



Barriers to climate change adaptation in indigenous communities: A case study on the mohawk community of Kanesatake, Canada

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ABSTRACT

The switch from climate change mitigation to the adaptation to its impacts or effects initially appears to be a promising strategy. Academics and practitioners, however, confront limits and barriers to the adaptation both in theory and practice. Despite the extensive efforts in understanding limits and barriers, little is still known about political and institutional barriers, more specifically political challenges in Indigenous communities that typically nullify the effect of adaptation strategies. This study investigates the experience of the Mohawk community of Kanesatake, a First Nations community in Canada, during and after the 2017 and the 2019 floods in Quebec. Results reveal the links between the proximate set of barriers and historical, political pressures in Indigenous communities. Findings explain that unhealed wounds in relationships among nations generate political and institutional hurdles, which eventually orchestrate the co-occurrence of multiple barriers: the lack of land ownership rights, insurance, and social institutions such as police force and firefighters, to name a few. Findings have implications both for theory and practice. In theory, the findings reveal the fact that barriers are not mutually exclusive; in fact, they are often interdependent. In practice, findings support the fact that policies fail if they disregard underlying interdependencies.

1. Introduction

Economic incentives, political ignorance, and technical limits often hinder global efforts for the reduction of greenhouse gas emissions, causing a constant rise of global temperature, and consequently, producing vulnerability in particular groups. Unequal relations of power in the global political economy and incentives for development, among many other reasons, prevent sufficient decrease of greenhouse gas emissions that eventually necessitates adaptation to the undesirable, yet inevitable events. In scholarly discussions and international climate policy [1], a focus on reducing carbon emissions (mitigation) prevailed at first. The discourse of adaptation gradually appeared in the climate change literature in the 1990s, and in 2001, the Intergovernmental Panel on Climate Change (IPCC) for the first time claimed that adaptation strategy is necessary to complement climate mitigation efforts at all scales [2].

During the last few decades, the world has experienced a noticeable increase in the intensity and frequency of climate hazards. For instance,

according to The International Federation of Red Cross and Red Crescent Societies [3], between 2008 and 2017, the number of floods (1,522) and storms (1,001) increased more than five percent comparing the previous decade (1998–2007). Similarly, many areas across the globe have experienced intense heats waves and seasonal record highs in temperatures [4]. An example of such extreme weather is the heat wave of 2010 in Europe, which surpassed records not only in terms of temperature but also in geographical spread [5]. According to Seneviratne et al. [6]; it is highly likely that human influences have more than doubled the probability of hot European summer like that of 2010.

In response to the altering climate conditions now and in the future and to adjust to its adverse (or beneficial) impacts, climate change adaptation became a priority in international development agendas and broadly received recognition and resources. Despite globally equal emphases on climate change adaptation, researchers discover contextual barriers, which alternate adaptation capacities among different nations, regions, and communities [7–12]. The discourse around barriers is frequently formed around five dimensions, demonstrating how

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budgetary constraints, unavailable technology, lack of knowledge, multilevel institutional fragmentations, and different values, beliefs, and experiences in societies threaten adaptation strategies [13,14].

Notwithstanding the growing knowledge over barriers to climate change adaptation, there is still much to know about their underlying causes and short- and long-term consequences. An emerging body of work has raised critical understanding about political barriers to climate change adaptation in larger scales. For instance, Scoville-Simonds, Jamali and Hufty (2020, p. 1) distinguished three fundamental political adaptation problems, “related to differential responsibility, the global uneven production of vulnerability, and unequal relations of power in adaptation decision-making.” However, smaller scale political barriers to climate change adaptation and their underlying factors for excluding the interest of racial, ethnic, or minority groups in adaptation decision making remain less understood. In response, this study aims at examining barriers to climate change adaptation in Indigenous communities in southern Quebec, Canada, who typically suffer from long-standing socio-political tensions.

Previous studies have shown how Indigenous populations could be disproportionately affected by climate change due to “existing social gradients in health, close relationships with a rapidly changing environment for livelihoods and well-being, and capacity challenges and colonial legacies” [15]; p. 129 among other systemic barriers [1]. Some scholars also have argued the clash between the politics of energy and the politics of Indigenous people’s rights as an example of barriers to climate change adaptation in north slope of Alaska [16]. Their findings reveal the fact that tendency to marginalize the rights of Indigenous people in planning for the development of oil and gas resources in North America exacerbates their sensitivities to climate change and constitutes acute livelihood challenges. Recently, there has been a growing scholarly attention towards understanding challenges for climate change adaptation in Indigenous communities [17,18]. To contribute to this emerging body of knowledge, this study aims to better explain the underlying factors of barriers to climate change and their consequences in Indigenous communities. This paper examines the experiences of the Mohawk community of Kanasatake (a First Nation community located at the confluence of Ottawa and St. Lawrence rivers) after the 2017 and the 2019 floods in southern Quebec, Canada.

