

Local Knowledge in Resilience and Adaptation to Snowstorm Hazards in Two North Atlantic Islands: Newfoundland and Iceland

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Article abstract

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ABSTRACT

Drawing on first person observations, this paper explores how severe winter storms impacted the two rural island communities of Newfoundland and Iceland in January of 2020. The authors, as researchers and local community members, examine vulnerability, resilience, and adaptation as processes of community transformation in response to large-scale environmental hazards. Highlighting the significance of local knowledge and place-based worldviews, we argue that community-driven interactions are more effective than top-down approaches for hazard reduction and climate change adaptation. Our observations aim to offer broader insights for regions with similar socio-cultural and environmental contexts, underscoring how localized perspectives can foster positive transformation and strengthen adaptive capacity.

1. Introduction

If I look at how my ancestors even 200 years ago, they didn't spend a lot of time banking capital, they didn't rely on material

wealth for their well-being and economic stability. They put energy into meaningful and authentic relationships. So their food security and economic security was based on how good and how resilient their relationships were — their relationships with clans that lived nearby, with communities that lived nearby, so that in hard times they would rely on people, not the money they saved in the bank. I think that extended to how they found meaning in life. It was the quality of those relationships — not how much they had, not how much they consumed — that was the basis of their happiness.

— Leanne Betasamosake Simpson (2013)

As concerns over the impacts of climate change continue to intensify, communities the world over focus on vulnerability, resilience, and adaptation. Change is a universal and pervasive force of life. Yet, experiences with sudden, chronic, or rapid change in social and environmental conditions leave an imprint on the human psyche that holds the potential for both negative and positive outcomes (van der Kolk, 2014). Humans can rebound from countless events of social disruption resulting from hazards and environmental changes within their occupied landscapes. However, if a human community lacks knowledge or ability to relate to non-human phenomena and is therefore unprepared, the impact of hazards may not only damage property and destroy lives but compromise a community's physical, emotional, and mental health, severely impacting their ability to respond successfully to future events (Kaniasty, 2020). Alternatively, a community's social-ecological structure; worldviews; and how they think, act, and behave concerning the environment enhance their ability to respond to future impacts brought by climate change.

A worldview is a set of assumptions and beliefs about the physical and social reality that impact behaviour: how humans perceive, think, know, and act in the world (Koltko-Rivera, 2004). Over emphasis on techno-centric approaches to adaptation is criticized for not addressing the complex and integral social, economic, political, and environmental circumstances at a local level (Burton et al., 2002; Adger et al., 2005; Schipper, 2007; van Aalst et al., 2008; McNamara & Buggy,

2017). Many scholars suggest that the techno-centric must allow for the spaciousness of alternative knowledge systems, such as inherited local knowledge specific to place and community, in the decision-making processes of adaptation to climate change (Cronin et al., 2004; McNamara & Westoby, 2011; Bird et al., 2011; Wilson, 2014; McNamara & Buggy, 2017). Although local knowledge has been sometimes excluded from this previous scholarship, such knowledge can make essential contributions to decisions concerning planning, preparedness, and adaptation strategies for rural coastal island communities (Bird et al., 2011; McNamara & Westoby, 2011; McNamara & Buggy, 2017). Furthermore, while the dialogue around who holds the knowledge and thus gets to be included in decision-making has been broadened (Latulippe & Klenk, 2020; Klenk et al., 2017; Hall, 2013), positivistic Eurocentric worldviews remain dominant.

We draw on the work of symbolic interactionist Hubert Blumer (1969), who challenges the dominant worldview of science and technology being traditionally accepted as the one and only approach to truth (Carter & Fuller, 2016). Blumer suggests that, to understand social behaviour and relationships, one must get inside the individual and community to see how they perceive their world and the changes associated with its evolution. Symbolic interaction evolved in resistance to the dominant, positivist approaches that tended to objectify and investigate society from the 'top down' perspective, focusing on the impact that macro-level institutions and social structures had on individual persons or groups of persons within a given society (Carter & Fuller, 2016). Symbolic interactionists shift their attention to the interpretation of subjective viewpoints and how individuals make sense of their world from their unique perspective of meaning-making through shared action and interaction towards a thing: objects, events, ideas, perceptions, relationships (Blumer, 1969). The meanings that emerge from action and interactions with other individuals and with society are understood to be continuously created and recreated through interpreting processes during interaction with others (Blumer, 1969), suggesting that human life is a group life in a constant cycle of stability and change (Denzin, 1969).

The following case study takes place at two different island communities: Newfoundland, Canada, and Iceland, as both are considerably isolated, remote, and with more rural populations relative to their parent nations of Europe and Canada. In particular, the focus is on the city of St. John's in eastern Newfoundland and the municipalities of Ísafjarðarbær and Bolungarvíkurkaupstaður (part of the peninsula of Vestfirðir [Westfjords]) in northwest Iceland.

Between January and February 2020, both areas experienced intense winter storm events with record-breaking snow falls and wind gusts. The authors were present at the time of the events (one living in St. John's and the other in Bolungarvíkurkaupstaður) and discuss community responses as well as what they personally witnessed. Our observations and reflections are written from an "eye-of-the-guest," as neither of us are initially from the communities, as well as from a "local" perspective, as each of us currently live within each of these communities. We use the symbolic interactionism approach to interpret our subjective viewpoints and compare the unique perspectives witnessed during the storm events and the meaning behind shared actions and interactions among our communities. We were active members of these communities before, during, and after the snowstorms. We offer an alternative to the detached stance of an objective observer; we accept our roles as more engaged and active participants and we situate ourselves within the event as it unfolded, in relation to both human and non-human agency (Edgeworth & Benjamin, 2017).

The aim of this paper is to highlight personal and community experiences and agentic responses to two snowstorms in the winter of 2020 as understood by the authors and the ways in which community responses contributed successful adaptive outcomes. While we reflect on our observations, we also view our communities as experts in the field of local knowledge, establishing alternative means of communication to share information when technology is not accessible. We believe that our findings are important to share as our observations provide insight into how local and small communities can survive in times of uncertainty and especially when higher authorities are unable

to respond rapidly. Overall, this case study provides insight on communal response from two different countries and cultures that are both islands in the North Atlantic. Thus, the study gives perspective on the important use of local knowledge and, from that, communication tools that need to be readily available to prosper from a crisis.

1.1 Hazards and Disasters of Two Northern Island Communities: Trauma, Vulnerability, Resilience, and Adaptation

When a community experiences the impacts of a hazard, it may be exposed to collective trauma. The collective trauma concept is rooted in the work of French sociologist Émile Durkheim. Durkheim suggested that the building blocks establishing social order (such as norms, values, and rituals) are upended during significant scale disturbances, compromising the very fabric of a society and resulting in collective trauma that influences the well-being of generations to come (Durkheim, 2008). The exchange of experiences after disasters in which populations are collectively affected is referred to as secondary traumatic stress (Creamer & Liddle, 2005), vicarious trauma (Abramowitz, 2005; Smith et al., 2014), and/or collective trauma (Abramowitz, 2005). Trauma in vulnerable persons impairs the individuals' abilities to live a happy, healthy existence and the human capacity to "register, know, transmit, record and remember" (Laub & Lee, 2003, p.434), therefore debilitating the ability to respond effectively and possibly leading to maladaptive strategies for future events. Alternatively, although disasters are inevitably environments of volatility, uncertainty, and ambiguity, the impact of these events may also contribute to the resilience and strengthening of individuals and communities. Over time, and with repeated exposure to an event, coupled with evolving worldviews, individuals and communities have the *potential* to develop higher tolerance, greater resilience, and successful adaptive responses to future events. We are thus faced with the following question: What characteristics and worldviews are embedded in the structure of a community that positively influence the community's well-being and, therefore, their resilience and adaptive capacity to future events?

The terms vulnerability, resilience, and adaptation work cooperatively to illustrate how communities around the globe transform through the processes of expected environmental — immediate and long-term — effects. In human life, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities (McNamara & Buggy, 2017). Resilience can be described differently depending on the vulnerability and/or adaptive approaches that an individual or a community is armed with in the face of an environmental disturbance. Exposure to the event impacting a community is defined as the degree to which a hazard can occur in a particular location or region and is understood based on the physical environment, such as climate, geology, and terrain (Vasseur & Catto, 2007). Social vulnerability is the propensity of society to suffer from damages in the event of a given natural hazard or disturbance and is based on several factors, including demographic, social, cultural, economic, and political (Gaillard, 2007). For instance, although northern regions face greater exposure and thus are more vulnerable to climate impact than their southern counterparts, they are also locations where societies are known for their resiliency to extreme environmental conditions (Jóhannesdóttir & Gísladóttir, 2010; McNamara & Buggy, 2017).

