SUPPORTING A GREENER WELL-BEING:

BROADENING HEALTH IN A GREEN RECOVERY

OCTOBER 2021

Smart Prosperity Institute

About Smart Prosperity Institute

Smart Prosperity Institute is a national research network and policy think tank based at the University of Ottawa. We deliver world-class research and work with public and private partners – all to advance practical policies and market solutions for a stronger, cleaner economy.
institute.smartprosperity.ca

Lead Author:
Research Associates: Teslin Augustine & Harshini Ramesh

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EXECUTIVE SUMMARY

The economic downturn in Canada since the start of the COVID-19 pandemic has been severe. Economic recovery discussions are strongly rooted in the understanding that the way forward is green, and recovery needs to help Canada reach its 2030 and 2050 greenhouse gas reduction targets. While a green recovery offers an opportunity to advance solutions that support economic growth and improve environmental outcomes, policymakers should also consider the health impacts of green recovery spending.

The unique characteristics of this recession, and the uneven impact of the pandemic, offer an opportunity to better understand and advance a number of health benefits through recovery spending. Using a "health plus" approach, which was developed based on a number of leading health evaluation frameworks from internationally recognized bodies, this report conducts a holistic assessment of the long-term health benefits of projects that are experienced by individuals and communities. Health plus places health and equity at the forefront and seeks to address synergistic goals between health, health equity and a green recovery. Accordingly, it is conceptualized as the outcome of the interactions between the three factors outlined below:

- *Personal Characteristics*–Includes individual behaviours such as diet, exercise, alcohol or tobacco consumption, as well as psychosocial circumstances such as stress and coping styles.
- *Socio-economic and Demographic Factors* – Includes age, gender, race, level of education, and income level.
- *Community Characteristics* – Includes neighborhoods, access to healthcare and green spaces.

Using the health plus approach, this report delves into the following five types of green recovery projects and describes their underlying potential to improve health and reduce health inequities in society. It also highlights the populations, communities, or regions that stand to gain most from the deployment of these projects.

1. **Workforce Development**: Being employed is linked to better physical and mental health, perceived health, and overall well-being. Job loss increases the risk of stress, anxiety, depression, low self-esteem, suicidality, cardiovascular disease, and type 2 diabetes. Job loss, during the pandemic, has been disproportionately felt by workers in low-wage sectors, part time workers, women, recent immigrants, visible minorities, and Indigenous peoples. These individuals stand to benefit most from targeted workforce development policies.

2. **Expanding Active Transportation Infrastructure**: Through increased physical activity, active transport offers health benefits and avoids adverse health impacts such as depression, anxiety, stress, cardiovascular risk factors, obesity, stroke, and hypertension. In the context of COVID-19, reluctance to use public transit may lead to an over-reliance on single-occupancy vehicles - an option not available to every Canadian. Income, age, education level and gender disproportionately impact access or engagement with active transport, and these inequities can be mitigated by expanding active transport infrastructure to benefit these groups.

3. **Increasing Food Security: Strengthening Local Food Access** – Food insecurity is significantly associated with poorer physical, mental, and social health outcomes including stress, depression, anxiety, psychiatric morbidity, compromised nutritional status, weight gain, and anemia. A healthy diet and nutritional support are essential to protect against non-communicable diseases including diabetes, stroke, cancer and heart disease. Food security is strongly tied to income, a factor that has been worsened by COVID-19. Therefore, strengthening local food access for individuals, especially those also facing income insecurity, offers health benefits.

4. **Managing Methane Emissions from the oil and gas sector**: Methane is a powerful greenhouse gas and a precursor to ozone, which contributes to increased risk of adverse effects on the respiratory system and mortality. Canada's largest source of anthropogenic methane emissions is oil and gas production, and many of these emissions occur in the form of fugitive emissions. These emissions are concentrated in the Alberta and British Columbia, and disproportionately impact First Nations communities who have a notable geographical relationship with energy development in western Canada.

5. **Municipal Solid Waste Management**: Landfills and incinerators are linked to adverse health impacts including respiratory diseases, cancer, mortality, and birth defects. Human health can be vastly improved with well-designed waste systems. Municipal solid waste management sites may be located near low income, low-education, and ethnic minority groups. Remote Northern Indigenous communities do not always have access to appropriate waste disposal sites, and may rely on unlined open dumping grounds or open incinerators for waste disposal. These can have severe health impacts through worsened air quality and, soil and water contamination. Access to better waste management practices is especially critical for these communities.

Based on the health plus assessment of these five projects, this report identifies the following key takeaways that are relevant to green recovery discussions. Since projects championed as part of the green recovery will likely also be advanced in other plans and policies announced by the government, these takeaways can guide not just COVID-19 related recovery efforts, but also Canada's long-term clean growth strategy:

- **Every green recovery project analyzed in this report has the potential to offer significant health benefits:** All five projects discussed above identify a range of direct and indirect health benefits emerging from their adoption. This furthers the business or investment case for some projects whose primary benefits are not traditionally thought of as being health related. Policymakers supporting these projects should be aware of the health benefits that they offer to communities and regions.

- **Green recovery projects can have substantial health benefits over the short-term, medium-term, and long-term:** Green recovery projects offer health benefits throughout their life cycle. Short-term benefits occur through the creation of high-quality jobs, while medium-term and long-term benefits can occur either through avoided adverse impacts or as direct benefits. Taking a life-cycle perspective on health impacts makes it apparent that green recovery projects can support health quickly, and all offer benefits will be experienced by communities for years to come.

- **Applying a health plus lens allows for a more robust understanding of the health impacts of projects:** When only a smaller subset of health benefits is considered, an understanding of health impacts can leave out critical information that identifies how projects impact people's ability to be mentally, physically, socially, and emotionally healthy. A limited approach may also not consider impacts over time, which is important when considering infrastructure decisions that impact communities for generations.

- **Health inequities dramatically shape the way the health benefits of green recovery projects are experienced by individuals:** The health benefits of projects identified in this report are heavily influenced by proximity (methane, municipal waste management) and accessibility (active transport, food security). This means that negative health impacts are felt directly, or health benefits not experienced at all, by communities who already face structural inequities.

If green recovery projects do not explicitly take these inequities into account and design policies to remediate them, they risk realizing fewer health benefits in practice, or seeing positive health impacts occur for only a small group of already well-off individuals.

- **Reducing the risk of unintended consequences requires looking at more than individual green recovery projects:** Many unintended consequences of projects identified in this report point to the need for systemic solutions beyond a single project: tackling food security requires redressing income insecurity; addressing landfill waste requires addressing consumption and waste creation patterns; and reducing the adverse health impacts of job loss requires creating a better work environment for employees. This illustrates that health does not occur in a vacuum, and no one project can completely redress every socio-economic factor that negatively impacts human health. To meaningfully redress those, systemic solutions are required.

Informed by these key takeaways, this report offers four policy recommendations to help policymakers incorporate a broader set of health considerations into project discussions in a green recovery:

1. Health impacts should be considered in decision-making on green recovery projects.
2. Ensure equity assessments are a standard part of considerations of health impacts.
3. Projects need to prioritize data collection on health impacts on different individuals and communities.
4. Recovery spending must service long-term goals of growth, equity, resilience and sustainability.

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LIST OF ABBREVIATIONS

BMI	Body mass index
GHG	Greenhouse gases
HIA	Health impact assessment
IAA	Impact Assessment Act
GBA+	Gender-based analysis plus
HiAP	Health-in-all-policies
MSW	Municipal solid waste
NBS	Nature-based solutions
SDoH	Social determinants of health
SEM	Socio-ecological model of health
SPI	Smart Prosperity Institute
WHO	World Health Organization

INTRODUCTION

The COVID-19 pandemic, and the subsequent economic downturn, have had pronounced effects on the health and economic well-being of Canadians. In 2020, almost 1.1 million[1] workers suffered from either loss of employment or reduced hours, and real GDP declined by 5.4%[2], the steepest decline since data was first recorded in 1961. These aggregate figures mask the unequal impact of the pandemic, and the consequent recession, on different communities and marginalized individuals.

Mainstream discussions around what an economic recovery that supports Canadians might look like are based in an awareness of the need to continue combatting climate change. They often cite that actions taken need to help Canada reach its emissions reduction commitments under the 2015 Paris Climate Agreement[3] as well as its own net-zero greenhouse gas emissions target by 2050. A "green recovery"[4], from the pandemic-induced recession, offers an opportunity to advance solutions that support economic growth and improve environmental outcomes. It is also worth considering, however, the often under-appreciated and under-examined health impacts that emerge from recovery spending. This includes analysing not just the direct health co-benefits of projects advanced under the umbrella of a green recovery, but also thinking about how recovery spending will impact the underlying factors that determine an individual's ability to be healthy. Applying this broader health lens supports a clearer understanding of the merits of allocating recovery spending towards different types of projects. Projects with seemingly fewer co-benefits, may offer significant potential to mitigate the effects or risks from factors that negatively impact an individual's ability to be healthy.

This report examines projects advanced in the mainstream green recovery discourse since the start of the pandemic through a broader health lens. The objective of this analysis is to identify projects that merit attention due to their potential beneficial effects in improving overall public health and in mitigating factors and circumstances that widen health inequities. The health assessment proposed by this report allows for a more holistic assessment of the long-term health benefits, experienced by individuals and communities, associated with a project.

This analysis has both long-term and short-term value. While the importance of supporting a green and healthy recovery from COVID-19 cannot be understated, this report recognizes that recovery spending is unlikely to be the only avenue to advance green recovery projects. Projects championed as part of the green economic recovery discourse will also be advanced in other plans and policies announced by governments, both at the federal and at the provincial level. The 'Healthy Environment and a Healthy Economy' plan to meet 2030 emissions reduction targets, the 'Growth Plan' led by the Canada Infrastructure Bank and Bill C-12, the Canadian Net-Zero Emissions Accountability Act, all support positive environmental outcomes. As Canada looks to help communities realize health benefits in the midst of a net-zero transition, better understanding how projects advanced in green recovery discussions impact health will guide not only COVID-19 related recovery decision making, but also Canada's long-term growth strategy.

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Overview of Report

This report begins with an examination of why a deeper understanding of the health benefits of recovery projects can meaningfully contribute to discussions of a resilient economic recovery. It argues that economic recovery from the current recession must be designed keeping in mind its distinctly different cause, nature, and context. Thereafter, the report delves into how health is conceptualized by leading global actors and describes how health and health equity are interlinked concepts.

Subsequently, the "health plus" framework used to evaluate green recovery projects in this report is presented, which is operationalized using a four-step analytical process. The health plus framework is used to analyze the health impacts of five green recovery projects, which have been selected using a set of established criteria. These green recovery projects are workforce development, expanding active transportation infrastructure, increasing food security by strengthening local food access, managing methane emissions, and municipal solid waste management.

Each project write-up summarizes the health impacts (avoided adverse impacts and potential health benefits) linked with project implementation through the health plus lens, examines health inequities by looking at which social identities are most likely to see the health benefits of recovery spending, and highlights some of the unintended consequences that could arise from project implementation. Finally, this report concludes with a number of key takeaways and policy recommendations for incorporating a health plus lens into assessments of green recovery spending and future climate policy.

WHY THIS RECOVERY WILL BENEFIT FROM APPLYING A HEALTH LENS

The economic recession caused by COVID-19 is different from previous recessions for three main reasons. First, unlike the last three recessions[5], the current one is the direct result of a global public health crisis which has severely restricted peoples' ability to participate in economic activity. The previous three economic downturns were all caused by issues concerning asset or commodity markets. As a result, economic recoveries from recessionary periods in the past have focussed on reducing vulnerability to the factors that led to the downturn in the first place, such as strengthening financial institutions and reducing systems-level weaknesses. The current recession is the result of inactivity emerging from a need to contain the spread of a zoonotic virus, and has highlighted the importance of a resilient public health system. Since the nature and cause of the current recession are different, attempts to reduce vulnerability to the factors that led to the downturn will therefore be different as well. In this case, supporting greater resilience in the face of future pandemics and natural disasters is being emphasized as a priority.

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Second, unlike previous recessions, the disproportional and inequitable economic impact of the current recession are more explicitly visible. The distribution of the economic impact of COVID-19 offers an example of how viral transmission rates, public concerns about safety, and public health guidelines, have been felt more in certain communities than others. This is partially due to which industries were hardest hit. While the construction and manufacturing sectors had suffered in previous recessions, early layoffs in the pandemic were concentrated in entertainment, service and retail sectors. This disproportionately impacted individuals and groups with high employment concentrations in these sectors, such as part time workers, young workers, women, racialized communities, and new immigrants. Part time workers have faced tougher job market conditions than full time workers, more women have lost their jobs than men, and young workers between the ages of 15 to 24 years, especially women in this age category have borne the brunt of the COVID-19 induced job loss. Racial and immigrant status also seem to have been predictive of job loss. These negative economic impacts have been compounded by the unequal distribution of the disease burden of the pandemic, with the most ethno-culturally diverse neighbourhoods seeing infection rates as much as three times higher than less diverse neighbourhoods[6]. This pattern extends to mortality rates as well. Neighbourhoods with the highest proportion visible minorities experienced mortality rates almost two times higher than those with the lowest proportion of visible minorities[7]. This inequality of impacts has raised awareness of the need to support a recovery that addresses these economic and health inequities.

Finally, the context of the current recession is very different from previous ones. The effects of climate change are now visible and undeniable. The number of natural disasters has increased tenfold since the 1960s[8]. In the last two decades there were 7,348 recorded disasters, causing USD 2.97 trillion in losses to the global economy and resulting in approximately 1.23 million deaths[9]. A growing number of countries, including Canada, are committing to a net-zero greenhouse gas emissions future[10], and momentum around climate action is building.

The cause, nature, and context of the current recession are very different from previous ones. An economic recovery from this pandemic-induced recession needs to reflect these three realities, and must be designed to address the unique features of this recession. Grounding recovery discussions in the reality of climate change, and in service of reaching net-zero emissions, is one part of that. Another aspect is advancing overall public health and mitigating the systemic health inequities highlighted by the pandemic. Any recovery should focus on improving public health to ensure that vulnerabilities to future pandemics are reduced, and the disproportionate health impacts that have emerged during this pandemic are remediated.

UNDERSTANDING HEALTH

The first step towards understanding how a green recovery can support health is to define health. Health is a multi-dimensional concept and ways of thinking about it have evolved over time in two key ways. First, health is not merely the absence of illness or disease. The World Health Organization (WHO) released a foundational Constitution in 1948, which defined health as a "state of complete physical, mental and social well-being"[11]. This conceptualization of health deviated from the then dominant understanding of health, which solely considered the physical manifestations and characteristics of diseases[12].

Second, health encompassess all interacting factors of an individual's life. In 1986, the Ottawa Charter for Health Promotion defined health as a dynamic model, whereby achieving complete physical, mental and social well-being required that "an individual or a group must be able to identify and realize aspirations to satisfy needs and to change or cope with the environment"[13]. It outlined prerequisites, which are the fundamental conditions and resources, required for good health, including peace (absence of conflict), shelter, food income, and a stable ecosystem among other considerations. The identification of these prerequisites by the Ottawa Charter is in alignment with the Socio-Ecological Model (SEM) of health. The SEM is based on the idea that health is a function of the interaction between a person's individual characteristics, their immediate surroundings (community-level interactions such as work, school, and neighborhood), and society-wide macrosystems including cultural, societal norms, religious values. Both the Ottawa Charter and the SEM highlight health as being interactional and co-dependent on both individual characteristics and factors identified in one's broader environment.

What the Ottawa Charter and the SEM describe as pre-requisties are elsewhere referred as the social determinants of health (SDoH). The WHO classifies SDoH into either structural or intermediary determinants[14,15]. Structural determinants affect the political and socio-economic context of a person's life, and are rooted in the systems and institutions impacting peoples' daily lives. These include: macro level factors, such as existing social and economic policies in place, cultural and societal values; and micro-level factors, such as level of income, education, gender, and race. Intermediary determinants of health include: people's

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material circumstances, such as housing, and physical work environment; their psychosocial circumstances such as stressful relationships or living circumstances, coping mechanisms or lack thereof; and behavioural and biological factors such as genetics, nutrition, physical activity, and tobacco or alcohol use[16]. The structural determinants interact with each other and shape the more specific intermediary determinants of health resulting in differences in peoples' vulnerability to adverse health impact. The relationship between the structural and intermediary determinants and health can be circular[17]. For example, ill health can compromise earning capacity (a structural determinant), which can in turn shape intermediary determinants, and so on. While not classified as such, all the structural and intermediary determinants identified by the WHO are part of the Canadian government's own list of twelve social determinants of health[18].

How Health is Experienced

It is vital to acknowledge that everyone experiences health differently. Health differences are often understood through the concepts of health inequalities and health inequities. Health inequalities are broadly defined as "any measurable aspect of health that [vary] across individuals or…socially relevant groupings"[19]. Health inequities, or health disparities, are understood as specific types of health inequalities that are unjust and avoidable by reasonable means[20]. Health equity, therefore, is the "absence of unfair and avoidable or remedial difference in health among social groups"[21].