This objective implies developing an analytical framework that combines the concepts of vulnerability and adaptation. In this paper, we borrow the concept of underlying factors of vulnerabilities to explain the progress of barriers development, their underlying factors, and consequences in the form of increased vulnerabilities and decreased adaptation capacities. The theoretical framework guided the design of research methods, determined several themes to examine in this study, and helped us with interpreting results. Therefore, this article is structured as follows: the theoretical discussions and the framework are explained first. Then, the section of research method presents the qualitative methods used for this study. We then present the results in the form of a qualitative assessment of underlying factors of barriers to climate change adaptation in Indigenous communities. The section of discussion further elaborates on the theoretical and practical implications of the research findings.

2. Climate change adaptation barriers

Along with efforts for the mitigation of carbon emissions, adaptation to the unavoidable consequences of climate change became necessary for several reasons. Scientific analyses reveal the fact that the carbon dioxide already emitted will remain in the atmosphere for decades, affecting the climate still for many years even if the world stop emitting GHGs today [19–21]. Despite international endeavors for limiting global warming to 1.5° Celsius, researchers still expect our world continues suffering negative impacts on intensity and frequency of extreme events, on resources, ecosystems, biodiversity, and food security [12,22–24]. Besides, according to Pielke Jr et al. [25]; adaptation has become a

necessary strategy because those who suffer most from the effects of global warming are the poor countries and societies with the least responsibilities for the emissions and the most need for risk reduction measures for decades to come.

A general consensus on the concept of adaptation has emerged gradually in the climate change literature, which is broadly understood as “adjustment in natural or human systems in response to experienced or future climatic conditions or their effects or impacts—which may be beneficial or adverse” [26]; p. 882). In the other words, Nichol and Harford [27] argue that adaptation’s central purpose is to reduce vulnerabilities and build societal resilience. Many believe that humans are extraordinarily adaptive; individuals and communities have adapted to changing climatic conditions for millennia. Indigenous peoples, in particular, have witnessed, endured and adapted to environmental changes over thousands of years [28]. Yet, recently climate-related extreme events exceed our capacities to react and adapt, causing substantial losses economically and health wise.

As a result, adaptation to climate change became an urgent priority around the world. Since the 2000s, the IPCC and other international agencies and governments adopted an normative approach to adaptation and established top-down driven policies to largely avoid the cumulative effects of uncertain climatic changes and potential losses at the global scale [29,30]. For instance, within the United Nation Framework Convention for Climate Change (UNFCCC), the Green Climate Fund (GCF) is established as an operating entity of the Financial Mechanism to assist developing countries in adaptation to climate change. In fact, climate change appears as a priority at the top of the international development agenda, which broadly recognized by politician and received sizeable and increasing funding streams.

The top-down, physical approach to climate change, however, is repeatedly criticized by several scholars from different disciplines. For instance, Mercer (2010, p. 260) argue that the top-down approach of Climate Change Adaptation policies is “disconnected to a large extent from communities directly affected by climate change.” Critics argue that adaptation narratives mainly focus on technical solutions, overlooking social context, cultures, and power-relations on the ground [31, 32]. They also argue that an emphasis on physical adaptation “depoliticizes” responses to disaster risk reduction and masks failures in policies that have produced marginalization, exclusion, racism, colonialism, and other injustices [32,33]. As a result, the adoption and implementation of higher-scale adaptation strategies often contradict or devalue traditional knowledge and cultural values in smaller scales.

First Nations and Inuit peoples of Canada have been cited as more vulnerable to the climate mediated changes in their environment because, in part, of the strong biophysical and cultural connection and dependency on the land [34]. For example, Inuit communities and peoples are sensitive to the negative impacts of climate change due to their dependency on wildlife for sustenance foods [35], terrain conditions for the infrastructural integrity of buildings, which requires permafrost [36,37] and transportation such as ice bridges (M [38]. The disconnections between higher-scale adaptation strategies and the North American Inuit communities are consistent with other examples from India [39,40] and Brazil [41], where top-down policies undermine and devalue traditional adaptation capacities.

Drawing on findings from studies in Northern Canada, Ford et al. [42] explain how Indigenous communities experience climate change differently from others and thus require context-sensitive responses. Canadian Indigenous communities are significant examples in which historical events such as colonization have impacted their wellbeing and capacities. According to Turner and Turner [43]; Indigenous Peoples have been subjected to an immense array of precipitous changes as a result of historical events. In Canada, many indigenous communities have experienced undesirable changes resulted in hardship and even death such as debilitating disease epidemics; drastically reduced access to traditional lands and resources; erosion of traditional languages; reduced occasions for intergenerational learning; increasing loss of food

security; and accompanying declining health [28,34,44,45].

The mainstream research on Indigenous communities focus on providing materialistic solutions such as technological enhancement and health service improvement [14,46,47]. However, studies on how Indigenous communities perceive, understand and respond to climate change are largely absent. In fact, the historical and contextual complexities that underlie indigenous peoples' experiences with climate change have not yet been studied adequately [48]. Although several proximate factors such as poverty, ill health, social deprivation, and marginalization are usually recognized as limits to adaptation in Indigenous communities, there is still insufficient understandings of their historic, political, social and economic root factors [42].

