it achieve in Asia's subregions? Asian Development Bank Economics Working Paper Series No. 117. https://doi.org/10.2139/ssrn.2306801

Canadian Press. 2011. Charest unveils $80B plan for northern Quebec. *CBC News*, May 9. https://www.cbc.ca/news/canada/montreal/charest-unveils-80b-plan-for-northern-quebec-1.1001327

———. 2019. Andrew Scheer pitches national 'energy corridor' in Edmonton. *Global News*, September 28. https://globalnews.ca/news/5964903/andrew-scheer-national-energy-corridor-edmonton/

CIRNAC. (Crown-Indigenous Relations and Northern Affairs Canada). 2019. Canada's Arctic and Northern Policy Framework. Ottawa: CIRNAC. https://www.rcaanc-cirnac.gc.ca/eng/1560523306861/1560523330587

Comtois, C. 2012. Définition et perimètre des grands corridors de transport fluvio-maritime. In: Alix, Y., and de Monie, G., eds. Les corridors de transport. Le Havre: Fondation Sefacil. 63–86.

Coté, L. 1972. L'énergie en héritage : l'aménagement hydro-électrique de Churchill Falls, de l'avant-projet à la réalisation. St. John's: Churchill Falls (Labrador) Corp. 75 p.

Dufour, J. 1993. Les revendications territoriales des peoples autochtones ua Québec. Cahiers de géographie du Québec 37(101):263–290.

———. 1996. Le projet Grande-Baleine et l'avenir des peuples autochtones au Québec. Cahiers de géographie du Québec 40(110):233–252. https://doi.org/10.7202/022570ar

———. 2012. Plan Nord : la dérogation aux droits ancestraux et fonciers des autochtones. http://www.mondialisation.ca/plan-Nord-la-d-rogation-aux-droits-ancestraux-et-fonciers-des-autochtones/30730?print=1

Duhaime, G., Brousseau, S., Grenier, J., Therrien, A., and Beaudoin-Jobin, C. 2013. Le développement du Nord et le destin du Québec. Recherches sociographiques 54(3):477–511. https://doi.org/10.7202/1021001ar

Fan, S., and Chan-Kang, C. 2005. Road development, economic growth, and poverty reduction in China. Research Report 38. Washington, D.C.: International Food Policy Research Institute. https://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/70020/filename/70021.pdf

Fellows, G.K., Koch, K., Munzur, A., Mansell, R., and Forest, P.G. 2020. The Canadian Northern Corridor: Planning for national prosperity. The School of Public Policy Publications 13: 28. https://doi.org/10.11575/sppp.v13i0.71388

Genivar. 2011. Étude de préfaisabilité, réalisation d'un tronçon ferroviaire reliant Schefferville et Kuujjuaq. Montréal, Québec: Genivar Inc.

Girard, R., Auger, R., Collette, V., David, D., Labrèche, Y., and Perron, N., eds. 2012. Histoire du Nord-du-Québec. Québec: Les Presses de l'Université Laval. 554 p.

Gourd, B.-B. 2007. L'Abitibi-Témiscamingue : Les régions du Québec histoire en bref. Québec: Les Presses de l'Université Laval. 196 p.

Government of Québec. 2020. Memorandum of understanding on the Cree-Québec Sustainable Infrastructure Development Program in the Eeyou Istchee James Bay Region. Montreal.

Government of Yukon. 2021. Learn about the Yukon Resource Gateway Program. Whitehorse. https://yukon.ca/en/doing-business/funding-and-supports-business/learn-about-yukon-resource-gateway-program

Graham, A. 1990. Indexing the Canadian North: Broadening the definition. Northern Review 6:21–37. https://thenorthernreview.ca/index.php/nr/article/view/255

Hamelin, L.-E. 1968. Un indice circumpolaire. Annales de Géographie 77(422):414–430. https://doi.org/10.3406/geo.1968.15690

———. 1975. Nordicité canadienne. Montréal, Québec: Hurtubise HMH. 444 p.

———. 2000. Le Nord et l'hiver dans l'hémisphère boréal. Cahiers de géographie du Québec. 44(121):5–25./ https://doi.org/10.7202/022879ar

Hopper, T. 2016. The grandiose—but failed—1960s plan by an Ontario war hero to settle a 'second Canada' below the Arctic. *The National Post*, September 1.

Judicial Committee of the Privy Council. 1927. In the matter of the Boundary between the Dominion of Canada and the colony of Newfoundland in the Labrador Peninsula between the Dominion of Canada of the one part and the Colony of Newfoundland of the other part. UKPC 25. Report of the Lords of the Judicial Committee of the Privy Council. https://www.bailii.org/uk/cases/UKPC/1927/1927_25.html