The conditions in which people live, study, work, the quality of their communities, their interactions with their health, social service and educational institutions affect health. This implies that some Canadians simply have more opportunities to lead a healthier life than others. Studies have confirmed disparities in life expectancy amongst Canadians depending on income and level of education. Those with higher levels of income or education have a longer life expectancy and are more likely to spend a greater portion of their lives in good health[22]. Addressing these health inequities is required for shaping an inclusive and equitable Canadian society. By some measures, health inequities in Canadian society were wider in 2020 than in 2005[23]. In the current context, the uneven distribution of the disease burden of COVID-19 among neighborhoods depending on their ethno-cultural and socioeconomic characteristics is yet another example of the inherent inequities in health and shows why centering health discussions around equity concerns is important[24]. Therefore, achieving health equity underpins peoples' ability to be healthy.

A prominent Canadian example that explored these concepts is the Code Red study, whose objective was "to describe the disparities in the determinants of health and health status" in the City of Hamilton, Ontario for a lay audience[25]. One specific health outcome that was measured was birth weight, wherein certain neighbourhoods reported lower birth weights compared to others, which is a measurable health inequality[26]. This identified disparity was linked with specific spatial and social characteristics, which highlighted how inequities exacerbated negative health outcomes. In this case, prospective mothers with worse birth outcomes were more likely to live in poorer, inner city neighbourhoods and were more likely to not have a high school education, compared to more affluent and educated suburban neighbourhoods[27].

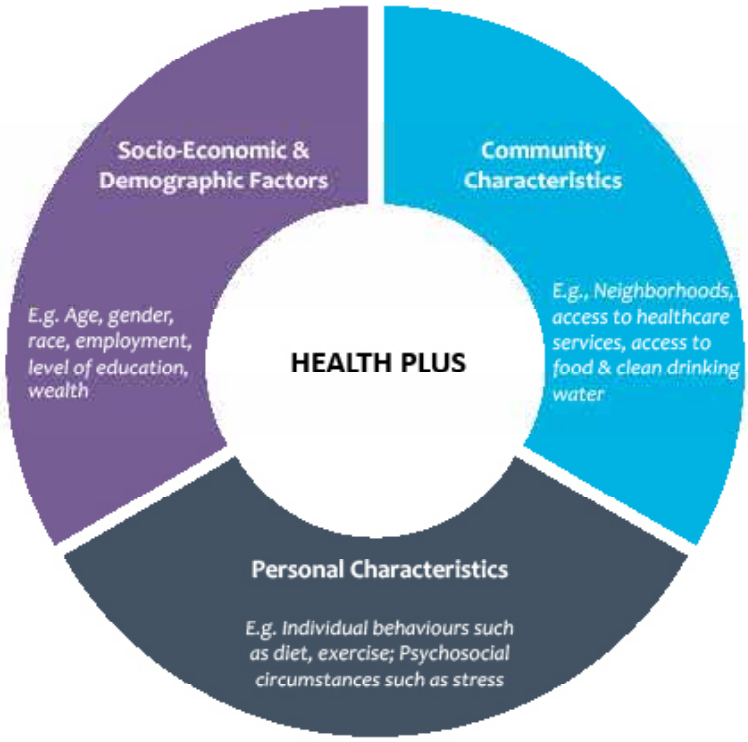
Conceptualizing Health Plus

This report takes the above discussions and descriptions of how health is impacted and experienced, and integrates them into a conceptualization of health that is referred to as "health plus" in this report. References to health plus, outlined in Figure 1 below, imply both disease prevalence and health equity, meaning it incorporates socio-economic and demographic features as well as community characteristics and personal characteristics. This approach is used to assess the health impacts of green recovery projects identified in this report.

The proposed health plus approach captures the conceptual definition of health advanced in WHO's Constitution, the SEM and the Ottawa Charter. It is primarily based on WHO's SDoH framework, described above, and also shares many characteristics with the Healthy Communities approach developed by the Canadian Institute of Planners[28]. Like SDoH, health plus conceptualizes health as the outcome of the interaction between structural micro level factors such as level of income, education, gender and race and intermediary determinants such as housing, psychosocial circumstances, and behavioural factors such as nutrition, physical activity, and tobacco or alcohol use[29]. Similarly, like Healthy Communities, health plus provides an opportunity to address key determinants of health such as access to basic needs including education, housing, healthcare services, healthy food and clean water, safety, opportunities for active living, ecosystem health, reliable public transit, social development and a thriving economy[30].

Though similar to SDoH and the Healthy Communities approach, health plus deviates from them in important ways. Unlike SDoH, health plus omits larger systems level factors such as labour policies, cultural norms and other macroeconomic factors such as presence of social safety nets etc. Given this report's core objective of assessing green recovery projects, which are not

Figure 1: Conceptualization of Health Plus



designed to bring about large-scale systems level changes, these factors were scoped out of the analysis. For the same reason, health plus also omits genetic composition, a component of SDoH[31], as a factor influencing health. On the other hand, unlike the Healthy Communities approach which is heavily geared towards built environment factors, health plus also considers social factors such as race and gender. In some ways, therefore, health plus lies somewhere between the WHO's SDoH and the Healthy Communities approach.

This report conceptualizes health through three interacting characteristics:

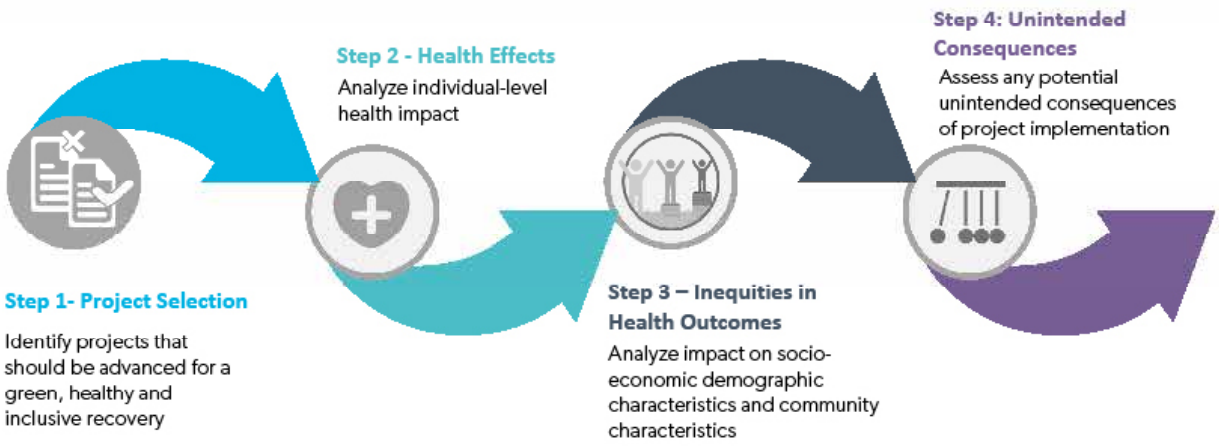
- **Personal Characteristics**: This includes individual behaviours such as diet, exercise, alcohol or tobacco consumption, as well as psychosocial circumstances such as stress and coping styles
- **Socio-economic and Demographic Factors**: This includes factors such as age, gender, race, level of education, and income level.
- **Community Characteristics**: This includes contextual factors such as neighbourhoods, access to healthcare, and access to green spaces.

Health plus is proposed as an alternative to the more prominently used co-benefits framework to capture the health benefits of green projects. Briefly, health co-benefits are positive spillover effects or ancillary benefits arising from projects, policies or ideas set to address climate action goals (e.g. cut greenhouse gas emissions)[32]. While the health co-benefits approach has several advantages, not the least being that it enables accounting for health co-benefits in monetary terms[33], it is limited in that it only considers the direct health benefits of recovery projects, arising primarily from air quality improvements. Due to its focus on direct health benefits and adverse health impacts, the co-benefits approach does not align with the broader definition of health proposed by WHO, the SEM or the Ottawa Charter. Therefore, the health plus framework is proposed as an alternative. Health plus places health and equity at the forefront and seeks to address synergistic goals between health, health equity, and green recovery. Instead of asking which green recovery ideas also offer health co-benefits, this report looks at which projects have the potential to advance health and health equity (health plus goals). In other words, instead of looking at green recovery ideas that make environmental and economic sense and also have health co-benefits, this report analyzes and highlights some of the less prominently discussed green recovery ideas given their impact on health and health equity.

ANALYTICAL APPROACH

The fundamental objective of this report is to apply the health plus lens to a suite of green recovery projects to evaluate which projects can meaningfully support health, and ensure greater health equity. To this end, the analytical strategy employed in this report consists of the 4 steps described below.

Figure 2: Overview of analytical approach



Step 1: Project selection – This initial step identifies projects that have the potential to advance a green, healthy and inclusive recovery. A robust methodology was employed for selecting projects, which is detailed in Appendix 2 of this report.

Step 2: Health impacts – This step examines the impacts of projects on individuals. This is based on an assessment of the effects on personal characteristics (behaviours such as diet, alcohol or tobacco consumption; and psychosocial circumstances such as stressful life circumstances). Here the potential adverse health impacts that can be avoided by implementing the recovery project; and the potential health benefits that will accrue from implementing the project are analysed[34].

Step 3: Inequities in health outcomes – This step brings an equity lens into the analysis by looking at which socio-economic and demographic groups, and which physical or community characteristics contribute towards inequities in health outcomes. This step also briefly discusses how and why the green recovery projects address existing health inequities.

Step 4: Unintended consequences - The final step in this analysis identifies potential unintended consequences of project implementation, and higlights strategies through which these could be managed.

Overall, this four-step analytical strategy helps understand how green recovery projects can advance health through the health plus lens, and ensures that projects selected are well-suited to advancing a recovery from this recession. Step 1, discussed immediately hereafter, scopes relevant projects, and steps 2-4 conduct a health plus assessment of each project.

IDENTIFYING PROJECTS FOR A GREEN, HEALTH & INCLUSIVE RECOVERY

Recovery discussions in the aftermath of COVID-19 feature a plethora of green recovery projects and pathways for an economic recovery. This report reviewed 15 national and international reports, and 9 media articles (op-eds, blogs, and open letters) published between March – December 2020. Together, these 24 sources, which are listed in Appendix 1, appropriately capture the breadth and depth of the green recovery discussion in Canada at this time. A qualitative assessment of the 24 sources reveals 23 thematic categories[35] of green recovery projects, as listed below[36]. These ideas range from retrofitting buildings to eco-tourism. Low-carbon infrastructure investments aimed at decarbonizing transport, building and energy were the most often repeated green recovery ideas, discussed in over 50% of surveyed sources.

However, given that these projects are discussed in-depth in a companion Smart Prosperity report, they were ultimately not considered in-depth for this work[37].

The fundamental objective of this report is to apply the health plus lens to a suite of green recovery projects to evaluate which projects can meaningfully support health, and ensure greater health equity.

Green recovery projects: List of thematic categories[38]

1. Chemicals plan
2. Clean energy
3. Climate adaptation
4. Decarbonize industry
5. Eco-tourism
6. Expanding active transportation
7. Green infrastructure investments
8. Improving digital infrastructure
9. Increasing food security
10. Managing methane emissions
11. Marine shipping
12. Municipal solid waste management
13. Protection and conservation (NBS)
14. Research & Development
15. Sustainable construction
16. Sustainable finance
17. Sustainable fishing
18. Sustainable food systems
19. Sustainable healthcare
20. Upgrading buildings
21. Upgrading transport
22. Urban green spaces (NBS)
23. Workforce development

Following this compilation, an analysis was conducted to further refine the list of projects using an established set of criteria. This analysis, whose methodology is detailed in Appendix 2, identified five projects that are well-suited to advance a green, healthy and inclusive recovery:

- **Workforce Development**: Workforce development includes policies for training a workforce for ecosystem restoration and management, natural tourism, and other green infrastructure projects. It also includes supporting transitioning energy workers, and creating green job pathways for youth starting in high school. Over 40% of the sources reviewed for this report featured green recovery ideas collectively referred to as 'workforce development' in this report.

- **Expanding Active Transportation Infrastructure**: Active transportation is any form of travel that avoids the use of engine or motor for movement; it includes cycling, using a wheelchair, small-wheeled transport, like skateboarding, and walking[39]. More than 30% of the green recovery reports revewied for this report, call for an expansion of walking and cycling infrastructure, and encourage active transport.

- **Increasing Food Security: Strengthening Local Food Access** - Food insecurity is the "…inadequate or uncertain access to an acceptable amount of quality and healthy food" [40]. Investing in increasing food security appeared in about 20% of the green recovery reports reviewed. Specifically, interventions to build local community capacity (community agriculture, community garden, household and community food storage systems), provide access to income to purchase food, and encourage urban agriculture were discussed.

- **Managing Methane Emissions from Oil and Gas:** Recovery ideas aimed at reducing methane emissions were found in approximately 17% of the reports surveyed. These revolved around reducing methane emissions by funding the clean-up of orphaned oil and gas wells, and creating a fund to support independent methane inventory from anthropogenic sources. The health analysis that follows centres around these specific recommendations.

- **Municipal Solid Waste Management**[41]: A recovery that involves better management of municipal solid waste (MSW) by reducing harmful landfill gases and chemicals, as well as by-products of MSW incineration was discussed in a green recovery source reviewed for this report. While this recommendation was not as common, it still offer significant health benefits, and addressing it can meaningfully redress health inequities.

HEALTH PLUS ANALYSIS OF IDENTIFIED GREEN RECOVERY PROJECTS

This section applies steps 2 to 4 of the analytical approach described above to the five green recovery projects that have been identified. Health impacts including avoided adverse impacts and potential health benefits, inequities in health outcomes and the unintended consequences of project implementation are discussed hereafter.

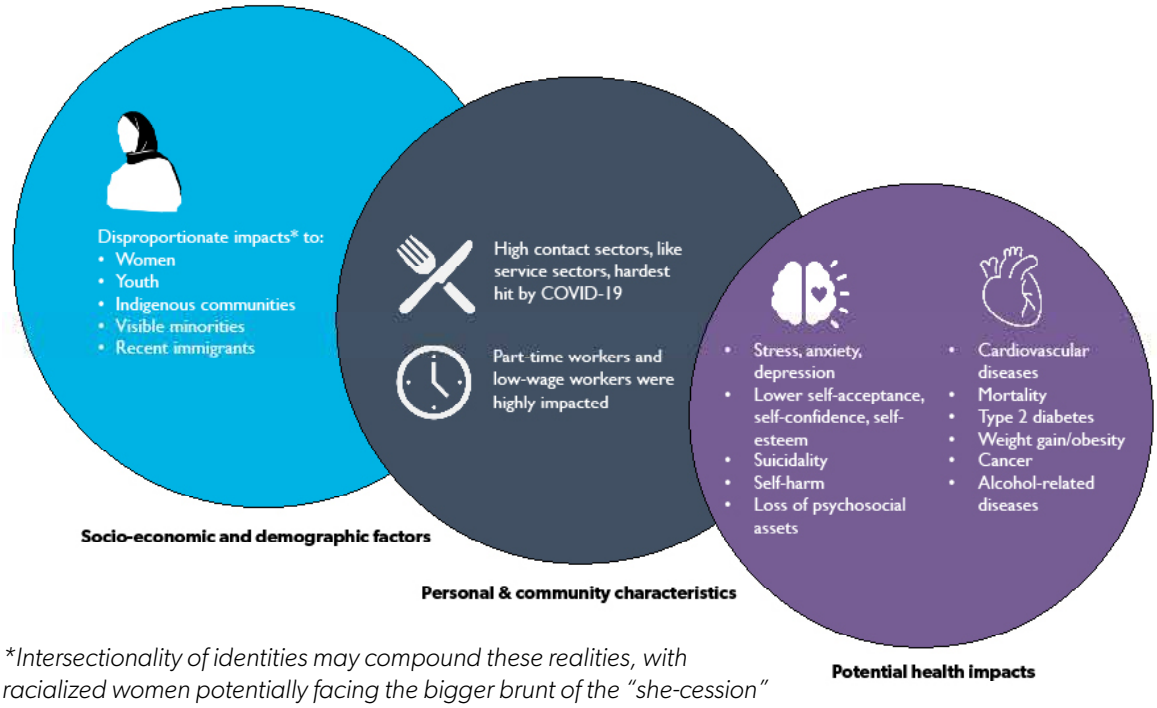
1. Workforce Development

Workforce development includes policies for training a workforce for ecosystem restoration and management, natural tourism, and other green infrastructure projects, supporting transitioning energy workers, and creating green job pathways for youth starting in high school. Over 40% of the sources reviewed for this report featured green recovery ideas collectively referred to as 'workforce development' in this report.

Health Impacts

The primary adverse health impacts emerging from employment occur as a result of job losses, or being involuntarily unemployed. Involuntary job loss generally indicates a situation wherein workers are laid off or fired due to downsizing, restructuring etc., and where job loss comes as an exogenous shock[42]. The term 'job displacement' refers to a specific type of involuntary job loss that is the result of economic or business conditions and includes job loss from plant closure[43,44]. In this report, pandemic induced job losses are categorized as involuntary job loss.