To better understand barriers to climate change adaptation in Indigenous communities, this study relies on the concept of vulnerability. The discourse of vulnerability has a rich and long history in research on poverty and entitlement [49], food security [50], and more in general, on environmental change [51]. With respect to climate change, some researchers previously incorporated social and contextual factors into the discourse of vulnerability [52,53]. In hazard-related studies, however, a critical conception of vulnerability is produced with a specific attention to contextual vulnerabilities and their root causes at local and broader scales [54]. Advocates of this context-sensitive understanding of vulnerability argue that vulnerability does not simply depend on assets or capacities individuals or groups possess, yet it is produced and experienced through historical, political events from the local to the global [55,56]. In the Pressure and Release (PAR) model [57], explain that root causes (often historic economic, political and social conditions) lead societies to dynamic pressures (such as rapid rural migration, lack of infrastructure and poverty) that eventually materialize in unsafe conditions that put people and assets at risk.

Borrowing a basic concept of PAR, this research develops the Model of Progression of Barriers to Climate Change Adaptation to illustrate the process of barriers creation and their outcomes (Fig. 1). The model illustrates the relationship among the historical tensions, their consequent challenges, and barriers in different categories and their outcomes as residual vulnerabilities to climate-driven disasters. This model illustrates how barriers to climate change adaptation trace back to historical challenges, which eventually reduce communities' capacities and increase their vulnerabilities during a long period of time.

Based on historical evidences, we can use the theoretical model and hypothetically assume a relationship between the conflictual history in Indigenous communities and their vulnerabilities to climate change. For instance, since the beginning of the colonization, the Indigenous communities in Canada have experienced long-standing tensions with European immigrants. Indigenous population drastically declined after contacting with Europeans as they had no biological and cultural adaptation to epidemics of smallpox, tuberculosis, scarlet fever, influenza and measles [45]. There is a growing consensus among academics that the introduction of infectious diseases from European had devastating effects on Indigenous populations [58]. With so many people

affected by the epidemics, regular food harvest became impossible, causing the lack of nutrients, and eventually speeding up mortality rates. All in all, the waves of epidemics depopulated the Indigenous communities, undermined their power, and eventually cleared the way for the colonization and repression that followed [59].

Following the population decline, governments and churches colonized the weakened Indigenous communities, resulting in the repression of their spirituality, education, cultural practices, and land and resource access. As an example, the government established residential schools at the beginning of the 19th century (J.R [60]. To encourage religious conversion at schools, the government later collaborated with Christian missionaries to develop an educational policy that relied heavily on residential schools after 1880. Overall, students had traumatic, painful experiences at residential schools with often long-lasting consequences. The residential school assimilation policies disallowed First Nations children from speaking their languages, aiming to disconnect the children from their cultural practices [61]. According to J.R. Miller [62]; the assimilation of Indigenous students left them "between two worlds," with the feeling that they belonged to neither Indigenous nor settler society. Besides, many students suffered abuse, and in some cases, died due to diseases and weak health care systems in the overcrowded residential schools [63].

Therefore, the consequent impacts of the long-standing tensions (1st column - Fig. 1) appeared in different forms (2nd column - Fig. 1) such as the devaluation of traditional knowledge, culture loss, erosion of traditional languages, and the reduced occasions for intergenerational learning in Indigenous communities [42]; J.R [60,64]. Plenty of studies revealed consequent troubles as results of long-standing pressures that Indigenous communities experienced in the last few centuries in Canada. Presumably, these dynamic pressures contribute to generating climate change barriers such as budgetary constraints and unavailable knowledge and technology that eventually lead to vulnerabilities to climatic hazards. In this study, we employ the Model of Progression of Barriers to Climate Change Adaptation to explain how barriers rooted in historical stresses eventually increase Indigenous communities' vulnerability to climate-related disasters (Fig. 1).

3. Research method

This study relies on inductive inference logic; results are expected to support or modify the theoretical model proposed in the previous section. The research draws primarily on semi-structured and structured interviews conducted between February 2018 and October 2019 in collaboration with McGill University's School of Urban Planning Masters' program in Montreal, Canada. This research is a case study aims to explain the Kanesatake community's experience in responding to and recovering after the 2017 floods, and then later in 2019, in Quebec, Canada. Different sources of evidence have been used to collect data (interviews, observations, and documents). The Model of Progression of Barriers to Climate Change Adaptation, the theoretical framework

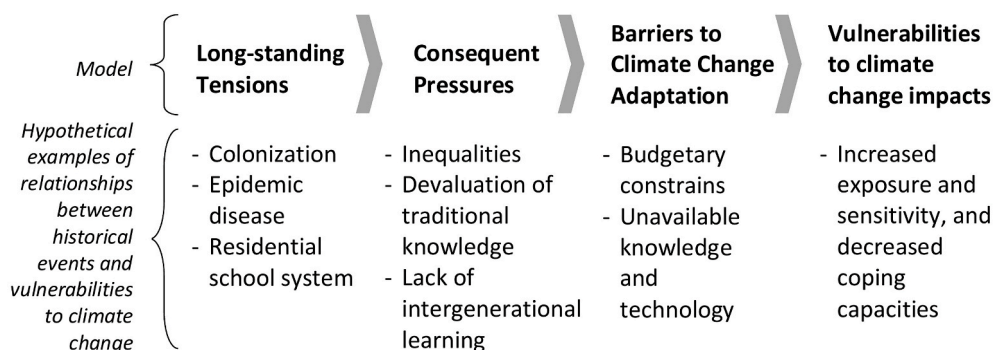


Fig. 1. The Model of Progression of Barriers to Climate Change Adaptation.

developed in the previous section, served this research to guide data collection, analysis, and the interpretation of results. The questionnaires for interviews were designed to inquiry historical events and their links with current vulnerabilities to climatic hazards in Kanesatake. Documents were also reviewed with a particular attention to historical conflicts and their long-lasting consequences in the Indigenous communities.

