All Things Considered: Evaluating Emergency Preparedness for Vulnerable and Disadvantaged Populations in Canadian Cities

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ABSTRACT

In the past few decades, an increase in the severity and the occurrence of natural disasters has been observed around the world. In parallel, the global population is growing, ageing, and densifying, which will only intensify the impact of future natural disasters. When a disaster strikes, certain populations (people of low-income, people with disabilities, people with health issues, people in the care of others, people with a low level of education, the very young, the elderly, the homeless, immigrants, and even tourists) become disproportionately affected prior to, during, and after the disaster due to their pre-existing vulnerabilities and disadvantages.

While Canada experiences a range of natural disasters annually, their relatively small size and tendency to affect less populated areas have restricted their potential for devastation. However, with the recent occurrence of several large-scale disasters in similar high-income countries (Hurricane Katrina, the Christchurch earthquake series, and Hurricane Sandy) and the devastation they specifically caused among vulnerable and disadvantaged populations has uncovered the need to properly plan for these groups in the face of disasters.

This supervised research project aims to investigate how the vulnerable and disadvantaged populations of a large city (Vancouver, British Columbia) and a mid-sized city (Windsor, Ontario) in Canada would fare in a large-scale hypothetical disaster (respectively, a large earthquake and major flooding). The local, provincial, and federal emergency management plans and web resources for both cities were evaluated in their consideration of vulnerable and disadvantaged populations and of the hypothetical disaster.

The analysis uncovered that emergency management plans and resources in Vancouver and Windsor did not properly or consistently address the needs of vulnerable and disadvantaged populations in the context of a large-scale disaster. Adequate consideration and planning for these groups is therefore necessary not only to ensure the survival of many should a disaster strike, but also to reduce the societal disadvantage of their pre-existing vulnerabilities.

The results of the analysis coupled with lessons learned and best practices with respect to vulnerable and disadvantaged populations in recent large-scale disasters were amalgamated to develop the following recommendations for Vancouver, Windsor, and Canada as a whole:

- Emergency preparedness, planning and response must be two-tiered: (1) for the general population and (2) for vulnerable and disadvantaged populations in order to ensure adequate consideration of these groups;
- All levels of government and bodies (NGOs, transit agencies) involved in the preparedness, response, and recovery process must have public, clearly laid-out, and coordinated emergency management plans and resources specifically for their concerned areas and vulnerable and disadvantaged populations;
- Develop communication channels specifically for vulnerable and disadvantaged populations in disasters;
- Prioritize outreach and social network-building for vulnerable and disadvantaged populations in preparation for a disaster;
- Access to services, mobility, and outreach for vulnerable and disadvantaged populations must be prioritized in the immediate aftermath and short-term following a disaster;
- In emergency preparedness, response, and recovery, infrastructure that is essential to the well-being of vulnerable and disadvantaged populations, including communications, power, water, and transit, must be protected (when possible);
- Use the aforementioned infrastructure to its full potential (ie. transit for the evacuation of vulnerable and disadvantaged populations) in order to improve efficiency and for these resources to be allocated repeatedly and in a variety of ways during the course of disaster response and recovery.

This supervised research project does not pretend to analyze the capability of these cities to deal with vulnerable and disadvantaged populations in large-scale disasters. It rather seeks to evaluate the consideration of these groups in Canadian emergency management plans and web resources, opening the door for future and more in-depth research on the matter.

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Introduction

Every passing year, natural disaster impacts break yet another record. An 80% increase in large-scale weather events has been observed globally from 1980 to 2009, and in Canada, insurable damage caused by severe weather was at its highest-ever in 2016 (Garrett, 2015; Insurance Bureau of Canada, 2017). While Canada experiences a range of natural disasters annually, their relatively small size and tendency to affect less populated areas have restricted their potential for devastation. However, with increasing population age, growth, and urbanization in the country, the effects of natural disasters will likely intensify (Garrett, 2015; Davey & Neale, 2013; Renne et al., 2008). When a natural or human-made disaster occurs in developed countries, certain populations are disproportionately affected due to their lack of resources: people of low-income, people with disabilities, people with health issues, people in the care of others, people with a low level of education, the very young, the elderly, the homeless, immigrants, and even tourists. Depending on the type and severity of the disaster, these populations could be affected on many scales prior to, during, and even after the disaster; due to not having the means to evacuate or to reach shelters, not being able to access essential services, not being able to understand or have the means to understand information from authorities, not being able to access employment due to damaged infrastructure, etc. For the purpose of this supervised research project, the populations described above will be categorized as Vulnerable and Disadvantaged Populations (VADPs) in the context of large-scale disasters.

While Canada has so far escaped devastating large-scale disasters affecting its biggest cities, the recent occurrence of several catastrophes in high-income countries has demonstrated that while they possess more resources to prepare for and respond to disasters than lower-income countries, they are not immune to devastation from these events. When Hurricane Katrina hit the New Orleans area in 2005, many people were unable to escape the city because they lacked transportation and were left to perish due to a lack of proper planning and preparation by the local government, while most people with a car were able to successfully leave the area. Moreover, delivering emergency supplies and services to those remaining in the

area was made near impossible, mostly due to roads being completely obstructed cars (Schwartz & Litman, 2008). In the aftermath of the 2011 Christchurch earthquake, the local elderly populations, mobility-challenged populations, and people with disabilities were severely affected, as damaged `infrastructure impeded access to welfare centers and services for most, while car-owners or people with a strong social network experienced little disruption (Phibbs et al., 2012). When Hurricane Sandy hit the east coast of the United States in 2012, public transit service was suspended in some cases for weeks due to damaged equipment and infrastructure, which greatly affected the VADPs of these areas and impeded their access to jobs, services, and social networks (Klinenberg, 2015).

Relatively little research exists on the consideration of VADPs in the case of disasters, yet these are the groups for whom public sector services may mean life or death in an emergency and a rapid or slow return to normality in the aftermath of a crisis. The objective of this supervised research project is to evaluate the readiness and equity of Canadian emergency management structures in serving VADPs in the event of a disaster. The following questions guide this research: To what extent are VADPs considered and prioritized in Canadian emergency preparedness? What lessons can be learned from recent disaster experience in other similar high-income countries? How does Canada compare to other developed countries with respect to well-articulated and equitable preparedness measures for VADPs in emergencies?

The methodology used for this supervised research project entails an examination of the particular issue VADPs face in the context of disasters and a review of recent Canadian disasters. Three recent cases of large-scale disasters affecting similar high-income countries will then be presented; a review of the existing research on the effects of these disasters will uncover the experience of VADPs and aim to identify resulting policy changes, lessons learned, and best practices following these events. An analysis of a large urban area (Vancouver, British Columbia) and a mid-sized city (Windsor, Ontario) will then be conducted; the local, provincial and federal governments' plans, official documents, and web resources on emergency management and preparedness will be evaluated in respect to their consideration of VADPs; the analysis will also consider that a hypothetical disaster would affect each city (an earthquake in Vancouver and flooding in Windsor); this analysis will uncover the ability of the cities to plan for, prepare, and

respond to VADPs in the case of a large-scale disaster. The final chapter will consist of a discussion, and present recommendations in terms of how these cities can improve their resilience and equity in emergency management.

It is important to note that a complete evaluation of a city's preparedness for a disaster is multi-dimensional and would require years and a large team of researchers to conduct in-depth analyses of budgets, resources, etc. For the purpose of this supervised research project, only a few aspects of emergency preparedness will be analyzed, including public and official plans, documents, and principal public information outlets (websites, social media). Moreover, only the prior, immediate, and short-term effects of disasters on VADPs and a few elements of the planned government response will be considered in this research, including access to services (public awareness and preparedness campaigns, public assistance to disaster victims) and mobility (evacuation, re-entry, rescue). However, it is important to note that serious long-term effects often stem from disasters, especially for VADPs, such as persisting housing problems (deplorable conditions, not being rehoused after a disaster, etc.), economic insecurity resulting from the disaster, and enduring physical and mental health problems (Grohen et al., 2013). Lastly, this supervised research project does not claim to include all existing VADPs and people which may be disproportionately affected in disasters; rather, it aims to identify existing societal issues and disadvantages experienced by some, provide insight on how to increase general social equity, and provide context for further research on the topic. The importance of the study is reflected in the growing concentrations of vulnerable and disadvantaged urban populations, their exposure to catastrophes, and the expected increase of disasters linked to climate change.

Context

This chapter will first present a brief history and the context of disasters in Canada. A review of the existing literature on the experience of VADPs in emergencies will then be presented in order to identify overarching and existing issues, followed by a review of mobility and access to services for VADPS in the case of emergencies.

History of Disasters in Canada

Canada's emergency management structure resembles that of other Commonwealth countries and is a relatively lucky country in that it is not subject to many large-scale natural disasters. However, its urban population is growing and ageing, and the scale of weather events is increasing (Garrett, 2015; Insurance Bureau of Canada, 2017). It is therefore critical for the country to reassess its emergency management structure in order to properly plan for growing VADPs in the context of disasters. In this chapter, an overview of the Canadian disasters that have had the most impact in the last 75 years will be presented, along with a more detailed review of two of the most recent large disasters.

Canada's risk environment is composed of a variety of natural and man-made disasters, including "wild land and urban interface fires, floods, oil spills, the release of hazardous materials, transportation accidents, earthquakes, hurricanes, tornadoes, health or public health disorders, disease outbreaks or pandemics, major power outages, cyber incidents, and terrorism" (Government of Canada, 2011, p. 2). As it will be illustrated in the following paragraphs, the disasters that have had the most impact in Canada in the last 75 years have been transportation accidents, winter storms, flooding, and forest fires.

In the last few decades, two disasters have happened in the form of train derailments in Canada. The first was in Mississauga, Ontario in 1979, where a freight train derailment caused explosions and released a toxic cloud of chlorine. Around 225,000 people were evacuated safely, including six nursing homes and three hospitals, and there were no deaths. It was the largest

evacuation in peacetime Canada (Abdelgawad & Abdulhai, 2012). Ambulances and buses from surrounding transit commissions were sent to help evacuate (City of Mississauga, n.d.), and police officers patrolled the area to alert residents to leave. A few thousand people were evacuated by transit; nearly half of the city's public transit fleet (48 out of 128 buses) was used to evacuate hospitals and nursing homes, as well as people that did not have other means to evacuate. Some buses were also used as shelters for firefighters (Scanlon, 2003). More recently in 2013, a train carrying crude oil derailed in Lac Mégantic, Québec, destroying most of the town's downtown core and killing 47 people in the resulting fire and explosions. Survivors were evacuated to nearby shelters (Transportation Safety Board of Canada, 2014).

The harsh Canadian winters are also an important cause of disasters in Canada; the infamous ice storm of 1998, which struck the Ottawa and Montreal regions, killed 28 people as a result of loss of electricity (cold, carbon monoxide poisoning, etc.) and due to people not being able to leave their homes on account of the ice accumulation. This ice storm was technically Canada's largest disaster in known history, as 250 communities declared a state of emergency, and 600,000 people were evacuated (Abdelgawad & Abdulhai, 2012). Transit agencies, police, fire, ambulance, health and social services, shared operational duties in the evacuation and the transportation of people (Scanlon, 2003).

The Canadian Spring can also bring disasters, as the thaw of the winter stock of snow along with periods of rain can create overflowing rivers, leading to flooding. In Canada, flooding is the most expensive hazard in terms of property damage (Abdelgawad & Abdulhai, 2012). The deadliest known case in Canadian history was in 1954 when Hurricane Hazel hit the Toronto area, causing the Humber River to flood and killing 30 people as a result (Abdelgawad & Abdulhai, 2012). More recently, in 2009, snowmelt combined with rain and snow caused the flooding of the Red River, where nearly 30,000 people were forced to evacuate the Winnipeg, Manitoba area.