Figure 3: Differential and adverse health impacts of job loss represented using the Health Plus Framework



**Intersectionality of identities may compound these realities, with racialized women potentially facing the bigger brunt of the "she-cession"*

Avoided Adverse Impacts

Involuntary job loss impacts health by way of the negative economic and social consequences that occur as a result of losing a job[45]. Job loss triggers earning declines in both the short term and the long term, which can lead to stress[46]. Stress, in turn, negatively affects cardiovascular health, which can often lead to hospitalization or death[47]. One study estimated a 55% increased risk of death from circulatory diseases during the 4 years after job loss[48]; another estimated a 24% increased risk of death in the same period[49]. Loss of income can also bring about negative lifestyle changes by either curtailing an individual's ability to invest in health enhancing goods and services, such as healthier foods, or a gym membership[50], or by triggering coping mechanisms with unhealthy impacts such as increased alcohol, tobacco, or food intake[51]. Studies have found a positive impact of job loss on obesity, which may also be linked to a greater risk of Type 2 diabetes[52] and cardiovascular illness[53]. Studies have also found that job loss may be associated with a 13% - 39% increase in the risk of death from smoking related cancer within 4 years of job loss[54]. Similarly, the risk of death and hospitalization from alcohol-related diseases[55] is much greater after job loss both in the short and the long term[56]. One study found that the risk of death from alcohol-related diseases increases by 164% in the year of plant closure and by 66% within 4 years of plant closure[57]. Risk of hospitalization due to alcohol-related diseases is found to increase by 28% within 10 years of displacement[58,59]. Death or hospitalization can also happen as a result of traffic accidents caused by alcohol abuse[60].

Involuntary job loss also has serious social consequences. Job loss represents the loss of an important social role as well as the loss of work-related social networks. This can impact psychosocial well-being[61]. Two separate meta-analyses that examined 428 research papers have found a causal relationship between job loss and poor mental health and loss of psychosocial assets[62]. One study found a 63% increased risk of hospitalization from mental disorders in the year of the job loss and a 19% increase in risk of hospitalization within 1-20 years after job loss[63]. Involuntary job loss is also associated with poor self-rated health, higher rates of depression, low self-acceptance, self-confidence, self-esteem, morale, life satisfaction, goal and meaning in life, social support and a sense of control[64]. Being unemployed might also be considered a stigma, which can cause depression, anxiety, and shame. The increase in symptoms of depression and anxiety among displaced workers is roughly 15 to 30%, when compared to non-displaced workers. Suicide or suicide attempts may follow depression. The risk of suicide or suicide attempts is 62% higher within 1-4 years of job loss[65]. Over an 8-year period, the risk of serious self-harm is more than doubled following involuntary job loss[66].

Overall, involuntary job loss increases the risk of death substantially. Risk of mortality after job loss increases by 61% in the first 2 years after job loss, by 39% in three years and 41% within the 4 years after[67]. Another study found that job loss increases mortality by 79% in the first year after displacement, 35% in the first four years after displacement, 17% within ten years, and 10-15% during the 20 years after displacement[68].

Work can be therapeutic and can actually help a person recover from an illness or enhance mental well-being or even reverse the adverse health impacts of unemployment.

Potential Health Benefits

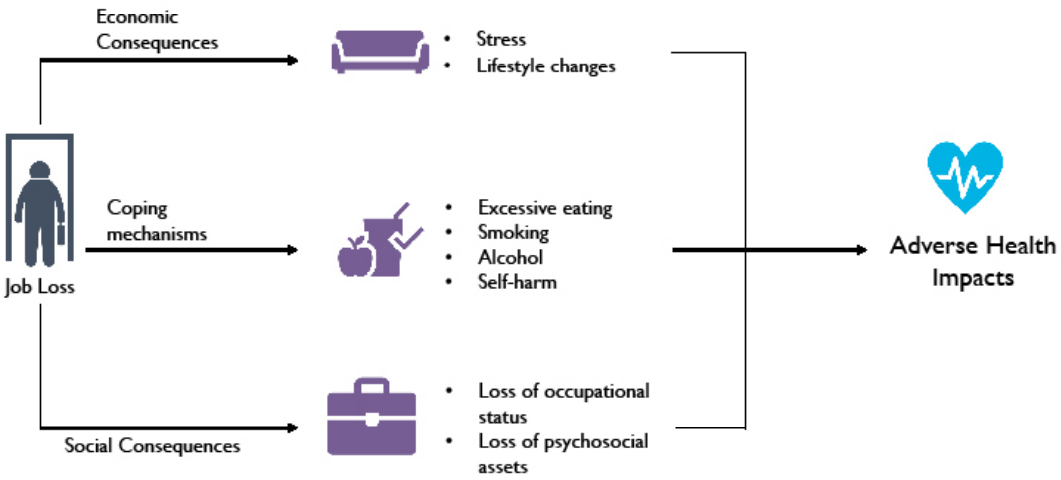
Literature on the potential physical health benefits of having a job is somewhat limited and has mostly focussed on the mental health benefits associated with having a job[69]. There is, however, strong evidence to show that work or being employed is generally good for individual physical and mental health, perceived health, and overall well-being[70]. Having a job is generally associated with a greater sense of autonomy, increased access to resources to cope with demands, greater social status and opportunities for personal development and mental health promotion[71]. A systematic meta-review on the mental health benefits of work, particularly depression and anxiety, concluded that work can be beneficial to an employee's well-being[72]. Another systematic review found strong evidence supporting the hypothesis that employment has a protective effective on the health of an individual, particularly against depression and general mental health issues[73]. Health benefits of employment are felt by both men and women, holds true for healthy people of working age, for many disabled people, and for most people with common health problems[74]. Interestingly, studies have even found that work can be therapeutic and can actually help a person recover from an illness or enhance mental well-being or even reverse the adverse health impacts of unemployment[75].

Inequities in Health Outcomes

Millions of Canadians lost their jobs either permanently or temporarily due to the pandemic. The national unemployment rate which had been steadily declining throughout the last decade rose to 13.7% in May 2020 from a low of around 5.6% in December, 2019[76]. Perhaps unsurprisingly, COVID-19 related job loss has disproportionately impacted vulnerable sections of society. Low-wage workers, particularly women and those employed in high-contact sectors such as the food service industry, were the hardest hit. In fact, the disproportionate impact of this pandemic on women's labour force participation has led many to refer to this economic downturn as a "she-cession"[77].

The employment rate for workers earning less than $16 an hour fell 27 percent in 2020, almost five times larger than the decline in overall employment[78]. Part time workers, women, and youth between the ages of 15 to 24 years, were disproportionately impacted by job loss. Racial and immigrant status also seems to have been predictive of job loss. Among Canadians aged 15 to 69 years, unemployment rate for Indigenous communities and visible minorities have been higher compared to those who neither identify as Indigenous nor are a visible minority[79]. The same holds true for recent immigrants. Prior to COVID-19, the rate of transition to non-employment (the share of individuals employed in the previous month but not in the next month) was similar for Canadian-born individuals, immigrants who landed in Canada within 10 years or less and long-term immigrants who landed in Canada more than 10 years earlier. When the pandemic hit, the rate of transition from employment to non-employment

Figure 4 : Job loss - Adverse health impact pathways



jumped for all groups, but rose disproportionately for recent immigrants. Importantly, female recent immigrants experienced the largest increase in the rate of transition to non-employment[80].

Having a stable job is a critical socio-economic determinant of health. Given the context outlined above, targeted workforce development policies which place the employment needs of women, younger individuals, visible minorities, new immigrants and part-time workers will significantly improve health equity for Canadians.

Unintended Consequences

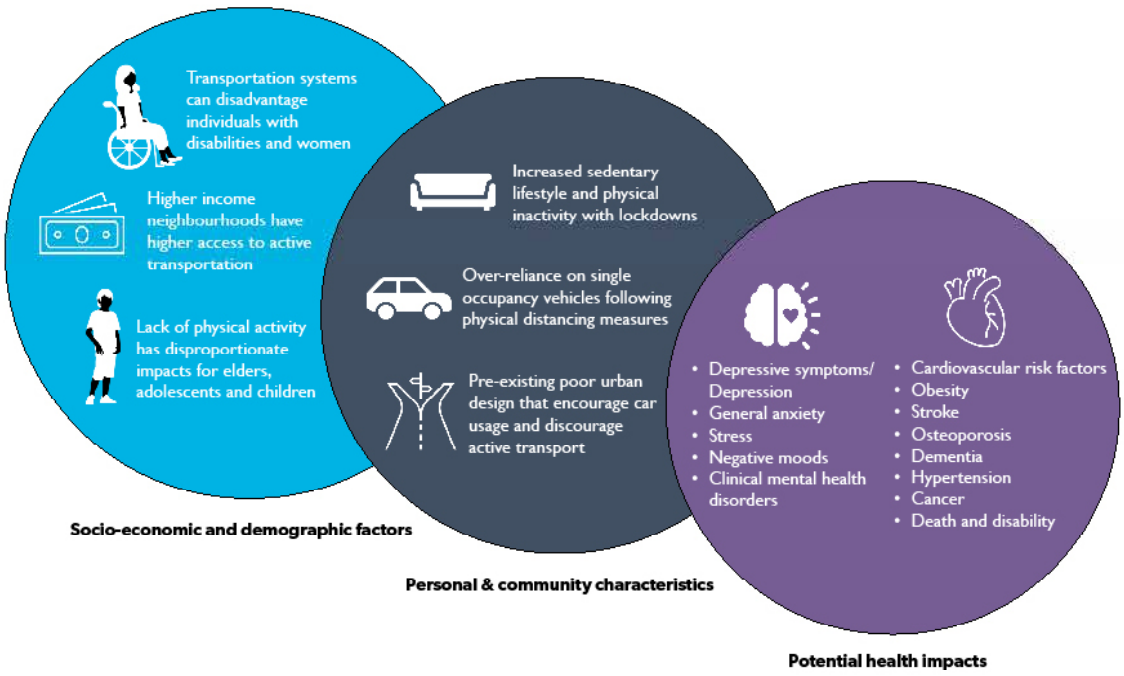
One potential pitfall that should be avoided while investing in workforce development is related to the quality of jobs. The relationship between employment and health is moderated by job quality[81]. Precarious or low-security jobs, high stress jobs, or jobs that require long shifts, may not benefit health but could potentially harm health[82]. While the differential impact of permanent versus non-permanent employment on health is unclear[83], the characteristics of employment or the psychosocial quality of work such as the quality of supervision, job demands and complexity, job security, and unfair pay are all identified as important[84]. In fact, jobs with poor psychosocial qualities or precarious employment relationships may even lead to a decline in health when compared to being unemployed[85]. Research on "how much work is good for health" confirms that it is not the quantity, but the quality of work that matters. Even 1-8 hours of paid work a week can significantly boost mental health and life satisfaction[86]. Therefore, it is important that the jobs created as part of the green recovery are good quality jobs which offer labour protection for those facing marginalization.

Overall green jobs[87] are expected to be high quality. Research suggests that green jobs are more likely to be middle-class jobs and are less likely to be low-paying jobs than non-green jobs[88]. A US study found that 'low-wage' workers in green jobs earn $5–7 more per hour than low-wage workers nationally[89]. Another study compared traditional fossil fuel energy jobs with jobs in the renewable energy industry and found that clean energy jobs are more likely to come with better benefits and as well or slightly better pay than fossil fuel jobs[90]. In other words, research to date suggests that green jobs are likely to be good quality jobs. Given the significant negative health impact of bad quality jobs, this is an aspect that must be kept in mind while developing workforce development policies.

2. Expanding Active Transportation Infrastructure

Active transportation is any form of travel that avoids the use of engine or motor for movement; it includes cycling, using a wheelchair, small-wheeled transport, like skateboarding, and walking[91]. A reluctance to use mass public transit as a result of pandemic-related physical distancing measures has lead to an over-reliance on single-occupancy vehicles[92]. Transportation systems must adapt and provide alternate transportation

Figure 5: Differential and adverse health impacts of physical inactivity represented using the health plus framework



opportunities like low-emission vehicles, electrification infrastructure and commuter cycling options to address these new concerns. Echoing this need, more than 30% of the green recovery reports revewied for this report, call for an expansion of walking and cycling infrastructure, and encourage active transport as key for a green recovery.

Health Impacts

Avoided Adverse Impacts

Active transport can address physical inactivity and sedentary lifestyles, a persistent public health issue[93] that has exacerbated with the pandemic. It is important to note that while physical inactivity, and sedentary behaviours have certain nuances that distinguish them[94], this report considers them as similar in the context of mobility, and refers to both as physical inactivity.

Physical inactivity is a modifiable risk factor associated with chronic diseases, with a high prevalence of 62.4% for children and youth and 82.5% for adults[95]. Creating interventions, like through the use of active transportation, is necessary to avoid long-term chronic conditions. Physical inactivity has a wide range of medium and long-term adverse health impacts, and currently stands as the fourth leading risk factor for death in Canada, affecting 8 out of 10 Canadians[96]. Short-term and long-term physical inactivity can contribute to cardiovascular risk factors, an increased risk of chronic diseases or conditions, including obesity, Type 2 diabetes, coronary heart disease, depression, cancer, dementia, stroke, and hypertension[97]. Physical inactivity has been attributed to ~5.3 million global deaths from all-cause mortality[98]. The fraction of Canadians who are at risk of experiencing certain disease outcomes due to physical inactivity are: 19.4% for coronary heart disease, 24.3% for stroke, 21.1% for Type 2 diabetes and 24% for osteoporosis[99].

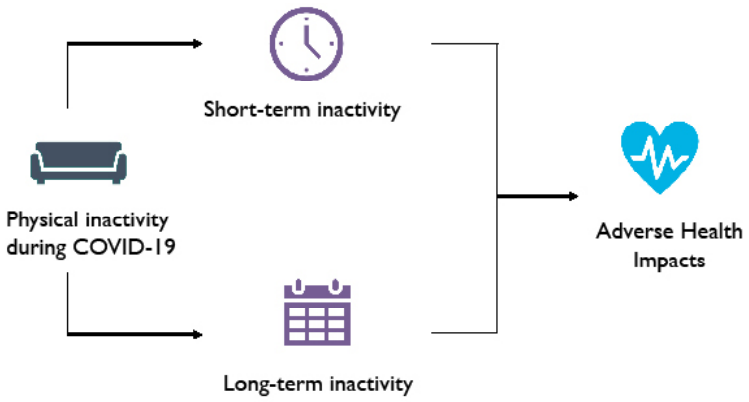
While the long-lasting effects of this pandemic on health and behaviour patterns will not be realised for a few years, it is speculated that it may accelerate and exacerbate physical inactivity and sedentary behaviour[100]. Exercise withdrawal and physical inactivity is linked to adverse mental health impacts, including depressive symptoms, general anxiety, clinical mental health disorders, negative mood changes with increased feelings of anger, irritability, frustration, sluggishness, and stress[101]. A meta-analysis found sedentary individuals face higher occurrences of depressive disorders[102]. The longer the withdrawal from physical activity, the more significant decreases in mental health become[103].

Potential Health Benefits

Engaging in physical activity through active transport demonstrates clear and quantifiable physical and mental health benefits[104]. Consistent active mobility, like walking and cycling, improves physical health and reduces risk of colon cancer and breast cancer, pulmonary and cardiovascular disease, stroke and Type 2 diabetes, in addition to reducing risk of death[105]. A US-based study demonstrated "every additional kilometre walked per day is associated with a 4.8% reduction in obesity"[106]. A meta-analysis found that a reduction in cardiovascular risk by 11% is associated with active commuting. Another study associating high levels of walking for transportation with a 31% decrease in cardiovascular disease risk[107]. A meta-analysis found those partaking in 150 and 300 minutes of physical activity per week experienced a 14% and 26% reduction in mortality, respectively[108].

Regular physical activity is associated with improved mental health[109]. It can reduce symptoms of anxiety or anxiety disorders, panic disorders and depression, risk of dementia and cognitive problems, and lead to improvements in mood and self-esteem[110]. Building on previous work which suggested that regular physical activity correlates to a 45% lower odds of clinical depression symptoms onset and 28-48% lower odds of clinical anxiety symptoms onset, a meta-meta-analysis concluded that physical activity can reduce depression and anxiety[111]. Transitioning from passive to active mobility can enhance perceptions of happiness and satisfaction and enrich community life[112].

Figure 6: Physical inactivity: Adverse health impact pathways



Active transportation may also contribute to a reduction in air pollution by reducing the number of vehicles on roads[113]. A recent Health Canada report notes that 15,300 premature deaths in Canada are attributed to air pollution[114]. However, consensus on this is still emerging. There are potential health risks associated with increased risk of air pollution exposure during active transport[115]. Some studies argue a higher risk of exposure from active transportation, while others suggest a greater risk for those inside vehicles[116]. Regardless, the health benefits greatly outweigh the risk of active transport, and even show increased health gains of an additional 3 to 14 months as well as avoidance of all cause mortality[117].