The data collection process began with a site visit to the Mohawk community of Kanesatake in February 2018. During the visit, informal, unstructured interviews were conducted with the Grand Chief and technical experts responsible for emergency management in the community. Our preliminary interviews illuminated the overall impact of the floods and challenges during the emergency and recovery processes. Based on these, we then interviewed the head of emergency preparedness program, the Kanesatake Environment department manager and team, the manager of the First Nation Adapt Program (a funding program under the federal government), insurance agents, as well as several experts in environmental impact and community needs assessment in Kanesatake. Also, the Grand Chief of the community and some experts were invited to give lecture at McGill University, during which time we asked many of our questions and their answers allowed us to fill gaps in our findings.

Beyond this, because of the importance of recovery challenges at the scale of families, we deliberately interviewed several affected households both after the 2017 and 2019 floods. We chose interviewees based on their experience after the floods and their willingness to participate in this study. To reach our interviewees, we applied different methods: face-to-face, telephonic, and email interviewees. Overall, we interviewed 12 households, 10 officials, and 6 experts both in and outside of the community.

Our initial, semi-structured interviews, which averaged about 1 h each and were conducted in or outside of the community, consisted of questions about post-floods emergency management decisions, the housing recovery process, disaster risk reduction challenges, historical conflicts, and the community's vulnerability to natural disasters. Consent for information sharing was obtained from all participants and interviews were conducted in line with ethical principles for research involving human participants.

Besides, to directly observe the emergency management challenges, the authors participated in the sandbagging process during the spring flood in 2019. We also conducted follow-up interviews by phone and in-person with some members of the Mohawk Council of Kanesatake, the Grand Chief, and others for whom we had questions of clarification.

Also, we reviewed and analyzed several policy documents, press releases, and reports to understand underlying components of historical conflicts and their impacts on the community's vulnerabilities to natural disasters. The theoretical model as well as the combination of information obtained through interviews, observations, and the review of documents determined themes emphasized in the result section. The research project adopted triangulation of data and methods to converge different lines of inquiry and minimize the risk of relying on incomplete information. In this study, the interviews and documents were analyzed using the qualitative content analysis method.

4. Results

In May 2017, unprecedented floods inundated southern Quebec, and more specifically the Montreal agglomeration in Canada. According to historical climate data in Canada, the winter of 2017 was the fourth warmest since 1948 and the accumulation of snow and rain was the second and third highest, respectively, in over 50 years [65]. The accumulation of higher than normal precipitation plus quicker melting process of the snow cover caused severe floods in April and May 2017. As a result, more than 5000 homes were flooded, with about 4500 residences affected, and over 3500 people evacuated from their homes [66]. The floods affected almost every varied social group of residents

from English-language wealthy minorities to middle-class immigrants, from French-dominant small cities to low-income neighborhoods and First Nation communities in southern Quebec including the Montreal Agglomeration. Among all, the Mohawk community of Kanesatake was severely affected and faced many hurdles during the emergency and recovery processes. For example, many citizens had to temporarily relocate in 2017 and were still out of a home when the 2019 floods hit the community.

In 2019, a deep and rapidly melting snowpack and many days of intensive rain again caused unprecedented flooding that in some areas beat previous records set during the 2017 floods [67]. Spring floods struck 250 municipalities in Quebec and made around 9500 people to evacuate their homes. In total, more than 6500 homes were flooded with a further 3500 surrounded by water [68].

In response to the floods, Kanesatake worked together to pile sandbags, help residents remove belongings from flooded homes, and to help communities to evacuate to safer ground (Fig. 2). The emergency response required a concerted effort from many volunteers, including local community members, members from their sister Mohawk communities, Kahnawá:ke and Akwesasne, as well as some assistance from Oka, the adjacent non-Indigenous municipality east of Kanesatake. This collaboration was a sign of strength; "When Mohawks mobilize, you can't stop us" says Grand Chief of Kanesatake to the Montreal Gazette newspaper [69]. Despite the reaction of the community to the emergency phase of the disaster, the recovery process appears to have been more challenging. Answers to our interview questions and personal observations during the 2019 floods, two years after the previous floods, reveal the fact that the recovery process was still ongoing, the evacuated households were still in need of permanent housing, and in some cases, households had moved into trailers located next to their damaged houses after the previous floods (Fig. 3). According to members of Mohawk Council of Kanesatake, their abilities to respond to floods was noticeably improved in 2019, yet the recovery process after the 2017 floods was slow and insufficient. During the floods in 2019, the community manifested improvements in the management of available resources to control floods. However, the investigations reveal inappropriate recovery by Mohawks of Kanesatake. Among many other potential reasons, our findings identify that political and institutional challenges impede the reduction of future disaster risks, preparedness for proper response, and appropriate recovery.



