Urban Disaster Risk & the COVID-19 Pandemic

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Introduction

As an increasing proportion of Canada's population urbanizes, its cities are often faced with intensified challenges of urban living. One of these challenges is social, economic, and infrastructure vulnerability to disasters owing to modification of natural systems, intensified development, and densification which all serve as underlying causes and drivers of such vulnerability. Owing to this, there has been a significant growth in discussion and research surrounding the impacts of disasters on cities, and how the necessary planning, prevention and recovery measures can minimize losses.[1] Leading to the understanding that how we plan and invest in cities ultimately determines how resilient they are.

Against the backdrop of pervasive vulnerabilities, increasing needs of residents, and strained local government resources, the Covid-19 pandemic has emerged as a multi-dimensional urban threat. This is because health crises, especially pandemics, are difficult policy problems to conceptualize and address. This is especially true for Covid-19 as a novel disease where crucial knowledge over its transmission, symptoms, recovery rates, and incubation periods are poorly understood in the beginning. This is a stark comparison to how cities prepare for other types of disasters like floods or ice storms where the causes are understood, and the best courses of emergency preparedness and response are clear.[2] But where there are short fallings and pervasive vulnerabilities there are also hubs of resilience and innovation in cities ready to adapt and persevere.[3] This will require

[1] Sharifi, A., & Khavaian-Garmsir. (2020). The COVID-19 pandemic: Impacts on cities and major lessons for urban planning, design, and management. *Science of the Total Environment*, 749, 142391. Page: 2.
[2] Capano, G., Howlett, M., Jarvic, D., Ramesh, M., and Goyal, N. (2020). Mobilizing Policy (In)Capacity to Fight COVID-19: Understanding Variations in State Responses. *Policy and Society*, 39 (3): States and Covid-19 Policy Making. Page: 258.
[3] United Nations (2020). Policy Brief: COVID-19 in an Urban World. Page: 2.

conscious policy action and reflection on how we handled the current pandemic, and strategic foresight on how we can best prepare for the next one.

The purpose of this report is to examine urban experiences with Covid-19 in Canada with the intention of laying the foundation for bigger conversations on how cities can build resilience for future pandemics and health crisis. It is important to note that the objective is not to criticize current governments or policy makers who are working to control Covid-19 and its negative spillover effects.

In this report, the many types and forms of disasters will be discussed, leading to an overview of disaster management practices from a global to local level. With a specific city-level focus this report will explore how Covid-19 has illuminated long-standing structural inequalities and will provide policy guidance that may enable meaningful changes to best prepare for the next pandemic.

Section 1: Understanding Disasters

Disasters, Risk and Vulnerability

Table 1: Types of Disasters[4]

	Type	Example
Hazardous Agent	Atmospheric/ Hydrological	Flood, hail, tornado, ice storm, snowstorm, drought, avalanche, cold wave, heat wave, hurricane, etc.
	Geological	Landslide, tsunami, earthquake, etc.
	Biological	Infestation (forest), epidemic/ outbreak, etc.
	Transportation	Aviation, marine, rail, road, etc.
	Industrial/ Technological	Fire, explosion, toxic chemicals, mine, oil spill, radiation, etc.
	Social	Crime, etc.

Disasters come in many shapes and forms (see Table 1). Sometimes they result in immediate and devastating human, economic, or environmental loss, while other times they may be predictable seasonal events. No two disasters look the exact same. While a forest fire in *"Town A"* may result in complete destruction, another forest fire in "*Town B"* may result in minimal disruption. While

[4] Hewitt, K. (2000). Safe place or 'catastrophic society'? perspectives on hazards and disasters in Canada. *Canadian Geographer*, *44*(4), 327.

such variations may be determined at random or by varying severities, typically they are shaped by how communities prepare for them.

Disaster Risk	The likelihood of loss of life, injury or destruction and damage from a disaster (type of hazard) [5]. This definition takes into account the severity and frequency of a hazard, the number of people and assets exposed to it, and their vulnerability to damage [6].
Hazard	A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.[7]

Any disaster is a combination of both a triggering event and a set of vulnerabilities, and its these vulnerabilities which affect the capacity of a society to 'bounce back' after the disaster take place (this may include post-disaster construction efforts, economic considerations, etc.).[8] It is for this exact reason that preparation for disasters by minimizing vulnerabilities is studied at such great lengths.

Strengthening Resilience, Addressing Vulnerability

Increasing capacity and strengthening resilience within any community is the cornerstone of disaster planning, as deliberate policy objectives have the potential to reduce risk. Varying interpretations and definitions of the term's vulnerability, capacity and resilience persist across

[5] UNISDR. (2015). Global Assessment Report on Disaster Risk Reduction: Making Development Sustainable, the Future of Disaster Risk Management.
[6] Ibid.
[7] Public Safety Canada, Emergency Management Policy and Outreach Directorate. (2017). An Emergency Management Framework for Canada: Ministers Responsible for Emergency Management. Page 21.
[8] Ginige, K., Amaratunga, D., Haigh, R. (2009) Mainstreaming Gender in Disaster Reduction: Why and How? *Disaster Prevention and Management*, 18(1): 23.

academia, leading to widespread confusion, misunderstanding among researchers, practitioners, and the public. For the purpose of this report, the following definitions will be used for clarifications and subsequent policy guidance.