Alberta Floods

In 2013, Alberta experienced the worst flooding in its history due to heavy rainfall. Around 30 states of emergency were declared and emergency operations centres were opened to assist

the 75,000 evacuated. Over 2,000 Canadian Forces troops were deployed to assist the flooded areas in evacuation. Social media played a big role in the well-being of the population; many residents and businesses in safe zones offered their assistance and opened their homes to displaced people, and social media was also heavily used by the government to communicate updates. About 300 people in the High River community of 13,000 people south of Calgary refused the mandatory evacuation orders. The government offered pre-loaded debit cards for displaced residents, but not to residents who refused to stay behind. High River had no sewage or running water and was severely flooded. Some desperately wanted to return to their homes, but the government wouldn't let them do so right away because of the dangers of E. coli in the water, and deep treacherous waters (CTV News, 2013). The police had gone door to door in search of residents trapped by flooding in the worst hit areas; while three people drowned in the flooded rivers, one 83-year-old woman perished in her ground floor apartment in the evacuation zone. The police had believed that she would comply and evacuate, and say they had no reason to believe she could not do it on her own (CTV News, 2013). The city has since reviewed its emergency management plans to provide more warning time to residents about floods (Maclean, 2017).

Fort McMurray

A wildfire began south of Fort McMurray, Alberta on May 1st, 2016. By May 3rd, it had swept through the town and prompted the largest wildfire evacuation in Alberta's history. While 88,000 people were successfully evacuated and there were no deaths as a result of the fires, over 2,400 homes were destroyed and another 2,000 residents were displaced due to contamination in their homes. While most people evacuated in their personal vehicles given that it is a very car-oriented town, public transit was also essential in the evacuation of hundreds of people who either did not have a car or a ride, who had mobility restrictions, who commuted from out of town by bus, whose car was out of gas due to the long traffic jams, or who chose not to evacuate by car. Buses marked "Evacuation" picked up people from several communicated points throughout the town such as schools, gas stations, etc. and brought them to a local recreation

centre at a safe distance from the fire (see **Appendix A**). Pets were welcome on the buses (Franson, 2016).

Public transit also assisted in the evacuation of medical patients; it took just under 2 hours to evacuate 105 patients of the Northern Lights Regional Health Centre, including nine babies. They were taken by bus to an airfield, then flown overnight to Edmonton, where they were transferred to a number of different hospitals and continuing care centres. All the newborn were with their mothers for the journey and hospital care teams stayed with the patients during the evacuation (Edmonton Sun, 2016). In some areas, the fire spread so quickly that immediate evacuations were required. In one school, when many parents had not yet picked up their kids and the mandatory evacuation order had been instated, the principal of the school ordered for a school bus to bring them north of the city, as instructed by emergency officials. Along the way, they picked up families and others who either had run out of gas or who had no vehicle (French, 2016). Buses were also used to carry supplies to the areas, and played a crucial role in re-entry to the area after the fires had been put out or contained (Edmonton Sun, 2016). The Canadian Urban Transit Association presented an award to the Regional Municipality of Wood Buffalo Transit Agency for Exceptional Service During Time of Crisis to Transit staff (Regional Municipality of Wood Buffalo, 2017).

Vulnerable and Disadvantaged Populations in Disasters

When a disaster strikes, VADPs may become disproportionately affected due to their pre-existing situations and conditions (such as people with disabilities, people with health issues, people in the care of others, people with a low level of education, the very young, the elderly, people with mobility restrictions, people of low-income, immigrants, the homeless, and even tourists), which only become amplified as a result of an emergency. Most emergency preparedness and planning is made for the general population; however, changing demographics and the increasing occurrence of disasters are highlighting the need for proper planning for populations that may need additional assistance during disasters.

The Effect of Disasters on Pre-existing Vulnerabilities

Vulnerability is the reduced capacity of an individual or a group to anticipate, handle, withstand, and recover from a disaster. In counterpart, resilience is the ability to bounce back better from a disaster (Bergren et al., 2013). High vulnerability therefore goes hand in hand with low resilience, and they cluster in certain populations and geographical areas. For example, if an area already has limited access to healthy food, stores, and services (including public transportation), a disaster of even a small scale can cause significant problems for its residents.

> "The way individuals and groups experience a disaster—and the impact the disaster has on their lives—varies according to geographic location and demographic characteristics such as socioeconomic status, personal history, and differential access to resources before, during, and after the event" (Bergen et al., 2013, p. 4).

Reducing a person's vulnerability is therefore a matter of equity. People who are not well-off only become less so following a disaster, and it is why they should be prioritized in recovery response (Bergren et al., 2013). According to Bergen et al. (2013), "the use of non-emergency population categories—everyday stakeholder categories such as homeowners or students—rather than indicators of vulnerability, reproduces inequity and vulnerability in disaster relief" (p.3). Improving the social and economic well-being of these populations will therefore reduce their vulnerability, and is in itself a means of readiness for the effects of a disaster. The factors that will determine a person or city's success when hit by a disaster is the preparedness of individuals, but also the preparedness and responsiveness of communities, organisations, and welfare centres, which includes access to information, housing, mobility and transport, and health prior to, during, and after the disaster (Phibbs et al., 2012).

Many officials overlook the importance of planning for VADPs in disasters because natural events or emergencies are too unpredictable to allow for specific preparation. However, it is a critical and an ethical necessity to plan for these populations, as better preparation can increase the possibility of success (Schwartz et al., 2008). Governments must take into account the lessons learned from recent disasters, which cost thousands of people their lives and put some in a more vulnerable state than they already were. Equitable and compassionate emergency response is required to improve the societal disadvantage certain populations face, in turn improving the efficiency and the availability of resources in a disaster (Litman, 2006).

Mobility in the Context of Disasters

Mobility is one of the most important aspects in ensuring the health and well-being of populations during and after a disaster. Mobility ensures that a person may move around and access services, but it is something that is often restricted amongst VADPs, especially in the context of disasters, due to lower-incomes, physical disabilities, age, etc. One aspect of mobility which will be a focus of this research paper is transportation, as it has an important role to play in each phase of a disaster: before, during, and after a disaster strikes (Kumar, 2006). For example, transportation is used to evacuate people prior to or during a disaster, but it is also used in the aftermath to provide access to services, jobs, food, shelter, social networks, re-entry to the area, and more. For those who do not have access to a personal vehicle, public transit is an extremely versatile and flexible asset that can provide on-demand, custom services tailored to the unplanned needs of tens of thousands of people (Litman, 2006). VADPs often are very restricted in terms of mobility options. Moreover, some cities may have populations which might not be particularly vulnerable, but that depend on transit to move around. For example, over half (56 %) of New York City's households do not have a car. This city would therefore require public transit to evacuate most of its residents.

However, as will be illustrated in the case studies of disasters, planning for the evacuation of VADPs is not often properly considered in emergency management, and has led to thousands of deaths. One report shows that only slightly over half of emergency management plans in the U.S. addressed non-drivers, just under half discuss the use of transit, and a third of websites discussed emergency plans at all, indicating a lack of coordination between offices of emergency management and transit agencies. The report also found that cities with a history of disasters were more likely to mention transit agencies on their emergency management websites, and were more likely to develop emergency plans that include transit (Schwartz et al., 2008). Another report states that only 43 % of state transit divisions have an emergency response plan, and around the same amount conduct assessments of the readiness of transit agencies, and participate in emergency exercises. There is also a lack of understanding in most states of the role of transit agencies in emergencies; several are reluctant to participate in aiding other states in emergencies due to their own experience in not being reimbursed in the past for expenses

(Transportation Research Board, 2008), which may indicate the lack of coordination between transit agencies and emergency management entities, which is essential to a successful evacuation or in servicing VADPs during disasters.

> "Planners can help prevent future disasters by demanding that emergency response plans devote at least as much attention to non-automobile evacuation as to automobile-based evacuation, and by developing ways to prioritize use of critical transportation resources, such as road capacity and fuel, during emergencies. Planners need to anticipate the needs of non-drivers, who include many people with various physical, economic and social problems. This may require community outreach to build understanding and trust among public officials and the people they serve before an emergency occurs" (Litman, 2006, p. 18).

Planning for these populations is even more essential as natural disasters are increasing in size and in magnitude, and as the percent of households without a vehicle seems to be increasing. In the United States households without a vehicle increased from 8.7% in 2007 to 9.2% in 2012 (DeGroat, 2014). This number is even higher (12 %) in Canada (Natural Resources Canada, 2009). After New York City (56 percent), at least a quarter of the households in seven American cities do not own vehicles: Washington, D.C. (38 percent), Boston (37 percent), Philadelphia (33 percent), San Francisco (31 percent), Baltimore (31 percent), Chicago (28 percent) and Detroit (26 percent). This trend is expected to increase, coupled with a growing ageing population and a growing population of people with disabilities (DeGroat, 2014). In Canada, 14 % of people over the age of 15 are considered people with disabilities (Canadian Census). Planning for populations requiring mobility aid or public transportation during a disaster is all the more important because it can be difficult to identify the location of where these services are needed most; in most cities, there is a large population that use transit to commute, but who have a car at home, while there are populations who rely entirely on transit or para-transit, and others who may not have any other mobility options. According to Renne et al. (2008), "identifying carless populations and being able to gauge their level of transportation mobility may be the greatest obstacle to a successful evacuation plan" (p. v). While Census data can support the identification process, specific and individual data is not available. Moreover, when registry systems exist, few carless individuals are utilizing them due to various issues, so governments should not rely on these to plan in the event of a disaster (Renne et al., 2008).

Another issue that arises with VADPs and evacuations is that they might not want to evacuate; people might decide to stay behind, either because they are not informed, they choose to stay behind, they are scared, they want to stay with their pets (animals are often not allowed in public transit, even in evacuations), they want to protect their property, they do not see anyone else evacuating, or they are inconvenienced by evacuating (Abdelgawad & Abdulhai, 2012). Renne et al. (2008) argue that little has been done to address the persistent issues in emergency transport for low-mobility populations, while the additional risks faced by carless households during an evacuation are well-documented in numerous reports and papers; "tragedies (…) are bound to be repeated unless best practices can be understood and adopted widely" (Renne et al., 2008, p. ii).

Among the best practices identified to assist VADPs during evacuations or to provide them with basic mobility is to include disaster response as part of all transportation planning (and vice-versa), create communication and support networks that serve the most vulnerable people, and establish standards that specify what level of emergency planning is required in various types of cities in terms of size, exposure, etc. (Schwartz et al., 2008). Moreover, in terms of evacuations, given that the largest cities in Canada operate near capacity during peak periods and are therefore congested, normal travel demand and patterns become severely altered in the case of emergencies, especially when transit or road system resources are altered (loss of fleet, damaged roads, etc.). During an emergency, the coordination of existing resources is therefore essential (Abdelgawad & Abdulhai, 2012). While the optimization of an evacuation process is another topic essential to the functioning of a city during disasters, it will not be discussed in this supervised research project.

Some have gone as far as to suggest providing more cars or car subsidies to low-income populations as a way to reduce their vulnerability in disasters; while cars may provide mobility, they have higher costs overall than public transit, which limits their use in some situations and for some people, particularly those most vulnerable (Litman, 2006). In any case, it is important to plan transportation systems to provide basic mobility to VADPs in their everyday lives; this will in turn reduce their vulnerability towards a disaster. It is also important to work with community organizations to identify their needs, and maintain effective communication with VADPs, as well

as transit agencies under normal conditions in order to prepare ways to communicate with residents and travelers under emergency conditions (Litman, 2006).