Fig. 2. The 2017 floods in Kanesatake.

Source: Smith, S. (May 09, 2017). Army's offer to help with Kanesatake flooding revives memories of Oka Crisis. Retrieved from <https://www.cbc.ca/news/canada/montreal/army-s-offer-to-help-with-kanesatake-flooding-revives-memories-of-oka-crisis-1.4106827> Nov. 13, 2019



Fig. 3. A trailer next to the damaged house as a permanent housing solution after the 2017 floods.

Source: Fedosieieva, N. (2019). *Lifeline Tossed in Flood Zone, As Waters Rise*. Kahnawake Mohawk Territory. Retrieved from <https://www.easterndoor.com/2019/05/09/lifeline-tossed-in-flood-zone-as-waters-rise/> Nov. 13, 2019

5. Lack of secure land tenure because of a controversy on KANESATAKE'S history

Our interviewees repeatedly blamed the lack of secure land tenure as a prominent historical problem undermining their community's vulnerability and their inability to adapt to climatic pressures. Kanesatake's land status is complicated and has caused many conflicts and disputes, still to this day.¹ According to the Constitution Act of 1867, Kanesatake is recognized as an Indigenous *territory* having no reserve status to their lands unlike other Indigenous groups in Canada. The complicated problem of land in Kanesatake is based on a controversy on their history; a debate exists between the written history by Euro-Canadian in the 18th century and oral history of the people of Kanesatake. The history of Kanesatake as it is written by Euro-Canadian is that the community came into existence when the Seminary of St-Sulpice established a mission in 1721 in the north shore of Lac des Deux Montagnes (the lake of two mountains). On the other hand, the people of Kanesatake argue that the land was occupied by their ancestors long before the Seminary arrived [70]. The people of Kanesatake believe that the story is made up only of half-truths; "our knowledge and oral history are completely absent from the written history" said Valerie Tewisha, the director of Kanesatake Education Center.

According to the non-Indigenous literature, the Mohawks of Kanesatake are part of the Haudenosaunee – the Six Nations Confederacy in the North America – who moved to Canada after the American Revolution, once the British were defeated [71]. From the British Crown, the Mohawks received land (known as the Grand River Tract) where the city of Montreal is now located [72]. Later in 1717, the French Crown granted the Lac des Deux Montagnes (a large area on the north shore of the Montreal island) to the Sulpician Order that was a French company for training the priesthood candidates [71]. In 1721, the Seminary of St-Sulpice established an Indian mission, settled Indians and to this day, the descendants of these settlers remain [71,73].

This view of history dominates the literature, giving the people of Kanesatake no legitimate right to the land as their presence in the region did not predate European presence. In July 1990, during the so-called Oka Crisis, the department of Indian Affairs issued a press release and explained the Government of Canada's rejection of the Kanesata'kehó:non land claim of 1975 in terms of 1721. A comprehensive land claim

made in 1975 by the people of Kanesatake (along with Kahnawà:ke and Akwesasne) was rejected by the government of Canada. The court decision says that since the "Mohawk presence in the region did not predate European presence, the Mohawk came to settle at Oka only after the Mission was established in 1721" and "Mohawk could not assert aboriginal title as they had not maintained possession of the land since time immemorial."

However, some historian and the people of Kanesatake contest this version of the Kanesata'kehó:non history. For instance, L. Tremblay [74] mentions of Mohawk presence at the Lac des Deux Montagnes before the Sulpicians arrived. According to L. Tremblay [74]; the Mohawks settled at the Lac des Deux Montagnes following the decline of the Five Nations. In addition, the oral history of Kanesatake is also full of evidence of a pre-1721 Kanien'kehà:ka settlement, known as Kanesatake, located at the Lac des Deux Montagnes. In general, our interviewees, the people of Kanesatake, never doubt that a group of Onkwehó:we, in the company of a priest of the Seminary of St-Sulpice, moved to Kanesatake and their descendants now live in Kanesatake. However, referring to a great wealth of oral history and archaeological findings, the people of Kanesatake state that their ancestors occupied the land long before the Seminary arrived [70,75].

Since the beginning of the 20th century, Kanesatake's restricted access to the lands ignited frequent conflicts over land ownership with the Sulpicians. To resolve the conflicts, the Government of Canada agreed to purchase land lots from the Sulpicians, among other private owners, on behalf of the Kanesatake Mohawks in 1945 [71]. The lands involved in these transactions, however, are small parcels that are interspersed with privately-owned non-Indigenous lands in the village of Oka [71,73]. These, along with other lands purchased by the federal government in the 1960s and early 1980s, comprise what is a present-day patchwork of properties). In fact, the Kanesatake Mohawks do not consider this to be a settlement of their long-standing grievances over land claims.