Vulnerability	A measure of how well prepared and equipped a community is to minimize the negative impacts of hazards.[9]
Capacity	Refers to all the resources within a community/ society (infrastructure, institutions, human knowledge and skills[10]) that are available to manage and reduce disaster risk and strengthen resilience.
Resilience	The capacity of a system, community or society exposed to hazards to adapt to disturbances resulting from hazards by persevering, recuperating or changing to reach and maintain an acceptable level of normal function. [11]

Disaster Risk Drivers

When attempting to understand the occurrence of disasters and their subsequent severity, it becomes increasingly important to address the drivers of risk which perpetuate vulnerabilities, as they necessitate its existence. These drivers may be condensed into the following categories. While this is not an exhaustive list, it acts as a starting point for understanding influences of vulnerabilities particularly in Canadian cities.

[9] Public Safety Canada, Emergency Management Policy and Outreach Directorate. (2017). An Emergency Management Framework for Canada: Ministers Responsible for Emergency Management. Page 23.
[10] UNISDR. (2017). Terminology on Disaster Risk Reduction. *UNISDR Annual Report.*
[11] Public Safety Canada, Emergency Management Policy and Outreach Directorate. (2017). An Emergency Management Framework for Canada: Ministers Responsible for Emergency Management. Page 22.

1. Climate change: alters the frequency and intensity of environmental disasters (example: decreasing agricultural yields due to heat stress)[12];
2. Environmental degradation: the direct result of overconsumption of natural resources;
3. Uneven economic development [13];
4. Poverty and inequality: poverty of which is both a driver and consequences of disasters, permeated within inequality;
5. Poorly planned urban development: neighbourhoods/ communities which lack public regulation, resilient infrastructure, and adequate service provision[14];
6. Weak governance: whereby the government is either unable or unwilling to assume their roles and responsibilities in protecting citizens' rights by providing basic services and ensuring management of DRR is effective[15];
7. Critical infrastructure interdependence;
8. Shifting demographics.

Disaster Risk Reduction

Disaster Risk Reduction (DRR) may be understood as being the identification, assessment, and reduction of disaster risks. As a systematic approach, DRR policy is the enabling mechanism for a society to utilize and increase its capacity to prevent or to mitigate and prepare societies for

[12] UNIDSR. (2009). Global Assessment Report on Disaster Risk Reduction: Risk and Poverty in a Changing Climate.
[13] UNISDR. (2015). Global Assessment Report on Disaster Risk Reduction: Making Development Sustainable, the Future of Disaster Risk Management.
[14] UNISDR. (2011). Global Assessment Report on Disaster Risk Reduction: Revealing Risk, Redefining Development.
[15] OECD. (2006). The Challenge of Capacity Development: Working Towards Good Practice. *Development Assistance Committee Network on Governance.*

adverse impacts of hazards. Recognition of projected increases in exposure to drivers of risk (climate change, increased urbanization, etc.) have underscored the importance of developing how DRR policy is conceptualized and enacted.

Legislative Framework: The Sendai Framework

In 2015, 187 countries at the UN General Assembly adopted the *Sendai Framework for Disaster Risk Reduction 2015-2030*. The *SFDRR* was created by the United Nations Office for Disaster Risk Reduction (UNISDR), a subsidiary of the UN which works to provide key actors and stakeholders with the tools, information, technical expertise to translate the *SFDRR* into concrete actions[16]. Signatories to the *SFDRR* represent a mix of states with differing levels of economic development, vulnerabilities to disasters, capacities and resilience mechanisms. The UNISDR's overarching objective is to facilitate the prevention of new and existing disaster risks and to strengthen resilience. [17]

The *SFDRR* notably attempts fill gaps in policy missed by its predecessor, the *Hyogo Framework for Action 2005-2015 (HFA).* During the *HFA's* 10-year run, disasters continued to globally produce massive human, economic, infrastructure and ecological losses[18]. Although the *HFA* was ground-breaking in its ambition and scope within the DRR field, it lacked correct language, targets and indicators necessary on determining how to reduce the imbalance often found within

[16] UNISDR. (2018). UNISDR Annual Report 2017, 2016-17 Biennium Work Programme Final Report. Page: 12.
[17] Ibid.
[18] Tozier de, P., Baudoin, M. (2015). From Yokohama to Sendai: Approaches to Participation in International Disaster Risk Reduction Frameworks. *International Journal of Disaster Risk Science,* 6(2): 131.

disasters[19]. Thus, commitments to continuously supporting DRR efforts were renewed through the *SFDRR* when the *HFA* came to an end.[20]

Emergency Preparedness in Canada

Although Canada is the second largest country in the world, its 'hazardscape' is less severe than the majority of other countries/ regions. This has more to do with the relative spareness of the land and dispersion of population than it does the occurrence/ severity of hazardous agents that it experiences. When disasters do strike in Canada, they are typically most devastating in cities where there is a higher concentration of population, critical infrastructure, and social/ economic activity.[21]

Control over repercussions and damage of urban disasters are not a matter of chance, wealth, demography, nor geographic conditions.[22] Rather, it is a result of strategic public policy giving priority to building resilience through implementing DRR practices. This means proactively developing evacuation procedures, emergency response protocols, entrenching climate-resilient building requirements into infrastructure, etc. As a signatory state of the *SFDRR*, the Canadian federal government has allocated Public Safety Canada as the federal department responsible for its domestic implementation.