Maguire & Cartwright (2008, p. i) describe social resilience as the community's ability "to adaptively respond to change rather than simply returning to a pre-existing state." A community's success in overcoming issues associated with a disaster is based on its adaptive capacity and what resources can be used. Social resilience looks closely at the interaction between people and the environment (Folke, 2006) to understand how humans can co-exist with hazards, for example, bushfires and volcanoes (Paton & Johnston, 2001) as well as social aspects of climate change and resource dependency (e.g. human use of the Great Barrier Reef) (Marshall et al., 2007). Overall, human communities can become resilient depending on their environment, the extremity of environmental change on the community, and the community's ability to respond to that change.

The relationship between communities and environment is inherently complex, consisting of interactions, feedback, and links within

and between humans and non-humans. These interactions are significant because they can either facilitate or constrain human action in different contexts (Barnes et al., 2017). In the face of an event that causes social upheaval, cooperation, accommodation, and assimilation results in eventual stability, whereas competition and conflict results in chaos and stress.

A social resilience approach to adaptation to disasters, in particular, identifies the resources and adaptive capacity of the community — the internal mechanisms that help to overcome the problems that arise — and thus emphasizes the inherent capabilities of a community rather than only relying on external interventions to overcome vulnerabilities (Maguire & Cartwright, 2008). Although social resilience depends on the ability of a group or community to cope with problems that may be caused by social, political, or environmental stresses that are external to the community (Speranza et al., 2014), it also focuses on resilience to transformation (Maguire & Cartwright, 2008). Resilience to social transformation is based on the responses to change and can apply such responses to a current environment. Instead of trying to ‘survive’ or ‘stay afloat’ during a disturbance, the community responds by finding ways to transform that community’s foundation. Transformations from social resilience are an outcome of focusing on the adaptive capacities of a community (Maguire & Cartwright, 2008).

Folke et al. (2010) concluded that transformability applies to new domains of development and stability. This study also argues that transformation applies novelty and innovation where transformational change at a smaller scale can trigger resilience targeting at larger scales. Thus, social transformation is formulated from social resilience as a community reaches its threshold of adaptive capacity from a disturbance. Adaptive strategies by a community arguably develop over a long period of time, through generations of relationality, kinship, and inherited knowledge that emphasize connection and strong ties among people and with their environment that lead to action that preserves emotionally significant attachments within remote communities (Devine-Wright, 2010).

2. TWO ISLAND PLACES

There are two reasons why the communities of St. John's and Ísafjarðarbær and Bolungarvíkurkaupstaður were chosen (Figure 1). First, the authors had lived experiences with these communities, as they were residents of Iceland and Newfoundland during the time of snow/windstorm events (details in next section). Second, the primarily rural populations and isolation of these two islands coupled with their histories, sizes, and populations, imply that a comparison of the two places offers potential to examine their self-efficacy in response to dramatic events.

There are different perceptions of what defines rural and remote within Iceland, dependent on where people live in the country. At the time of these events, Reykjavík (with a population of ~230,000; almost identical to the northeast Avalon) is the capital and largest city. Many of its residents consider the Westfjords as remote because of frequent road closures and difficulties of ground and air travel. Within the Westfjords, Ísafjörður (population ~ 2,700) is the largest town, and most Westfjord residents would not consider it as remote. However, Ísafjarðarbær and Bolungarvíkurkaupstaður municipalities are remote relative to Reykjavík, due to periodic challenges to accessibility and limited medical resources and local food supplies available in the face of a hazard. St. John's and the surrounding areas of the Northeast Avalon Peninsula are more densely populated (110,525 and 212,579) than the Westfjords in Iceland and are not subject to the same frequent closures to ground and air travel; however, relative to mainland urban centres of Canada as well as its distance from those centres, the Avalon is considered a remote island community.

Although histories of settlement and social conditions of these places are quite different, what the current communities in each of these places have in common is their adaptability; people decided to settle in each of these places, with physical landscapes that might have felt similar to their homelands, and they brought social worlds with them. However, the unfamiliarity of each of these places (whether the

climate, the volcanoes, or the settlement patterns) is what made them challenging, yet both communities of settlers shared an ability to adapt to remote island places with harsh winter months along the North Atlantic and Arctic coasts.

The Avalon Peninsula of Newfoundland and the Westfjords of Iceland have distinct physical geographies, including geology and climate. Although the European settlers of Newfoundland were not forced to adapt to volcanic eruptions and glacial outburst floods as Nordic settlers in Iceland have become accustomed to, Icelanders did not have to adapt to the hurricane events familiar to Newfoundlanders. Nonetheless, shared environmental conditions such as high winds, sleet, rain, snow, and ice over bare layers of soil and harsh maritime conditions have always made living in the western North Atlantic challenging.

Both coastal places receive cycles of wet winters and are subject to extratropical storms that contribute to high winds and precipitation from September to April, resulting in several shared hazards. The northern maritime conditions have accelerated in intensity and frequency in the face of climate change. For example, past studies suggest Iceland is susceptible to climate change based on outcomes that include, and are not limited to, glacier retreat (Aðalgeirsdóttir et al., 2006; Chandler et al., 2016*a*, 2016*b*), runoff (Aðalgeirsdóttir et al., 2006), permafrost degradation (Farbrot et al., 2007), and coastal erosion (Étienne & Paris, 2010). Similarly, Atlantic Canada has seen an increase in storm surges, sea-level rise, flooding, and other associated events (Thompson et al., 2009). Aside from extra-tropical storms, both of these coastal regions are subject to freeze and thaw cycles, snowstorms, flooding, rock fall hazards, and avalanches during the winter months (Batterson et al., 1995; Shapiro & Grønås, 1999; Alchorn & Blanchard, 2004). St. John's, in particular, has experienced impacts from floods, rockfalls, and avalanches more than any other Canadian city (Liverman et al., 2006).

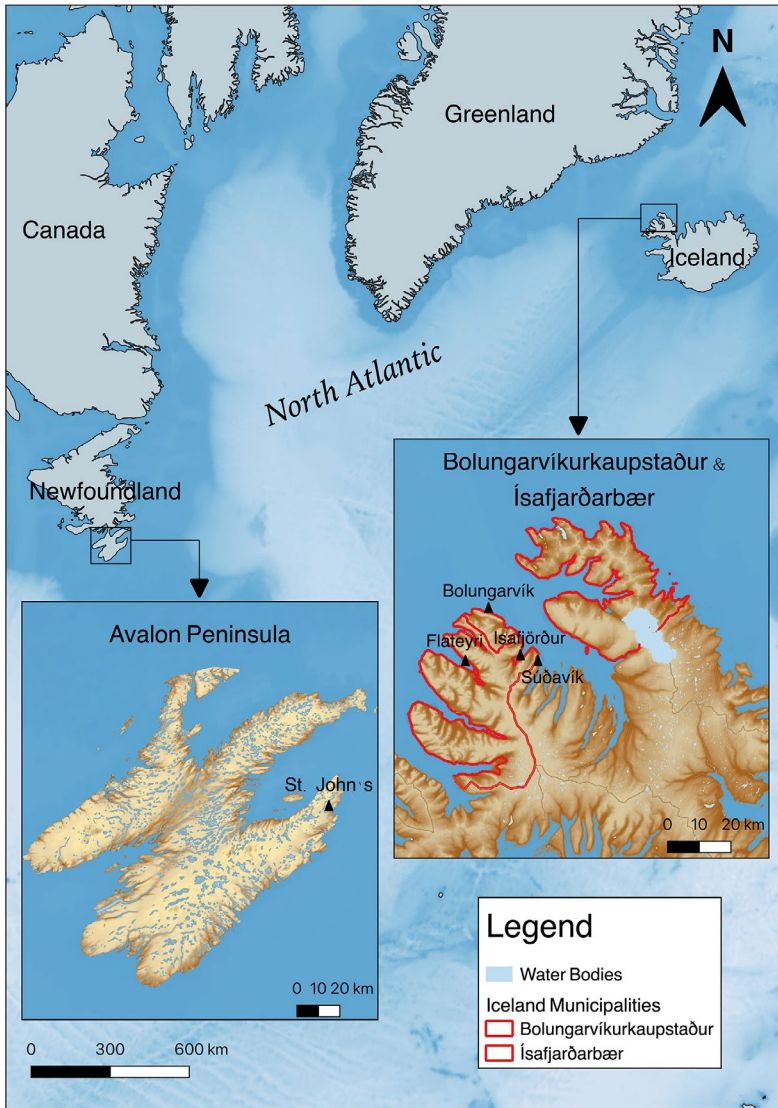


Figure 1. Illustration of the two island study regions. Specific municipalities and towns are highlighted based on focused observations.