Emerging research also suggests that physical activity can act as a mediating factor between the pandemic severity and life satisfaction, and serve as a coping mechanism[118]. Active transportation promotes physical activity through leisure activities, occupational roles or commutes, while creating attractive and safe cities that strike a sense of belonging and pride[119]. Additional social benefits include increased social interactions, greater social cohesion, a stronger sense of community and vitality, and greater access to social networks and capital[120]. A greater sense of belonging within a community is strongly associated with improved physical and mental health[121]. Overall, active transport can serve as a means to promote healthy living and potentially reverse some of the negative impacts of physical inactivity and a sedentary lifestyle.

Inequities in Health Outcomes

Disproportionate prevalence of the aforementioned health impacts are propagated because of how active transportation infrastructure influences the social and physical determinants of health. Physical determinants of health including pre-existing and poor urban design can exacerbate negative health impacts and inequities. Current urban conditions like car-intensive transport systems, urban sprawl and congestion lead to an over reliance on personal vehicles and make active transport less feasible, safe or attractive[122]. These factors can result in increased mortality and mental health impacts like stress, absenteeism from work or school, and fatigue[123]. Physical inactivity impacts certain age groups differently and disproportionately compared to others. For older adults, there is an increased risk of negative effects of aging such as risks of falls, reduced lifespan, onset of chronic disease or illness as well as social withdrawal and isolation[124]. Sedentary behaviours and physical inactivity, especially in adolescents, can have long term mental health consequences - like psychological distress and depressive symptoms - if adolescents develop persistent lifestyle behaviours[125].

An interplay between physical and social determinants of health can further propagate inequities. Generally, higher income suburbs have more walkable and bikeable paths resulting in differences in transportation and health inequalities[126]. Other social determinants such as existence of physical disabilities, income of neighbourhoods, age, education level and gender can perpetuate further inequities, and disproportionately impact access or engagement with active transport or promote sedentary lifestyles[127]. Women have different travel patterns compared to men, which could be addressed through more accommodating active transport infrastructures. Transportation systems planned by men focus on rush trips and do not accommodate for circumstances such as need to travel during off-peak hours and travel short distances to run errands before and after work, a burden falling mostly on women[128]. Furthermore, women and girls are less likely to partake in physical activities like organized sports, further reducing chances for active transportation[129]. In addition to gender disparities in participation, wealth and affluence plays a role in dictating access to transportation. Those with access to more active forms of commute, like public transport, have more opportunities to partake in physical activity[130]. For example, a report from Québec revealed that the demographics more likely to cycle include those who possessed a University degree (61%), and earned an income over $80 000 (71%)[131].

Overall, health benefits of active transportation are heavily dependent on factors such as income, urban setting, and access to physical activity[132]. Safe walking and cycling opportunities can shorten the gap in inequalities by providing individuals without motor vehicles avenues to access goods and services with greater ease, especially for children, the elderly and lower income families who are less likely to own cars[133]. Walkable neighbourhoods create opportunities for accessible public transport while limiting transport poverty, which can advantage marginalized communities including older people, children or people with disabilities[134] and would facilitate greater accessibility for low-income populations who are "more reliant on alternative transportation modes"[135]. For example, infrastructure planning in Toronto must target immigrant and low-income communities who may work outside of traditional hours and do not have the resources for private transportation, making walking and cycling options far more attractive for their lifestyles[136]. Research from Toronto suggests that targeting lower income neighbourhoods to promote higher levels of walking and cycling may address health disparities commonly seen in these communities including "higher premature mortality, higher cardiovascular disease, higher rates of diabetes, lower self-rated health and lower levels of physical activity"[137]. For women, safe, convenient and comfortable cycling paths are more likely to attract higher number of women riders, providing opportunties for daily physical activity and supporting public health benefits[138]. An inclusive active transportation plan should consider and reflect the realities of different populations and needs.

Unintended Consequences

Investing in active transport can be associated with additional risks or variable effectiveness. First, there could be a rise in crash injuries from increased pedestrian traffic or cycling[139]. This can be explained by North America having certain walking and cycling conditions that contribute to higher risk of traffic injuries; policy responses should address safety measures, otherwise health co-benefits of active transportation will not be as high[140]. Crash

injuries from cycling do not offset the health benefits, and costs can be mitigated with measures to prevent collisions[141]. Second, there are potential health risks associated with increased risk of air pollution exposure during active transport[142]. There is debate around this as some studies argue a higher risk, while others demonstrate a greater risk for those inside vehicles[143]. Regardless, the health benefits greatly outweigh the risk of active transport, and even show increased health gains of an additional 3 to 14 months as well as avoidance of all cause mortality[144]. Furthermore, extreme levels of air pollution exposure are required to overtake health benefits and cause harms, which are currently not present in most cities[145]. Finally, active travel may not always contribute to overall physical activity levels. Understanding how physical activity in other areas of life, food intake, equity considerations and cultural or psychological meanings of walking or cycling are required to understand the association between active transport and health benefits[146].

3. Increasing Food Security – Strengthening Local Food Access

Food insecurity is characterized by the "…inadequate or uncertain access to an acceptable amount of quality and healthy food"[147]. The COVID-19 pandemic increased food shortages among Canadians exacerbating pre-existing food insecurity issues[148]. Investing in increasing food security appeared in about 20% of the green recovery reports reviewed. Specifically, the green recovery discussion talked about interventions to build local community capacity (community agriculture, community garden, household and community food storage systems), provide access to income to purchase food and engage urban agriculture, as a means to support access to foods and alleviate insecurity. While food security is large and permeates local and systems level changes, the following section focuses on increasing and directly supporting household food security, and the health impacts or benefits accompanying the strengthening of local food access.

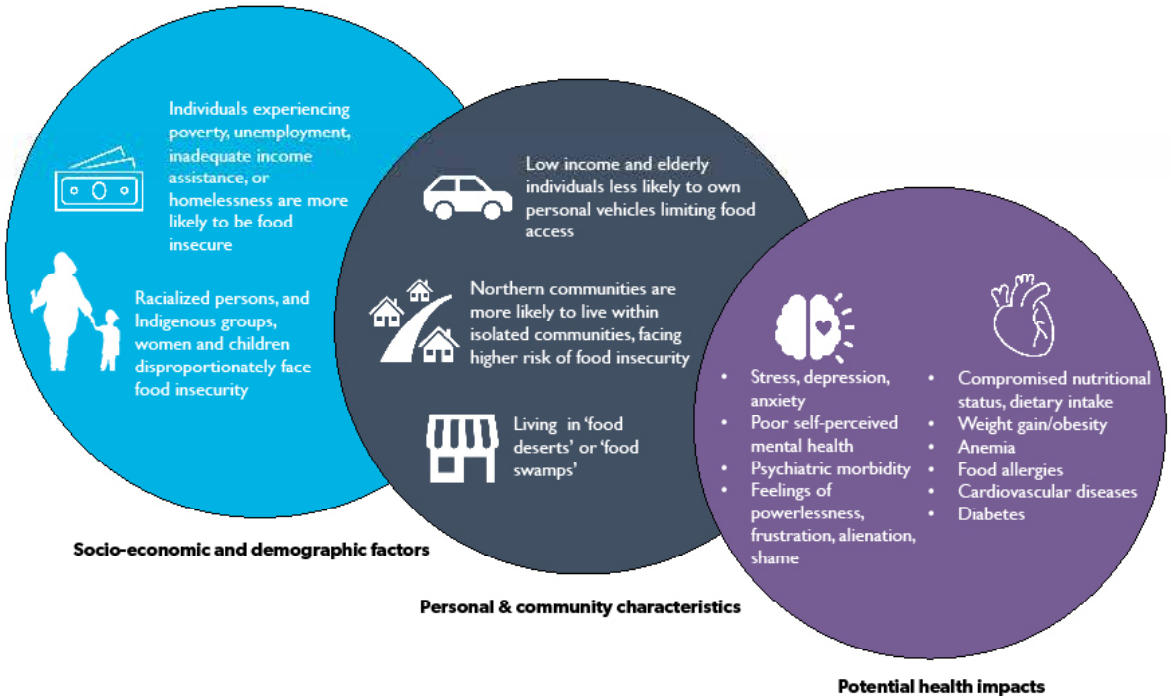
There is a clear, causal relationship between food insecurity and health outcomes, wherein insecurity is significantly associated with poorer physical, mental and social health outcomes.

Health Impacts

Avoided Adverse Impacts

There is a clear, causal relationship between food insecurity and health outcomes, wherein insecurity is significantly associated with poorer physical, mental and social health outcomes[149]. Food insecurity is highly disruptive of nutritional status, compromises dietary intake and may facilitate weight gain[150]. There is a potential association between being overweight or obese with

Figure 7: Differential and adverse health impacts of food insecurity represented using the health plus framewor



food insecurity[151]. One study conducted in 12 American states found that food insufficiency placed women at a significant risk of obesity[152]. Other associated health outcomes include poorer self-rated health, anemia, food allergies, heart disease, diabetes, and high-blood pressure[153]. Additonally, food insecure individuals have twice the odds of experiencing diabetes[154]. This is particularly concerning when considering poor diabetes and chronic disease management, which can compound pre-existing issues[155].

Food insecurity is also associated with higher rates of stress, depression, anxiety, poor self-perceived mental health, and psychiatric morbidity[156]. A systematic review found a positive relationship between food security and risk of depression and stress[157]. Experiencing food security is highly stressful, conjuring stress, feelings of powerlessness, frustration, alienation and possibly shame which can trigger or amplify psychosocial stressors[158]. Anxiety and depression can arise if there is lack of affordable or culturally appropriate food, in addition to the inability to feed one's family[159]. A Government of Canada survey, launched in May 2020, reported significantly different prevalence in fair or poor perceived mental health (45.3 - 51.0%) and moderate or severe anxiety (45.0 - 70.5%) within moderate to severely insecure households[160]. These mental health impacts may be further exacerbated by other pandemic factors like physical and social distancing measures, health risks and financial insecurity[161].

Potential Health Benefits

A healthy diet and nutritional support, achieved through food security, is essential to protect against non-communicable diseases including diabetes, stroke, cancer, and heart disease[162]. The benefits of food security will centre around the three aforementioned ideas identified in green recovery reports: building local community capacity, incorporating urban agriculture, and providing access to income to purchase food.

Building Local Community Capacity

Health benefits include increased consumption of healthier foods (fruits and vegetables), reducing BMI and even increased physical activity[163]. One study suggests the importance of these spaces for therapy or rehabilitation programs for individuals with mental illnesses or learning disabilities[164]. Community-based gardening activities also build and improve social capital, social cohesion and a sense of community[165]. Other community capacity actions include supporting food banks or local food initiatives. Accessing these food supports (food banks, food pantry) can lead to significant decreases in diabetes distress or medication non-adherence and increases in diabetes self efficacy, according to two studies[166]. A systematic review found that BMI, in a time frame of 6 months, was found to be reduced significantly by accessing food banks and pantries[167].

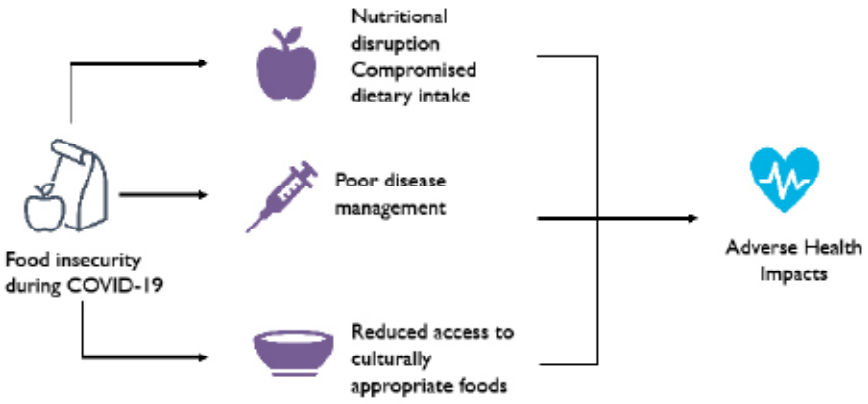
Incorporating Urban Agriculture

Urban agriculture is associated with increased access to and consumption of healthy foods i.e. vegetables and fruits[168]. A study found that adults participating in community garden agriculture are "3.5 times more likely to consume fruit and vegetables at least 5 times daily"[169]. Light physical exercise accompanies gardening, which could improve muscle mass[170], although additional research is required to confirm this Emerging evidence also suggests a potential link to obesity reduction[171]. Urban agriculture is associated with reduced stress, benefits for individuals experiencing mental illness; one study demonstrated that women participants had lower depression and overall improved quality of life and general well being[172]. Finally, studies show that there is greater social cohesion and support amongst gardeners[173], demonstrating the social benefits of these spaces.

Providing Access to Income to Purchase Food

Food insecurity is a symptom of poverty and income insecurity[174]. According to one study, a guaranteed income source in the form of federal public pension benefits for low-income Canadians

Figure 8: Food insecurity - Adverse health impact pathways



above the age of 65 leads to approximately 50% decrease in food insecurity prevalence[175]. Furthermore, the self-reported health and mental health status is markedly better with food security[176].

A healthy diet and nutritional support, achieved through food security, is essential to protect against non-communicable diseases including diabetes, stroke, cancer and heart disease.

Inequities in Health Outcomes

Understanding the nexus between food insecurity and health equity is very complex, requiring the consideration of various intersecting and interacting factors. The unique economic and social consequences of COVID-19, notably job loss and social distancing measures, reflect a strong link between food security and income[177]. Food insecurity is strongly tied to income; individuals experiencing poverty, unemployment, inadequate income assistance, or experiencing recent homelessnes are more likely to be insecure[178]. A 2003 Ontario-based study found that up to 47% of all households making an income of $10,000 - $15,000/ annually[179] or less, experience food insecurity[180]. Although an older study, it demonstrates a key disproportionality between lower income and food insecurity. Another Canadian study found individuals experiencing homelessness bear similar strong links between food insufficiency and poorer physical and mental health conditions, including multiple chronic conditions, heart diseases, depression and emotional disorder[181].

Race, in addition to economic circumstances, is also associated with food insecurity[182]. Northern Indigenous communities experience higher rates of food insufficiency and are therefore associated with lower nutrition rates[183]. These higher rates of food insufficiency, standing at nearly 2.2x higher than the national average in 2017, as well as a transition away from traditional foods to Western diets have further propagated food insecurity in Inuit communities[184]. Mood disorder is disproportionately prevalent in First Nations communities (Nunavut) experiencing severe food insecurity, compared to food secure households[185].

Finally, women and children also face disproportionate health impacts from food insecurity. A study on early COVID-19 conditions found households with children had higher odds of facing insecurity. Food insecure children face immediate and long-term health consequences, and overall have comparatively poorer health[186]. These children are more likely to suffer from frequent stomach aches and headaches, have increased odds of being hospitalized, are more likely to have seen a psychologist, have academic performance issues, anxiety, depression, and higher levels of iron deficiency with anaemia[187]. A study in Vermont found that compared to men, 42% of women were "more likely to experience household food security during COVID-19"[188]. Another found that food insecure mothers experience mental health issues 2.2x more compared to secure mothers[189].

While the above commentary on disproportionate impacts is by no means exhaustive, it paints a picture of how food insecurity is compounded by social determinants of health. These determinants shape one's location and therefore, access to food. Spatial accessibility to food is determined by location, access to transportation, and neighbourhood characteristics[190]. Distant food access points can disadvantage elderly and low income populations, who are less likely to own personal vehicles[191]. As well, Northern communities are more likely to live within isolated communities, facing higher risk of food insecurity[192]. In terms of transportation, a lack of reliable transport can hinder food options especially for rural or low-income individuals[193]. Finally, individuals residing in food deserts, where individuals are unable to access food due to aforementioned factors or food swamps, where individuals are in areas with an overabundance of high-energy foods, are more likely to experience obesity, poverty and poor nutrition[194].

Prior to the pandemic, 2017-18 data showed that 8.8% - 12.7% of Canadian households experienced food insecurity[195]. A food insecurity survey conducted in May 2020 found 14.6% of the surveyed Canadian sample to be faced with food insecurity in the last 30 days[196]. Emphasizing community-centred or local initiatives as part of recovery efforts can address food access barriers and insecurity. A scoping review of studies found that 75% of reviewed studies demonstrated positive impacts of urban agriculture on food security[197]. Local and place-based projects, such as urban agriculture or cooperatively owned grocery stores can expand geographic access to food in the short-term[198]. The social benefits for traditionally marginalized populations like new immigrants, refugees, African American and Latino residents were cited to be enabling a place for cultural learning and sharing[199]. Benefits of community gardens , found in shrinking cities like Detroit and St. Louis, include creating neighbourhood stability that may benefit long-term residents like low-income individuals[200]. In short, local solutions for food security can increase access to healthier foods while sustaining community-driven initiatives.