[19] Blanchard, K. (2015). Gender and the Sendai Framework. *Crisis Response Journal* 10(4), Page: 53.
[20] Tozier de, P., Baudoin, M. (2015). From Yokohama to Sendai: Approaches to Participation in International Disaster Risk Reduction Frameworks. *International Journal of Disaster Risk Science,* 6(2): 131.
[21] Sharifi, A., & Khavaian-Garmsir. (2020). The COVID-19 pandemic: Impacts on cities and major lessons for urban planning, design, and management. *Science of the Total Environment,* 749, 142391. Page: 2.
[22] Hewitt, K. (2000). Safe place or 'catastrophic society'? perspectives on hazards and disasters in Canada. *Canadian Geographer, 44*(4): 326.

Public Safety Canada → Federal department responsible with assisting communities build resilience to emergencies and disasters through the development and implementation of policies, plans and programs.[23] One of its primary functions is to provide financial assistance to provincial and territorial governments in the event of large-scale disasters where response and recovery costs exceed their financial capabilities.

Emergency Management Act → Established by Public Safety Canada, this Act determines the responsibilities allocated to the Minister of Public Safety and Emergency Preparedness. [24] This Act builds on the foundational principles of the SFDRR in order to establish clear federal, provincial, and territorial priorities to strengthen the resilience of Canadian society by 2030.[25] This Act further stipulates the roles that all stakeholders must play in Canada's emergency management system.

EM Strategy for Canada: Toward a Resilient 2030 → Current emergency management strategy being implemented in Canada since it was approved and released in 2019. This strategy identifies the cross-governmental priorities that

[23] Government of Canada. Emergency Management, Public Safety Canada. Link: https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/index-en.aspx
[24] Ibid.
[25] Public Safety Canada. (2019). Emergency Management Strategy for Canada, Towards a Resilient 2030. Page: 5.

will strengthen Canada's resilience by 2030.[26]

Section 2: The Emergence of the COVID-19 Global Pandemic

In 2019, climate-change related hazards including floods, droughts, and typhoons dominated disaster policy discourse. Only in the very final few days of the year did this change completely, when a cluster of pneumonia-like illnesses were reported in east-central China, ultimately shifting attention to managing a new emerging risk that would become a global pandemic.[27]

Epidemic	A disease that affects a large number of people within a community, population, or region.
Pandemic	An epidemic that has spread over multiple countries or continents.

The Novel Coronavirus (2019-nCoV), later renamed COVID-19, was declared a global pandemic by the World Health Organization on March 11, 2020. While the world has previously seen other pandemics emerge like the Ebola virus in 2014, Swine Flu in 2009 and SARS in 2003 (see Table 2), COVID-19 stands unique as it is extremely hazardous owing to its high rate of transmission. This is especially worrisome for dense urban areas in the world, particularly ones with vulnerable infrastructure and poor health service systems.[28] Beyond the immediate risks posed to health, the

[26] Government of Canada. Emergency Management, Public Safety Canada. Link: https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/index-en.aspx

[27] UNDRR Asia Pacific COVID-19 Brief. (2020). Combating the Dual Challenge of Covid-19 and Climate-related Disasters. Page 2.

[28] Urban, Disaster Risk Management, Resilience and Land (GPURL). (2020). Urban and Disaster Risk Management Responses to COVID-19. The World Bank. Page 2.

effects of COVID-19 also cascade into implications for socio-economic, behavioural, psycho-social, governance and technological realms of life.[29] The full and final repercussions of Covid-19 are still yet to be seen.

Three important characteristics of COVID-19:[30]

1. High rate of spread (highly transmissible);
2. Particularly dangerous for persons with low-immunity, underlying health conditions, and elderly;
3. Variance in recovery rates in different countries/ communities owing to varying levels of access to and quality of health care and overall capacity within health care systems.

Table 2: Recent Global Pandemics

Pandemics	Years Active	Total Deaths	Cumulative Cases
SARS[31]	2002- 2004	774	8096
Swine Flu (H1N1)[32]	2009- 2010	~284,000	-
MERS-CoV[33]	2012- Present	858	2484
Ebola Virus[34]	2013- 2016	12,950	31, 905
COVID-19[35]	2019- Present	917,417	28,637,952

[29] Zhang, H., & Shaw, R. (2020). Identifying research trends and gaps in the context of COVID-19. *International Journal of Environmental Research and Public Health, 17*(10): 2.
[30] Ibid.
[31] WHO. Summary of probable SARS cases with onset of illness from 1 November 2002 to 31 July 200. Link: https://www.who.int/csr/sars/country/table2004_04_21/en/
[32] CDC. 2009 H1N1 Pandemic (H1N1pdm09 virus). Link: https://www.cdc.gov/flu/pandemic-resources/2009-h1n1-pandemic.html
[33] WHO. Middle East Respiratory Syndrome Coronavirus (MERS-CoV). Link: https://www.who.int/emergencies/mers-cov/en/
[34] WHO. (2020). Ebola Virus Disease. Link: https://www.who.int/news-room/fact-sheets/detail/ebola-virus-disease
[35] WHO. (2020). Coronavirus Disease (COVID-19) Pandemic. Link: https://www.who.int/emergencies/diseases/novel-coronavirus-2019

COVID-19 in Canada

Table 3: Timeline of Covid-19 Emergence in Canada

January 25, 2020	First case of Covid-19 confirmed in Canada as Toronto resident returns from Wuhan, China.[36]
January 26, 2020	Canada warns citizens to avoid all non-essential travel to China.[37]
March 4, 2020	Prime Minister Justin Trudeau announces the creation of a new Cabinet committee to focus on COVID-19.[38]
March 5, 2020	British Columbia is the first case of apparent community transmission, a woman with no recent travel history or any know contact with anyone is infected with the virus. [39]
March 9, 2020	First Canadian death related to COVID-19[40]
March 11, 2020	Federal government announced a $1-billion fund for the domestic and global response to COVID-19. The fund includes $500 million for the provinces and territories, including money for buying protective equipment, public education, surveillance and monitoring, and access to testing.[41]
	The WHO declares Covid-19 a global pandemic
March 12, 2020	Ontario orders all elementary and high schools in province to close between March 14 and April 5[42]
	New Brunswick, Manitoba, and Saskatchewan report first cases
March 15, 2020	Newfoundland & Labrador, Nova Scotia and PEI report first cases
March 16, 2020	Canada announces the closure of its borders to travellers who are not Canadian citizens or permanent residents.