In the U.S., the first responders to an emergency are generally fire, police and ambulances. The roles of responding agencies and officials is determined by Emergency Operations Plans (EOPs), which are guided by a structure called the incident command system (ICS). There are then agreements between states to share assets in a disaster; "transit agencies have physical assets including buses, trains, fleet maintenance facilities, passenger facilities, and personnel at their disposal—all of which can be useful in an evacuation and during a disaster response" (Transportation Research Board, 2008, p. 4). Public transit also plays a role in maintaining operations afterwards, in order to sustain public health and safety, in facilitating economic recovery (Transportation Research Board, 2008). However, the coordination of these resources often fails because there is lack of hazard prediction, a lack of prediction of the population to be evacuated as well as their needs, a lack of understanding on how to communicate evacuation information, and a lack of estimating shelter capacity. An accurate representation of the spatial and temporal distribution of the population and their needs during an emergency is therefore essential (Abdelgawad & Abdulhai, 2012). One report finds that there are several different models of EM coordination, but that in general, it begins at the local level, working upwards, and that the level of coordination varies between states. Among the best practices is to ensure better communication and coordination through the creation of regular forums, promoting communication between transit systems and different levels of emergency management (including developing an inventory of transit agency resources), conducting state-wide training, and by disseminating these practices to transit agencies, including to the VADPs (Renne et al., 2008; Transportation Research Board, 2008). The literature on the whole suggests that information sharing is essential, and that a coordinated effort between authorities and community groups is required to achieve this, and to be able to account for and consider VADPs' needs during emergencies and disasters.

This chapter has introduced the amplified effects that VADPs face in a disaster and reviewed Canada's history of disasters. While the case studies have demonstrated that Canada

fares relatively well in terms of the social well-being of its population during disasters, it cannot be said that Canada has experienced recent large-scale and extremely disastrous events affecting densely populated areas. Moreover, literature on the topic is lacking and almost non-existent for cases of Canadian disasters and Canadian emergency management. This may be due to the fact that large-scale disasters are much less common in Canada, however, this does not mean that large-scale disasters will not happen in the near future, and with the ageing and growing urban population, it is of the utmost importance to assess the situation and that the country plan in accordance with growing VADPs in the context of disasters.

Methods

This supervised research project has thus far introduced Canada's experience with disasters and provided context on the amplified disadvantages that VADPs face in emergencies. This chapter will list the methods used in this supervised research project to evaluate the preparedness of Canadian cities and their VADPs for large-scale disasters. The choice of the case studies from similar high-income countries in which lessons and best practices were uncovered will be discussed, followed by the method used to select Canadian cities for analysis. Lastly, the evaluation method for the Canadian cities and their governments' preparedness in attending to their VADPs in an emergency will then be described in detail.

Case Studies

Three recent and large-scale disasters were identified as case studies in order to provide insight into the experience of VADPs for this supervised research project. As this project aims to study Canadian cities, the case studies were chosen from similar high-income countries in order to more adequately transfer knowledge to the Canadian context. Among the cases chosen, one was selected for a large city (over 2,000,000 people in the metropolitan area) and one for a mid-sized city (of around 300,000 people); as will be discussed in the following section, the choice of Canadian cities for analysis also follows this rule. The disasters from the case studies chosen were also selected to be applicable to the Canadian environment, such as flooding, storms, and earthquakes, and have occurred recently, not exceeding 15 years past.

As such, Hurricane Katrina in New Orleans (Louisiana), the Christchurch earthquake series of 2011 in New Zealand, and Hurricane Sandy in New York City were chosen as case studies for this supervised research project.

Selection of Canadian Cities for Analysis

This supervised research project seeks to analyze Canadian cities in terms of emergency preparedness for VADPs in disasters. For the purpose of this project, two cities will be analyzed; one large city (over 2,000,000 people in the metropolitan area), and a mid-sized city (of around 300,000 people). These cities were chosen according to their sociodemographic profiles, which reflected concentrations of populations that would be vulnerable in a disaster. This includes high population density, poverty levels, individuals who do not own a car and non-drivers, immigrants, and minorities. The methodology used to identify the large and mid-sized cities for analysis will be described in the following paragraphs.

There are many ways to identify populations that would be most affected in the occurrence of a disaster; the method most often used to specifically identify the location of these groups uses Geographic Information Systems (GIS) along with engineering calculations to capture the spatial and temporal distribution of people requiring assistance (Abdelgawad & Abdulhai, 2012). For the purpose of this project, a vulnerability matrix will be used to identify the cities for analysis. The matrix will identify the vulnerability of a city in terms of its levels of population density, people with disabilities, the elderly, education, visible minorities, language, poverty, and exposure to disasters. According to UN Habitat (2011), vulnerability in the case of a disaster can be defined as:

Vulnerability = (Exposure + Sensitivity) – Adaptive Capacity

The exposure to disasters considers the history and potential for disasters in the city, while the sensitivity is the degree to which a city could be affected given its population, infrastructure, etc. The adaptive capacity, which reduces the level of vulnerability, is the ability of the city or its population to respond to a disaster. The adaptive capacity of the cities chosen will be analyzed in the Analysis and Discussion chapters.

The three largest Canadian cities (Toronto, Montreal, and Vancouver), and three mid-sized cities (Windsor, Saskatoon, and St. John's) in different provinces in Canada were chosen for initial analysis. The levels of density, people with disabilities, poverty, visible minority, elderly,

education, official languages, and carless population were then calculated using Canadian Census data (2006, and 2011 when available) to achieve a profile of the different cities. The history and potential exposure to disasters for each city was then included to achieve an overall vulnerability index. This vulnerability matrix can be consulted in **Appendix B**.

From this matrix, Vancouver (British Columbia) and Windsor (Ontario) were selected as case studies to analyze given their high overall vulnerability compared to the other cities, and the fact that they are in different provinces. Windsor was chosen among the mid-sized cities as it had the highest density, the highest concentration of visible minorities, poverty, elderly people and people with no high school diploma. Vancouver was chosen as it faces a much higher threat of disasters (including an imminent earthquake risk) and has the highest density of the large cities. The two cities chosen are in different provinces. Given the types of disasters the cities experienced or have the potential to experience, a hypothetical disaster was attributed to each for analysis: an earthquake in Vancouver and flooding in Windsor.

Method of analysis

The federal, provincial and local frameworks will be reviewed as they apply to each province and city of the analysis, in order to evaluate the level of consideration given to VADPs during emergencies in these Canadian cities. In order to evaluate how the VADPs of both cities would fare in their respective hypothetical disasters, it is first important to review the overarching federal framework and how it applies to each city, followed by local and Provincial governments. For each level of government, publicly available emergency management plans will be assessed in their consideration of VADPs and of the hypothetical disaster applied in each city. In addition, the websites and documents of each entity will be evaluated in terms of the information and resources they provide that are specific to the applied disaster and to VADPs. Particular attention will be given to how each entity defines VADPs (if at all) in their emergency plans, resources and other official documents.

The Discussion and Conclusions chapter will summarize the best practices and lessons learnt from the case studies of other similar high-income countries, followed by a summary of

the determined outcomes of Vancouver and Windsor in their respective hypothetical disasters. These best practices and lessons learnt from the case studies will then be applied to the two cities in order to develop recommendations for governing entities with respect to the consideration of their VADPs in disasters.

It is important to note that the resources evaluated in the Analysis chapter (websites and public documents available on the web) are but a fraction of the available material and resources produced by the different levels of government. It is understood that not all populations would refer to web resources as their source of information, but due to the time constraints of this supervised research project, only resources of this nature were evaluated.

Case Studies

This chapter will present three recent cases of large-scale disasters (directly affecting 500,000 people or more) in developed countries and the way in which VADPs were disproportionately affected in the ordeals. From the case studies, best practices and lessons learned pertaining to the experience of VADPs will be uncovered and applied to the Canadian context hereinafter. The literature reviewed includes scholarly, professional, media, and government sources.

Hurricanes Katrina and Rita, South-Central Coast (USA)

In the fall of 2005, the south-central coast of the United States was struck by two of the most devastating hurricanes in the country's history; Katrina and Rita. Hurricane Katrina affected the New Orleans area, where 1,4 million people were in high threat zones when the mandatory 48-hour evacuation notice was ordered by the mayor. Over 300,000 of those people were unable to evacuate themselves, and public officials provided little assistance or guidance to them; 10 pickup locations were established where city buses were to take people to emergency shelters, but service was unreliable, the demand was overwhelming, and some people were not able to get to the pickup points due to health issues, mobility restrictions, etc. For those who could make it to the shelters, the conditions were deplorable (Litman, 2006; Kumar, 2006; Renne et al., 2008; Schwartz et al., 2008). Just over 1,800 people died as a result of the storm; "the city failed to get information to its most vulnerable residents in time and it failed to facilitate their evacuation" (Wade, 2015); "in the days following Hurricane Katrina, the world watched in disbelief as all systems indiscriminately failed to respond, affecting young, elderly, poor, and [people with disabilities] alike" (Renne et al., 2008, p. iii). All the while, evacuation for those who had a car went relatively well (Litman, 2006; Kumar, 2006; Renne et al., 2008; Schwartz et al., 2008).

> "Years of planning and coordination amongst transportation planners, emergency managers, and police led to an effective contraflow system that enabled anyone with a car the ability to evacuate. Unfortunately, the carless were literally left behind" (Renne et al., 2008, p. iii).

The effects of Hurricane Katrina were worsened by the concentration of poverty in New Orleans neighbourhoods vulnerable to flooding (Litman, 2006); low-income populations were disproportionately affected by the storm in that they might not have had the means to evacuate, especially if they are welfare recipients, as the storm landed a few days before the month's paycheck; it is important to note that the ticket to ride on the evacuation bus was not free. Moreover, low-income populations might also have less access to information disseminated about the storm, less access to social networks, and are less likely to leave where they grew up (Litman, 2006; Wade, 2015). A study on people rescued from New Orleans found that 55% of them did not have a car or a way to evacuate, 68% had no money in the bank, 76% had children under 18 with them in the shelter, 77% had a high school education or less, 25% suffered from a chronic disease, and a staggering 93% were black (Wade, 2015). Moreover, seniors living independently or in nursing homes were disproportionately affected by the hurricane; of the 1,800 who died from the storm, 70% were over the age of 60, and 47% were over 75 years old. Many stayed behind because they were unsure of what to do, did not have a social network or the means to evacuate, were mobility-challenged, scared, or wanted to remain with their pets (Renne et al., 2008).

The Senate reported that the Louisiana Department of Transportation and Development did not arrange for transportation before Hurricane Katrina hit, and that the City of New Orleans failed similarly (Khanna, 2006). The city's emergency evacuation plans did not specifically address how to evacuate VADPs; they only acknowledged that some people might require additional assistance or do not have means of personal transportation and that government employees and vehicles may be necessary to assist and provide transportation for these individuals. The result was an uncoordinated, last-minute effort by the few transit workers who agreed to stay behind to drive a bus out of the city for those who were able to make it to the pickup points. While the city's transit and school bus fleets could not have carried all residents who needed transport out of the city, multiple trips could have been made during the 48-hour evacuation period (Khanna, 2006; Litman, 2006). To make matters worse, hundreds of buses from transit agencies and school boards that could have been used in the evacuation of thousands were uselessly left to drown (Khanna, 2006) (refer to **Appendix C**). John L. Renne, Principal Investigator of the National Study

on Carless and Special Needs Evacuation Planning and Professor of Transportation Studies and Urban Planning at the University of New Orleans states: “as I evacuated, I recall feeling guilty and somewhat responsible that my profession, transportation planning, failed to deliver an effective plan for a disaster that everyone knew would happen” (Renne et al., 2008, p. iii). The experience of VADPs during Hurricane Katrina highlights the huge disparity between the wealthy and the poor, motorists and non-motorists, white and black, people with disabilities, people with health issues, minorities, and people with limited English proficiency (Kumar, 2006; Litman, 2006; Renne et al., 2008).