Unintended Consequences

At its core, food insecurity is an income issue. However, the push for more locally grown foods often comes from middle-income households over food-insecure or hungry households in communities[201]. Accordingly, measures to support local food access may not always meet the food needs of low-income households, who typically buy foods that are satiating (staple foods that are whole grain) which are typically non-garden foods, meaning they are less nutritious or healthy[202]. Furthermore, designing measures that do not account for the fact that low-income families often lack the capacity to grow their own food due to factors like balancing multiple jobs[203] can be problematic. Without accounting for the complex interaction between socio-economic demographic factors and food security, interventions

can further perpetuate exclusion, poverty, structural racism and other disparities[204]. Interventions run the risk of being incomplete, or worse, harmful towards already-disenfranchised communities.

While municipal governments can build local capacity, they do not possess the policy levers necessary to tackle income insecurity, which is a fundamental part of a long-term solution for food insecurity[205]. There is yet to be a concrete understanding of the effectiveness and public costs associated with delivering food-based initiatives compared to increasing provincial and federal social benefits[206]. Overall, while community-based or local capacity initiatives can bring some security temporarily, they cannot be relied upon for long-term security. A comprehensive approach is required to eradicate food insecurity including increasing income security, providing affordable childcare, and ensuring there are community and system-level interventions[207].

4. Managing Methane Emissions from Oil and Gas

Methane is a toxic[208], colorless, odorless, and flammable gas[209]. It is the main component of natural gas and is primarily released into the environment as a by-product of oil and gas production[210]. Methane is also a powerful greenhouse gas, accounting for 15% of Canada's total anthropogenic GHG emissions[211]. Canada has committed to a 45% reduction of methane emissions from the oil and gas sector by 2025[212]. Recovery ideas aimed at reducing methane emissions were found in approximately 17% of the sources surveyed. These revolved around reducing methane emissions by funding the clean-up of orphaned oil and gas wells, and creating a fund to support independent methane inventory for anthropogenic emissions. The health plus analysis that follows focuses primarily on methane emissions from oil and gas including those from orphaned wells. The indirect health benefits of setting up a methane inventory cannot be credibly assessed and are therefore not covered in this report.

Health Impacts

Avoided Adverse Impacts

Direct exposure to high concentrations of methane or its by-product carbon monoxide is usually accidental or caused because of self-harm[213]. Leaky gas pipes and insufficient ventilation can result in inadvertent exposure to methane[214]. Exposure to methane especially in a sealed room or another closed space, for a period as brief as one minute, can be sufficient to cause acute lung injury or death due to suffocation[215]. Incomplete combustion of methane produces carbon monoxide, a toxic gas, which can at low-levels cause flu-like symptoms and at high levels result in dizziness, convulsions or even death[216]. From a public health perspective, methane is problematic because of its role in creating other pollutants that negatively impact human health and impact climate change. Notably, methane is a precursor to ground level ozone, a GHG which is associated with harmful health impacts[217].

Figure 9: Differential and adverse health impacts of methane emissions from oil and gas represented using the health plus framework

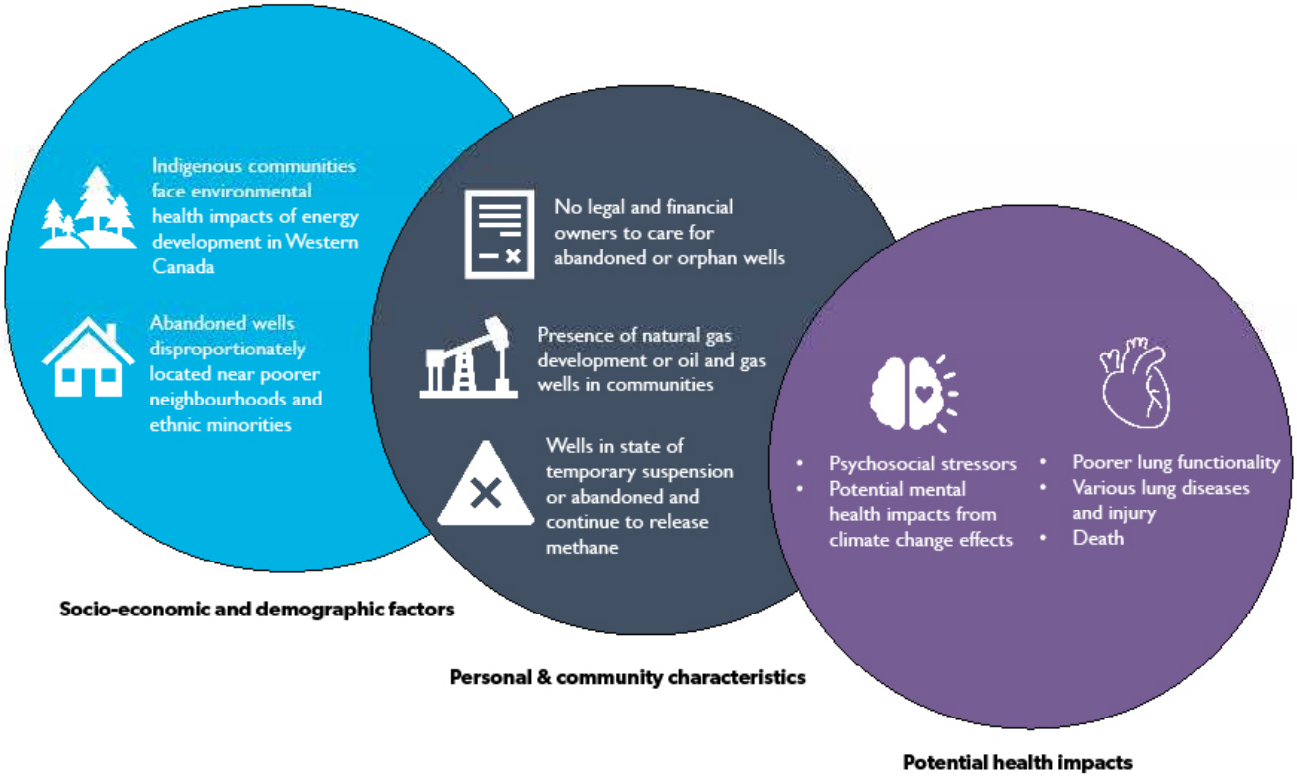
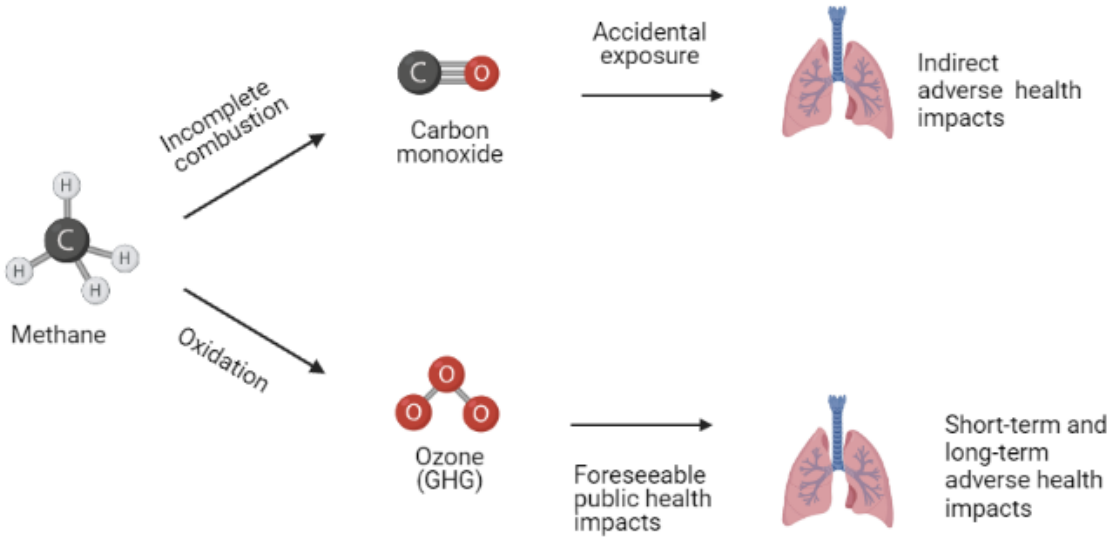


Figure 10: Methane emissions: Adverse health impact pathways



Owing to its chemical characteristics, exposure to ozone occurs almost exclusively by inhalation[218]. There is a large body of literature on the short-term effects of ozone inhalation on the respiratory system. Research points to a clear linkage between short-term exposure to ozone and reduced lung function, lung inflammation, lung permeability, mild bronchoconstriction, cough and pain on deep inspiration, immune system activation and epithelial injury[219]. As far as long-term ozone exposure is concerned, the United States Environmental Protection Agency has concluded that long-term ozone exposure is likely to have a causal relationship with respiratory effects[220]. Some studies focusing on new-onset asthma in children and on increased respiratory symptom effects in asthmatics found evidence of a relationship between long-term ozone exposure and respiratory morbidity[221]. The risk for respiratory morbidity associated to an increase of 20 µg/m3 ozone ranges from zero to 5%[222]. Pre-existence of asthma, allergic rhinitis or chronic obstructive pulmonary disease increases susceptibility to reduced respiratory function caused by exposure to ozone[223]. Studies have also found a positive and significant association between ozone levels and increased mortality. It is estimated that 1.04 - 1.12 million respiratory deaths in adults are attributable to ozone exposure globally[224]. Health Canada estimates that 4,100 deaths per year are attributable to ozone in Canada[225]. There is some evidence, albeit less conclusive, supporting impacts on the cardiovascular system following short-term ozone exposure[226].

Methane, in addition to impacting health through ozone generation, also plays a key role in accelerating climate change. The effect of climate change on health is well established and includes heat-related illnesses and death, increased respiratory diseases, increase in vector-borne diseases, increased mental health impacts from forced migration and civil conflict, and health impacts from severe weather events[227].

Potential Health Benefits

Only a handful of studies have examined the health benefits of methane reduction. Air pollution related benefits of methane reduction are comparable to benefits associated with reducing carbon dioxide[228]. Reducing methane emissions will not only slow down anthropogenic climate change, but also reduce ozone-related mortality through a reduced potential to create secondary pollutants. Reduction in ground-level ozone, due to methane emissions mitigation, would reduce premature mortality associated with ozone[229]. Using 2010 as the base, one study estimated that reducing anthropogenic methane emissions by 20% would result in 370,000 fewer all-cause premature mortalities globally between 2010 and 2030[230]. Another found that reducing global methane emissions by one million tonnes in 2020 would have prevented 830 premature cardiovascular and respiratory deaths[231].

Inequities in Health Outcomes

The oil and gas sector is the largest emitter of methane in Canada [232] and represents the single biggest opportunity to capture and reduce methane emissions[233]. The magnitude of these emissions continues to be debated. There is an emerging body of scientific research which has found that methane emissions from the sector in the past decades may have been significantly underestimated[234].

Domestic oil and gas production in Canada is concentrated in Alberta and British Columbia. Much of the methane released by the oil and gas sector is in the form of 'fugitive emissions'. There are three sources of fugitive emissions within the sector: methane leaks from faulty pipes, often accidentally, during oil and gas extraction and transportation[235]; methane released due to flaring (the intentional burning of gas at oil facilities); and methane released from inactive, abandoned, and orphan wells. Methane released from orphan wells, i.e. wells without a legal owner and that haven't been permanently sealed off, is of particular concern. The number of orphan wells in Alberta has increased by 750% since 2013[236], whereas in BC it has increased by 769% since 2016[237]. What is clear is that the negative health externalities of methane emissions from oil and gas are disproportionately felt by residents of Alberta and BC, where current oil and natural gas operations are largest[238]. What is not fully understood, however, is which socio-economic and demographic sectors are most impacted.

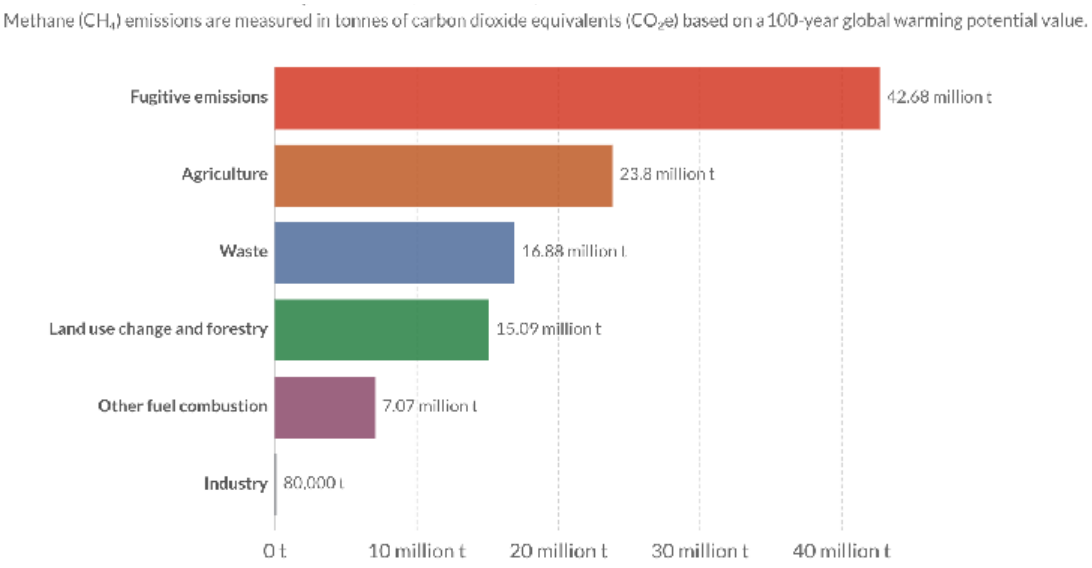
There is reason to believe that Indigenous communities are disproportionately impacted by the environmental and health impacts of oil and gas production. There is a notable geographical relationship between First Nations communities and energy development in Western Canada. A 2013 report noted that every oil and gas project being proposed in Western Canada at the time implicated at least one First Nations community[239]. An estimated 23,000 Indigenous people live in the oil sands region in northeast Alberta, with 18 First Nations and six Métis settlements located in the region[240]. Additionally, studies have observed that wells are disproportionately located in poorer neighborhoods and that ethnic minorities are more likely to be exposed to natural gas flaring events compared to Caucasian residents[241]. The generalizability of these findings to the specific circumstances under which methane emissions occur in Canadian provinces is not clear, and there are significant data gaps that hamper a more comprehensive understanding of the equity impact of methane emissions. That said, initial indications show further research is merited.

Additionally, as discussed above, methane is a powerful GHG. Climate change does not affect everyone or all regions equally. Coastal and Northern communities face an elevated risk from climate change. Unequal geographic distribution of health risks aside, Indigenous Peoples, young people, and socially and economically disadvantaged populations in Canada are particularly vulnerable to the effects of climate change[242,243].

Unintended Consequences

Methane emissions – its sources, health impacts, interactions with other pollutants – have only recently started receiving significant scientific attention. There is also a lot that is yet to be understood about the communities most impacted by methane emissions. Research on the hazardous impact of natural gas development, especially on the communities living near oil and gas wells, and production facilities is limited by lack of data availability on factors such as frequency and duration of human exposure, and lack of baseline ambient air quality data [244]. Consequently, methane-related recommendations in the green recovery discussion are based on a limited evidence base. It is therefore difficult to assess whether funding orphan well clean-ups offer a cost-effective path to reducing methane emissions from the sector, or whether another policy move altogether would be more cost-effective for reducing methane emissions. Unintended consequences that emerge from the indirect impacts of reducing methane emissions, such as actions taken to redress the severity or incidence of the impacts of a changing climate, are critical to consider, but discussing them in depth is ultimately beyond the scope of this report.

Figure 11: Methane emissions by sector, Canada, 2016



Ritchie and Roser 2017a

5. Municipal Solid Waste Management

Waste management is particularly relevant in the context of COVID-19 given the spike in household waste, in part due to e-commerce and the increased use of disposables[245]. Landfills are the most common final disposal destination for waste in Canada. There are about 2,000 operating landfills across Canada where approximately 97% of the country's municipal solid waste, after diversion and recovery, ends up[246]. Incineration, on the other hand, is not as widespread. A recovery that involves better management of municipal solid waste (MSW) by reducing harmful landfill gases and chemicals[247], as well as by-products of MSW incineration was discussed in a green recovery report. The following paragraphs summarize the scientific discussion around the health impact of landfills and incineration especially for communities living near these sites.

Health Impacts

Avoided Adverse Impacts

Landfills not only release a number of harmful air pollutants including methane, carbon dioxide and hydrogen sulphide, but also contaminate soil and water[248]. 86% of the plastic waste in Canada ends up in a landfill[249]. Landfilled plastics can leach into and percolate into the soil and water, and subsequently can make its way into the food chain, through for example microplastics that may end up in clean drinking water[250]. Additionally, carbon dioxide and methane, both important greenhouse gases, significantly contribute to global warming and carry their own set of adverse health impacts, are released during the microbial biodegradation of plastics[251].