[36] CBC News. (2020). Health officials expect more coronavirus cases, but say risk of outbreak in Canada remains low. Link: https://www.cbc.ca/news/politics/coronavirus-hajdu-tam-health-china-1.5440950
[37] Ibid.
[38] Prime Minister creates committee on COVID-19. https://pm.gc.ca/en/news/news-releases/2020/03/04/prime-minister-creates-committee-covid-19
[39] The Globe and Mail. (2020). B.C. records first-known community transmission case of coronavirus. Link: https://www.theglobeandmail.com/canada/article-bc-records-first-known-community-transmission-case-of-coronavirus/
[40] CBC News. (2020). Canada's first COVID-19 death is not cause for panic — but shows need to protect most vulnerable. Link: https://www.cbc.ca/news/health/coronavirus-canada-death-1.5491907
[41] Global News. (2020). Trudeau announces $1B coronavirus response fund for provinces, territories. Link: https://globalnews.ca/news/6659384/coronavirus-funding-trudeau/
[42] The Globe and Mail. (2020). Ontario to close all public schools for two weeks after March break. Link: https://www.theglobeandmail.com/canada/article-ontario-to-close-all-public-schools-for-two-weeks-after-march-break/

March 18, 2020	Canada-US border closes.

Table 4: Key Covid-19 Updates in Canada (as of October 9, 2020)[43]

Total Cases	178,117
Active Cases	19,008
Recovered	149,524
Deaths	9,585

Table 5: Exposure Setting of Covid-19 in Canada (as of October 9, 2020)[44]

Exposure Setting	Precent of Cases
Domestic Acquisition Contact with a Covid-19 case Contact with a traveller Unknown source	93.7 % 59 % 1 % 33.6 %
Travelled outside of Canada	2.7 %
Unknown	3.6 %

[43] Government of Canada. (2020). Coronavirus disease 2019 (COVID-19): Epidemiology update. Link: https://health-infobase.canada.ca/covid-19/epidemiological-summary-covid-19-cases.html?stat=num&measure=total#a2

[44] Ibid.

Figure 1: Total Number of Cases in Canada & Geographic Distribution[45]

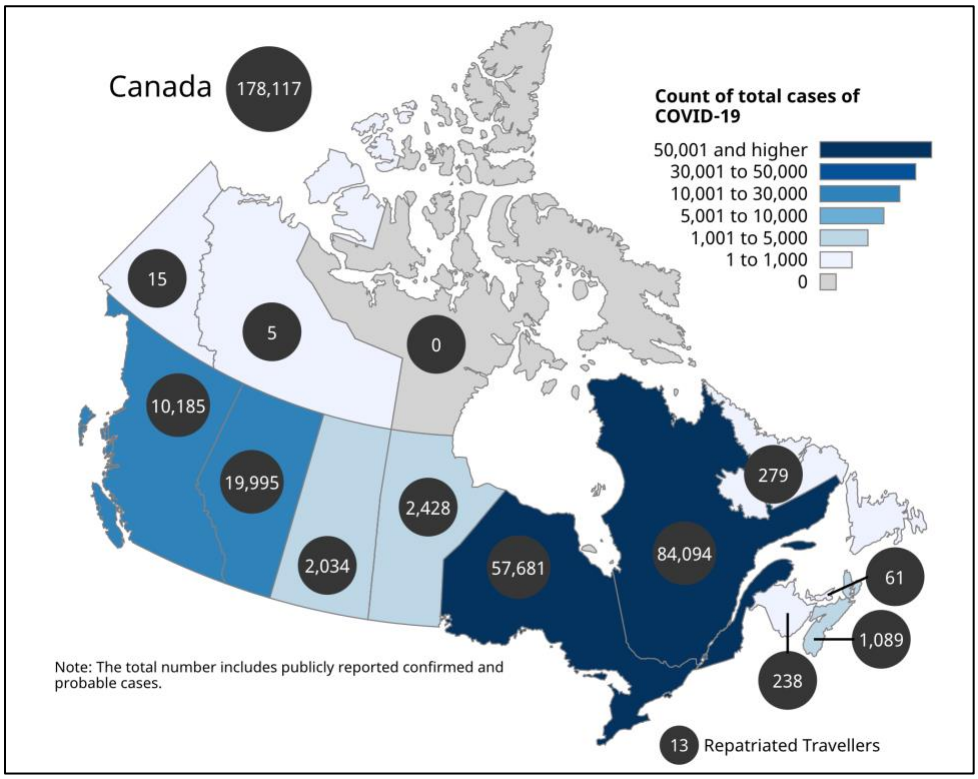
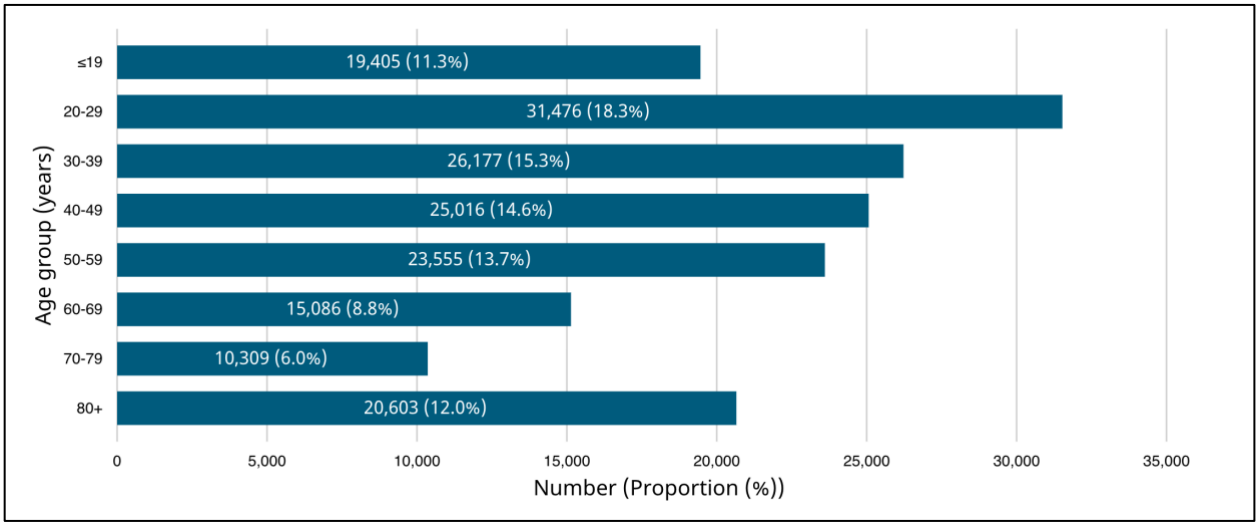