2.1 Introducing the Authors

Thompson

I have lived in Newfoundland with my two children since 2007. At that time, our family was unsure about how long we would stay in St. John's. However, in a very short time I had decided that this was the best place to raise my children and to pursue graduate studies in coastal geomorphology. The Avalon Peninsula offered me familiarities as well as potential for a new and unique adventure. Not unlike my hometown of Winnipeg, I observed that the capital city (St. John's) had and has strong advocacy for human rights and an active collective arts community within its downtown core. However, it was the accessibility to Nature of St. John's that compelled me to stay; the abundance of conifer forests, a moderate relief of rolling hills that ends with a dramatic cliff face before reaching ocean, were visible from my downtown home. Nearness to Nature also provided our family with a much-missed connection that we craved after living in a densely-populated urban area for six years prior. By 2011, after several experiences with the socio-cultural and physical climate, especially post-Hurricane Igor in 2010, we became attached to this island community. These experiences with both natural events and the coastal communities instilled within us a sense of security that, even in the face of hazard and/or disaster, we were not alone, but rather a part of a larger community. As a single mother of two young children, I was not alienated, and during any extreme event, we did not feel isolated. As a novice researcher in coastal hazards and disasters at that time, my experiences in the downtown community of St. John's and adjacent rural areas during storm events was my first glimpse into a promising narrative I might hope for in response to climate change. I looked forward to learning more about this potential narrative and ended up focusing my studies on local knowledge of rural coastal communities' responses to rapidly changing coastal environments in Iceland. After several visits to Iceland, I observed several shared characteristics between these two island communities.

Although I have lived in Newfoundland with my two children for close to 18 years, and I have come to respect and know the ways of the islanders, and consider myself as one, I also simultaneously see myself as a 'come-from-away' or guest to the island.

Valliant

I have lived on two islands for the last 13 years, seven years in Newfoundland and five years in Iceland. I am originally from the greater Toronto area (GTA) in Ontario, Canada. Ever since I was a little girl, I had the desire to live close to the ocean and learn as much as I could about it. I ended up moving to St. John's to pursue my Bachelor of Science, focusing on marine biology at Memorial University. The people, the culture, the coastal living and, most importantly, the experiences I obtained in my undergraduate degree made me fall in love with the coast and the ocean. More recently, in the last five years, I have been living in the Westfjords of Iceland, first pursuing a master's degree in coastal marine management at the University Centre of the Westfjords in Ísafjörður. I now own an apartment in downtown Ísafjörður and am pursuing a doctorate in Biology at the University of Iceland where my research continues to be based in the Westfjords. I consider myself a local as I have found my sense of community and place and am now working towards permanent residency and eventually citizenship. I have always felt welcomed in these two island areas because of feeling closer to the ocean and wilderness, and connecting with the people of the communities. I have felt looked after and taken care of, especially in times of bad winter storms. Collectively, the communities of the Westfjords look after each other, offer each other assistance (like pulling each other's cars out of snowbanks or offering our neighbours a bowl of soup if their power has gone out), and provide an environment where everyone is accounted for. As a guest from another country and integrating as a local, I have never felt more at home and connected with a small coastal community.

2.1.1 The Snowstorm of 2020 — Ísafjarðarbær and Bolungarvíkurkaupstaður, Westfjords, Iceland

Iceland's winter season of 2020 (mid-December to the end of March) was challenging and relieving as tense situations occurred and were later resolved. Focusing on the municipalities of Ísafjarðarbær (specifically Flateyrarhreppur, Ísafjarðarkaupstaður, and Þingeyrarhreppur) and Bolungarvíkurkaupstaður (specifically Bolungarvík), locals faced isolation from the rest of the Westfjords. Winter hazards had intensified during the winter of 2020 compared to previous years, causing various livelihood challenges for most people and survival adaptation.

2.1.1.1 Environmental Hazards

The hazards that were faced within Ísafjarðarbær and Bolungarvíkurkaupstaður include the large abundance of snow, high wind gusts, and avalanche warnings. The weather gradually intensified from the beginning of the winter season. Throughout Iceland, there were warnings of windstorm speeds gusting as high as 60 m/s at the beginning of January, and other storms throughout the season had been between ~25–40 m/s. During the time of the largest snow/windstorm in early January 2020, people were warned to stay indoors and strap down any loose objects outside as the storm lasted for several days (Figure 2). It was dangerous to be out driving and walking because there was limited visibility and people could be blown off their feet. Therefore, no one left their homes, and everyone bunkered indoors until the winds subsided.

Old buildings within Ísafjarðarbær and Bolungarvíkurkaupstaður degraded during the winter of 2020 because of the amount of snow and wind gusts. Infrastructures close to the coastline and within the valleys of the mountains were secured, as locals recognized the importance of saving them and ensured they could withstand the brutal conditions. However, traditional fish drying racks (Hjallar) close to the main beach of Bolungarvík are examples of old infrastructure that are



Figure 2. The intensity of snowfall in Ísafjörður (Kevin Dubois, 2020).



Figure 3. The infrastructure of “Hjallar” in Bolungarvík, Winter 2020.

not being looked after by the community as they are not necessary for modern fishing practices (Figure 3). Most are still standing, but some are slowly degrading as residents are not hanging and drying fish there anymore. The old main road called *Óshlíð* between Bolungarvík and Hnífsdallur was classed as the most dangerous road in Iceland (Figure 4) and since 2010, it has been closed due to coastal erosion. With each passing season, you can see a difference as coastal erosion continues along the main



Figure 4. The “Old Road” (Óshlíð) from Bolungarvík to Hnífsdallur, Winter 2020.

coastal road. A tunnel was created in 2010 to take its place and form a safe passage for transportation as the old road continues to fall apart.

Iceland has always experienced intense winter storms of high wind gusts and snowfall throughout the winter season. Still, the winter of 2020 was the worst in over 25 years due to its severity and frequent storm events. During times of high windstorms, this severity brought snow and increased the chances of avalanches. Throughout January and February, avalanches occurred throughout the municipalities of Ísafjarðarbær and Bolungarvíkurkaupstaður. Avalanches occurred on different occasions along the road from the town of Ísafjörður to Hnífsdalur, the inner fjord of Ísafjörður, and the road from Ísafjörður to Súðavík. The town of Flat-eyri experienced two large avalanches that hit either side of the town and rolled out from the sides of the barriers and into the harbour (Figure 5). No one was injured, but one teenage girl sleeping upstairs in her home was swept away by the avalanche. A volunteer emergency rescue team (björgunarsveitir, landsbjorg.is) moved quickly and got her out safely in a few hours.

The town called a state of emergency (SOE) as these two avalanches occurred. Students at nearby schools stayed within the main

building and were told not to leave until further notice. Many boats in the harbour got hit by the avalanche slide, sinking a few to the seafloor. Commercial divers and the Icelandic Coast Guard (Landhelgisgæsla Íslands) were on the scene quickly to try and retrieve what they could of the sunken vessels and take care of the damage.

The amount of snowfall or avalanche during intense winter storms prevented road access to towns until it became manageable for snowploughs to clear the snow off the roads (Figure 6). If the amount of snow continued for more than a few days, then a SOE would be announced.

Within the municipalities of Ísafjarðarbær and Bolungarvíkurkaupstaður, I did not witness a state of panic. Everyone seemed programmed to know what needed to be done through these challenging times. For example, the snow ploughs acted quickly and effectively to clear the snow so that any town was not completely isolated for a long period.

There are only a few roads that go through Ísafjarðarbær and Bolungarvíkurkaupstaður during the winter from Reykjavik to get food and other goods to and from the townships. When a SOE occurs, fast



Figure 6. Snowplough removing snow on a road after a large snow fall in Flateyri (Peter Weiss, 2020).

action must happen to get the roads open again so that the communities can continue to function effectively.