Despite an extensive understanding of landfill gases, research on the actual health impact of landfills is controversial. Uncertainties in health impact research emerge from a number of factors, including: the wide range of pollutants emitted by landfills; the various pathways of exposure (air, water and soil); the typically long-term and low-level of exposure to landfill pollutants; and, the potential for confounding factors such as interaction with or exposure to multiple pollutants at the same time[252]. However, it can be conclusively said that there is insufficient evidence that landfills are safe, especially for those living in close proximity to them.

A 2016 cohort study from Italy found that exposure to hydrogen sulfide emitted from landfill sites was associated with greater mortality and admissions to hospital caused by respiratory diseases, including lung cancer for individuals, especially children, living within 5 km of these waste sites[253]. An earlier Canadian study compared the risk of cancer among males living close to a landfill from others farther away, and found some evidence that the male residents living close to the site were at a greater risk for non-Hodgkin lymphoma and liver, pancreas, and kidney cancers[254]. Another Rome-based study found that residents who lived within a 2km^2 area of a municipal solid waste landfill or an incinerator had a higher risk of laryngeal cancer[255]. Several Africa-based studies have also observed adverse health impacts on people living near landfill sites. One study found that residing within 5 km of a waste site significantly increases risk of asthma, tuberculosis, diabetes, and depression[256]. Another reported that most people living close to landfill sites reported as suffering from flu, eye irritation and weakness of the body[257]; and a third found that residing near a landfill site is associated with an increased likelihood of respiratory effects among children[258]. In the United Kingdom, statistically significant elevated risks

Figure 12: Differential and adverse health impacts of MSW landfills and incineration represented using the health plus framework

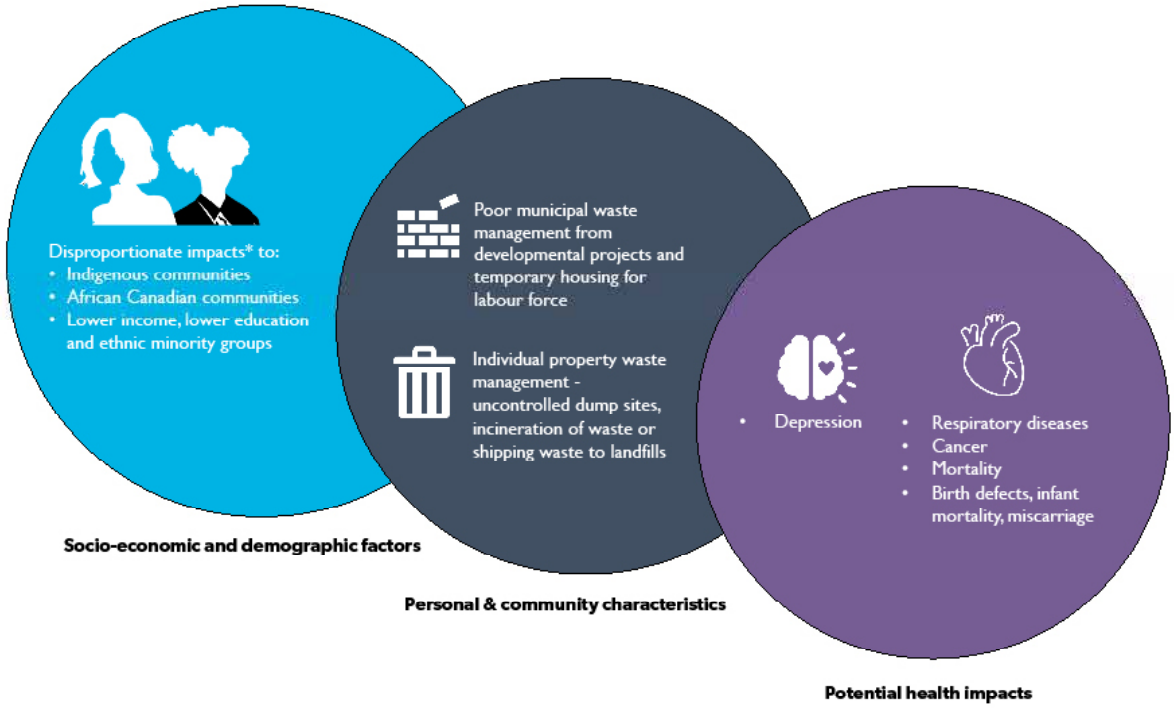
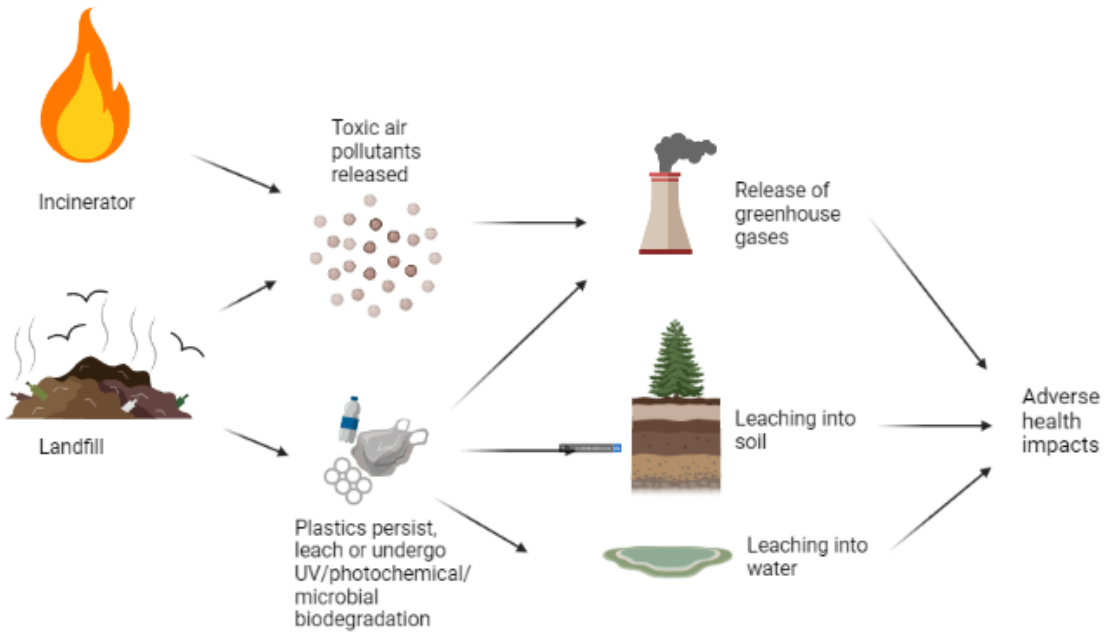


Figure 13: MSW management: Adverse health impact pathways



were found for congenital malformations, neural tube defects, abdominal wall defects, surgical correction of gastroschisis and exomphalos, and low and very low birth weight for births to people living within 2 km of landfills[259]. It bears mentioning that research findings from other countries are somewhat limited in their applicability to a Canadian context since there are varying types of waste sites with different applicable regulations and varying levels of compliance to those standards.

In Canada, incineration is not very prevalent and there is only one large (>25 tonnes/day) municipal solid waste incinerator remaining in the country (in Quebec)[260]. A range of adverse health impacts, including neoplasia, congenital anomalies, infant deaths and miscarriages have been linked to incineration activities[261]. Air pollutant ingestion is the most common exposure pathway. Public health impact of incinerators is dependent on the kind of incinerator technology in use. While newer technologies reduce exposure, older incinerators or those that are not well maintained have been strongly linked with adverse health impacts[262].

Potential Health Benefits

Health risks to Canadians can be reduced with with well-designed waste systems[263]. Improvements in waste management contributes to a wide range of public health and well being benefits including improved sanitation and reduced waste burning[264]. In general, there is a dearth in literature on the health benefits of waste management. As such, only three main studies are highlighted for their specificity and relevance to the discussion at hand.

A study addressing a new model for solid waste management in Nova Scotia highlighted key considerations for costs and benefits. Closures of substandard landfills can contribute to direct short-term and long-term public health and environmental benefits upon a reduction in leachate[265] generation and landfill gas[266]. The authors argue the importance of considering benefits which can be non-quantifiable, but that reduce future public health and environmental impacts[267]. Another study from Nova Scotia found that the operating and amortized capital costs of landfills are offset by factors like reduced groundwater leachate and air emissions, improvements in public health, and employment benefits, raising awareness around indirect benefits of proper management[268]. Net cost savings upon implementation of a waste-resource management system in 1996-97, was estimated to be $33 - $178 per person per year and produced a total savings of $31.2 - 167.7 million in 2000-01 fiscal year[269]. While not limited to health savings, and despite fairly dated results, this study demonstrates that among other factors, health is greatly benefitted through effective waste management practices. Finally, a Madrid-case study assessed the health benefits of phasing-out of municipal solid waste incineration[270]. The results of modelling scenarios revealed that human toxicity with cancer effects reduced when there is no incineration[271]. Eliminating incineration leads to greater avoidance of ash production and disposal, which presents a high risk of toxicity, and therefore leads to positive health impacts[272]. Overall, emerging evidence requires further research to aggregate findings and outline specific health benefits from effective waste management.

Inequities in Health Outcomes

The current state of knowledge around health inequities in vulnerable or marginalized groups as a result of poor waste management is sparse and the evidence is mixed, rarely capable of establishing a strong or causal link. Elucidating and establishing links between waste and health inequities remains challenging for many reasons: certain study designs may be unable to establish causal or non-causal relationships between adverse health impacts and landfill or incinerator proximity; there may be confounding variables that are not accounted for; and, there exists complexity in deriving exposure through a measurement of geographic zone[273].

The paucity in research should not deter from the importance and prevalence of poor waste management in Canada, as well as the communities it most intimately impacts. Some evidence suggests that individuals of lower income, lower education, and ethnic minority groups are more likely to reside near waste treatment facilities[274]. A cornerstone study found that out of 65 sites in Nova Scotia, 30 (46.2%) were located near African Nova Scotian and Mi'kmaw communities. Furthermore, 5230 (28.5%) of 18,355 African Nova Scotian residents were found in areas close to or within 5km of waste sites[275]. Another instance of this includes the African Canadians dwelling in Lincolnville, Nova Scotia, a community which exists near a landfill[276]. The Lincolnville community has raised concerns around "traces of carcinogens, including cadmium, phenol and toluene, being above the upper limits" in surface and groundwater, which are primary sources of potable water[277].

Health risks to Canadians can be reduced with with well designed waste systems.

Environmental contamination from poor waste management is a major concern for Indigenous communities, especially considering high population density on reserve land[278]. Garbage dumps and solid waste landfills are primary sources of land pollution in Indigenous communities[279]. Many communities lack proper amenities for waste disposal, leading to various informal and unsafe methods of waste management. These unsafe waste disposal techniques vary from burial of waste on individual property, which are often proximal to drinking-water wells, to using small open and uncontrolled dump sites, creating dump fires and incinerating waste, or shipping waste to larger engineered landfills[280]. These practices pose health risks and unintended secondary consequences, like water and air contamination[281]. Uncapped old or abandoned landfills can continue leaching and exposing communities to harmful levels of chemical and biological contaminants in water sources[282]. In general, toxics exposure disproportionately impacts racialized, Indigenous and low-income Canadians[283].

While there are not many incinerators managed by regional governments in Canada, in rural areas, especially in Northern Indigenous communities, it is common practice to incinerate or have open dumping grounds that are unlined. The ground temperature is typically too cold to allow for organic disintegration, which leads to toxic emissions to be dispelled from leachate[284]. Several health problems can arise from the release of chemicals like "ammonia nitrogen, polycyclic aromatic hydrocarbons, and total petroleum hydrocarbons", through direct exposure from waste or contamination of food and water sources[285]. Community activities like development projects can also be a large source of municipal solid waste. A case study in Happy Valley-Goose Bay (Labrador) revealed that a disproportionate amount of waste can be generated by workforces, like those who built the Muskrat Falls hydroelectric development project. Housing workers require "temporary camps (Muskrat Falls), permanent settlements (Churchill Falls), or entirely new public municipalities (Labrador City)" all of create household waste[286]. Governance and privacy around development projects create barriers to proper municipal waste management[287].

Waste management is a necessary component of a healthy community. Waste sites prevent the presence of excessive waste in communities, which are a source of odours, pests and disease[288]. Additionally, they can be sources of employment and, in the case of recycling, green-collar jobs[289]. To reap these benefits and provide healthy living spaces, waste management practices must account for the inequities experienced by certain communities. Recognizing that environmental hazards disproportionately impact socially and economically vulnerable communities[290] and ensuring the creation of community-specific management is a first step. For example, different Indigenous communities vary in waste management practices based on geographic locations or their access or lack thereof to municipality partners[291]. Therefore, community based strategies, tailored to unique circumstances, may be the best approach to tackling solid waste disposal[292].

Unintended Consequences

Moving towards sustainability in waste management requires that the underlying causes for waste production in specific communities are addressed. For example, a higher incidence of pre-packaged food consumption has been observed in at-risk Indigenous communities, a practice commonly associated with lower income households. As a result, municipality and waste collection service providers have also noted that these communities produce more waste[293]. Curbing the issue of waste production does not only require proper waste management but an understanding of other factors that compound circumstances and therefore, additional changes by way of income security that can lead to a sustainable reduction in waste.

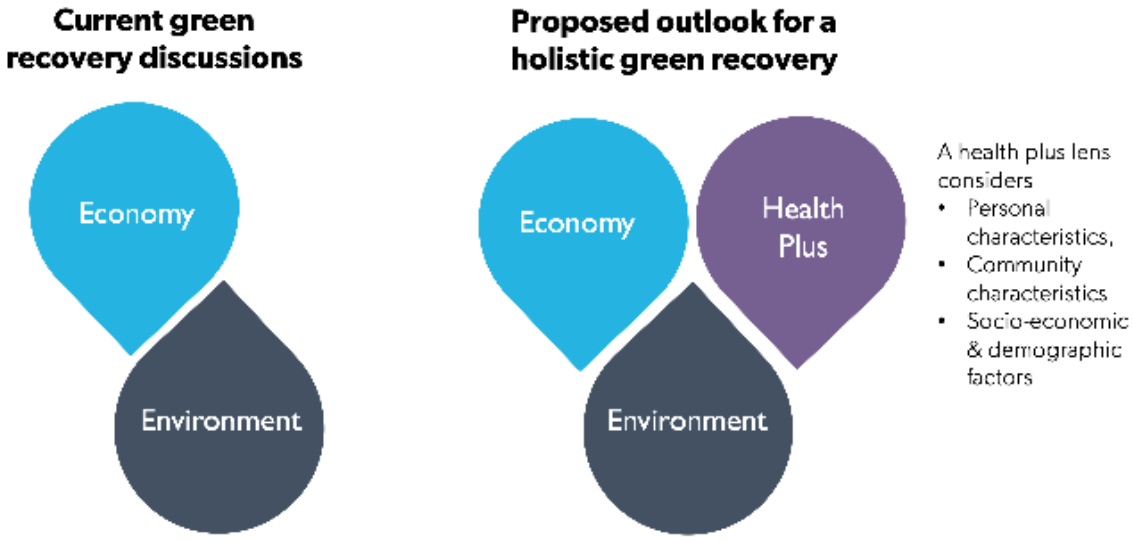
KEY TAKEAWAYS FOR THE GREEN RECOVERY DISCUSSION

This report offers a different approach to green recovery discussions, and argues for a health plus lens to be incorporated into recovery decision-making. It applies the health plus lens to five emerging green recovery projects, and illustrates why and how a health plus lens is advantageous in addressing the range of challenges amplified by COVID-19. Application of the health plus lens will allow policymakers to apply and identify ideas whose health benefits are not as initially apparent as improvements in air quality. This recovery, in its focus to ensure economic stability from a pandemic, cannot sideline health and wellbeing. In a recession brought on by a pandemic, an emphasis on health can foster greater resilience across all communities to the impacts of future health crises.

This research identified a number of key takeaways for policymakers to be aware of within a green recovery:

- **Every green recovery project analyzed in this report has the potential to offer significant health benefits:** All five projects discussed above identify a range of direct and indirect health benefits emerging from their adoption. This furthers the business or investment case for some projects, such as orphaned oil and gas well clean-ups, income supports to improve food security, and workforce development programs, whose primary benefits are not traditionally thought of as being health related. Policymakers supporting these projects should be aware of the health benefits that they offer to communities and regions.

Figure 14: Implication for the green recovery discussion



- **Green recovery projects can have substantial health benefits over the short-term, medium-term, and long-term:** Green recovery projects offer health benefits throughout their life cycle. Short-term benefits occur through the creation of high-quality jobs, which offer significant health benefits to individuals. Medium-term and long-term benefits can occur either through avoided adverse impacts, or as direct benefits. For example, expanding active transport infrastructure will create jobs, which brings direct health benefits in the short term, and will improve overall cardiovascular health in the medium and long-term through increased physical activity. Taking a life-cycle perspective on health impacts makes it apparent that green recovery projects can support health quickly, and all offer benefits will be experienced by communities for years and decades to come.