Hurricane Rita, on the other hand, struck the coast of Louisiana and Texas only weeks after Hurricane Katrina devastated New Orleans. Not wanting to repeat the scenario from Katrina, public officials ordered the evacuation of 3 million people on coast lines and offered free bus transportation out of the city for non-drivers; the local transit agency deployed multi-purpose services, including round trip transit, rescue of evacuees, humanitarian lifeline services, and demand response emergency relief. They made 4,500 trips using 1,000 vehicles to transport more than 20,000 people. They also distributed 45,000 bottles of water to stranded motorists along area freeways using buses, and conducted last minute sweeps of freeways to rescue motorists and residents seeking shelter. Bus service was only suspended in the afternoon the day before Hurricane Rita landed. Notwithstanding this success, as with Hurricane Katrina, authorities struggled to have people remain for work at transit agencies, airports, and other transportation entities (Litman, 2006; Abdelgawad & Abdulhai, 2012).

While more residents responded to evacuation instructions than they had for Hurricane Katrina in New Orleans, there were significant automobile traffic problems, as public transport out of the city was still seen as a last resort (Litman, 2006). Over a hundred evacuees that fled by car died as a result of the horrific 100-mile long traffic jams that lasted 24 hours (Khanna, 2006; Abdelgawad & Abdulhai, 2012). Nevertheless, evacuation by public transit was a success for thousands of people who had no other way out, and who were able to get to safety and shelters. This allowed for more resources to be allocated to the rescue of people requiring additional assistance to leave their homes (Litman, 2006).

The evacuations from Hurricanes Katrina and Rita were among the largest in U.S. history (Renne et al., 2008). While Katrina's evacuation plan failed to serve New Orleans' VADPs who depended on additional assistance, public transit or guidance from authorities to evacuate, Rita's evacuation plan failed due to excessive reliance on cars, resulting in 10-mile-long traffic jams and fuel shortages (Litman, 2006). While Rita evacuees therefore fared much better than Katrina's, they still did not use all of their resources available (public transit, school buses, charter buses and trains), which would have helped alleviate the horrific traffic jams (Kumar, 2006; Litman, 2006). Nevertheless, transit was used much more effectively during Hurricane Rita than during Katrina. In both hurricanes, there was a massive failure in identifying who was in charge, and there was inadequate communication across the board (Kumar, 2006; Litman, 2006). For example, Houston's emergency management plans designated the Metropolitan Transit Authority as primary responsibility for transportation in the event of an emergency, but designated the police as having primary responsibility in an evacuation, which led to a lack of coordination (Schwartz et al., 2008). In both hurricanes, authorities failed to help evacuate the families of essential services staff, so that they could concentrate on emergency response (Litman, 2006; Renne et al., 2008). Nursing homes were especially ill-prepared in the evacuations; they struggled to secure buses, many died from exhaustion or heat stroke, yet many still do not have plans, contracts for transportation, or arrangements with shelters for emergency housing (Litman, 2006). Then again, even if a nursing home has an emergency evacuation plan that includes the rental of a bus, there is no guarantee that the bus will show up during a disaster if the driver decides to evacuate themselves and their family. Emergency planning at the government level must therefore take into account the evacuation of service personnel and their families (Khanna, 2006).

Christchurch Earthquake Series, New Zealand

A series of large and devastating earthquakes struck the Christchurch, New Zealand area in 2010 and 2011, killing nearly 200 people and inflicting severe damage on the natural, built, social, and economic environments. Casualties were especially high as one of the earthquakes occurred in the middle of a work day downtown. Mobility became extremely difficult following

the quakes, as the physical environment (roads, sidewalks, etc.) were severely damaged or obstructed, meaning that many were unable to get to evacuation and welfare centers in the immediate aftermath. This also had some repercussions in the weeks and months following the earthquakes, as many were unable to access certain services due to closures (grocery stores, clinics, etc.), disruptions (elevators out of commission), changes in services (public transport routes), and due to damage that had not yet been repaired (crossings for people with vision impairments weren't repaired for months). Large areas lost power for several weeks, and many were without sewerage (Phibbs et al., 2012; Potter et al., 2015).

Elderly populations and people with disabilities were disproportionately affected during the earthquake series, especially in terms of mental wellbeing. Reports based on the results of interviews about the experiences of the elderly and people with disabilities during and after the quakes discuss how their lives were further affected by the earthquakes: normal activities, such as shopping for groceries, using public transport, staying positive, sewerage and water facilities, were severely impacted (Phibbs et al., 2012). Moreover, home support services faced difficulties in reaching their clients (Davey & Neale, 2013). Meanwhile, people with access to cars experienced little disruption; for example, the closure of certain supermarkets meant that people had to sometimes travel farther for food, which was easy with a personal vehicle (Phibbs et al., 2012).

The report also states that people with disabilities who did not have strong pre-existing social and family networks were extremely vulnerable after the earthquakes, and that they were not at all prepared for these possible repercussions. Even some with strong social networks saw them disrupted following the earthquakes, due to the fact that many had to abandon their homes and communities, and were under immense physical, emotional and financial stress. The aid given to the elderly populations and people with disabilities was very variable, with some receiving excellent support and others none at all (Phibbs et al., 2012); "in some cases, government organisations were either slow to meet the needs of people with impairments, or failed to understand or respond to their stated needs" (Phibbs et al., 2012, p. iii). While the New Zealand Ministry of Social Development checked on elderly populations and people with disabilities by phone, door knocking campaigns were led by volunteer groups. These groups

played a major part in helping with immediate clearing as well. Many, however, did not want to leave their homes due to a sense of security, and the most affected of the elderly population were single women (Davey & Neale, 2013).

The report states that the main concerns of the people with disabilities if another quake were to happen are: "the physical safety of [people with disabilities] during and after the earthquakes; ensuring communication (is) accessible for all; the availability of accessible housing and transport; and being able to access healthcare in the immediate aftermath of the earthquakes" (Phibbs et al., 2012, p. iii). The report concludes that emergency service response was not adequate for the people with disabilities, and recommends an integrated multi-agency response; "consideration of ways to enhance mobility and lessen the impact of changes to public transport for people with disabilities should also be addressed as a priority" (Phibbs et al., 2012, p. iv).

Hospitals also experienced important challenges, as they were not only faced with evacuating their patients, but with treating several that had been brought in, injured from the quake. While power was lost completely, generators were able to provide electricity on the short term (Davey & Neale, 2013). Following the earthquake series, the importance of emergency preparedness for the elderly and people with disabilities has become critical, especially given the growing ageing population.

Hurricane Sandy, New York City

Hurricane Sandy hit the East coast of the United States in 2012, killing just over a hundred people. New York state's governor declared a public emergency on October 28, 2012; voluntary evacuations were ordered for the South Shore storm surge area, with mandatory evacuations ordered in the most vulnerable areas. New York City's infrastructure was especially affected by the storm's passage, as certain roads, train tracks, and all but one of the tunnels of the Subway system became flooded. Electricity was lost for several days in large parts of the city, and flooding disrupted voice and data communication in parts of lower Manhattan. Mandatory evacuation was ordered for the southern tip of Manhattan and its surroundings (U.S. Department of Health & Human Services, 2012); as over half of people in New York City do not have a personal vehicle,

transit played an important role in the evacuation of residents. Most businesses in the city closed early to let their employees get home or evacuate before the transit system was shut down (DeGroat, 2014).

At the arrival of Sandy, the city had a coastal emergency plan, which had been developed following Hurricane Irene in 2011; areas identified for evacuation during Hurricane Sandy were those hardest hit during Irene. Over 70 evacuation shelters opened around the city, all surgeries except for emergency procedures were cancelled, and some hospitals were evacuated by ambulance brought in from other areas. The City opened centers for the distribution of meals and water, AT&T delivered charging stations and Wifi access points, and the National Guard went door-to-door to deliver meals and supplies to elderly and home-bound residents. Limited bus service resumed two days after the storm passed, and shuttle services were offered until full re-service of the subway (U.S. Department of Health & Human Services, 2012). The City was therefore relatively well-prepared for the storm. However, just over fifty people died in the city as a result of Hurricane Sandy, and half of people who died were over the age of 65. As with the hurricanes and earthquakes previously discussed, the disparities faced by VADPs is even more flagrant during disasters; “Hurricane Sandy exacerbated crises which existed before the storm and continued afterwards in heightened form, including poverty, lack of affordable housing, precarious or low employment, and unequal access to resources generally” (Bergen et al., 2013, p.2). Certain housing complexes and small businesses were without power, heat, or hot water for weeks, and some buildings were badly damaged by flooding which caused a serious mold problem “those most affected by the storm were affected differently depending on pre-storm vulnerabilities and resilience” (Bergen et al., 2013, p. 7). During the ordeal of Hurricane Sandy, community groups were formed to help assist the most vulnerable. They created physical and virtual hubs for residents to post and receive information. Local governing bodies in the communities hardest hit also developed local emergency plans (Klinenberg, 2015).

The New Jersey area was particularly affected by the storm in terms of mobility, as a large part of their public transit infrastructure was damaged due to flooding (35 % of its locomotives and 25 % of its passenger cars were damaged, including new equipment, leading to millions in losses). Several attribute this to the fact that a decision made by New Jersey Transit to park most

of its equipment in rail yards that forecasters predicted would flood, and that they should have moved it to higher ground, like the New York City's agencies did for their rail and subway rolling stock; New York City's transit agencies' did not incur any damage to their fleet, while the subway tunnels became completely flooded. Even three weeks after the storm, the agency was only able to run half of the trains it would usually run during rush hour. However, the agency stands by the fact that the storm changed in intensity and that their equipment should normally have been safe. However, even if the damage had been inevitable, the agency should have organized alternative transit for its users, especially the most vulnerable (Roberts et al., 2012). The entire region experienced long and episodic delays for years after the storm, as workers repaired the extensive damage to the transit system, therefore impeding proper access to services, jobs, and social networks for millions of people (Klinenberg, 2015).

This section has reviewed the literature available on the experience of VADPs in emergencies, on their resulting mobility and access to services, and on governance during emergencies; three recent cases of large-scale disasters in developed countries were presented, highlighting the way in which VADPs were disproportionately affected in the ordeal. Notwithstanding the different natures of the disasters, the lessons learned can be regrouped as the following:

- The needs of VADPs are often overlooked in emergency preparedness, planning, and response;
- There is a flagrant lack of coordination between governing bodies, transit agencies and community groups, preventing proper consideration of the needs of VADPs in disasters;
- Disaster plans do not adequately consider the protection of infrastructure that is crucial to offer assistance to VADPs and to ensure a rapid return to normalcy;
- Transit agencies in general are not adequately prepared to respond in a disaster, and their employees lack training and resources for their families in order to properly assist VADPs in an emergency;
- Communication between authorities and VADPs in emergencies needs to be re-evaluated.

It is important to keep in mind these key lessons for the following Analysis chapter, in which a hypothetical disaster in a large and a mid-sized city in Canada, Vancouver and Windsor, will be analyzed in the context of VADPs in emergency preparedness and response measures.

Analysis

This supervised research project has outlined the need in Canada for emergency preparedness planning that adequately considers VADPs. The previous chapter, which uncovered the experience of VADPs in similar high-income countries, has provided the framework for the analysis of Canada's emergency management system. This chapter will analyze the federal, local, and provincial governments' plans and web resources available to the public for the cities of Vancouver (British Columbia) and Windsor (Ontario), while applying a hypothetical disaster to each city; an earthquake in Vancouver and flooding in Windsor.