Though the Mohawks have land rights in Kanesatake, the fact that these are federally-owned Crown lands, does not give the Mohawks any power over them [71]. Furthermore, the lack of official *reserve* status means there is "no clear legislative regime applicable to provide for local control and administration of these lands" [71]. According to Grand Chief Simon and his colleagues in the Kanesatake Band Council, this presents a practical barrier to cohesive land management and prevention of any invasion to their territory.

6. "Oka crisis" and its long-term consequences

In 1988, one of the most heated disputes over land, which is known as the Oka Crisis, caused the involvement of the Canadian Armed Forces and left almost 100 people injured. The story began when the Oka Golf Club renewed its lease for an additional 35 years announcing to expand its development and build a condominium complex over Kanesatake's land. Tensions heightened throughout 1990 and the Mohawks responded to the threat of their land by creating barricades around their land. By August 1990, the Canadian Armed Forces around Montreal were called in, the residents of the village of Oka were evacuated, and eventually the barricades were bulldozed. The devastating physical and emotional wreckage caused by the Armed Forces has left scars in the Kanesatake community as well as other Indigenous communities across Canada [76].

The disputes over the land and the involvement of the Armed Forces during the Oka crisis have had long-term consequences. As a simple example, in the first days of the flooding in May 2017, when the water levels rose to extreme levels, the Canadian Armed Forces offered their assistance in emergency relief, like they do with both Indigenous and non-Indigenous communities that are affected by natural disasters. The offer, however, was rejected by Kanesatake as it was a stark reminder of the Army's involvement in the Oka crisis [77]. "After receiving the call from the Army, I turned to my people and asked their opinion; they all

¹ Kanesatake's 301-year-old land dispute highlights flaws in Canada's Specific Claims Policy. Available from <https://www.cbc.ca/news/indigenous/kanesatake-mohawk-specific-claim-process-1.5245268>. Accessed 15 August 2019.

disagreed” said Grand Chief Simon in a personal interview. Moreover, flood victims that were interviewed mentioned that the focus from the Kanesatake emergency relief team was on helping community members first and foremost. In 2019, the army’s help was offered again and was kept as secondary measure by the band council.

7. Shrinking territory without an opportunity to relocate

Another inevitable consequence of the land-related legal issues is the fact that the relocation strategy in the face of disasters is impracticable for the Mohawks of Kanesatake. Members of the Kanesatake community have no other territory and cannot take their land rights elsewhere [78]. Grand Chief Simon, as well as the flood victims interviewed, spoke of the fear that, Kanesatake having been historically reduced to close to 2% of its original size (from 689 to 12 km²),² it does not offer large expanses of land for flood victims to relocate within Kanesatake. Consequently, this is a significant barrier that prevents the community from retreating from flood-prone areas, which form a considerable portion of their territory that experiences floods almost every year.

8. Unattainable flood insurable

Adding to these frustrations, flood insurance, though available, became unattainable for several reasons for most of Kanesata’kehó:non. During the interviews, the community members and officials commonly expressed their perception that Mohawks of Kanesatake are ineligible for any land-based insurance as the federal government is the legal proprietor of their lands. In response to our question, however, a principal consultant of Desjardins Insurance in Canada argues that “Desjardins Insurance does not price or underwrite according to the fact that a client, from an Indigenous community or not, lives in reserve areas or territories. The fact that the federal government owns the land is not also an element to influence the underwriting of the risk.” Besides, the Insurance Bureau of Canada (IBC) claims that the insurers must use the same criteria for all their clients, regardless of their ethnicity or cultural background. This is hardly respected in Kanesatake. “After the Oka crisis in 1990, insurance costs in general increased for community members as the territory was flagged as a ‘red zone’ by insurance companies,” repeatedly expressed by community members. Therefore, many people opted out of insurance because of the prohibitive costs.

In addition, flood insurance policy in Canada unintentionally excludes the Indigenous communities. For instance, the physical condition of the building, as a critical criterion, limited the Indigenous communities’ access to flood insurance. The housing quality in Indigenous communities is an issue of particular significance in Canada. According to Canada census 2016, one in five (19.4%) indigenous people live in a dwelling in need of major repairs, and over one in ten (11.5%) Aboriginal people lived in overcrowded housing [79]. Therefore, substandard and deplorable housing conditions that have been a persistent and growing phenomenon in many Indigenous communities continue to prevent the Indigenous households from flood insurance.

In addition, due to their cultural connection and dependency on wildlife for sustenance foods, the Indigenous communities often occupy riverbanks, recently marked as high-risk floodplain areas after frequent water level rises in previous years. Consequently, the occupants of high-risk areas are excluded from flood insurance because in “high-risk zones flood is no longer conceived as a risk but almost a certainty that will cause damages on a regular basis,” said the principal consultant of Desjardins insurance in Canada. Eventually, the combination of economic, social, political, and environmental factors makes flood insurance unattainable for most of Indigenous households.

² <https://www.cbc.ca/news/indigenous/kanesatake-mohawk-specific-claim-process-1.5245268>.