- **Applying a health plus lens allows for a more robust understanding of the health impacts of projects:** When only a smaller subset of health benefits is considered, an understanding of health impacts can leave out critical information that offers a deeper understanding on how projects impact people's ability to be mentally, physically, socially, and emotionally healthy. It also does not explicitly consider the full range of impacts over time, which is important when considering infrastructure decisions that will impact the health of communities for generations.

- **Health inequities dramatically shape the way health benefits of green recovery projects are experienced by individuals:** The health benefits of projects identified in this report are heavily influenced by proximity (methane, municipal waste management) and accessibility (active transport, food security). This means that negative health impacts are felt directly, or health benefits not experienced at all, by communities who already face structural inequities. If green recovery projects do not explicitly take these inequities into account and design policies to remediate them, they risk realizing fewer health benefits in practice, or seeing positive health impacts occur for only a small group of already well-off individuals. If health inequities are appropriately considered, these projects have the potential to further the objective of fostering environmental justice and combatting environmental racism. However, greater research is required to evaluate how redressing health inequities could advance social and environmental justice within communities.

- **Reducing the risk of unintended consequences requires looking at more than individual green recovery projects:** Many unintended consequences of projects identified in this report point to the need for systemic solutions beyond a single project: tackling food security requires redressing income insecurity; addressing landfill waste requires addressing consumption and waste creation patterns; and reducing the adverse health impacts of job loss requires creating a better work environment for employees. This illustrates that health does not occur in a vacuum, and no single project can completely rectify every socio-economic factor that negatively impacts human health. To meaningfully redress those, systemic solutions are required.

POLICY RECOMMENDATIONS

This report offers recommendations to ensure policymakers incorporate health considerations and assessments across all five green recovery projects discussed in this report, as well as other projects discussed in a green recovery context.

Recommendation 1: Health impacts should be considered in decision-making on green recovery projects

Recovery spending will profoundly influence the health and health experiences of Canadians. Accordingly, evaluating the health impacts of projects on Canadians is recommended before deciding whether or not to greenlight a certain project, or while thinking about the location where a project should be deployed[294]. One tool to conduct this assessments is the Health Impact Assessment (HIA). As per the WHO, an HIA is a tool for evaluating the potential effects of a project on the health of a population, and the distribution of those effects within the population[295]. An example of using HIA in the green recovery context includes: in active transport projects, HIA may result in the recommendation of pedestrian or bicycle facilities within a transportation plan to promote a built environment that facilitates public health goals[296].

HIA was instituted in Canada through the Impact Assessment Act (IAA) in 2019[297,298]. Though a pivotal step towards incorporating public health sector perspectives, as it stands, IAA is limited in scope to natural resource, energy, and large infrastructure projects[299]. Additionally, the Government of Canada also requires health impact assessments of specific regulations targeting

carbon mitigation, such as those pertaining to on-road vehicle emissions, to assess and quantify air pollution health benefits and socioeconomic value to society[300,301].

Current health assessment regulations stand as examples of how public health perspectives can be considered in large infrastructure projects, opening up a suite of opportunities for health plus impact assessments in other project types. However, due to their limited scope these will not be applicable to the recovery projects studied in this report. This report recognizes that the nature of spending within an economic recovery may limit available time or resources that could hinder the implementation of a full HIA. If undertaking an HIA is identified as inappropriate due to time or resource limitations, it is critical that policymakers still consider health impacts in decision-making using an approach that is both credible and rigorous.

Recommendation 2: Ensure equity assessments are a standard part of considerations of health impacts

The pandemic has disproportionately impacted certain communities and a recovery without an equity lens runs the risk of further marginalizing communities. Equity considerations are key in ensuring benefits are reaped in impacted and disadvantaged communities, and that projects do not propagate further harms or inequalities. Beyond green recovery projects, equity considerations should be a distinct part of project assessment processes for all climate and clean growth project spending to clearly identify who bears the costs and who reaps the most benefits from targeted interventions.

The pandemic has disproportionately impacted certain communities and a recovery without an equity lens runs the risk of further marginalizing communities.

Health equity, however, cannot be addressed solely with the analysis of health data and the identification of marginalized populations; community and public input is a core necessity of the impact assessment process[302]. Of extreme importance is the inclusion of Indigenous voices and leadership in the decision-making process. The analysis within this report revealed that Indigenous individuals were impacted in four out of five project areas, demonstrating clear health inequities that require attention. Partnership and ownership in green projects are also key in a green recovery. A study found that Indigenous participation and ownership in "renewable energy projects contribute to economic reconciliation and self-determination because it asserts their rights and title to their land and builds partnerships with industry and government, while generating own-source revenue"[303].

Recommendation 3: Projects need to prioritize data collection on health impacts on different individuals and communities

Data disaggregated by demographic group, geography and along various dimensions of social identities forms the basis of equity-informed decision-making[304], and this simply does not exist with respect to many of the green recovery projects discussed in this report. Lack of raw data aside, what this report's analysis also makes clear is that there is a dearth of Canadian studies, both nationally and at the regional level, examining the health considerations assessed in the health plusframework, for green recovery projects. This report's third recommendation seeks to address this gap by proposing that fund allocation and budgeting for green recovery projects should specifically account for data collection and to fund further health research on considerations identified in the health plus approach.

There are many reasons for making data collection a project goal. As discussed above, health inequities determine the way health benefits of recovery projects are experienced by individuals. Therefore, to truly "build back better"[305] policies and projects must be grounded in local realities. Another reason to invest more resources into data gathering is because building in continuous improvement is a best practice when it comes to GHG mitigation projects and policies[306]. For green recovery projects, gathering data and supporting research is essential to do this. For example, to expand active transportation in a manner that maximizes the health benefits considered in health plus, high quality disaggregated data on where active transportation infrastructure already exists, areas which are transit deserts, and the characteristics of the communities living near these transit deserts needs to be better understood.

Recommendation 4: Recovery spending must service long-term goals of growth, equity, resilience and sustainability

Health inequalities and inequities are the result of decades old systemic issues. No single project can completely rectify these inequities. Recovery spending, therefore, must be seen as part of a larger effort towards creating long-term employment opportunities, increasing growth, reducing social inequalities and inequities, and addressing climate change[307]. Prioritizing only short term thinking can be detrimental for citizens' long-term interests and wellbeing. Research has found that stimulus efforts that are focused on increasing aggregate demand and employment in the short-run, while taking longer-term environmental and economic impacts into account, offer the largest overall benefits[308].

A two-fold approach (short-term planning that complements a larger longer-term goal) offers a real chance at a realizing the principles of resilience and sustainability within a green recovery.

A two-fold approach also allows for an assessment of the trade-offs between social, health, economic, or other goals in the short-term and, in the longer term, strategies can be built to address systemic origins of issues and the impacts of major shocks[309]. For example, in the case of food security, short-term strategies can target and provide food access; however, these are unsustainable means of feeding impacted populations over the long-term[310]. Long-term strategies need to address the systemic causes of food insecurity and for instance, work towards agricultural policies that promote a household food security lens or push forward investments in poverty reduction[311]. This combination of approaches can offer both short and long-term benefits, and will advance the principles of a green recovery to benefit a larger number of Canadians.

CONCLUSION

A Canadian green recovery has the potential to meaningfully advance health, climate action, and redress inequities to advance the goal of inclusivity. This analysis illustrates that the application of a health plus lens can robustly shape an understanding of the health impacts of green recovery projects. The health plus lens proposed in this report may offer a meaningful way to further the objective of fostering environmental justice and combatting environmental racism through a green recovery, although further research is needed to evaluate this potential. Policymakers looking to build back better, both in the spirit of a green recovery and over the longer-term as Canada seeks to decarbonize, are well-postionned to begin considering the health benefits of projects more holistically. This will ensure Canada realizes the potential benefits of a net-zero emissions future for all Canadians.

This analysis illustrates that the application of a health plus lens can robustly shape an understanding of the health impacts of green recovery projects.

APPENDIX 1: LIST OF GREEN RECOVERY REPORTS, AND DEFINED LIST OF GREEN RECOVERY PROJECTS

Table 1: List of green recovery reports referenced for this work

#	Date of Publication	Title	Organization/Affiliation	Type of Document
1	Mar-20	Green stimulus	Pembina Institute	Report (Canada)
2	Apr-20	8 conditions Canada should attach to upcoming oil and gas bail-outs	Smart Prosperity Institute	Blogpost
3	Apr-20	Greening the recovery	International Monetary Fund	Report (International)
4	May-20	These 10 steps will strengthen Canada's economy and climate	Smart Prosperity Institute	Op-ed
5	May-20	Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change?	Oxford Smith School of Enterprise and the Environment	Report (International)
6	May-20	We don't have to choose between economic recovery and the environment. Funding should be directed at helping us rebuild for long-term resilience.	Authored by employees of the David Suzuki foundation	Op-ed
7	May-20	WHO manifesto for a healthy recovery from COVID-19	World Health Organization	Report (International)
8	Jun-20	Green strings: Principles and conditions for a green recovery from COVID-19 in Canada	International Institute for Sustainable Development	Report (Canada)
9	Jun-20	Building back better with a bold green recovery	Corporate Knights	Report (Canada)
10	Jul-20	Healthy recovery plan: For a safe and sustainable future	Canadian Association of Physicians for the Environment	Report (Canada)
11	Jul-20	Technical report: The case for a green and just recovery	C40 Global Mayors COVID-19 Recovery Task Force	Report (International)
12	Jul-20	Nature conservation should be central to Canada's recovery from Covid-19	Coalition of 235 environmental organizations	Open letter
13	Jul-20	Future-proof Canada's economy by investing in youth hard-hit by pandemic	Authors associated with the World Economic Forum Global shapers	Open letter
14	Jul-20	Green infrastructure can revive post COVID-19 world	Canadian Commission for UNESCO and UNESCO Chair on Food, Biodiversity, and Sustainability Studies	Op-ed
15	Aug-20	Op-ed: Canada's green recovery must support displaced workers	David Suzuki, David Suzuki Foundation	Op-ed
16	Sep-20	Bridge to the future	Task Force for Resilient Recovery	Report (Canada)
17	Sep-20	Making a green recovery inclusive for all Canadians	Smart Prosperity Institute	Blogpost

18	Sep-20	Recommendations for recovery and budget actions in 2020-2021	Green Building Coalition	Report (Canada)
19	Sep-20	Assessment of green recovery plans after COVID-19	We Mean Business Coalition	Report (International)
20	Oct-20	Jobs for a strong and sustainable recovery from Covid-19	Centre for Economic Performance, London School of Economics	Report (International)
21	Oct-20	Making the green recovery work for jobs, income and growth	OECD	Report (International)
22	Oct-20	Green jobs for youth the key to pandemic recovery in Canada	Brennan Strandberg-Salmon, Climate Change Policy and Research Division, British Columbia Council for International Cooperation	Op-ed
23	Nov-20	Canada's Green Building Engine - Market Impact and Opportunities in a Critical Decade	Canada Green Building Council	Report (Canada)
24	Dec-20	COVID-19 and green recovery	World vision	Report (International)

Table 2: Description of green recovery projects identified in this report

#	Green Recovery Projects	Description
1	Chemicals plan	Regulations that enhance health sector engagement in the management of chemicals
2	Clean energy	Expand clean energy sources, decarbonize electricity and implement a clean fuel standard
3	Climate adaptation	Invest in flood protection, resilient roads and buildings, natural infrastructure solutions, and community-centred disaster risk management
4	Decarbonize industry	Incentivize industrial decarbonization and support low and zero-carbon industries
5	Eco-tourism	Expand the Federal Tourism Growth Strategy and invest in building a tourism industry that respects nature
6	Expanding active transportation	Expand walking and biking infrastructure
7	Green infrastructure investments	Build healthy, liveable cities that promote active living, sustainable mobility and energy efficiency. Invest in clean energy, greening transportation systems, green drinking water and sanitation systems, and urban agriculture
8	Improving digital infrastructure	Improve digital infrastructure to build on the global teleworking experience
9	Increasing food security-strengthening local food access	Address food insecurity by investing in community agriculture, community garden, urban agriculture, household and community food storage systems and access to income to purchase food
10	Managing methane emissions	Fund orphan well clean-up, support methane monitoring, and inventory work, and other methane mitigation measures
11	Marine shipping	Develop a national shipping GHG and black carbon reduction strategy, R&D investments to support innovation to decarbonize marine shipping
12	Municipal solid waste management	Reduce waste sector emissions by diverting and treating food waste, capturing landfill gas and improving recycling
13	Protection and conservation (NBS)	Projects that protect nature, biodiversity, freshwater including restoring ecosystems, a habitat renewal fund, a waterfowl management plan, NBS solutions for forests and farmland, a pan-Canadian approach to wildlife protection, healthy oceans and promoting indigenous stewardship of lands and oceans
14	Research & Development	Invest in clean technology, energy storage, battery technology, and carbon capture, utilization and storage.
15	Sustainable construction	Use sustainable materials and reduce embodied carbon emissions from construction
16	Sustainable finance	Promote wider adoption of sustainable finance approaches by implementing recommendations of the Expert Panel on sustainable finance, adopting the EU Sustainable Finance Taxonomy, and stricter European Investment Bank-style requirements for Canada's financial institutions
17	Sustainable fishing	Invest in the transition of aquaculture out of ecologically sensitive areas, reduce industry costs for disease management, minimize production risks from storms, warming waters and ocean acidification, invest in fuel efficient and quiet fishing vessels, and in science and observer programs

18	Sustainable food systems	Promote healthy and sustainable food systems by updating national dietary guidelines to reflect sustainability elements, strengthening local food production, by applying sustainable food production and natural resource management practices, and implementing ecological goods and services programming for agricultural lands
19	Sustainable healthcare	Establish sustainable practices in the healthcare sector by defining targets for healthcare institutions to measure and track environmental performance, and providing access to green infrastructure funding
20	Upgrading buildings	Retrofitting existing residential, public and commercial building stock to increase energy efficiency, set up standards for new buildings and provide tax incentives o new net-zero buildings
21	Upgrading transport	Promote ZEV production and sale for personal and commercial usage, electrify transport, expand public transit, introduce car scrappage scheme, and price road infrastructure
22	Urban green spaces (NBS)	Expand urban tree cover, new urban green space, park trail upgrades, green corridors, increase access to and quality of national and provincial parks, and develop nature-based municipal infrastructure
23	Workforce development	Train a workforce for ecosystem restoration, management, natural tourism and green infrastructure projects, support transitioning energy workers, create green job pathways for youth starting in high school

APPENDIX 2: METHODOLOGY FOR SELECTING GREEN RECOVERY PROJECTS

In step 1 of the analytical methodology employed in this report, green recovery ideas that merited further consideration were identified. For this purpose certain inclusion and exclusion criteria were established, which are outlined in Table 3 below.

Table 3: Inclusion & Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Not examined in complementary SPI reports	Examined in complementary SPI reports
Project or action	Measures e.g. fiscal incentive, policy or regulatory action
Specific project or action	General project or action
Projects that advance health	Projects that don't advance health

First, green recovery ideas discussed in complementary SPI reports were eliminated from further consideration. This is done to avoid research duplication. Second, ideas in the form of a 'measure' such as a fiscal incentive, or a policy or regulatory action were excluded. Instead, only ideas in the form of a project or an action were taken forward for further evaluation. Thus, for example, food security, which involves investing in community agriculture, community garden and food storage systems is a project or an action; whereas sustainable food systems which requires updating national dietary guidelines is considered to be a measure. This is because there is no way to reasonably predict the volume, scope and in turn the health impact of actions or projects that originate from a particular measure. Third, green recovery ideas that are general in nature were excluded from further consideration, whereas those that are specific were included. Thus for example, expanding active transportation infrastructure is a specific green recovery project idea, whereas improving digital infrastructure, which could include a plethora of projects such as increasing broadband connectivity, mobile networks or communications satellites would be a general recovery idea. This is done because it is hard to make a convincing argument regarding the health or health equity impact of a project when the scope of it is unclear. The final criteria used for project selection was based on whether the project or green recovery idea improves health outcomes of individuals. This was assessed based on a preliminary literature review of each of the 7 ideas that had not been excluded from consideration in the earlier stages. Given the health plus lens of this report, this criteria was used to ensure that only projects that can directly benefit health (including health equity) were taken up for further analysis. The assessment as to whether a given green recovery project direct benefits health and health equity was made based on a scan of existing scientific research analyzing the impact of a project on health and health equity.

As shown in Table 4, the project selection strategy was applied to the 23 green recovery ideas. Out of 23, 6 were excluded in stage 1 since they have already been thoroughly dealt with in complementary SPI reports. Of the remaining 17 projects, 7 were excluded since they were not articulated in terms of a project or action. Thereafter, another 3 were eliminated because they were general ideas possibly encompassing a range of projects. Of the remaining 7, 2 were excluded since based on a preliminary literature review, evidence linking these ideas with health was either absent or very tenuous. Five green recovery ideas emerged at the end of step 1: workforce development; expanding active transportation infrastructure; increasing food security; managing methane emissions; and, municipal solid waste management.