Federal Government

The development of Canada's modern emergency planning and response framework stemmed from the country's participation in the North Atlantic Treaty Organization (NATO) in 1948; response to peacetime catastrophes became the focus of Canadian civil defence. The FLQ kidnappings of politicians in 1970 and the train derailment in Mississauga in 1979 also sparked interest in planning for emergency response and evacuation. The country's emergency management system is heavily drawn from its neighbour, the United States, which has experienced more frequent and severe disasters of the same nature (Caro & Angelis, 2001).

In Canada, the emergency management structure works from the bottom up; the local government is responsible for the first level of response, followed by the provincial government. The Federal government will then become involved if the disaster is of a magnitude that warrants it; "most emergencies are local in nature and are managed at the community or provincial/territorial level. The Federal Government can become involved where it has primary jurisdiction and responsibility as well as when requests for assistance are received" (Government of Canada, 2011, p. 1). The Federal government nevertheless provides overarching framework for the Canadian emergency management structure.

The role of the Federal Government of Canada during emergencies is contained in an Act, a Policy, and a Plan; the overarching document is the Emergency Management Act (EMA) of 2007, which contains Canada's legal framework related to emergencies and emergency preparedness; the Federal Policy for Emergency Management (FPEM) of 2009 presents the government's approach to emergency management planning; and the response to an emergency by the government is outlined in the Federal Emergency Response Plan (FERP) of 2011.

The EMA, under the Minister of Justice, was last amended in 2007, and is current to April 12, 2017.

> "(It) sets out the responsibilities of the Minister of Public Safety and each minister accountable to parliament; establishes the emergency preparedness responsibility of federal departments to prepare emergency management plans in respect of those risks, maintain, test and implement those plans and conduct related exercises and training; and recognizes provincial/territorial interests when providing federal assistance during an emergency" (Transport Canada, 2011).

The Act outlines that while the government may declare a provincial emergency to be of its concern, in general, "a government institution may not respond to a provincial emergency unless the government of the province requests assistance or there is an agreement with the province that requires or permits the assistance" (Government of Canada, 2007, p. 5). The FPEM recognizes the need for an integrated emergency management structure:

> "The Government of Canada has adopted an all-hazards approach to emergency management, encompassing four interdependent, but integrated functions: mitigation/prevention, preparedness, response and recovery. Effective emergency management dictates the need for a seamless relationship across all of these emergency management functions" (Public Safety Canada, 2009, p. 2).

When an emergency arises, the Minister of Public Safety is also responsible for coordinating the government's response, which is described in the FERP. The Plan outlines the processes and coordination under which the government responds to an emergency. The FERP states that Canada's response to an emergency will be integrated and coordinated, because each Federal government institution has the responsibility to develop emergency management plans in relation to risks in their areas of accountability; "the FERP is designed to harmonize federal emergency response efforts with those of the provinces/territorial governments, non-

governmental organizations, and the private sector" (Government of Canada, 2011, p. 1). There are 11 Emergency Management and National Security Regional Offices spread out around the country, usually in the provincial capitals.

The Ministry of Public Safety has the responsibility of exercising leadership relating to emergency management in the country by "coordinating, among government institutions and in cooperation with the provinces and other entities, emergency management activities" (Government of Canada, 2007, p. 2). The latter includes establishing policies, programs and emergency plans, as well as coordinating assistance to a province in the case of an emergency. It is important to note that certain risk factors, such as climate change, increased urbanization, infrastructure dependencies, terrorism, scientific and technological developments, diseases, and the increased movement of people and goods around the world increase the potential for disasters to cross boundaries (Government of Canada, 2011); when a disaster transcends geographical or jurisdictional boundaries, it becomes more difficult for the Federal government to manage emergencies in coordination with the provincial entities.

Under the FERP, each Ministry is responsible for an Emergency Support Function (ESF) which is used to provide more specific Federal support, such as telecommunications (Industry Canada), transportation (Transport Canada), public health and human services (Health Portfolio, Public Health Agency of Canada and Health Canada), and human and social services (Human Resources and Skills Development Canada). The Ministers' responsibilities are to identify the risks that are "within or related to his or her area of responsibility" (Government of Canada, 2007, p. 4), therefore to "prepare emergency management plans in respect of those risks; maintain, test and implement those plans; and conduct exercises and training in relation to those plans" (Government of Canada, 2007, p. 4). Industry Canada's telecommunications responsibilities include coordinating with the telecommunications industry, restoring telecommunications infrastructure and services, and coordinating federal actions to provide temporary emergency telecommunications when required during a disaster. Among Transport Canada's ESF responsibilities is to make recommendations and provide resources for the use or availability of its assets or of civil transportation which could assist during an emergency. The public health portion of Health Canada's ESF also applies to all government institutions required to respond to

a request for assistance which could impact the health of a population, and "particularly those with a duty of care for specific populations such as those departments that make up the Federal Healthcare Partnership)" (Government of Canada, 2011, p. A-6). Human Resources and Skills Development Canada's ESF responsibilities include providing "human and social services and the communication of information in response to emergencies related to the delivery of social benefits" (Government of Canada, 2011, p. A-6). Public Safety Canada also has ESF responsibilities, which lie in logistics and operations management; they house the Government Operations Centre (GOC), which regularly monitors human and natural events regarding Canada and provide daily reports compiled from a variety of sources (even when there is no emergency or disaster). Depending on the magnitude and nature of an event, Public Safety Canada will conduct risk assessments to identify vulnerabilities and potential impacts, and coordinate federal response. Moreover, when additional subject matter expertise is required during an emergency, non-governmental organizations (NGOs) and the private sector may be asked to support the Federal government in its response (Government of Canada, 2011). Depending on the scope or the nature of the disaster, one or more ESF may be implemented. The government may also place the Canadian Forces on service when required (Justice Canada, 2015).

Public Safety Canada also has a planning component in the FERP; they develop contingency plans for incidents that are forecasted from weeks to years in advance, and for recurring events (especially floods), where they devise suitable response approaches, such as the Flood Action Plan for British Columbia, The Ontario Electricity Emergency Plan, The National Earthquake Support Plan for British Columbia, and the Government of Canada Atlantic Hurricane Contingency Plan.

While acts outline the government's role in emergency preparedness, there are also websites, online resources, and documents aiming to inform the population on emergency measures and prepare them for emergencies. The Federal Government's main emergency management website (getprepared.gc.ca) aims to educate citizens concerning emergency preparedness. Certain VADPs are mentioned here; there is a section concerning people with disabilities or special needs, but nothing is present for other types of VADPs. One particular document available on the Get Prepared website is entitled "Planning for Safety: Evacuating

people who need assistance in an emergency" (Human Resources and Skills Development Canada, 2009); it is meant as a resource for building managers, building occupants, floor wardens and first responders to develop evacuation plans for themselves and for others through a preparedness checklist. Disabilities in this guide are described as physical restrictions that are permanent or temporary. The guide states that people should contact their municipal Emergency Management Coordinator through their local government for more information on emergency management arrangements for people with disabilities, but it is not indicated how this can be done (no contact information is provided and no details are given on other forms of communication for people with disabilities). Nevertheless, this document is generally a comprehensive and helpful resource; a similar document could be developed to cater for other types of vulnerabilities. It would also be important to make this document available in more formats (for different disabilities) and placed on strategic websites; the federal government's Accessibility Resource Center page lists the document under "Workplace" resources, but it should instead be listed under a category named "Emergency Preparedness". The Get Prepared website also provides a document entitled "Your Emergency Preparedness Guide" and a separate document called "Emergency Preparedness Guide for people with disabilities/special needs". This second document considers disabilities as physical mobility limitations (does not include access to a personal transportation), hearing and vision impairments, old age, developmental disabilities, non-visible disabilities (including mental health and communication), and lastly, people living in high rises. The document recognizes that the challenges people with disabilities face is amplified when an emergency arises, such as a reliance on electrical power, accessible transportation, and accessible communication. The Guide provides a checklist and assessment tool for personal emergency preparedness (Public Safety Canada, 2010).

Having reviewed the different acts, policies and documents containing Canada's Federal Emergency Management structure, several discrepancies can be observed. While the ESF responsibilities include providing an array of social services, they do not specify if certain populations would require additional or special assistance. While this is understandable because there are so many different types of people that could be affected depending on the emergency, it is a point that should be addressed. The EMA and the FERP do not specifically address VADPs

either, and are very general in language; the FERP's objective is outlined as the reduction of economic and social losses in emergencies and disasters (Government of Canada, 2011). Moreover, while it is not clear in the FERP if this is the case, NGOs and the private sector should be involved in the planning component, not only the recovery process, to ensure that the most VADPs are addressed. While government institutions are responsible for developing, testing and maintaining their emergency management plans and to identify risks within their scope of responsibility, it is possible that there needs to be a parallel approach targeting certain populations; for example, whether one agency should be responsible for elderly populations, or whether all agencies should address the elderly within their domain. As the acts and plans are nearly all ten years old, they certainly need reassessment, especially given the presence of a new government since 2015.

Vancouver, British Columbia

The city of Vancouver in British Columbia is home to 2.5 million residents, and a density of 1116 people per square kilometer, the highest overall density in Canada. Largely due to its relative proximity to Asia, Vancouver is home to a large population of immigrants; 27% of its population is of visible minority (second highest overall in the country) and 6% (highest overall in the country) do not speak either English or French. Also, Vancouver is among the most expensive cities in the country; 39% of its population are considered as living in poverty, and 17 % do not have a high school diploma. In Vancouver 15 % of people are considered as people with disabilities, and 14 % are elderly. Vancouver remains at a high exposure for natural disaster as it is an area that lies by a fault line. While the city itself has never experienced a major earthquake, some have occurred offshore and in the surrounding unpopulated areas. Nevertheless, there is a 25% chance that a major earthquake will strike the city within the next 50 years (City of Vancouver, 2017).

Local government

In 2013, the city of Vancouver developed the Earthquake Preparedness Strategy, as it recognized the need for proper formal planning for a major event of the sort. The Strategy identifies 56 actions that the city will undertake in the coming years to build preparedness and resilience. By 2016, 85% of the actions had been completed or were in progress. The Strategy targets the following infrastructures and services for improvement in terms of response and mitigation in an earthquake situation: sewer and water systems (backups in case of failure and post-earthquake servicing plans), transportation systems (seismic upgrades and disaster response routes), civic facilities and private buildings (review of seismic capacity), continuity of operations (procurement of an Emergency Management Information System), volunteers and community resilience (development of disaster support hubs and workshops), and training (full-scale exercises, etc.). While VADPs aren't specifically addressed in the Strategy, it does outline the action of the development of disaster support hubs for communities and engagement with local businesses, as well as the maintenance of strong urban search and rescue team with experience.

The City does not show on its website homepage any information on emergency preparedness; this information must be found through the "Home, property, and development" tab under "Public Safety" where "Earthquakes" is listed. The Earthquakes section of the website clearly shows that the city has thought about and planned for an earthquake; a short video demonstrates their strategy on preparation, and their concern that most citizens aren't sufficiently prepared for a disastrous earthquake. Links on preparedness (knowing the risks, making plans and emergency kits, being prepared, etc.), as well as a range of free emergency preparedness workshops on earthquakes are also made available to the public. The City also has an established social media and app presence, and alerts subscribers when an emergency happens, including important information and related instructions. It is also possible to sign up for emailed emergency preparedness tips from the city.

While the content and resources are extremely user-friendly and easy to understand, they are only available in English. Moreover, the earthquake section of the site makes no mention of populations that might require special assistance during an earthquake. One needs to look under

"Public Safety", then "Prepare for disasters", then "Personal and family emergency preparedness" to find "Emergency planning for people with disabilities and special needs". On this page, one can download a self-assessment checklist to determine what their needs would be in an emergency. There are also links to Public Safety Canada's Emergency preparedness guide for people with disabilities and special needs, Emergency Management BC's emergency preparedness information for people with disabilities and Seniors BC's BC Seniors' Guide.