Figure 2: Age Distribution of Covid-19 Cases in Canada (as of October 9, 2020)[46]



[45] Ibid.
[46] Ibid.

Section 3: How Canada Prepares for a Pandemic

This section will briefly overview how Canada is prepared to confront a pandemic health crisis through a case study examination of Influenza (flu) in Ontario. It is important to note that while Influenza (flu) and Covid-19 share commonality in the fact that they are both contagious respiratory illnesses, they are caused by different viruses. It is also worth noting that while other viruses like SARS and Ebola have higher fatality rates, the transmission rate of Covid-19 is much higher.[47] This directly results in greater challenges in dense urban settlements, especially in ones already facing challenges in their service delivery systems, and infrastructure renewal.[48]

The use of Ontario's Influenza pandemic plans as a case study stands as a skeleton framework for how Covid-19 management is currently operating, and how best to understand the roles of all levels of government in a health crisis.

Responsibilities- Influenza Pandemic in Ontario[49]

	Actor	Role/ Responsibilities
Global	World Health Organization (WHO)	Coordinate international response, perform international health surveillance, declare global pandemics.
National	Public Health Agency of Canada (PHAC)	Coordinate national pandemic response, liaison internationally with other countries and the WHO, and coordinate vaccination production and response.

[47] Urban, Disaster Risk Management, Resilience and Land (GPURL). (2020). Urban and Disaster Risk Management Responses to COVID-19. The World Bank. Page 2.
[48] Ibid.
[49] Ministry of Health and Long-term Care. (2013). Ontario Health Plan for an Influenza Pandemic. Emergency Management Branch. Pages: 6-9.

Provincial	Ontario Ministry of Health and Long-Term Care	Collaborate with Public Health Ontario (PHO) to track the severity and distribution of pandemic cases, communicate progress/ updates to the public, distribute stockpiled supplies/ equipment/ antivirals to health care workers, employers, and pharmacies.
	Public Health Ontario (PHO)	Support provincial government with monitoring pandemic spread, coordinate laboratory testing, provide technical advice on infection prevention and control methods.
	Emergency Management Ontario	Coordinate provincial response, specifically with a focus on non-health care sector consequences and challenges (economic, social, infrastructure).
Local	Municipal Governments	Carry out local emergency actions to prevent viral transmission, continue support for those most affected/ vulnerable (sick, homeless, small businesses, etc.).[50]
	Local Health Integration Networks	Oversee regional administration of public healthcare services.
	Public Health Units	Oversee community (municipal) administration of public healthcare services. Lead local implementation of treatment, immunization, and other public health measures.
	Health Sector Workers/ Employers	Coordinate/ provide local care and treatment. Participate in research and monitoring activities.
	Public	Follow public health measures, provincial health orders, and immunize as soon as possible.

Section 4: Urban Experiences with Covid-19

The Covid-19 pandemic is a global health crisis like nothing this generation has ever seen before. Covid-19 is multifaceted, disrupting all facets of normal life, in every corner of the world. Its

[50] Urban, Disaster Risk Management, Resilience and Land (GPURL). (2020). Urban and Disaster Risk Management Responses to COVID-19. The World Bank. Page: 2.

emergence necessitates good reason to re-examine the scope and interpretation of risk, how we handled this current disaster, and how we might prepare for a similar one in the future. As local governments are on the frontlines of tackling and containing Covid-19 outbreaks in Canada, an unprecedented opportunity arises to better understand their experiences and what actions and public policies are necessary to enhance future urban pandemic resilience. [51]

Growing concerns in urban spaces include:

- Will people want to continue living in densely populated areas?
- How will public transit systems adapt to health risks, and attract ridership once again?
- Should a 15-minute city mindset, with multi-centres be implemented?
- How will the future of work affect the built form of urban spaces?
- How can public spaces be adapted to be socially distant friendly?
- How do cities address the growing urban demand of public green spaces?