2.1.1.2 Past Experiences, Resiliency, Adaptation

During these challenging winter storms, the municipalities of Ísafjarðarbær and Bolungarvíkurkaupstaður worked together by forming relations to help each other get through it, both mentally and physically. For example, during the days of winter storms, we helped each other strap down loose objects outside or tow vehicles stuck in the snow. There have been numerous times my truck was stuck in the snow where I had to either call a friend to help tow it out or wave down a snowplough. Having this consistent experience, how I can get my vehicle out of bad weather conditions is almost second nature now, along with the willingness to help others (even a neighbour I never met before) if they need assistance. Talking about stormy weather with colleagues and friends became a natural everyday conversation. Conversations with people became check-ups on preparedness and mental well-being whether before, during, or after a winter storm. Through the experiences of winter storms, from the big one that occurred in January to other bad storms later in the season, it became normalized to engage in conversation, to ask how each other were doing and to be there physically for one another.

At the time I lived with a small family where, as a household, we collectively worked together to get through the big storm that happened in early January. It was standard practice that food was made together to ensure everyone had hot meals until the roads opened again and the SOE was lifted. A family friend, a local fisherman, even stayed at the house for two days as he was from the Reykjavik area and was prevented from getting home. Collectively as a household, we “bunkered down” in this SOE where we reserved food, what we thought was essential, that would last us a few days instead of having to go outside repeatedly in bad weather to the grocery store. Bunkering down was a common occurrence for all households. The grocery stores became quite bare right before the storm hit and everyone in

town had the idea to stock up. Bunkering down to me meant making meals like homemade baked goods of bread and cookies, and meals that would be long-lasting and would feed the whole house, like stews. At times of having nothing to do and being stuck inside, we would all play board games and hang out together while drinking alcohol as a social gathering and bonding activity. Blackouts became soothing (and short-lived) as we were all together and not alone. We worked together as a family, forming a greater friendship and self-development to get through hazardous weather physically and mentally.

Locals informed me that the winter storm of 2020 was similar to experiences of the 1950s, 60s, and 70s. In the mid-1980s, I was told that the communities would get snow up to the roofs of their homes. Pictures of this can be found in restaurants, municipal buildings, homes, etc. The Bolungarvík pool even has pictures of snow tunnels dug out in the 1980s for people to be able to move from various hot-pots (thermal tubs for soaking). It was also stated to me by locals that the 2020 winter season hit records of snowfall, wind gusts, and avalanches since the early 1900s. When the avalanches occurred in Flateyri in early January, the locals of that town (also nearby townships) had flashbacks of memories from when the avalanches occurred in 1995. Episodes of devastation had a ripple effect for locals in the winter of 2020 as they reflected on similar past winter storm events. As a new resident of the area, I heard stories about this devastation and tried to explain it to tourists during the summer of 2019. I had an empathetic understanding of what these people went through during the 1995 avalanches but no real idea of what it was like to experience it. Now, witnessing the avalanches that occurred in the winter of 2020 in Flateyri, I have a much different perspective. I see the emotional expressions on the faces of locals as they tell me what has happened or read and hear about it through the news.

When a disaster strikes, word gets out quickly around the small communities of the Westfjords, causing an emotional drain from reliving past traumatic events (like the avalanche of 1995), and from concern for their family's well-being and that of neighbours, friends, and

family beyond their own doors. This produces a lasting bond not only amongst locals but also people outside the Westfjords, including foreigners that live in the communities and international students at the university centre in Ísafjörður.

Mannaskðaveður means ‘human loss weather’ in Icelandic. The term is used to describe extreme weather that could be life threatening. The term can also help describe how humans have to adapt to horrible weather conditions, emphasizing that the people here are used to dealing with bad conditions when they occur. The people here are resilient and adaptive to whatever situation comes their way. The municipalities of Ísafjarðarbær and Bolungarvíkurkaupstaður are remote locations, and it is important for everyone to embrace the challenging times instead of feeling trapped and hopeless. As I lived in the Westfjords in the winter of 2020 and witnessed all that happened, it has given me perspective on what these coastal communities go through. I feel closer to them as I become a local myself, deepening my connection to the place, hearing about stories of disasters in the past, and witnessing first-hand what winter storms are like. Overall, I was learning how to prepare myself and adapt my well-being to these situations on a personal level.

2.1.2 The Snowstorm of 2020 — “Snowmageddon”: St. John’s and the Avalon Peninsula, Newfoundland, Canada

In January 2020, the New Year had just rung in, and Environment Canada issued blizzard and wind warnings for much of eastern Newfoundland that started on Friday, January 17th and continued to the morning hours on Saturday, January 18th. The snowstorm impacted much of the Avalon Peninsula of Newfoundland, but the following experiences were primarily within the municipality of the capital city of St. John’s.

2.1.2.1 Environmental Hazards

Not unlike Iceland, the Avalon Peninsula is a maritime climate with reasonably mild and wet winters where there are cycles between rain

and snow and frequent high winds in the January, February, and March months. For southeastern Newfoundland, highest precipitation amounts are typically in the winter (Abbasnezhadi et al., 2020), contributing to freeze and thaw cycles. Frost heave along the coast upends trails and roads and contributes to rock toppling along coasts. Heavy, wet snowfalls coupled with the distinct landscape relief make driving difficult-to-impossible on roads with a steep incline. Along the east coast of the Avalon Peninsula, storms have caused extensive damage



Figure 7. The Battery facing SE of the St. John's Harbour (Ritche Perez, 2015).



Figure 8. The Battery facing NW from the St. John's Harbour (Shirley Eales, 1959).

from their high winds, high precipitation (rain and/or snow) leading to flooding, and the washing out of roads. Mass movement such as landslides and avalanches are not uncommon throughout the island of Newfoundland but have a particular impact on the residents within the historic fishing village, The Battery, which is located to the south-east of St. John's. While the Avalon Peninsula is used to high winds, it is the unexpected gusts of up to 100+ km/h that make moving from place to place particularly dangerous.

By mid-morning on Friday, January 17th in St. John's, snow was blowing in from all directions and city streets were all but abandoned. Extreme snow events are the most common reason for the city of St. John's to shut down throughout the winter months, but the predicted snowstorm event had higher than usual anticipated wind speeds and snow precipitation expected along the coastal Avalon and Bonavista peninsulas. Wind speeds were predicted to be close to that of hurricane speeds and extensive snowfall would cause whiteout conditions from early that Friday evening (January 17th) to the following Saturday (January 18th) morning. We had been told to prepare for an expected 40 to 75 centimetres of snow.

By 12:30 p.m. on Friday January 17th, 33 centimetres (Figure 9) had already been recorded at St. John's International Airport, according



Figure 9. Downtown St. John's during 'Snowmageddon.'

to Environment Canada. Via social media we were informed that snowploughs were being taken off highways on the Avalon Peninsula due to dangerous conditions, and people were advised to avoid travel. Late Friday, St. John's also pulled its ploughs from the roads, citing deteriorating conditions and reduced visibility. The Royal Newfoundland Constabulary said its officers were on call and available to respond to emergencies in St. John's. A spokesman advised people to stay off the roads if possible and prepare for power outages, with flashlights, food, and water on hand. The City of St. John's declared a SOE, ordering businesses closed and vehicles off the roads. The nearby towns of Mount Pearl, Paradise, Torbay, Portugal Cove-St. Philip's, and Conception Bay South followed suit. Air traffic in the region was also shut down Friday, and the airport issued a release that there would be no flights before Sunday at the earliest. In response, I observed a rallying of resources by the community members of St. John's and beyond.

2.1.2.2 Past Experiences, Resiliency, Adaptation

What I have noticed over the years, and during this snowstorm event, was that community members prepare for storms in such a way that they do not underestimate the potential damage the coming storm will bring. However, they do so with a general tongue-in-cheek sense of humour. As Newfoundland comedian Rick Mercer describes:

It's 400 years to waking up to a smack in the face,
It forces you to seek comic relief in death and depression.
In Newfoundland you have two choices: laugh or seek
therapy.

— Rick Mercer, 1992, from CBC The Archive

Although there was a fair bit of warning about the coming storm for those who lived on the Avalon, residents understand that it is difficult to predict. Community members were advised of wind damage such as removal of shingles or window blowouts on buildings and were

instructed to tie down and store loose objects on or near properties. Social media was inundated with photographs of store shelves emptied of 'storm chips' — and boasts of reasonably large quantities of alcohol that were to sustain households in the case of a power outage. Power outages and rolling blackouts are common during storm events impacting the Avalon. Communities often prepare for these occurrences, anticipating isolation that may potentially last for days.

The Friday evening felt like any other snowstorm evening, where we ensured we had food and candles, and that our electronics had been fully charged. Hunkered in, my children were reasonably invested in movies for much of the evening while I remained reasonably glued to my computer, monitoring social media comments that described occurrences and events in different communities near St. John's as well as frequent reviews of the recorded wind gusts from Environment Canada as they sporadically shook our house late into the evening.