9. Ambiguity of orders and inter-jurisdictional fragmentation

Relationships between First Nations communities and the local, provincial, and federal governments remain fragile. The historical disputes over lands and the role of the federal government as the legal proprietor loosen the Indigenous communities’ ties with the local governments, which eventually constitutes considerable challenges. More importantly, the existing institutional fragmentations among the Indigenous communities, federal governments, and their provincial representatives prevent Indigenous communities from owning their own civil services. Kanesatake still suffers from the lack of a local police force, a fire station, an emergency management department, and many other institutions as the required budget, administrative structure, and the scope of responsibilities are still subject to disputes (Fig. 4). Admittedly, if these clashes could be circumvented and Kanesatake had its own emergency and safety institutions, many adverse events and emergencies (such as the fire incident in 2015 that wholly burnt down a building) would be avoidable or at least less destructive [80].

More telling still, healthier connections with the local and provincial governments would permit more appropriate responses to the extreme yet predictable rise of the water levels in 2017. Three weeks before the peak floods, a state of emergency was pre-emptively declared by the Kanesatake Band Council [77], informing the federal government of the risk of flooding and requesting assistance. The warning received no reaction from the authorities; it might not have been delivered to the right office or ignored because of bypassing the political orders (Fig. 4). This is indeed an unconfirmed claim by the Kanesatake Band Council; however, the message would have probably received more consideration if it targeted the local and provincial authorities.

This ambiguity of orders and institutional fragmentations prevent effective communications such as the issue of life-saving notifications regarding the opening of upstream floodgates and the risk of extreme water level rise. Without the coordinated effort of the main reservoirs in attenuating the river’s flow, the water levels at the Lake of Two Mountains during the peak levels in May could have reached 11,000 cubic meters per second if the Carillon dams were not holding back water [66]. Whereas the limited reservoir capacity of the Carillon dam is undisputed, the lack of notification to the Kanesatake Band Council, advising of the opening of all the floodgates was a compounding factor in the flooding. “Had the management of the dam notified to the Council (Mohawk Council of Kanesatake), emergency efforts could have been stepped up to mitigate the additional flow of water” said Grand Chief Simon. Therefore, opening of the Carillon dam floodgates plus the extreme climate events caused an unprecedented surge of the water levels by 20 feet on the shoreline of Kanesatake in early May 2017. This left the Kanesatake residents no chance to prepare in real time for the increasing levels of water into their community [66].

10. Discussion

Several key themes stand out in this examination of climate change impacts on the Indigenous communities in Southern Quebec in Canada: the effects of historical conflicts, the importance of reconciliation in accelerating the process of climate change adaptation, and the recognition of vulnerabilities to climate change as consequences of long-standing pressures with roots in historical tensions. From a disaster management perspective, the results reveal that the chronological sequence of political crises exhausts Kanesatake’s capacities and leaves them isolated, unprepared for responding to and recovering from disturbing events.

Our research also show the link between the conflictual history of the Mohawk community of Kanesatake, the existing political barriers to climate change adaptation, and the community’s exacerbated vulnerabilities. Fig. 4 illustrates the progression of barriers creation in Kanesatake. The results show that the historical disputes over lands and territories (long-standing tensions) resulted in the lack of secure land

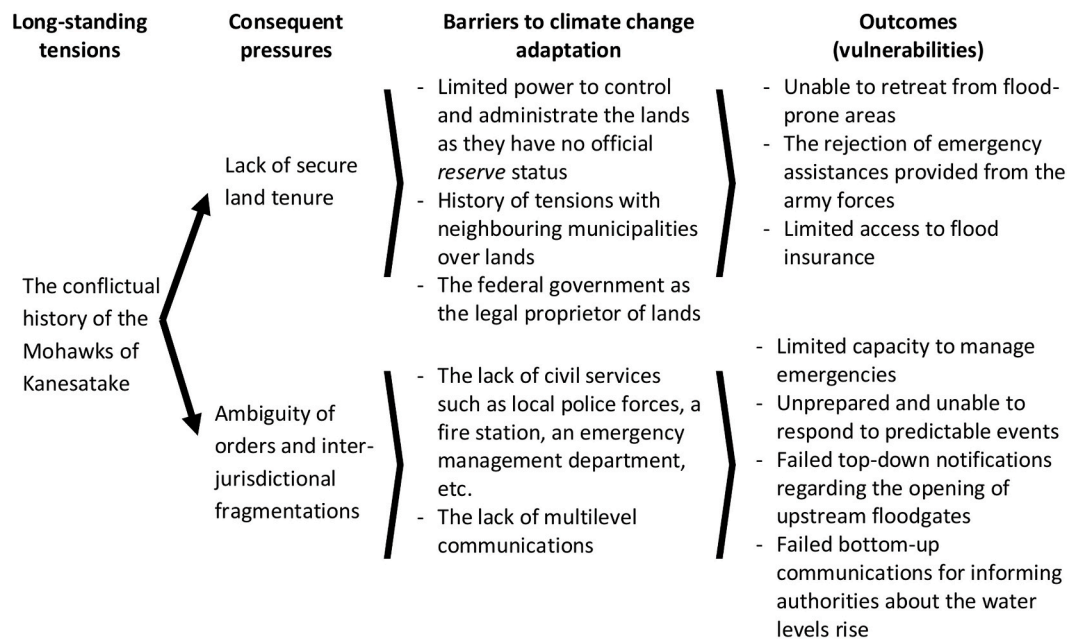


Fig. 4. Political barriers to climate change adaptation as long-term consequences of the conflictual history in Indigenous communities.