Answering these questions, and many more, is the starting point for building urban resiliency in Canadian cities. By applying lessons learned from the current pandemic, we can plan better for future ones, such that our insights are entrenched in future innovations in placemaking, urban planning and design, policy making, and urban governance.[52] Ultimately, these efforts must result in investing in targeted emergency preparedness and integrating public health risk and knowledge into disaster management systems in a more meaningful way. The following section in this report will utilize the City of Toronto as a case study of what the current challenges at a local urban level

[51] Sharifi, A., & Khavaian-Garmsir. (2020). The COVID-19 pandemic: Impacts on cities and major lessons for urban planning, design, and management. *Science of the Total Environment,* 749, 142391. Page: 2.
[52] Wahba, S., Mohd Sharif, M., Mizutori, M., and Sorkin, L. (2020). Cities are on the Front Lines of COVID-19. World Bank.

look like. Later sections will outline challenges to capacity building and begin formulating policy guidance for future urban pandemic preparedness.

Municipal Case Study: The City of Toronto

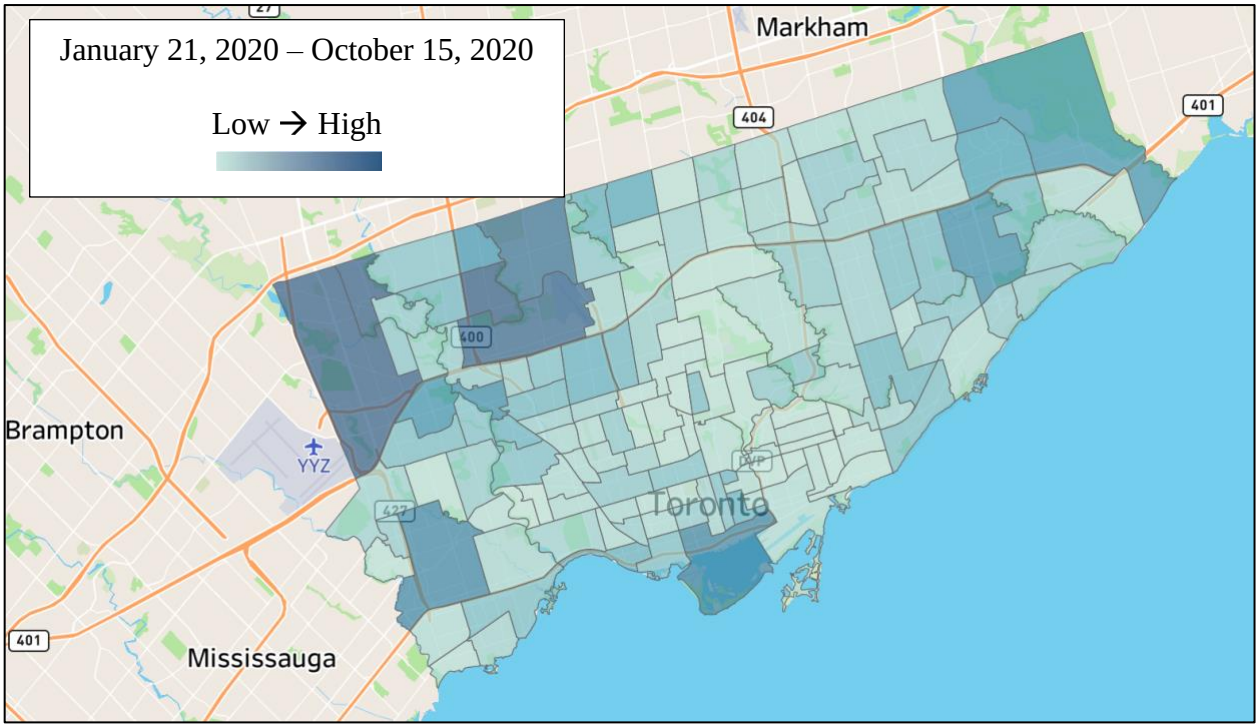
Current evidence from the United Kingdom and United States is beginning to show that some racial groups are more likely than others to become infected with, hospitalized for, and die from Covid-19.[53] Although socio-demographic data is not available at the individual-level in Canada, it is still important to begin looking for disproportionate experiences with Covid-19 at an urban level, especially in Canada's biggest city which houses large amounts of new immigrants, immense racial diversity, and high proportion of people living in lower-income communities.[54]

This past summer, Toronto Public Health used 2016 Canadian Census data to examine characteristics of neighbourhoods where people who have a probable or confirmed diagnosis of COVID-19 live to gain some insight about possible infection trends, and disproportionate experiences.[55] Initial conclusions from this study found that the lowest income groups within the City had the highest rate of COVID-19 cases (504 cases per 100,000 people) compared to the rate in the highest income group (162 cases per 100,000 people). [56] Although not fully conclusive, this study shows that neighbourhood/ community experiences with Covid-19 vary disproportionately.

[53] City of Toronto. (2020). Covid-19 and the Social Determinants of Health: What Do We Know? Toronto Public Health. Page 1.
[54] Ibid.
[55] Ibid.
[56] Ibid, Page 3.