The evacuation page describes that people will be notified of an evacuation by officials going door-to-door, a police vehicle with a loudspeaker, and by notices on social media, the city's app, radio, and television. The steps to evacuate explain that you should offer help to your neighbours that may be in need, and to take as few vehicles as possible; there is no focus checklist for people who do not have a car or a home, or who have disabilities or mobility restrictions.

Notwithstanding the above, the city recognizes that resources (electricity, water, phones and transit) may be affected during an emergency, impeding access to food, clean water, clothing, medicine, money, etc. for certain people.

Provincial Government

The Provincial government has more extensive documentation and resources on emergency management. On its website, this information is easily found under the "Public Safety & Emergency Services" tab, then under "Emergency Preparedness, Response & Recovery". The page first displays a link to PreparedBC, a "one-stop shop for disaster readiness information" which provides an array of resources for emergency preparedness catering to people's different needs. Among the resources available is a document entitled "Resources for People with Disabilities", an emergency preparedness guide specifically tailored to different types of disabilities and restrictions, including age, mobility, speech, developmental, etc. Here, the term disability includes most of the types of disadvantages targeted by this supervised research project, going as far as including people who do not have access to a personal vehicle due to disability, age, temporary injury, poverty, addiction, legal restrictions, and those who simply choose not to have a vehicle. While the recommendations for what to do in an emergency without a personal vehicle are minimal (identify meeting places and map out potential

evacuation routes without a vehicle), it is the only provincial document for British Columbia that addresses this specifically. PreparedBC also provides a preparedness guide for tour operators, who might have a number of tourists with them when disaster strikes. Moreover, PreparedBC recognizes the need to reach out to the younger population, and has developed emergency preparedness resources that target these groups, such as an awareness campaign where youth must prepare themselves for a fictional "zombie invasion"; the skills and knowledge transferred to youth by the campaign are applicable in real disasters. Emergency preparedness documents are also available specifically for schools and are available in French, and have been developed with First Nation school teachers.

The province's website provides a document on disaster recovery, which is also available in Punjabi and Chinese. A neighbourhood preparedness guide is also available and encourages people to reach out to their neighbours and create support groups in preparation for a disaster; seniors, people with disabilities, and people who speak English as a second language are mentioned in the document as people who would need extra assistance in an emergency. A page specifically for seniors is available; it displays best practices and links to other sites with further resources from other governments and entities (the Red Cross, the government of Florida). However, there are so many links and resources to choose from that it is difficult to know where to look. Among the listed documents is one from the California Department of Aging, which has an earthquake preparedness available document in 7 languages, including Asian languages.

The province has an extensive presence on social media, with accounts on Twitter, Facebook, Pinterest, Youtube, Soundcloud, Flickr, and an RSS feed. However, the many accounts even within one social media platform make it difficult to know what to follow (@EmergencyInfoBC vs @PreparedBC).

The province published the British Columbia Emergency Management System in 2016, which describes the province's framework and approach towards emergency management. In the System, the elderly are identified in the recovery process as people requiring extra help, with Community resilience centres available to assist these individuals; there is no indication as to how this will be done. The System also identifies people with disabilities and First Nations as groups to be targeted for education and outreach. The document is very limited in its scope.

The province has a plan (the B.C. Earthquake Immediate Response Plan) specifically for earthquakes, which was developed in 2015. The Plan's focus is largely on the organizational structure of emergency response; a hypothetical disaster is applied to describe the resulting situation and the entities deployed as a result. For example, the province's Ministry of Development and Social Innovation is responsible for providing "situational understanding on community living services to assist adults with developmental disabilities and their families and anticipated resource challenges" (p. 48). The Plan's mention of VADPs is nevertheless limited to a few lines, such as a recommendation that people should check on their elderly neighbours in the case of a major earthquake, and a mention in the sample radio messages to transmit during a disaster (that seniors, children and people with functional needs might require extra help). While limited, the Plan is the only instance in provincial planning where low-income populations are mentioned; seniors, low-income populations and the homeless are identified as priorities for short-term shelter admittance following an earthquake. The Plan estimates that 4% of the population would require short-term sheltering in the event of a major earthquake, and that this number takes into consideration age, ethnicity, income and home ownership of the population.

While the B.C. Earthquake Immediate Response Plan identifies BC Transit as responsible for coordinating response personnel and public transportation if necessary in the event of a major earthquake, Translink is not mentioned (BC Transit serves municipalities in BC other than Vancouver, which is served by TransLink). The plan identifies BC Transit as responsible for coordinating requirements for response personnel and public transportation, including school and privately-owned buses, as well as conducting impact assessments for their infrastructure and systems.

There is no mention of emergency management on Translink's website. In their "Transport 2040" plan, there is a section on mitigating and responding to risk. The plan recognizes the threat of natural disasters on the increasing population and its density; related goals are defined as maintaining and developing the resilience of the system, reaching full accessibility, and planning for adaptation to climate change impacts as well as emergency preparedness, but no indication as to how this will be done.

BC Transit's website also does not mention emergency management. However, through a web search, a BC Transit workshop presentation was obtained where BC Transit's role in emergency management is defined as providing staff to support emergency response, to communicate the availability as well as to provide transportation resources for use in evacuations, and to maintain scheduled transit service in unaffected areas. The presentation discusses an "Emergency Preparedness Guide" that was developed for BC Transit staff and their families, and an "Emergency Management Manual" that was developed as a quick reference document to be used by personnel as a crisis unfolds, and that details tasks, responsibilities, tools for BC Transit staff.

In 2012, the province developed "The All-Hazard Plan" which outlines the response framework for emergencies and disasters requiring the activation of EOCs. The Plan identifies BC Transit for public transportation (again, Translink is not mentioned), the Ministry of Social Development and Social Innovation for income and disability assistance, and the Ministry of Technology, Innovation and Citizens' Services for the transmission of public education materials. The Plan acknowledges the presence of different languages spoken in the city, but does not define specific requirements for the latter in the case of a disaster.

At the time that this analysis was conducted, the Province of British Columbia had declared a state of emergency due to rapidly spreading forest fires which displaced over 45,000 people. This is the worst evacuation in its history. In reviewing sample evacuation notices from this event, but there is no assistance or guidance to those who do not have the means to evacuate. On the Regional District of Nanaimo's website (a city situated not far from Vancouver, but not affected by the forest fires), evacuation is more detailed: "If you need transportation to evacuate, advise the individual providing the notice of evacuation" (Regional District of Nanaimo, 2017). However, it does not mention what to do if you are not able to communicate with the individual or reach them.

Windsor, Ontario

The city of Windsor, Ontario is home to 329,000 people and a density of 462 persons per square km, which is higher than most mid-sized cities in Canada. It is a mostly-industrial town that was hard-hit by a sharp decline in the automotive industry, which is reflected in part through its higher than average poverty rate of 41% and its population without a high school diploma at 19%. Among its population, 15% are elderly, which is relatively high compared to most cities, 15% are considered people with disabilities, and 2% do not speak either English or French. Windsor stands out from other mid-sized cities as 17% of its population is of visible minority, which is much higher than in other cities of its size. The city is surrounded by several large bodies of water, which increases the threat of flooding every spring and rainy season. Most recently in 2016, the area declared a state of emergency as it endured over 100 millimeters of rain in 24 hours; higher levels of government were called in to help. While the water levels were not high enough to cause significant danger to the population, the flooding caused over $100 millions in damages and the suspension of transit service for several days. While water levels, forecasts and snowmelt conditions are constantly monitored and can provide some level of warning to major flooding, devastation is not inevitable (City of Windsor, 2017).

Local government

The City of Windsor's emergency management information can be found on its website, under "For Residents", and "Emergency and Crime Prevention". The city states that an Emergency Management Program Committee along with the local Fire Chief are responsible for the development, implementation and maintenance of emergency management programs in the city. Windsor's Emergency Response Plan, which was adopted in 2005 and updated in 2015, can be found on the same page. It is indicated that hardcopies may be viewed at City Hall, Fire Headquarters, and City libraries. The Plan identifies the hazards having the greatest potential risk to the city as water emergencies, winter power emergencies, human health emergencies, severe weather emergencies, and hazardous materials emergencies; the Plan states that specific plans for each of these hazards will be developed in the coming years, with public education initiatives

for each. The city acknowledges that the Emergency Response Plan is for basic preparedness only, and that they recommend other sources (Public Safety and Emergency Preparedness Canada, Environment Canada, Emergency Management Ontario and the Ministry of Transportation) for further information. While VADPs are not specifically mentioned in the Emergency Response plan, among the group's responsibilities is the "ordering, coordinating and/or overseeing the evacuation or sheltering of inhabitants considered to be in danger" (City of Windsor, 2015, p. 10), as well as "determining if additional transport is required for evacuation or transport of persons and/or supplies" (City of Windsor, 2015, p. 11). Public transit will then be coordinated with Transit Windsor.

The Transit Windsor website makes no mention of emergency management or preparedness.

The City of Windsor's website contains a specific section on floods, among other types of disasters. This section displays instructions on basic preparedness for floods and actions to take when a flood occurs to protect oneself and one's family; there is no mention of specific types of people that might require special assistance, or how to evacuate. The page reminds residents to verify if they are in a designated flood zone, but there is no mention of how to find this out. A section for important phone numbers is clearly marked, as well as the city's safety agencies and their different roles in emergency management. Residents are instructed to listen to the radio for information on the location of evacuation centres.

A section entitled "Seniors and Disabled" on the city's website exists and recommends these populations to develop a support network and to make neighbours aware of the situation prior to an emergency, as well as other basic emergency preparedness information. There is no information listed on emergency mobility or evacuation.

The City of Windsor's website clearly states that emergency information will be communicated through radio and television public broadcasts, and that citizens can obtain information by calling 311, which is available by phone, online, or by mobile text. While social media is not listed among these sources of information, the city has a Twitter, Facebook, RSS feed, YouTube, and Flickr.

An Emergency Preparedness Guide was introduced as part of 2017's Emergency Preparedness Week, which takes place across the country. It provides similar information to what is on the city's website; the guide addresses people with hearing, mobility, and speech disabilities. The social media accounts mentioned in the guide are Windsor Fire and Police accounts.

Provincial Government

The Ontario Provincial government has much more and extensive documentation and resources on emergency management.

The province's website is available in English and in French, and displays in large letters on its homepage the different sections, including "Law + Safety", which then leads to "Emergency preparedness". The first interactions with the website are extremely easy for anyone to use; large icons, logos and short words are used to guide the user to what they need. The Emergency Preparedness page features a red banner to immediately access current alerts, and underneath, a list of different disasters, leading to more information on each. The alerts are general in nature and do not provide information on who to contact for further information on evacuation, etc. Moreover, the Emergency Preparedness page mentions that everyone in Ontario should be prepared by creating a preparedness plan for their household, and to remember to be mindful of any seniors, people with disabilities, children and pets (of their own household).

The Ontario government's page on floods is very general and does not provide information on evacuation or on how people requiring extra assistance might proceed in the case of major flooding.

It is possible to sign up for "Red Alerts" by mobile text or email, which the province issues to provide recommended actions in the case of an emergency. The province also has a Twitter account (@OntarioWarnings), and emails out emergency preparedness tips to those who sign up.

A huge discrepancy that needs to be addressed is that the province's website for emergency management does not link over to Emergency Management Ontario, which is a subsidiary of the provincial Ministry of Community Safety and Correctional Services, offering

much more comprehensive information on emergency preparedness and planning. Emergency Management Ontario exists to support municipalities and ministries in implementing their emergency-related programs by providing them with tools, training, and more.