tenure and indirectly resulted in troubled inter-jurisdictional relationships with the provincial and national governments (consequent pressures). Consequently, these challenges generate political barriers such as tensions with the neighboring municipality and the lack of power to control and administrate the lands, which ultimately exhaust their capacities and aggravate vulnerabilities. The outcomes are the land scarcity to retreat from flood-prone areas, the lack of trust in the local and federal authorities in case of emergencies, and limited access to land-based insurance (vulnerabilities in Fig. 4). Similarly, the ambiguity of orders and troubled inter-jurisdictional relationships (consequent pressures) cause shortages of civil services (barriers to climate change adaptation) that eventually restrict capacities to manage emergencies and respond to predictable climatic events (vulnerabilities).

Our study demonstrates barriers to climate change adaptation; political barriers that prevent the Indigenous communities from adaptation to the increasing risks of climate-related disasters. The results reveal the chronological sequences trace back to the conflictual events in history, allowing us to comprehend barriers in racial, ethnic, and minority groups that typically suffer from political tensions. Our findings also remind the researchers of the interdependency of barriers as they may stand on the same underlying factors. Although the political barriers have roots in historical events, they are not exclusive and independent. In fact, more research is required to reveal the interdependency of barriers and explain how common historical events underlie social, economic, technological, and environmental barriers.

We have also shown that there are relevant practical implications. First, our findings highlight the importance of political reconciliation between the levels of government and Indigenous communities. The global threats of climate change affect universally and require genuine, sustained, and inclusive efforts. This is, indeed, a highly complex issue and requires further multidisciplinary studies. Second, it is crucial to define appropriate communication mechanisms between the Indigenous communities and different levels of government. Effective communication channels and procedures are required to bridge the inter-jurisdictional gaps. Finally, barriers to climate change adaptation are multidimensional and appear in different scales. Any attempt toward overcoming the barriers requires factual, comprehensive, and multidisciplinary understandings.

This study confronted several challenges and limitations, and findings should be taken prudently. The research was limited by time

constraints, restricted access to members of the Kanesatake community, and insufficient academic research available on the adaptation of Indigenous communities to climate change. Moreover, this research remarks some marginally relevant factors to barriers to climate change adaptation, which are beyond the scope of this research. Further research, in fact, would therefore be required to obtain a fully comprehensive understanding of climate change adaptation in Indigenous communities.

11. Conclusion

In 2017 and again in 2019, extreme climate conditions caused floods in Quebec (Canada) and affected diverse communities in different ways. Notably, the floods unveil the Indigenous communities' vulnerabilities and barriers to adaptation to climate-related disaster risks. In this study, the findings explain multi-dimensional barriers - political barriers, in particular - to adaptation in Indigenous communities. Despite having a long history of managing seasonal flooding events, many politically rooted challenges limit the indigenous communities' capacities and exacerbate their vulnerabilities.

In this article, we have taken a different approach, showing how more than three centuries of the dispute over land has adversely influenced attempts for climate change adaptation in Kanesatake. The Mohawks of Kanesatake once occupied 689 square kilometers, which is reduced to 12 square kilometers today. For this reason, solving the land dispute, which turned into the 78-day armed standoff between the people of Kanesatake and the Canadian military in 1990, has been of the highest importance to the people of Kanesatake. While the people of Kanesatake blame the unjust expropriation of lands for the poverty in their community, our in-depth, qualitative investigations also reveal the nuanced processes through which historical tensions and disputes set up barriers to climate change adaptation. Despite the recognition of land disputes as one of the driving forces behind the delayed development in Kanesatake, efforts at reconciliation remain ultimately futile. At the time of writing this paper, the dispute again escalated when a private land developer offered to transfer 60 ha of the disputed land to the Mohawk community and offered to sell another 150 ha to the federal government to remain preserved for the Mohawk community. However, the land transfer is holed up, and lengthy, bilateral negotiations are going on with the federal government for many reasons [81]. A settlement must

be reached over the ongoing disputes soon; otherwise, a return to the status quo would cause further delays in progress and, as our findings suggest, prevent less adaptation and more vulnerability to adverse impacts of climate-driven disasters.

Our findings reveal the nuanced progression of barriers to climate change adaptation in Indigenous communities. Without such insights, it is difficult, for example, to formulate meaningful interventions to stimulate the process of climate change adaptation in Indigenous communities. Future research on the underlying factors of barriers to climate change adaptation in Indigenous communities should compare different case studies to synthesize complexities into higher-order and explain what causes barriers and how they interact and change over time in Indigenous communities. Indeed, more research is necessary to explain the complexity of barriers in Indigenous communities and unveil unique challenges facing these marginalized communities.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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