Late in the morning hours of Friday, January 17th, an avalanche occurred on the Southside of Signal Hill within the Battery (adjacent to St. John's Harbour). This was the same location of an avalanche that happened in 1959 (Liverman et al., 2006). This time around, the avalanche had caused damage to home and property, with no one seriously injured. In response, the residents of four homes nearby (seven people in total) agreed to evacuate their homes, while six others decided to remain in The Battery (Anonymous, Saturday, January 18th, 2020). The evacuees were transported to a hotel via a four-wheel-drive vehicle once a route was cleared of snow. On the Saturday evening after the storm had passed, I walked through the Battery and talked with a local resident about the avalanche event, and although the community member recalled the previous avalanche, it was with more awe than emotion as no one could recall the family of the 1959 avalanche event where five people were killed and several injured.

Although power outages leading to rolling blackouts, or blackouts that last anywhere from a few hours to a few days during snowstorm events, are often caused by the failure of the dated and dilapidated energy plant in Holyrood, this was not the case for the January 2020



Figure 10. Cars in St. John's needed to be shovelled out before the predicted freezing rain in the days to come.



Figure 11. Saturday morning after the event. Snow did not deter community members from heading out and assessing the snow cover.

snowstorm. Instead, the heavy snow had downed lines throughout the city which could not be attended to by the Municipality until the storm had passed. Medical staff had been stuck in hospitals, in some cases, for over 36 hours and needed to be relieved but snow drifts made roads impassable, so there was little the city could do during the 24-hour snowstorm. Sadly, one life was lost during the storm.

Environment Canada reported that the city had experienced a new one-day snowfall record of 76.2 centimetres, breaking a previous record of 68.4 centimetres that fell on April 5th, 1999 (Environment Canada, 2022). In addition to snowfall, winds at the St. John's International Airport were recorded at between 120 and 157 km/h at the height of the storm (Environment Canada, 2022). Due to the combination of wind and snowfall, drifts in some areas were up to 178 centimetres in height and the weight caused some roofs to collapse. Houses had snow to the tops of front doors, and in some cases roofs, contributing to several social media posts of impromptu refrigerators. Cars, especially in cul-de-sacs where the snow seemed to accumulate, were completely covered. A number of people stranded in their homes in the downtown area were unreachable and most of the streets were entirely impassable.

By early Saturday morning, neighbours were contacting each other and/or asking for help using social media. More importantly, several community members in my neighbourhood headed out knocking on the doors of those we suspected were a little more vulnerable.



Figure 12. Snow accumulation along the periphery of St. John's core was extensive (Kim Todd, 2020).

This included sex workers, elderly persons, and low-income family households, as well as those who were alone and isolated with physical or mental health issues. The kids and I grabbed our snow shovels and headed out to do our part. On January 20th, the Canadian Armed Forces arrived to dig residents out of their homes, however not before many of us in the downtown community dug out neighbours ourselves.

Residents of most rural communities in both Newfoundland and Iceland have lives that are a hybrid of traditional and modern practices, particularly related to food. The baking of bread was a therapeutic response — using the senses such as sight, touch (kneading), smell, and taste to find grounding in an event that otherwise might leave an individual feeling dissociative (not feeling connected to the body, usually a trauma response). Bread baking has the added benefit of a practical result at the end. These same advantages can be found in the making of soup. A few days after the storm event, the key ingredient for bread making, yeast, was growing scarce, and I traded several packages for a variety of partially-filled vodka bottles. Practices such as baking bread and making soup, that are helpful to community members' ability to cope with the stress of a hazard, we found added to the feeling of social cohesion.

The story of Stone Soup is not only an old English and Irish tale, but is a folklore story shared across the globe. The story begins with a community that is desperately short of food, but after a visit by a stranger, they are reminded of their wealth, symbolized by a single large pot of soup that comes about from a little imagination and shared community contributions. It starts with an onion left in the cupboard and another who offers a bit of salt beef; a third offers their single carrot and another a potato to add to the pot and so on. This old legend about a lesson in sharing during scarce or harsh times is the foundation for the stocking of food banks across the country but was acted upon as *pop-up foodbanks* in St. John's, and throughout the Avalon, immediately after the snowstorm had ended.

On Saturday the 18th, members of the community became aware of the need to get food to vulnerable individuals. It was understood

that these people would be far less able to cope under the current conditions. Within hours of the storm ending, the *St. John's Food Sharing Co-op Stone Soup* had been developed (St. John's Food Sharing Co-op Stone Soup, 2022). It first started at a neighbour's house two doors down from our home but had grown so large within a day that we had to find an alternative location, which was offered by the Jimmy Pratt Children's Foundation, located in the downtown area of St. John's. To reach those that did not have access to communication technologies, we grouped in twos and visited residents in the downtown neighbourhoods. We were aware that this was an important initiative to touch base with vulnerable persons to let them know that during a time of crisis they had not been forgotten. Members of the group went door to door in the downtown area introducing themselves — making friendships with local residents that otherwise we had little contact with during our everyday lives. We sought out their needs and promised to make deliveries within the next day or two. In a very short time, and due to the desperate situation, rapport was quickly established, and many reached out. For vulnerable groups in our downtown region already struggling with disabilities and mental health, the snowstorm rendered them helpless or further vulnerable in many respects; however, the local community's efforts in helping fellow neighbours in a time of crisis may have strengthened their resilience.

With only emergency roads cleared by Saturday afternoon, many volunteers showed up to deliver food by foot. Custom orders for those who were in a state of withdrawal due to drug usage were made, which included juice, yogurts, and other high-sugar items to counter the effects of symptoms. To ensure inclusivity, community members were given the opportunity to make requests anonymously online. A second social media site was developed to keep people informed, *The Snowmageddon Warriors 2020*, which kept morale up, bringing the community closer together (The Snowmageddon Warriors 2020, 2021).

Following the January 17th snowstorm, heavy rain was expected on January 20th, followed by both flooding and freezing. Snow-covered cars and homes would freeze under the weight of the snow, and there

was little promise of melt, for it was only mid-January. Exhausted community members mobilized again, ready to aid in shovelling neighbours out and to identify, locate, and clear the storm drains to avoid flooding in the downtown area. This included myself, my two children, as well as a guest from England staying in our home. Fortunately, precipitation was not as high as expected and the city of St. John's avoided greater hazardous conditions.

3. DISCUSSION

As non-local residents reflecting on these 2020 snowstorm events on the islands of Iceland and Newfoundland, we discovered that within both of our island communities a social resilience approach had a positive influence on the communities' ability to bounce back from a snowstorm event. However, we also noted ways in which the communities could have been better supported in the event of a hazard and disaster brought on by a climatic event. The following summarizes some of our experiences and observations that led us to this conclusion.

3.1 Community Response Prior to the Snowstorm Events

Although both locations are rural and remote, relative to mainland urban centres, these communities have access to communication (from bodies such as Environment Canada and Icelandic Meteorological Office) that provide ample advance warning of storm events. As members of each of the communities, we observed that upon learning of a snowstorm warning, community members immediately acted with a preconceived plan such as stocking up on food supplies and engaging in conversation (both in-person and online) about the predicted events. We believe this response is built from practices developed through past experiences. Snowstorms are a common occurrence in both regions and although both island communities have had previous experiences with false snowstorm warnings, where the event falls short in scale of catastrophe originally predicted, in our experience, community members

were not hindered from preparing for snowstorms. In both locations prior to snowstorms, there was a cancellation of classes in schools, businesses closed early, people prepared to stay in their home potentially for days, and warnings of the conditions to come were thoroughly broadcasted, not just through electronic media but in grocery stores, local pubs, and geo-thermal outdoor public pools (in the case of Iceland).

While communications technology contributes positively to the communities' knowledge of the snowstorm events, it is well known that the accuracy of the information for storm events is not always reliable. And yet, both island communities were seen to plan and prepare for an event that would potentially shut down their community for several days. Further, within the communities of the Westfjords, the storm events are very prominently seen and sensed (felt) based on environmental changes such as cloud coverage, wind, atmospheric pressure, and ocean behaviour. For example, Bolungarvík is the most exposed town to northerly winds compared to its neighbourly towns (like Ísafjörður and Sudavík). There, local community members can observe drastic changes of storm movement through each township. The cloud coverage becomes dense, wind gusts and ocean swells become stronger (and more frequent), and the atmospheric pressure drops. These atmospheric changes have a shared meaning amongst community members of Ísafjarðarbær and Bolungarvíkurkaupstaður, triggering a change in people's moods from the complacency of day-to-day life to stress and excitement, a generally accepted shift that propels the communities into collective action in response to the upcoming storm.