Immediately upon opening Emergency Management Ontario's homepage, you have the link to subscribe to Facebook, Twitter (@OntarioWarnings), email, and text message alerts about emergency management situations in Ontario. Moreover, one immediately sees "Seniors' EP guide and emergency form in over 20 languages" on the home page.

In the side tabs, there is a "Diverse Groups" section for seniors, people with disabilities, children, and pets. For seniors, the government acknowledges that not only is basic planning required, but the steps needed to get prepared, and the programs and services available to them to get through the emergency and return to normalcy. Resources specific to people with disabilities is also available, as Emergency Management Ontario and the Accessibility Directorate of Ontario joined forces to create a specific emergency preparedness guide for different disabilities, which is also available in French (five additional languages are also available upon request). The guide addresses an extensive list of disabilities and for each, how to prepare for an emergency (including evacuation preparedness; they are asked to call their municipal office to find out about programs and services that will help them during an emergency).

A section on general emergency preparedness entitled "Be Prepared" is also available in 23 other languages than English and French, and in other formats for users with disabilities. The page also features an array of promotional and print material readily available for local education campaigns. The site encourages people to learn more by taking a quiz, and encourages the spreading of awareness on emergency preparedness through social media challenges, such as taking "selfies" and sharing them to friends with a reminder to prepare themselves for disasters.

Since 2008, emergency management in Ontario is steered by an Incident Management System, which is a form of standardized emergency management consistent with internationally recommended best practices. As such, the Provincial Emergency Response Plan (PERP) was developed in 2008 to establish the framework for Ontario's response to a disaster. The PERP lack guidance for people with disabilities and seniors in the case of an evacuation; the recommended action during evacuations is to gather your family, get in your car, and get to a shelter. However,

the PERP discusses persons with disabilities as “disadvantaged populations” that require special care and attention during emergencies and evacuations (Emergency Management Ontario, 2008 p. 47). The Plan indicates that both provincial and municipal plans should articulate the short and long-term issues relating to those individuals in strategic planning; “assistance with the planning of emergency arrangements can be requested from the Ministry of Community and Social Services, as this ministry has the lead with respect to persons with disabilities and sheltering” (Emergency Management Ontario, 2008 p. 47). Moreover, language interpretation and translation when possible is an action that is considered necessary and recognized by the Ministry of Government Services as an OIC. There is no mention of transit-related tasks for the Ministry of Transportation during an emergency (Emergency Management Ontario, 2008).

In support to the PERP, the Ontario Mass Evacuation Plan (OMEP) is currently being developed by the Government of Ontario. As of this year, a detailed evacuation plan has only been created for the Far North of Ontario; plans for Near North and Southern Ontario are currently being developed. The Far North Plan recognizes that the size and demographics of a population can significantly change the course of an evacuation, and that personnel must understand the composition of the population to make decisions in terms of language, modes of transportation used, persons requiring additional assistance. For the latter, the Plan specifies a “non-exhaustive” list of people, including persons with disabilities (sensory, mobility, mental, developmental, learning), persons with medical conditions, persons requiring addiction services, persons requiring translation services, incarcerated persons, temporary populations (tourists, seasonal workers), students and children, persons with animals (including service animals), the homeless, and the elderly Government of Ontario. (2013).

The Plan (2013) states that in an evacuation and for re-entry after a disaster, the population will be divided into the following categories according to priority:

- Medical Evacuation (for those receiving home care or residing in a facility)
- Stage 1 evacuees (defined as people with disabilities, children, pregnant women, medical conditions, and caregivers of the evacuees)
- Stage 2 evacuees (all remaining residents)

The categories mentioned cover the array of vulnerabilities identified for this research, except for low-income populations. As this plan caters for the far North, which does not have public transit, the sections on transportation are very much focused on airlifting as the area is remote. Nevertheless, the Plan indicates that a joint transportation planning team approach is used to coordinate evacuation and return to the area.

The Plan also includes an Annex document to assist municipalities in creating their own evacuation plans. The document recommends that municipalities identify their demographics, geography and vulnerabilities, and to use the standard prioritization categories for evacuees in preparation for a disaster. The Plan further recommends that municipalities conduct an analysis to specifically identify populations that may require additional assistance during an evacuation, using census data (to identify low-income populations, single-parent households, and the elderly), vehicle ownership statistics, pet ownership statistics and public transportation usage statistics. The Plan recommends that public information about an evacuation be transmitted through the media and that it should specifically address where and how where evacuees should go, including specific indications for VADPs and for those without personal transportation.

The document includes an extensive list of questions a municipality must ask itself in order to consider all populations for evacuation planning, such as:

- Where are different populations located at different times of day?
- What population groups will need special assistance and what type of assistance?
- What percentage of evacuees has a personal vehicle?
- How many commute by transit and may rely on public transportation?
- Are people likely to use alternative modes of transportation to evacuate?
- How many people do not speak English as a first or second language?

The Plan also recommends including experts from a range of fields (including transit providers, public health, etc.) in the development of the plan.

Discussion and Conclusions

The previous chapter has reviewed the federal, provincial, and local public emergency management plans, documents, and web resources as they apply to Vancouver and Windsor in the context of an earthquake and a flood, respectively. The analysis revealed that while both cities are aware of the threats and range of natural disasters, and that certain people might need additional assistance in the context of an emergency, the emergency preparedness resources provided to the public do not cater for these VADPs, which would need it most. This chapter will summarize and apply the lessons learned from the case studies of Hurricane Katrina, the Christchurch earthquakes, and Hurricane Sandy to the Canadian context in order to provide recommendations on how Vancouver and Windsor (and in turn, the country) can improve their emergency management framework in order to be more equitable to VADPs in the wake of a disaster.

Lessons Learned and Best Practices

The review of recent case studies of large-scale disasters in high-income countries has highlighted the amplified effects that severe emergencies have on VADPs.

Hurricane Katrina uncovered the societal disadvantages under which people perished, did not receive the help they needed, were not able to evacuate, or were left behind in the disaster; including poverty, race, health, age, education, and language. From this experience, it is evident that preparedness measures and plans need to be implemented for people who are unable to evacuate themselves, either by having a predetermined way to signal help to authorities, or a sign-up program to indicate the impossibility of evacuating oneself. This comes as a result of New Orleans' emergency evacuation plans not specifically addressing how to take care of populations that do not have a car, do not have money to pay for gas to evacuate, or cannot drive themselves. In turn, the city has since undertaken measures to rectify this, such as by clearly indicating emergency and evacuation plans on the home page of transit agencies' websites in the New Orleans area. It would also be important for cities to create up-to-date maps identifying areas

with concentrations of VADPs, which would assist in identifying areas of greater need during a disaster and to consequently concentrate response efforts.

Victims of Hurricane Rita fared much better than those of Katrina, as government offered free public transportation out of the city. However, the authorities experienced difficulty in keeping transit agency employees in the area for work, as they needed to attend to their families. Therefore, it would be critical to provide training to employees for disasters, and to plan for the evacuation of their families so they can concentrate on helping others in need. The public transport agency's role in evacuation and re-entry must also be clearly laid out and pre-determined in order to be well-prepared in the event of a large-scale disaster; all infrastructure should be used if possible, and not left behind uselessly. As they had seen the horrors from Hurricane Katrina, people were more prepared for Hurricane Rita even though it occurred only a few weeks afterwards; Canada must not wait to lose thousands of people to a disaster, but instead take precautionary measures to prepare and plan for its most vulnerable.

Important lessons were also issued from the earthquake series in the Christchurch area of New Zealand, where the elderly and people with disabilities were most affected by the aftermath of the disasters. These populations' experiences have shown that it is essential for cities to plan for the provision of food, medical aid, social services, transportation and infrastructure not only in the immediate aftermath but in the months following the disaster, specifically for these populations. It is also essential that cities plan for door-to-door campaigns to take place following the disaster to ensure and assess for people who might require additional assistance. A wide range of communications methods is also necessary to provide important information to all potential victims, and to allow them to connect with public authorities if they need additional assistance.

Hurricane Sandy's effect on the New York City area has shown that it is essential for a city to recognize and to acknowledge its population's needs in the aftermath of a disaster; an important part of resilience is the return to normalcy, which includes access to services, jobs and social networks, transportation, etc. As was the case with Hurricane Katrina, some areas failed to protect their public transit infrastructure from the storm, which led to important and episodic delays for years, restricting mobility and accessibility for many. While not to prioritize it over

human life, it is necessary for a city to protect, if possible, infrastructure that is essential to the well-being of its population in the wake of a disaster.

Throughout the case studies, it is apparent that resilience and the outcome of the experience of VADPs in disasters relies on government preparedness and in turn, the ability of government to plan for these populations. Age, disability, income, education, and language can affect both mobility (moving around and transportation) and awareness (understanding and accessing information) in the event of a disaster. In turn, the level of mobility and awareness available is dependent on what public resources are available and provided. How a city's VADPs fare during disasters is therefore congruent on their governments being prepared and on preparing their populations for large-scale events of this nature.

Recommendations

Vancouver

The city of Vancouver recognizes the important earthquake threat it faces, and recognizes the lack of awareness of the majority of its population concerning earthquake preparedness. While efforts have been made by the city to improve its resilience in the face of an imminent earthquake threat (including an Earthquake Preparedness Strategy, public outreach campaigns, etc.), they do not acknowledge or tailor to the specific needs of VADPs in disaster preparedness and response.

The provincial government has more extensive documentation and resources for emergency preparedness, which cater for different types of vulnerabilities; the province describes a disability as something which may render a person vulnerable in the face of an emergency, just as it is described in this supervised research project. The province's outreach campaigns are more specifically targeted, such as to younger populations and First Nations. Some resources provided by the government are also offered in different languages. While linking to other websites allows the province to provide its populations with more information, it requires a lot of research on one's part to find the information they need as the links are numerous and

scattered; specific emergency preparedness information should be provided by the province on its own website and for its own residents. While social media presence is very high for both the city and the province, the same problem arises where there are too many channels which makes it difficult to choose one or to know which one to subscribe to.

Even more important than awareness is actual preparedness; as is the case with the city, the province recommends that neighbours reach out to those who may require additional assistance during an emergency. The province goes further by identifying different types of VADPs. While the province's B.C. Earthquake Immediate Response Plan describes that VADPs will be given priority for shelter admittance following a disaster (including low-income populations), it does not specify how these populations might reach the shelter; public transit is identified as a service that will be coordinated as part of the response to an emergency, but it does not specify how and for which populations.

If a major earthquake were to happen in Vancouver, there is no doubt that VADPs would fare the worst, and even more so due to insufficient preparedness and resources for the latter. As with the Christchurch earthquakes, seniors and people with disabilities would likely be disproportionately affected in a Vancouver earthquake due to damaged infrastructures, therefore impeding their access to essential services and likely for a long time. While this is not something that is preventable, Vancouver can reduce the potential impact by planning for and preparing these populations for a large earthquake, which includes improving communications, conducting outreach specifically for these populations, and assessing accessibility following a disaster. The city would do well to consult the Christchurch and New Zealand governments on lessons learnt and changes they have made to their policies since the last devastating earthquakes; such as proper planning and response for mobility-restricted populations in the immediate and short-term aftermath of an earthquake, including the provision of food, medical aid, transportation, access to services and social networks, etc.

Windsor

Windsor, as a mid-sized city, evidently has fewer resources than a larger city such as Vancouver. As such, it's emergency management framework is relatively limited. However, the city appears to be recognizing the threats it faces in terms of the increasing occurrence of weather events (including flooding) coupled with changing demographics which render its population more vulnerable. As such, it is currently developing specific plans for different types of disasters, and has planned a public education campaign for each of them. While the city provides electronic copies on its website of its official plans, it is indicated that they are also available in hard copy at City Hall, libraries and Fire Headquarters, which is practical for people that do not own a computer. The city has social media accounts, but it does not specify them as part of emergency management. Moreover, VADPs, other than seniors and people with disabilities, are not mentioned in the city's emergency management framework. While most VADPs are not targeted in Windsor's emergency management structure, they do indicate that transportation may have to be provided if people cannot transport themselves; as is the case with Vancouver, there is no mention of how this will be done.