Such a reality sheds light on the work that needs to be done in order to better prepare for the next one.

Figure 3: Cumulative Covid-19 Cases by Neighbourhood[57]



Social Determinants of Health in Cities: Possible Covid-19 Risk Drivers

Discrimination	Holds influence over access to housing, credit, services on basis of gender, age, nationality, class, and ethnic group.[58]

[57] City of Toronto. (2020). COVID-19: Status of Cases in Toronto, Neighbourhood Maps.
[58] World Health Organization. (2018). Our Cities, Our Health, Our Future: Acting on Social Determinants for Health Equity in Urban Settings. Report to the WHO Commission on Social Determinants of Health from the Knowledge Network on Urban Settings. Page: 61.

Health Care Access	Can be limited for some groups/ individuals owing to factors, including lack of transportation networks, childcare, or ability to take time off of work; communication and language barriers; cultural differences between patients and providers; and historical and current discrimination in healthcare systems.[59]
Occupation	People from some racial and ethnic minority groups are disproportionately represented in essential work settings such as healthcare facilities, farms, factories, grocery stores, and public transportation.[60] These occupations were notably kept open throughout Covid-19 lockdowns in Canada, thereby increase possibilities of exposure.
Housing	Issues relating to homelessness (growing concern due to job losses), housing quality, and overcrowding (challenge for social distancing) have direct impacts on health outcomes for individuals.

Section 5: Response Challenges

Compounded Risk

On the forefront of responding to Covid-19 challenges in Canadian cities is the possibility of compounding risk during a multi-hazard event, whereby dealing with crises on multiples fronts may exacerbate the impact of one disaster or both.[61] In some regions of the world this is already a reality of daily life, from the west coast wildfires in the USA, to the Beirut explosion in August. In these instances, Covid-19 has the potential to drastically impact the exposure, vulnerability, and

[59] Centres for Disease Control and Prevention. (2020). Health Equity Considerations and Racial and Ethnic Minority Groups. Link: https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/race-ethnicity.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fneed-extra-precautions%2Fracial-ethnic-minorities.html

[60] Ibid.

[61] UNDRR Asia Pacific COVID-19 Brief. (2020). Combating the Dual Challenge of Covid-19 and Climate-related Disasters. Page 3.

response elements associated with disasters and vice-versa. [62] In some scenarios, Covid-19 related gathering and mobility restrictions may hinder the timeliness and efficiency of evacuations of people from one place to another. [63] Other implications for emergency response efforts may include resource availability (funds, food, personnel, etc.), implementation modalities, and assistance types. [64] In these situations, it becomes a balancing act between mitigating Covid-19 risks, and upholding disaster response and recovery protocols.

While the reality of compounded risk during a multi-hazard event may not be a new phenomenon, Covid-19 still is. Health and infectious disease experts are still in the midst of learning about this illness, its long-term effects, its transmissibility, and treatment. Dealing with and preparing for a possible Covid-19 outbreak whilst dealing with another disaster is no small feat. It is for this reason that such compounded risk must be taken into consideration for all future pandemic planning procedures and policies.

Compounded Vulnerability

Closely related to compounded risk, the Covid-19 pandemic brings forward challenges to its response challenges though its ability to act on and exacerbate existing vulnerabilities.[65] These vulnerabilities are often linked to factors including, but not limited to: geography, housing, gender,

[62] Quigley, M. C., Januka, A., King, A., & Fabian, P. (2020). A multi-hazards earth science perspective on the COVID-19 pandemic: The potential for concurrent and cascading crises. *Environment Systems & Decisions, 40*(2): 200.
[63] UNDRR Asia Pacific COVID-19 Brief. (2020). Combating the Dual Challenge of Covid-19 and Climate-related Disasters. Page 3.
[64] Quigley, M. C., Januka, A., King, A., & Fabian, P. (2020). A multi-hazards earth science perspective on the COVID-19 pandemic: The potential for concurrent and cascading crises. *Environment Systems & Decisions, 40*(2): 199.
[65] UNDRR Asia Pacific COVID-19 Brief. (2020). Combating the Dual Challenge of Covid-19 and Climate-related Disasters. Page 3.

age, ethnicity, job sector, income, health, mobility, and education.[66] As seen in the Toronto case study, Covid-19 is already showing to impact certain groups disproportionately, particularly with regards contraction, hospitalization, and death rates. However, it is important to note that compounded vulnerability extends beyond to include individuals who do not contract the illness as well. The cumulating result of these compounded vulnerabilities range from physical, social, mental health, and financial implications with varying levels of severity. This may include individuals in overcrowded apartments with limited access to green spaces, individuals laid off/ unable to find work, or individuals experiencing mental health issues as a result of prolonged social isolation, etc. Overall, it is imperative that future pandemic plans take compounded vulnerability into consideration and create plans to proactively address issues that are borne out of structural inequalities.

Section 6: Policy Guidance

The lessons learned during the Covid-19 pandemic are the cornerstone of future pandemic planning in DRR practices and policy guidance. This is especially true for cities as they are on the front lines of combating Covid-19, their resiliency will be determined by their ability to shape future service delivery, infrastructure, and invest in risk reduction, all of which are a function of the effectiveness of their urban governance systems. [67] For this reason, this section will stand as a starting point for future DRR policy guidance by exploring early stage recommendations that could dramatically shape urban resilience in future pandemic scenarios.

[66] Ibid.