The planning and preparedness of communities on the Avalon Peninsula of Newfoundland specifically included: preparing to leave work/school earlier than usual, planning to stop for groceries and other supplies needed in case of a power blackout (or rolling blackouts), anticipating road closures between towns, and preparing for general isolation within homes. Group clustering of people occurs online and in public places to discuss the upcoming snowstorm event and continues as it is happening. Post-event, people meet out in the streets to assess the outcomes and damages. Whether it was pre-, during-, or

post-event, both regions acted to maintain communication, making social cohesion a priority.

We noted that while both island communities remained calm, the attitude of Newfoundlanders in anticipation of storms was also playful and full of humour. Many Newfoundlanders embrace humour during times of challenge and potential stress. Humour is symbolic of a community's boundaries of shared similarities and common understandings (Kuipers, 2009). Familiar, common utterances and jokes as well as laughing together is a sign of belonging (Kuipers, 2009) that brings people together, forming an intimate connection that sustains communities through times of crisis. However, humour is expressed in several different ways and is unique to each culture. Although Icelanders are known for their own unique expression of humour, without the ability to understand Icelandic, neither of the authors were able to interpret whether this was an adaptive approach in the Icelandic communities of Bolungarvík, Ísafjörður and Sudavík during the snowstorm events. Nonetheless, the approach and attitude of both communities within Newfoundland and Iceland were generally ones of acceptance. If anything, storms are often treated as an opportunity for the community to slow down and relax with friends and family in their homes until the event passes.

3.2 Community Response During the Snowstorm Events

As mentioned above, communication during snowstorm events is critical, particularly in the Westfjords of Iceland. Flateyri, Bolungarvík, and Súðavík are examples of towns with both snow-avalanche and debris-flow hazards (Decaulne, 2004) and where the Icelandic Meteorological Office (IMO) is constantly monitoring to provide updated information to the municipalities. The IMO would survey snow-packed areas and watch for freeze and thaw cycles regularly. Through these surveys, the IMO can communicate what areas are considered low or high risk for avalanches or mud slides, therefore addressing what areas are dangerous for people to drive and, in the worst case, identifying if evacuation is

required. By monitoring the snowpack's movement through these cycles and collecting this environmental data when snowstorm events occur, advised maintenance of snow barriers can be addressed as can the requirement of building new barriers in other areas.

There is only one road leading in and out of small towns like Bólungarvík. And roads, as well as homes, in and near Flateyri and Súðavík are known to be high-risk areas for snow avalanches. Communication among community members as well as from the Met Office is essential within each community to inform members of the dangers along commuting routes and of potential road closures. When a potential power outage or road closure due to avalanches and ice, snow, and wind gusts occurs, it is likely that small communities of the Westfjords become isolated for a few days until roads are cleared. Therefore, isolation occurs not just within homes and neighbourhoods; there is also no traffic movement between communities, emphasizing the necessity of preparing to “bunker down” in homes, potentially for days. For communities in both Iceland and Newfoundland, during times of forced bunkering down, home baking and cooking provide warmth and comfort. Staying safe indoors, playing games, and sharing moments with family/friends, sometimes referred to as *hygge* (Old Norse for hug), symbolizes the value of the informal connection of staying inside and cozy and of relaxed play. Although Newfoundland does not have an equivalent word to *hygge*, we did observe that Newfoundlanders took equivalent action in terms of accepting extreme weather events as a time to stay safe indoors and share in relaxed time with family and/or friends.

During a snowstorm event, few people take the risk of venturing outside. Most individuals remain indoors, keeping tabs on storm updates as well as its impacts on various parts of the community via social media, and/or texting. Although homes may be without Wi-Fi during blackouts, we observed many within the community to be privileged with the use of phone data. For example, messages between community members on the Avalon were light and positive, yet informative. Within Iceland, there are websites that people can access through

computers and their phones. Examples include: <https://www.ruv.is/> (news broadcasting that would be updated frequently across the country); <https://www.road.is/> (to give updates on road conditions, especially major highways over mountain passes, and provide camera footage of areas that are known to be worse for snow accumulation and wind); and <https://vedur.is/> (to give weather forecast updates across the country). In Newfoundland, Environment Canada is a frequently relied upon weather service. Facebook, for both regions, is also a popular platform for locals to check in on each other and provide updates to small groups of what is occurring in the towns. Both authors note that the use of social media platforms (for rapid communication and images, as well as for text with translation) was an excellent tool for ensuring that information is shared among residents for whom English or Icelandic is a second language.

Both before and during snowstorm events, the attitude we experienced among community members within each of these island communities was familiar, and yet simultaneously accepting of the uncertainty of what the snowstorm might bring in terms of physical damage to the community, and therefore what collective action might be warranted. We suggest that characteristics of familiarity and acceptance — developed over time and through multiple experiences with storm events — by both communities may make them more malleable to the unpredictable changes that climate change will bring to their regions.

3.3 Community Response Post-Snowstorm Events

Unless it involved someone employed in a critical job such as health care, policing, or the rescue team (“björgunarsveitir,” under the umbrella of Department of Civil Protection and Emergency Management, “almannavarnir”), we observed that each of these regions moved slowly in terms of getting back to normal in the storm’s aftermath. Resumption of pre-storm activity was largely secondary to first checking in on neighbours as well as getting the community up-and-running again, and ensuring that community members were mobile and

able to leave their homes safely. Agentic mobilization of able-bodied persons in both regions was swift and included the rallying of resources (e.g. food, water, shovels) and seeking out of those who were most vulnerable and in need of aid. Also, volunteer rescue teams were on the scenes if any emergencies arose. There was little assumed dependence on external organizations such as the Canadian Military or the Icelandic Coast Guard, both of which may not arrive for days post-event.

People experience agency when they manage to make things happen, and thus feel a sense of effective control in the process of change from state to state (Higgins, 2015). In both communities, people who were able walked out on the street to assess the damages caused by wind and excessive snowfall. Many people were prepared with outdoor clothes and armed with shovels to start digging out front doors of houses and cars. Within both regions, community members not only shovelled their own property out of metre-high snow drifts but proceeded to shovel their neighbours out as well — working collectively to mitigate damage brought about by the snowstorm. For many, the task of getting the place up-and-running again was a shared, collective responsibility. When people come together for the purpose of accomplishing a task their behavior involves more than the intentions and meanings brought into the situation, and suggests that the interaction as a central feature of all joint actions contributes to the emergence of a quality that may not have existed before the interaction occurred (Denzin, 1969).

The collective responsibility of each of these communities was acted upon pre-, during- and post-snowstorm event. The old legend of Stone Soup is not just about a lesson in sharing food during scarce or harsh times, but it is a metaphor with meaning — that when a community pools its resources together, they are the more successful for it. After several days of cozying up indoors where certain community members had the time and resources to make bread and soups, excess food was distributed post-storm. Pop-up foodbanks and soup kitchens were established in St. John's within 24 hours after the end of the storm.

4. CONCLUSION

The alternative is deep reciprocity. It's respect, it's relationship, it's responsibility, and it's local.

— Leanne Betasamosake Simpson (2013)

There are several reasons for the social cohesion of each of these island communities. What is clear is that people in both remote northern places have adapted to the harsh environment in which they settled. Because these regions are composed of very small human populations of approximately 393,000 (Iceland) and 572,000 (Newfoundland), human existence hinges on a collective ability to persevere, and persevere together. Collective action was clearly demonstrated during extreme events: able-bodied people got out onto the streets when it was safe to do so and they either shoveled snow for those who were snowed in by roof-high snow drifts, or buried cars were dug out. Fast-acting and community-based agentic mobilization was especially beneficial to vulnerable groups such as the elderly or those with physical disabilities who were potentially unable to get themselves out of their homes, some of which already had little food stores. Those privileged with a surplus of food donated it to those who did not — everybody who could give, gave something. Community action reduced stress and harm to many fellow residents.

The collective action not only decreased stress and harm in vulnerable groups but, significantly, *abated increased stress* in the more privileged by empowering their perception of the problem with the ability to help by taking action. We perceived this agentic mobilization as an attitude of “we are in this together” and “no one gets left behind,” both of which improved the mood and imbued a sense of hopefulness over hopelessness. Certain potentially vulnerable members of the community are aware of the community’s programmed response, decreasing their concern as they likely possess the knowledge that their community will be fast-acting and that they will be reached and assisted in a reasonable time.