It would be essential for the city to ensure its most vulnerable residents are properly prepared for a disastrous flood; Windsor would likely face a similar fate as New Orleans were a severe storm to strike it. As such, the city should map out where its most VADPs are located in order to ensure these are not left behind and are cared for if an evacuation notice were to arise. It should also create a pre-determined transit evacuation plan, as well as train its transit employees accordingly and provide a plan for their families so that employees can concentrate on their work in the event of a disaster.

As was the case with Vancouver, the provincial government has many more resources for emergency management planning and response. All of the Ontario government's websites and official documents on emergency management are available in English and in French, and resources and easily accessible and user-friendly. However, information and resources provided should be more specific to flooding and other types of disasters. Ontario's social media presence for emergencies is well displayed, on one account, and provides information and updates in the

case of emergencies, as well as emergency preparedness tips. However, it is essential that the government address the missing link between its main website and Emergency Management Ontario, which is a much more comprehensive source for emergency preparedness. The provincial government excels in providing information in an array of languages and formats for people with different needs and disabilities. They also excel in public outreach through a variety of mediums. The province not only defines the role of its different entities, but does well in describing them and how they apply in different situations. The Ontario government is also currently developing a province-wide evacuation plan (which has been completed only for northern Ontario); the Plan understands and acknowledges an extensive list of people with disadvantages who are prioritized in an evacuation, and even discusses the coordination of transportation services for people who cannot evacuate themselves. The Plan goes even further by creating a framework for municipalities to create their own plan.

As with hurricanes Katrina and Rita, major flooding in Windsor would affect its VADPs the most. Since the devastation from Hurricanes Katrina and Rita in New Orleans, the city has developed an extensive emergency management structure and plans, and even has predetermined transit evacuation routes and stops; Windsor would do well in doing the same, as well as to consult the New Orleans government in order to be properly prepared for major flooding. The New Orleans case has shown that it is essential to prepare in advance in order to avoid countless deaths due to a disaster. The Ontario government is shaping up to be extremely well-prepared for an emergency and an evacuation, and Windsor should make use the provided framework to prepare its own detailed emergency plans.

Federal Government

In the case of a major earthquake or flooding, the Federal government would act primarily as a support and consultant, bringing in the Armed Forces to assist in search and rescue, to provide financial assistance, and to provide expertise from its different ministries to assist in the recovery. In terms of emergency preparedness, the federal government does not provide substantial resources to the public on specific types of disasters and for specific types of populations other than people with disabilities; it could certainly benefit by developing resources

catered to other VADPs, and involve NGOs related to these different vulnerabilities in all emergency management planning components, in order to develop proper preparedness measures for these populations. Planning by the federal government also needs to be more concentrated; for example, one agency or ministry could be responsible for planning for the elderly in an emergency, which would assist in reaching as many VADPs as possible.

The Federal government would likely be better prepared for major flooding than for an earthquake, as most of its provinces have experience major flooding in the past. It should therefore pay particular attention to preparing itself and its most VADPs for a major earthquake.

While the different levels of government have different roles in the preparation, planning and response to disasters, the following recommendations apply to them all, and comprise the result for this supervised research project:

- Emergency preparedness, planning and response must be two-tiered: (1) for the general population and (2) for VADPs in order to ensure adequate consideration of these populations;
- All levels of government and bodies (NGOs, transit agencies) involved in the preparedness, response, and recovery process must have public, clearly laid-out, and coordinated emergency management plans and resources specifically for their concerned areas and VADPs;
- Develop communication channels specifically for VADPs and disasters;
- Prioritize outreach and social network-building for VADPs in preparation for a disaster;
- Access to services, mobility, and outreach for VADPs must be prioritized in the immediate aftermath and short-term following a disaster;
- In emergency preparedness, response, and recovery, infrastructure that is essential to the well-being of VADPs, including communications, power, water, and transit, must be protected (when possible);
- Use the aforementioned infrastructure to its full potential (ie. transit for the evacuation of VADPs) in order to improve efficiency and for these resources to be

allocated repeatedly and in a variety of ways during the course of disaster response and recovery.

Limits

While the goal of this research paper was to determine if VADPs are considered as part of Canadian emergency preparedness, it is important to recognize that governments with limited resources must plan first for the majority of the population before beginning to plan for specific groups. It is also acknowledged that there are many more types of disabilities and vulnerabilities not mentioned in this research paper. Moreover, while this supervised research project focuses on the immediate and short-term effects of disasters, serious long-term effects often occur especially for VADPs, such as persisting housing problems (deplorable conditions, not being rehoused after a disaster, etc.), economic insecurity resulting from the disaster, and enduring physical and mental health problems (Grohen et al., 2013).

This research was conducted from September 2016 to July 2017. The complexity of the research paper is therefore limited by amount of time to complete it. The analysis of the emergency management structures and resources for the different levels of government in Vancouver and Windsor does not claim to have reviewed all existing documents and resources, but only those found through a subjective search on the web. It is understood that web sources are not the only, nor necessarily the primary, source of information for many people. Moreover, the review of the literature for this research paper is by no means exhaustive. The methods used to select cities for analysis were developed to be unbiased; they are in no way scientific or meant to be used in order to identify or to prioritize certain populations in emergency management. It is important to note that since the completion of the research for this project, government plans might have been created or updated, and other large-scale disasters might have occurred.

Conclusion

This supervised research project sought to evaluate the readiness and equity the Canadian emergency management system in serving VADPs in the event of a large-scale disaster.

A review of Canada's recent history of disasters highlighted that while the country has so far fared well in emergency management, it has never experienced large-scale disasters causing devastation to its largest cities. The literature on VADPs' experience during disasters uncovered that these groups are not adequately considered in Canadian emergency management, even if they are the ones for which access to basic services or help during an emergency could mean the different between life and death. A review of three large-scale disasters affecting cities in similar high-income countries was conducted and revealed that VADPs were disproportionately affected by the disasters due to lack of proper preparedness by governments. Hurricane Katrina's passage revealed that it is essential to properly plan for the evacuation of VADPs in the case of an emergency. Hurricane Sandy and the Christchurch earthquakes highlighted that it is critical to plan for access to services and jobs when infrastructure and services are damaged and disrupted for extended periods of time. The disasters also demonstrated that infrastructure must be protected as much as possible as it is a valuable resource that will greatly aid in recovery if preserved.

For the analysis portion of this supervised research project, a large (Vancouver) and a medium-sized city (Windsor) in Canada were chosen for evaluation according to their demographics and the respective disaster threats they face. A hypothetical disaster was then applied to each city (an earthquake in Vancouver and flooding in Windsor); the federal, provincial, and local governments' emergency plans and online resources were then studied to determine how their concerned VADPs would fare in each disaster. The analysis revealed that local governments do not adequately address VADPs in disaster preparedness, response, and recovery, and they therefore would be extremely unprepared to cater for these groups in emergencies. Provincial governments, on the other hand, have resources that cater for specifically to VADPs. However, they currently seem to borrow best practices from exterior sources; the Ontario government in particular is currently developing an in-depth evacuation plan which will specifically address VADPs, and which provides the framework for municipalities for municipalities to create their own plan. This evacuation plan is shaping up to be a crucial resource that should be emulated by other provinces, municipalities, and referenced by the federal government. The federal framework for emergency management in Canada is general in

nature, but the federal government's role would remain in acting as an important source of finance and of expertise in the case of a disaster.

This research paper has unveiled that Vancouver and Windsor are aware of the imminent threats of large-scale disasters that their city faces, but that their emergency management frameworks would require improvement regarding the consideration of VADPs in order to be fully prepared for a large-scale disaster. Meanwhile, the New Orleans, New York City and Christchurch areas slowly recover from the devastation caused by large-scale natural disasters and are devoting resources to ensure that an immense loss of life and a slow return to normalcy for VADPs will not repeat itself should another disaster strike. While it is understood that governments must first plan for the general population before targeting specific VADPs, it is likely that many lives in these groups might be lost as a result of insufficient preparation and planning if a large-scale disaster were to occur. Emergency preparedness cannot wait, and with an ageing and densifying population coupled with an increase in the occurrence of natural disasters (Renne et al., 2008), governments must devote more resources to informing and preparing their most vulnerable residents for an emergency. Moreover, the process of recovery must not simply entail bringing people back to the dire state they were in before the disaster, but improve their situation, creating resilience (Grohen et al., 2013).

The importance of this research is reflected in the increasing rates of urbanization, the growing and ageing population, and increasing natural disasters. The research would benefit from interviews with individuals from VADPs to determine their awareness of emergency procedures and to understand what they might do in the case of an emergency or to prepare for one. It would also benefit from further investigation into past disasters, in North America or Canada in general; interviews could be done with VADPs to learn more about their experience during the disaster, as well as stakeholders working in the emergency management sector.

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Appendix A

Buses marked “EVACUATION” from the local transit agency’s fleet in Fort McMurray assist in the evacuation of the city from rapidly spreading wildfires in 2016.

Source: Seguin, Topher. Photos: Raging Fort McMurray wildfire forces thousands from their homes. *The Toronto Star.* Retrieved from https://www.thestar.com/content/dam/thestar/news/canada/2016/05/04 photos-raging-fort-mcmurray-wildfire-forces-thousands-from-their-homes/fire22jpg.jpg.size.custom.crop.1086x724.jpg

Evacuees young and old from the Fort McMurray area board a city bus to flee the area.

Source: McConnell, Rick, & Lamoureux, Mack. (May 4, 2016). More evacuation orders issued for Fort McMurray area. *CBC News.* Retrieved from http://www.cbc.ca/news/canada/edmonton/more-evacuation-orders-issued-for-fort-mcmurray-area-1.3566310

Appendix B

Vulnerability Matrix

		Toronto	Montreal	Vancouver	Windsor	Saskatoon	St. John's
Criteria	**Province**	Ontario	Quebec	British Columbia	Ontario	Saskatchewan	Newfoundland
	Population	5.9 million	4.1 million	2.5 million	329,000	295,000	206,000
Sensitivity	**Density (people/sq km)**	938	998	1116	462	362	286
	Disabled (province)	15 %	10 %	15 %	15 %	15 %	14 %
	Elderly	13 %	15 %	14 %	15 %	12 %	13 %
	Education (no high school)	17 %	19 %	17 %	19 %	17 %	17 %
	Visible Minority	47 %	20 %	27 %	17 %	11 %	3 %
	Language	4 %	2 %	6 %	2 %	1 %	0 %
	Poverty	41 %	39 %	39 %	41 %	34 %	36 %
Exposure	**History and potential for disasters**	Not high, mostly winter storms	Not high, mostly winter storms	High earthquake and tsunami possibility	Meteorological (flooding, storms, tornado), gas explosions, Detroit (nuclear)	Flooding, inexpensive construction, many aboriginal reserves	Coastal city, isolated
Overall vulnerability		Medium	Low	**High**	**High**	Medium	Low

Source: 2011 and 2016 Canadian Census

Appendix C

This image shows a fleet of school buses submerged in the flood waters brought by the 2005 Hurricane Katrina in New Orleans. These vehicles could have helped in the evacuation of thousands of VADPs, and helped save some of the 1,800 who perished.

Source: Wade, Lisa. (August 31, 2015). Who Didn't Evacuate for Hurricane Katrina? *Pacific Standard.* Retrieved from https://psmag.com/who-didn-t-evacuate-for-hurricane-katrina-db67eba6c084