[67] Urban, Disaster Risk Management, Resilience and Land (GPURL). (2020). Urban and Disaster Risk Management Responses to COVID-19. The World Bank. Page: 2.

1. Strong and strategic integration of health-related emergency risks into DRR policy at all levels of government.
    - Health, infectious disease and control knowledge must be implemented in disaster risk management policies starting at the local level. This will enable advanced understandings of outbreaks, pandemics, the health impacts of all hazards, and improved data collection methodologies.[68] Having integrated health knowledge across all local-government divisions will enable more inclusive, transparent and social accountable future policy interventions.[69]
2. Develop better understandings of Covid-19 economic implications to develop and enhance resilience.
    - Direct costs to city tax revenues, industries/ markets, small and medium-sized businesses, employers, workers, households, etc. It is important to gather economic data to fully understand and address the full impact of Covid-19 to local economies. Indirect costs should also be incorporated. The future of local supply chains should also be studied to better understand access to amenities, services and goods. This assessment should illuminate which neighbourhoods/ communities are in need of increased investments and targeted growth plans.

[68] Djalante, R., Shaw, R., DeWit, A. (2020). Building resilience against biological hazards and pandemics: COVID-19 and its implications for the Sendai Framework. *Progress in Disaster Science, 6.*
[69] Rangel, J. C., Ranade, S., Sutcliffe, P., Mykhalovskiy, E., Gastaldo, D., & Eakin, J. (2020). COVID-19 policy measures-Advocating for the inclusion of the social determinants of health in modelling and decision making. *Journal of evaluation in clinical practice*, *26*(4): 1079.

3. Augment strategic plans for inclusion of multi-hazard event preparedness during pandemic planning.
    - Through community and expert stakeholder engagement, such revisions could include updated standard operating procedures, contingency plans for infection containment and evacuation procedures.[70] These plans should specifically draw upon scientific knowledge and geo-spatial data to include provisions for the most vulnerable high-risk population groups.
4. Address underlying community-level vulnerabilities before they are exacerbated by hazardous events.
    - This means continuous infrastructure investments, particularly in neighbourhoods with a disproportionate number of at-risk groups as they typically bare the brunt of hazards. Such city-level infrastructure investments may include, providing access to affordable housing, increased transportation networks, and access to local supply chains.
5. Early implementation, widespread information sharing, and enforcement of social-distancing practices.
    - As with the case of Covid-19, a new infectious disease comes with a buffer time where treatment/ transmission knowledge, and vaccine provisions are delayed. Therefore, the best way to prevent and slow down transmission is through timely implementation of social distancing measures. As the closest form of government to local communities, municipal governments must clearly articulate the intricacies of the social distancing measures and enforce their adherence. Data should be pulled on which parcels of land, buildings, parks and neighbourhoods experiences unsafe crowding/ foot traffic during

[70] UNDRR Asia Pacific COVID-19 Brief. (2020). Combating the Dual Challenge of Covid-19 and Climate-related Disasters. Page: 4.

the Covid-19 pandemic. Such data can better prepare local governments to put protective contingency plans in place for these spaces in the event of a future health crisis.

6. Regulate and repurpose the use and operation of public facilities and land.
    - Public facilities (stadiums, community centres, etc.) can be repurposed as testing centres, shelter accommodations or quarantine facilities.[71] Local governments can seize an opportunity with decreased urban traffic to open up streets to pedestrians and cyclists to enhance outdoor social distancing practices. With regards to public parks and squares, fences/barriers can be utilized to discourage crowding during peak-pandemic times. While measures like drawing circles in public parks can encourage safe social distancing during times of infection slow-down.
7. Investigate urban characteristics, plans, and policies that have worked against Covid-19 control measures.
    - This includes maximum land use densities, small residential spaces, and limited public spaces. Understanding the aspects of urban living that have worked against Covid-19 control measures will better prepare local governments for future pandemic planning. This is also an opportunity to study the unintended effects of current response actions including job disruptions or social isolation.[72]

[71] Urban, Disaster Risk Management, Resilience and Land (GPURL). (2020). Urban and Disaster Risk Management Responses to COVID-19. The World Bank. Page: 4.
[72] Rangel, J. C., Ranade, S., Sutcliffe, P., Mykhalovskiy, E., Gastaldo, D., & Eakin, J. (2020). COVID-19 policy measures-Advocating for the inclusion of the social determinants of health in modelling and decision making. *Journal of evaluation in clinical practice*, *26*(4): 1079.

Concluding Remarks

The Covid-19 Global pandemic has put Canadian cities to the test and shown how capable of rapid transformation and adaptation they are. This report has explored the types and severity of disasters, their subsequent DRR legislation in Canadian governance structures, and how Canada prepares for and responds to pandemics. Using the city of Toronto as a case study, this report has shown how COVID-19 takes form and disproportionately affects certain communities. This case study illuminates the fact that Canadian cities cannot return to pre-pandemic status quo, we must better understand the underlying patterns and dynamics of pandemics, their effects on cities, and the necessary emergency preparedness measures to minimize them and enhance resilience.[73] The policy guidance brought forward in this report can be utilized as a starting point for such changes. With critical changes to how we think of and prepare for pandemics, future outbreaks may cause minimal shocks and stresses to cities- and then we would never have to repeat 2020 ever again.

[73] Sharifi, A., & Khavaian-Garmsir. (2020). The COVID-19 pandemic: Impacts on cities and major lessons for urban planning, design, and management. *Science of the Total Environment,* 749, 142391. Page: 2.

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