The use of technology as a predicative tool (i.e. weather forecasting) or for communications (i.e. social media) are helpful aids in planning and preparedness in the face of a snowstorm event — for those who have access. However, we argue that the community's shared worldviews that embrace inheritance of memory and familiarity of past events plays the greatest role in resilience and adaptation. Although the communities mentioned in this paper use forms of communication technology, we do not believe it was the primary contributing factor in their success as it excludes certain vulnerable groups.

With respect to storm events, we experienced an attitude among community members that generally accepted the unpredictability of nature as a way of life. This characteristic attitude of these communities suggests that they may be more adaptive to the unpredictable changes that climate change will bring to their regions and, arguably, many other regions across the globe. In both the Avalon Peninsula and Westfords, the relations of locals within towns and neighbouring townships show we are connected and going through similar challenges. Human interactions have also shown how people in these communities can help each other empathetically; our experiences are unique and should be deemed unique at a local level, yet we all share in the challenges brought about by the current climate crisis.

We observed several levels of resilience and adaptive success within local contexts. However, we believe strongly that even the most successful of local practices in the most resilient of communities must be supported through additional resources to facilitate and build community planning and preparedness for the increasing frequency and intensity of extreme weather events. For those resources to be enacted with maximum efficacy, top-level policy makers need to listen to and be inclusive of local stories and successes. Specifically, key resources must include the allocation of funding to local experts: the groups who provide support and services to vulnerable groups within each of these communities. In addition, we encourage continued local, place-based conversation and storytelling around experiences and perceptions of climate impact. The observations and personal experiences made here by the authors

provide a promising lesson about the value of local inherited knowledge through experience and social cohesion, as well as collective decision-making and action taken prior to, during, and following snowstorm events. We emphasize the integration of this local knowledge into the larger discourse around adaptation to the climate crisis, providing these communities with the support to lead themselves.

Symbolic interaction between community members over time proves to be a prominent part of inherited local knowledge and thus preparedness for disaster events. Therefore, community engagement is a significant factor when assessing risk and safety of community members. Globally, the climate crisis is upon us with Arctic and North Atlantic coastal communities being some of the most vulnerable areas. Understanding the local practices and knowledge that have made them more resilient in response to their environment is of great value to the community in times of immediate crisis and in each consecutive crisis thereafter by contributing positively to a community's ability to relate to drastic and rapid changes to their environment (van Manen, 2007). Within the global context, we find the lessons learned valuable to island communities with similar characteristics to that of Newfoundland and Iceland, but encourage all communities, urban and rural, to draw from these stories, embracing these less popular practices of social cohesion in the face of the climate crisis and the inevitable wave of increased intensity and frequency of climatic events.

In summary, successful rebounding from these snowstorm events resulted from collective action taken in response to communications that came about in many forms prior to, during, and post-snowstorm. The shovelling of snow, the baking of bread, the sharing of soup, as well as knocking on doors to exchange yeast for vodka had a meaningful impact on people's mental, emotional, and physical well-being. Subsequently, each of these communities were able to bounce back and will be able to respond effectively to future events.

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BIBLIOGRAPHY

- Abbasnezhadi, K., Rousseau, A.N., & Bohrn, S. (2020). Mid-21st century anthropogenic changes in extreme precipitation and snowpack projections over Newfoundland. *Canadian Water Resources Journal / Revue canadienne des ressources hydriques*, 45(3), 216–236. <https://doi.org/10.1080/07011784.2020.1760140>
- Abramowitz, S.A. (2005). The poor have become rich, and the rich have become poor: Collective trauma in the Guinean Languette. *Social Science and Medicine*, 61(10), 2106–2118. <https://doi.org/10.1016/j.socscimed.2005.03.023>
- Adger, W.N., Arnell, N.W., & Tompkins, E.L. (2005). Successful adaptation to climate change across scales. *Global Environmental Change*, 15, 77–86. <https://doi.org/10.1016/j.gloenvcha.2004.12.005>
- Aðalgeirsdóttir, G., Jóhannesson, T., Björsson, H., Pálsson, F., & Sigurðsson, O. (2006). Response of Hofsjökull and southern Vatnajökull, Iceland, to climate change. *Journal of Geophysical Research: Earth Surface*, 111(3), 1–15. <https://doi.org/10.1029/2005JF000388>
- Alcorn, H.S., & Blanchard, H.J. (2004). Treating the hidden wounds of a springtime disaster. *Environment and Climate Change Canada*. www.ec.gc.ca/water/en/mange/floodgen/e_andov.htm
- The Archive. (2020, October 3). *Young Rick Mercer explains Newfoundland*

- humour* [Video]. YouTube. https://www.youtube.com/watch?v=2YzCPqX8E_U&t=6s
- Barnes, M.L., Bodin, Ö., Guerrero, A.M., McAllister, R.R.J., Alexander, S.M., & Robins, G. (2017). The social structural foundations of adaptation and transformation in social-ecological systems. *Ecology and Society*, 22(4). <https://doi.org/10.5751/ES-09769-220416>
- Batterson, M.J., Liverman, D.G.E., & Taylor, D.M. (1995). The assessment of geological hazards and disasters in Newfoundland. Current Research. Newfoundland Department of Natural Resources, *Geological Survey*, 95(1).
- Bird, D.K., Gísladóttir, G., & Dominey-Howes, D. (2011). Different communities, different perspectives: Issues affecting residents' response to a volcanic eruption in southern Iceland. *Bulletin of Volcanology*, 73(9), 1209–1227. <https://doi.org/10.1007/s00445-011-0464-1>
- Blumer, H. (1969). *Symbolic interactionism perspective and method*. Berkeley & Los Angeles, University of California Press.
- Burton, I., Huq, S., Lim, B., Pilifosova, O., & Schipper, E.L. (2002). From impacts assessment to adaptation priorities: The shaping of adaptation policy. *Climate Policy*, 2(23), 145–159. <https://doi.org/10.3763/cpol.2002.0217>
- Carter, M.J., & Fuller, C. (2016). Symbols, meaning, and action: The past, present, and future of symbolic interactionism. *Current Sociology*, 64(6), 931–961. <https://doi.org/10.1177/0011392116638396>
- Chandler, B., Evans, D., & Roberts, D. (2016a). Characteristics of recessional moraines at a temperate glacier in SE Iceland: Insights into patterns, rates and drivers of glacier retreat. *Quaternary Science Reviews*, 135, 171–205. <https://doi.org/10.1016/j.quascirev.2016.01.025>
- Chandler, B., Evans, D., & Roberts, D. (2016b). Recent retreat at a temperate Icelandic glacier in the context of the last ~80 years of climate change in the North Atlantic region. *Arktos*, 2(24), 1–13. <https://doi.org/10.1007/s41063-016-0024-1>
- Creamer, T.L., & Liddle, B.J. (2005). Secondary traumatic stress among disaster mental health workers responding to the September 11 attacks. *Journal of Traumatic Stress*, 18(1), 89–96. <https://doi.org/10.1002/jts.20008>
- Cronin, S.J., Gaylord, D.R., Charley, D., Alloway, B.V., Wallez, S., & Esau,

- J.W. (2004). Participatory methods of incorporating scientific with traditional knowledge for volcanic hazard management on Ambae Island, Vanuatu. *Bulletin of Volcanology*, 66(7), 652–668. <https://doi.org/10.1007/s00445-004-0347-9>
- Decaulne, A. (2004). Combining geomorphological, historical and lichenometrical data for assessment of risk due to present-day slope processes, a case study from the Icelandic Westfjords. In Brebbia, C.A. (Ed.), *Risk Analysis IV* (pp. 177–186). Wit Press, Southampton. <https://10.2495/RISK040161>
- Denzin, N. (1969). Symbolic interactionism and ethnomethodology: A proposed synthesis. *American Sociological Review*, 34(6), 922–934. <https://doi.org/10.2307/2095982>
- Devine-Wright, P., & Clayton, S. (2010). Introduction to the special issue: Place, identity and environmental behaviour. *Journal of Environmental Psychology*, 30(3), 267–270. [https://doi.org/10.1016/S0272-4944\(10\)00078-2](https://doi.org/10.1016/S0272-4944(10)00078-2)
- Durkheim, É. (2008). The elementary forms of religious life. In Cladis, M. S. (Ed.), Cosman, C. (Trans.), *Oxford World's Classics*. Oxford, Oxford University Press.
- Edgeworth, M., & Benjamin, J. (2017). What is a river? The Chicago river as hyperobject. In Kelly, J., et al. (Eds.), *Rivers of the Anthropocene* (pp. 162–175). California, University of California Press. <https://doi.org/10.1525/luminos.43.1>
- Environment and Climate Change Canada. *Wind Speed - Hourly Data for St. John's*. Retrieved from <https://stjohns.weatherstats.ca/charts/wind-speed-hourly.html>. Accessed on September 26th, 2022.
- Environment Canada. *Historical Climate Data*. Retrieved from https://climate.weather.gc.ca/index_e.html. Accessed on January 27th, 2023.
- Etienne, S., & Paris, R. (2010). Boulder accumulations related to storms on the south coast of the Reykjanes Peninsula (Iceland). *Geomorphology*, 114(1–2), 55–70. <https://doi.org/10.1029/2006jf000541>
- Farbrot, H., Ezelmüller, B., Schuler, T., Guðmundsson, Á., Eiken, T., Humlum, O., & Björnsson, H. (2007). Thermal characteristics and impact of climate change on mountain permafrost in Iceland. *Journal of Geophysical Research*, 112(F3), 1–12. <https://doi.org/10.1029/2006jf000541>