Khandker, S.R., Bakht, Z., and Koolwal, G.B. 2009. The poverty impact of rural roads: Evidence from Bangladesh. Economic Development and Cultural Change 57(4):685–722.
https://doi.org/10.1086/598765
Kunaka, C., and Carruthers, R. 2014. Trade and transport corridor management toolkit. Washington, D.C.: World Bank.
https://doi.org/10.1596/978-1-4648-0143-3
Leclerc, R. 1988. L'infrastructure ferroviaire du Québec-Labrador. Annales de Géographie 97(543):578–592.
McNiven, C., and Puderer, H. 2000. Delineation of Canada's North: An examination of the North–South relationship in Canada. Geography Working Paper Series No. 2000-3. Ottawa: Geography Division, Statistics Canada.
https://www150.statcan.gc.ca/n1/en/pub/92f0138m/92f0138m2000003-eng.pdf?st=DIBzh6cj
MTQ (Ministère des transports du Québec). 1997. Scénarios de désenclavement et d'amélioration du transport Kuujjuaq-Caniapiscau-Schefferville / Région du Nord du Québec / Étude de pré-faisabilité.
Olsson, J. 2009. Improved road accessibility and indirect development effects: Evidence from rural Philippines. Journal of Transport Geography 17(6):476–483.
https://doi.org/10.1016/j.jtrangeo.2008.09.001
Ontario Chamber of Commerce. 2014. Beneath the surface: Uncovering the economic potential of Ontario's Ring of Fire.
https://occ.ca/wp-content/uploads/Beneath_the_Surface_web-1.pdf
Paquet, S. 2001. Histoire des transports et des déplacements au Québec. Québec : Ministère des Transports du Québec.
Paradis, P. 1967. Manic-Outardes : sept centrales sur deux rivières : l'aménagement hydroélectrique des rivières Manicouagan et Aux Outardes. Montréal, Québec: Hydro-Québec.
Patton, M.Q. 1990. Qualitative evaluation and research methods, 2nd ed. Newbury Park, California: Sage.
Pearce, T., Ford, J.D., and Fawcett, D. 2020. Climate change and implications for the proposed Canadian Northern Corridor. The School of Public Policy Publications 13:26.
https://doi.org/10.11575/sppp.v13i0.69570
Perron, D. 2003. On est Hydro-Québécois : Consommateur, producteur ou citoyen? Analyse de la nationalisation symbolique d'Hydro-Québec. Globe 6(2):73–97.
https://doi.org/10.7202/1000817ar
Proulx, M.-U. 2014. Nouveau cycle économique en périphérie nordique – Une lecture de la première décennie. L'Actualité économique 90(2):121–144.
https://doi.org/10.7202/1027975ar
Province of Quebec. 1898. The Quebec Boundary Extension Act, 1898. Assented to 13 June.
———. 1912. The Quebec Boundaries Extension Act, 1912. Assented to 1 April.
https://www.solon.org/Constitutions/Canada/English/Misc/qbea_1912.html
Provost, K. 2018. Federal transport minister calls proposed $100B Northern Corridor 'an appealing.' *CBC News*, October 13.
Rodrigue, J.-P. 2021. Constraints in the Canadian transport infrastructure grid. The School of Public Policy Publications 14(1): 70156.
https://doi.org/10.11575/sppp.v14i.70156
Savard, S. 2009. Quand l'histoire donne sens aux représentations symboliques : l'Hydro-Québec, Manic-5 et la société québécoise. Recherches sociographiques 50(1):67–97.
https://doi.org/10.7202/029969ar
SEBJ (Société d'énergie de la Baie James). 1987. Le complexe hydroélectrique de la Grande Rivière : réalisation de la première phase. Montréal, Québec: SEBJ / Éditions de la Chenelière. 496 p.
———. 1996. Le complexe hydroélectrique de la Grande Rivière : réalisation de la deuxième phase. Montréal, Québec: SEBJ. 427 p.
Secrétariat au Plan Nord. 2015. Plan Nord à l'horizon 2035, plan d'action 2015–2020. Québec: Gouvernement du Québec.
http://www.plannord.gouv.qc.ca/wp-content/uploads/2015/09/BCH_Long_PN_FR_vF2.pdf
Secrétariat aux affaires autochtones. 2002. Entente concernant une nouvelle relation entre le gouvernement du Québec et les Cris du Québec. Québec: Gouvernement du Québec.
https://cdn-contenu.quebec.ca/cdn-contenu/adm/min/conseil-executif/publications-adm/saa/administratives/ententes/Cris/2002-02-07_cris-entente.pdf?1607004430
Simard, M. 2017a. Le Nord québécois : un plan, trois régions, neuf défis. Recherches sociographiques 58(2):263–295.
https://doi.org/10.7202/1042164ar
———. 2017b. Les conceptions du Nord chez les géographes québécois : une analyse comparée de quelques auteurs clés. Cahiers de géographie du Québec 61(173):253–272.
https://doi.org/10.7202/1049372ar
Société du Plan Nord. 2017. Extension of route 138 along the Lower North Shore. Press release, July 6.
Sulzenko, A., and Fellows, G.K. 2016. Planning for infrastructure to realize Canada's potential: The corridor concept. The School of Public Policy Publications 9(22).
https://doi.org/10.11575/sppp.v9i0.42591

Sulzenko, A., and Koch, K. 2020. Governance options for a Canadian northern corridor. The School of Public Policy Publications 13(27). https://doi.org/10.11575/sppp.v13i0.69291

Turgeon, M., and Vaillancourt, F. 2002. The provision of highways in Canada and the federal government. Publius: The Journal of Federalism 32(1):161–180. https://doi.org/10.1093/oxfordjournals.pubjof.a004927

Vaguet, Y., Couillet, A., and Colange, C. 2018. Measuring the nordicity of the Arctic today. International Congress of Arctic Social Sciences (ICASS IX), 8–12 June 2017, Umea, Sweden. https://halshs.archives-ouvertes.fr/halshs-01821814v1

Wright, D.V. 2020. Cross-Canada infrastructure corridor, the rights of Indigenous Peoples and 'meaningful consultation.' The School of Public Policy Publications 13. https://doi.org/10.11575/sppp.v13i0.69222