- Folke, C. (2006). Resilience: The emergence of a perspective for social-ecological systems analyses. *Global Environmental Change*, 16(3), 253–267. <https://doi.org/10.1016/j.gloenvcha.2006.04.002>
- Folke, C., Carpenter, S.R., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). Resilience thinking: Integrating resilience, adaptability and transformability. *Ecology and Society*, 15(4). <https://www.jstor.org/stable/26268226?seq=1&cid=pdf->
- Gaillard, J.C. (2007). Resilience of traditional societies in facing natural hazards. *Disaster Prevention and Management: An International Journal*, 16(4), 522–544. <https://doi.org/10.1108/09653560710817011>
- Hall, P. (2013). *Recruiting the visual: Knowing our common place towards an encyclopedia of local knowledge*. Memorial University of Newfoundland, St. John's.
- Higgins, E.T. (2015). Control and truth working together: The agentic experience of “going in the right direction.” In P. Haggard & B. Eitam (Eds.), *The Sense of Agency, Social Cognition and Social Neuroscience* (pp. 327–344). New York: Oxford Academic. <https://doi.org/10.1093/acprof:oso/9780190267278.003.0015>
- Jóhannesdóttir, G., & Gísladóttir, G. (2010). People living under threat of volcanic hazard in southern Iceland: Vulnerability and risk perception. *Natural Hazards and Earth System Sciences*, 10, 407–420. <https://doi.org/https://doi.org/10.5194/nhess-10-407-2010>
- Kaniasty, K. (2020). Social support, interpersonal, and community dynamics following disasters caused by natural hazards. *Current Opinion in Psychology*, 32, 105–109. <https://doi.org/10.1016/j.copsyc.2019.07.026>
- Klenk, N., Fiume, A., Meehan, K., & Gibbes, C. (2017). Local knowledge in climate adaptation research: Moving knowledge frameworks from extraction to co-production. *Wiley Interdisciplinary Reviews: Climate Change*, 8(5), 1–15. <https://doi.org/10.1002/wcc.475>
- Koltko-Rivera, M.E. (2004). The Psychology of Worldviews. *Review of General Psychology*, 8(1), 3–58. <https://doi.org/10.1037/1089-2680.8.1.3>
- Kuipers, G. (2009). Humor styles and symbolic boundaries. *Journal of Literary Theory*, 3(2), 219–239. <https://doi.org/10.1515/JLT.2009.013>
- Latulippe, N., & Klenk, N. (2020). Making room and moving over: Knowledge co-production, Indigenous knowledge sovereignty and the politics of global environmental change decision-making. *Current*

- Opinion in Environmental Sustainability*, 42, 7–14. <https://doi.org/10.1016/j.cosust.2019.10.010>
- Laub, D., & Lee, S. (2003). Thanatos and massive psychic trauma: The impact of the death instinct on knowing, remembering, and forgetting. *Journal of the American Psychoanalytic Association*, 51(2), 433–464. <https://doi.org/10.1177/00030651030510021201>
- Liverman, D., Catto, N., & Batterson, M. (2006). Geological hazards and disasters in St. John's. *Newfoundland Studies*, 21(1), 71–96. Retrieved from https://id.erudit.org/iderudit/nflds21_1art03
- Maguire, B., & Cartwright, S. (2008). Assessing a community's capacity to manage change: A resilience approach to social assessment. Retrieved from <http://www.ag.gov.au/cca>.
- Marshall, N.A., Fenton, D.M., Marshall, P.A., & Sutton, S.G. (2007). How resource dependency can influence social resilience within a primary resource industry. *Rural Sociology*, 72(3), 359–390.
- McNamara, K.E., & Buggy, L. (2017). Community-based climate change adaptation: A review of academic literature. *Local Environment*, 22(4), 443–460. <https://doi.org/10.1080/13549839.2016.1216954>
- McNamara, K.E., & Westoby, R. (2011). Local knowledge and climate change adaptation on Erub Island, Torres Strait. *Local Environment*, 16(9), 887–901. <https://doi.org/10.1080/13549839.2011.615304>
- Paton, D., & Johnston, D. (2001). Disasters and communities: Vulnerability, resilience and preparedness. *Disaster Prevention and Management: An International Journal*, 10(4), 270–277. <https://doi.org/10.1108/EUM0000000005930>
- Schipper, E.L.F. (2007). Climate change adaptation and development: Exploring the linkages. Norwick, UK: Tyndall Centre for Climate Change Research. Working Paper, 107, 13.
- Shapiro, M.A., & Grønås, S. (1999). Historical Photos. In *The Life Cycles of Extratropical Cyclones* (pp. 87). American Meteorological Society, Boston, MA.
- Simpson, L.B. (2013) "Dancing the World into Being: A Conversation with Idle No More's," *Yes! Magazine*. Retrieved from <https://www.yesmagazine.org/social-justice/2013/03/06/dancing-the-world-into-being-a-conversation-with-idle-no-more-leanne-simpson>. Accessed on September 25th, 2022.

- Smith, L.E., Bernal, D.R., Schwartz, B.S., Whitt, C.L., Christman, S.T., Donnelly, S., Wheatley, A., Gillaume, C., Nicolas, G., Kish, J., & Kobetz, E. (2014). Coping with vicarious trauma in the aftermath of a natural disaster. *Journal of Multicultural Counselling and Development*, 42(1), 2–12. <https://doi.org/10.1002/j.2161-1912.2014.00040.x>
- Speranza, C.I., Wiesmann, U., & Rist, S. (2014). An indicator framework for assessing livelihood resilience in the context of social-ecological dynamics. *Global Environmental Change*, 28(1), 109–119. <https://doi.org/10.1016/j.gloenvcha.2014.06.005>
- St. John's Food Sharing Co-op - Stone Soup. (n.d.). Retrieved from <https://www.facebook.com/groups/3629397833744945>. Accessed on September 26th, 2022.
- The Snowmageddon Warriors 2020. (n.d.) Retrieved from <https://www.facebook.com/groups/2636262083118477>. Accessed on March 7th, 2021.
- Thompson, K.R., Bernier, N.B., & Chan, P. (2009). Extreme sea levels, coastal flooding and climate change with a focus on Atlantic Canada. *Natural Hazards*, 51(1), 139–150. <https://doi.org/10.1007/s11069-009-9380-5>
- van Aalst, M.K., Cannon, T., & Burton, I. (2008). Community level adaptation to climate change: The potential role of participatory community risk assessment. *Global Environmental Change*, 18, 165–179. <https://doi.org/10.1016/j.gloenvcha.2007.06.002>
- van der Kolk, B.A. (2014). *The body keeps the score: Brain, mind, and body in the healing of trauma*. New York, NY: Viking Press.
- van Manen, M. (2007). Phenomenology of practice. *Phenomenology & Practice*, 1(1), 11–30. <https://doi.org/10.29173/pandpr19803>.
- Vasseur, L., & Catto, N.R. (2007). From impacts to adaptation: Canada in a changing climate 2007. In D.S. Lemmen, F.J. Warren, Lacroix, J., & Bush, E. (Eds.), *Atlantic Canada* (pp. 119–170). Ottawa: Natural Resources Canada.
- Wilson, N.J. (2014). The politics of adaptation: Subsistence livelihoods and vulnerability to climate change in the Koyukon Athabaskan village of Ruby, Alaska. *Human Ecology*, 42, 87–101. <https://doi.org/10.1007/s10745-013-9619-3>