Table 4: Project Selection Results

#	Green Recovery Idea	Examined in other SPI Reports	Policy v. Measure	General v. Specific idea	Positive impact on Health
1	Clean energy				
2	Green infrastructure investments				
3	Protection and conservation (NBS)				
4	Upgrading buildings				
5	Upgrading transport				
6	Urban green spaces (NBS)				
7	Decarbonize industry	■			
8	Chemicals plan	■			
9	Marine shipping	■			
10	Research & Development	■			
11	Sustainable finance	■			
12	Sustainable food systems	■			
13	Sustainable healthcare	■			
14	Climate adaptation	■	■		
15	Improving digital infrastructure	■	■		
16	Sustainable construction	■	■		
17	Eco-tourism	■	■	■	
18	Sustainable fishing	■	■	■	
19	Expanding active transportation	■	■	■	■
20	Increasing food security	■	■	■	■
21	Managing methane emissions	■	■	■	■
22	Municipal solid waste management	■	■	■	■
23	Workforce development	■	■	■	■

APPENDIX 3: LIMITATIONS OF ANALYSIS

The analysis in this report has the following limitations:

- First, the green recovery projects that have been highlighted in this report have been filtered out from the universe of 24 green recovery reports and articles published between March and December 2020. This report's analysis must be understood in that context. The implication, therefore, by no means is that these are the only recovery projects that should be advanced. There could potentially be other recovery ideas that also bring forth significant health plus benefits, but have not featured in the 24 sources surveyed for this report.

- Second, this report talks about recovery projects purely through a health plus lens, and does not conduct a fulsome economic evaluation of the benefits of implementing these measure. This mean that the report does not give much information on how many jobs these recovery projects will create, and who it will benefit, among other similar considerations.

- Third, this report excludes projects aimed at decarbonizing building, transport and energy as well as certain nature-based projects from its scope. No health plus analysis of these projects has been done in this report. There are good reasons for this. These projects have been extensively dealt with in other SPI reports. Moreover, based on a co-benefits analysis, which is narrower than the health plus lens of this report, there is a very strong economic case for investing in these projects primarily related to the air pollution benefits accruing from them. These projects therefore merit attention even when a narrow health lens is applied.

- Fourth, the quantity and quality of scientific research for each of the five recovery projects vary. For example, research on the health benefits related to employment or the disproportionate 'blue collar' impact of COVID-19 related job loss is relatively well studied, as compared to understanding the long-term health impacts of living in regions with a higher methane concentration. This report's analysis is therefore limited by the breadth and depth of existing research.

ENDNOTE CITATIONS

1 Statistics Canada 2021a.
2 Statistics Canada 2021b.
3 Canada has committed to cut greenhouse gas emissions by 30% from 2005 levels by 2030.
4 This report uses the definition that a green economic recovery, referred to as a green recovery, is an economic recovery composed primary of investments in individual projects that offer meaningful improvements in environmental performance (reductions in greenhouse gas emissions, waste streams or pollution streams, increased levels of natural conservation and/or restoration, or improvements in the resource efficiency) relative to available alternatives. This definition does not exclude the need for an economic recovery to support economic growth through job creation and increased investment, nor does it exclude the imperative to invest in solutions that support greater equity and inclusion in the Canadian economy.
5 The 1981-1982 recession was caused by the high inflation and sharp increase in oil price following the 1979 Iranian Revolution (Kirby 2015), the 1990-1992 recession was the result of tight monetary policy and high interest rates implemented to fight inflation (Peters 1991), whereas the 2008-09 recession was triggered when the United States' housing bubble burst exposing existing weaknesses in the financial system (Thakor 2015).
6 Ontario Agency for Health Protection and Promotion 2020.
7 Subedi et al. 2020.
8 Vukic 2020.
9 van Loenhout et al. 2020.
10 Environment and Climate Change Canada 2020.
11 World Health Organization 2005.
12 Badash et al. 2017.
13 World Health Organization et al. 1986.
14 Solar & Irwin 2010.
15 The Public Health Agency of Canada (PHAC) further distinguishes between the various kinds of intermediary determinants. Accordingly, behaviours such as diet, physical activity, smoking etc., and biological factors are seen as proximal or downstream factors i.e. factors that most directly influence health. The upstream factors i.e. factors referred to as "structural determinants" by the WHO are seen as ultimately impacting and shaping these proximal downstream factors.
16 Ibid.
17 Ibid.
18 Health Canada 2020.
19 Arcaya et al. 2015.
20 Ibid.
21 Solar & Irwin 2010.
22 Bushnik et al. 2020.
23 Ibid.
24 Subedi et al. 2020.
25 DeLuca et al. 2012.
26 Ibid.
27 Ibid.
28 Craig & van Hemert 2012.
29 Ibid.
30 Craig & van Hemert 2012; Foley 2013; Rydin et al. 2012.
31 Solar & Irwin 2010.
32 Haines 2017.
33 Chang et al. 2017; Scovronick et al. 2019.
34 By assessing both avoided negative consequences and possible beneficial impacts, this report doesn't assume that simply because a project has been linked with reduced adverse health impacts, it also necessarily brings about positive health benefits. Relying on established scientific literature and using learnings from case studies, step 2 helps put together a comprehensive picture of the potential health impact of a project.
35 186 non-unique green recovery ideas were identified from these 24 sources. These were then coded and categorized into 23 thematic categories.
36 A more detailed list of projects which includes short description for each project is given in Appendix 1.
37 For an analysis of the health benefits emerging from investments in energy efficiency, zero-emissions transportation and renewable energy, please read Smart Prosperity's "A green and healthy recovery" (2021).
38 Ideas are listed in alphabetical order. For research transparency, the complete list along with sub-categories will be made available upon request
39 Toronto Public Health 2012; Yazid & Ladim 2015.
40 Public Policy Forum 2015.
41 The section 'Managing Methane Emissions' only considers the health impacts of methane from oil and gas production, whereas the section 'Municipal Solid Waste Management' considers the health impacts of landfill gases which includes carbon dioxide, methane and non-methane organic compounds.
42 Brand 2015.

43 This report uses the terms job loss and job displacement interchangeably and references to either suggest involuntary job loss. The distinction between the two is not always well defined within literature (Eliason and Storrie 2009a)
44 Brand 2015.
45 Black et al. 2015; Bloemen et al. 2018; Browning & Heinesen 2012; Burgard et al. 2007; Sullivan & von Wachter 2009.
46 Black et al. 2015; Hijzen et al. 2010.
47 Ibid.
48 Browning & Heinesen 2012.
49 Eliason & Storrie 2009a.
50 Price 1992.
51 Burgard et al. 2007; Black et al. 2015; Deb et al. 2011; Keefe et al. 2002.
52 Deb et al. 2011; Morris et al. 1992.
53 Black et al. 2015; Eliason & Storrie 2009b.
54 Bloemen et al. 2018; Eliason & Storrie 2009a.
55 Alcohol-related diseases are diseases that flow from serious and long-term alcohol abuse as well as short-term effects on death or hospitalization from these diseases when displacement leads to increased alcohol consumption. It encompasses both psychiatric and somatic diseases including alcohol poisoning, addiction syndrome, alcohol psychosis, varicose vein on gullet, alcoholic disease of the liver, and alcoholic disease of the pancreas.
56 Black et al. 2015; Hijzen et al. 2010.
57 Browning & Heinesen 2012.
58 Ibid.
59 Eliason & Storrie 2009b found an even larger effect on the risk of death and hospitalization from alcohol-related complications
60 Browning & Heinesen 2012.
61 McKee-Ryan et al. 2005.
62 McKee-Ryan et al. 2005; Paul & Moser 2009.
63 Browning & Heinesen 2012.
64 Buffel et al. 2017; Burgard et al. 2007; Keefe et al. 2002.
65 Browning & Heinesen 2012.
66 Keefe et al. 2002.
67 Bloemen et al. 2018.
68 Browning & Heinesen 2012; Sullivan & von Wachter 2009.
69 Van der Noordt et al. 2014.
70 Modini et al. 2016; Repetti et al. 1989; Rodriguez 2002; Ross & Mirowsky 1995; Waddell & Burton 2006.
71 Modini et al. 2016.
72 Ibid.
73 Van der Noordt et al. 2014.
74 Repetti et al. 1989; Waddell & Burton 2006.
75 Modini et al. 2016; Waddell & Burton 2006.
76 Statistics Canada 2021c.
77 Sultana & Ravanera 2020; Yalnizyan 2020.
78 Schembri 2021.
79 Statistics Canada 2020d.
80 Hou et al. 2020.
81 Jerome 2018.
82 Jerome 2018; Kim and Knesebeck, 2015; Lewchuck et al., 2008.
83 Lewchuck et al. 2008.
84 Modini et al. 2016.
85 Butterworth et al. 2011.
86 Kamerāde et al. 2019.
87 Green jobs are jobs that are clean energy-specific i.e. clean energy production, energy efficiency, and environmental management, or jobs promoting sustainability across activities in the value chain including in manufacturing, construction, wholesale trade and professional services (Environmental Entrepreneurs, American Council on Renewable Energy, Clean Energy Leadership Institute, BW Research Partnership 2020).
88 Muro et al. 2019.
89 Ibid.
90 Environmental Entrepreneurs, American Council on Renewable Energy, Clean Energy Leadership Institute, BW Research Partnership 2020.
91 Toronto Public Health 2012; Yazid & Ladim 2015.
92 Van Nijnatten et al. 2020.
93 ParticipACTION 2018.
94 Van der Ploeg & Hillsdon 2017.

95 CCDI Steering Committee 2018.
96 ParticipACTION 2018.
97 Thyfault & Booth 2011; Toronto Public Health 2012.
98 Peçanha et al. 2020.
99 Warburton et al. 2007.
100 Hall et al. 2020.
101 Weinstein et al. 2017.
102 Ali & Kunugi 2020.
103 Weinstein et al. 2017.
104 Chapman et al. 2018.
105 C40 Cities Climate Leadership Group, 2020; Edger et al. 2020; Shin et al. 2012; Sofia et al. 2020; Toronto Public Health 2012; Williams et al. 2018.
106 Toronto Public Health 2012.
107 Hamer & Chida 2008a; Hamer & Chida 2008b; Toronto Public Health 2012.
108 Samitz et al. 2011; Toronto Public Health 2012.
109 Martins et al. 2020.
110 C40 Cities Climate Leadership Group; Edger et al. 2020; Toronto Public Health 2012.
111 Physical Activity Guidelines Advisory Committee 2008; Rebar et al. 2015.
112 Edger et al. 2020; Toronto Public Health 2012.
113 Ibid.
114 Health Canada 2021a.
115 Toronto Public Health 2012.
116 Ibid.
117 Ibid.
118 Violant-Holz et al. 2020.
119 Toronto Public Health 2012.
120 Chapman et al. 2018; Rojas-Rueda et al. 2016; Toronto Public Health 2012.
121 Toronto Public Health 2012.
122 Chapman et al. 2018.
123 Toronto Public Health 2012; Wang et al. 2019.
124 World Health Organization Regional Office for Europe 2002.
125 Hoare et al. 2016.
126 Toronto Public Health 2012.
127 Giles-Corti et al. 2010; Martins et al. 2020; Smith et al. 2017.
128 Swanson et al. 2018.
129 Ibid.
130 Giles-Corti et al. 2010; Martins et al. 2020; Smith et al. 2017.
131 Transportation & the Environment Task Force 2018.
132 Chapman et al. 2018; Toronto Public Health 2012.
133 Toronto Public Health 2012.
134 Giles-Corti et al. 2010.
135 Lee et al. 2017.
136 Mohith 2019.
137 Toronto Public Health 2012.
138 Swanson et al. 2018.
139 Chapman et al. 2018.
140 Rojas-Rueda et al. 2016.
141 Chapman et al. 2018; Toronto Public Health 2012.
142 Toronto Public Health 2012.
143 Ibid.
144 Ibid.
145 Tainio et al. 2016.
146 Saunders et al. 2013.
147 Public Policy Forum 2015.
148 Agriculture and Agri-Food Canada 2020; Deaton & Deaton 2020.
149 Gundersen & Ziliak 2015; Vozoris & Tarasuk 2003.
150 Laraia 2013.
151 Gundersen & Ziliak 2015; Laraia 2013; Vozoris & Tarasuk 2003.
152 Laraia 2013.

153 Gundersen & Ziliak 2015; Vozoris & Tarasuk 2003.
154 Gundersen & Ziliak 2015; Seligman et al. 2007.
155 Laraia 2013.
156 Government of Canada 2020a.
157 Government of Canada 2020a; Pourmotabbed et al., 2020.
158 Ibid.
159 Pourmotabbed et al. 2020.
160 Government of Canada 2020a.
161 Ibid.
162 FAO, IFAD, UNICEF, WFP and WHO 2020.
163 Draper & Freedman 2010; Gregis et al., 2021.
164 Draper & Freedman, 2010.
165 Burt et al. 2021.
166 Long et al. 2019.
167 Ibid.
168 Ali et al. 2019.
169 Ali et al. 2019; Alaimo et al. 2008.
170 Ali et al. 2019; Horst et al. 2017; Audate et al. 2019.
171 Ibid.
172 Ibid.
173 Audate et al. 2019.
174 Emery et al. 2013.
175 Ibid.
176 Ibid.
177 Deaton & Deaton 2020.
178 Weiler et al. 2015.
179 This figure is in 2003 dollars .
180 Vozoris & Tarasuk 2003.
181 Hamelin & Hamel 2009.
182 Smoyer-Tomic et al. 2006.
183 Public Policy Forum 2015.
184 Deaton et al. 2020; Government of Nunavut 2017; Weiler et al., 2015.
185 Deaton et al. 2020.
186 Ke & Ford-Jones 2015; Kuku et al. 2012.
187 Gundersen & Ziliak 2015; Kuku et al. 2012.
188 Niles et al. 2020.
189 Gundersen & Ziliak 2015.
190 Dixon et al. 2007; Smoyer-Tomic et al. 2006; Weiler et al. 2015.
191 Smoyer-Tomic et al. 2006.
192 Deaton et al. 2020.
193 Population and Public Health 2013.
194 Ibid.
195 Government of Canada 2020a.
196 Ibid.
197 Audate et al. 2019.
198 Horst et al. 2017.
199 Ibid.
200 Ibid.
201 Collins et al. 2014.
202 Nogeire-McRae et al. 2018.
203 Horst et al. 2017.
204 Ibid.
205 Collins et al. 2014.
206 Ibid.
207 Population and Public Health 2013; Howard & Edge 2013.
208 Considered toxic under the Canadian Environmental Protection Act, 1999
209 Environment and Climate Change Canada 2018.
210 Hamburg 2021.

211 Environment and Climate Change Canada 2019.
212 Green Budget Coalition 2020.
213 Maryam & Elham 2010.
214 Ibid.
215 Jo et al. 2013.
216 Health Canada 2021b.
217 Sarofim et al. 2017.
218 Nuvolone et al. 2018.
219 Nuvolone et al. 2018; Katsouyanni et al. 2009.
220 U.S. EPA 2020
221 World Health Organization Regional Office for Europe 2013.
222 Amann et al. 2008.
223 Amann et al. 2008.
224 Malley et al. 2017.
225 Health Canada, 2021
226 Goodman et al. 2014.
227 Frumkin & McMichael 2008; Haines et al. 2006; Patz et al. 2000.
228 West et al. 2006.
229 Ibid.
230 Ibid.
231 Sarofim et al. 2017.
232 Ritchie & Roser 2017a.
233 Environmental Defense Fund 2015.
234 Chan et al. 2020; Williams et al. 2021.
235 Ritchie & Roser 2017b.
236 Riley 2020.
237 Cox 2020.
238 Vlavianos 2006.
239 Bains 2013.
240 Natural Resources Canada 2016.
241 Clough 2018; Johnston et al. 2020.
242 Mazumdar 2020.
243 Climate Change and Human Health 2019.
244 Shonkoff et al. 2014; Werner et al. 2015.
245 Chin 2020.
246 Giroux 2014.
247 Primarily composed of carbon dioxide and methane, and to a much smaller extent non-methane organic compounds.
248 Mataloni et al. 2016.
249 Solly et al. 2019.
250 Giusti 2009.
251 Okunola et al. 2019.
252 Porta et al. 2009.
253 Mataloni et al. 2016.
254 Goldberg et al. 1999.
255 Michelozzi et al. 1998.
256 Tomita et al. 2020.
257 Njoku et al. 2019.
258 Gumede & Savage 2017.
259 Elliott et al. 2009.
260 Giroux 2014.
261 Tait et al. 2020.
262 Tait et al. 2020; Ranzi & Dunbar 2015.
263 Walport & Boyd 2017.
264 Ocean Conservancy 2017.
265 Leachate is a liquid product of landfill waste that has broken down.
266 Wagner & Arnold 2008.
267 Ibid.
268 Walker et al. 2004.

269 Ibid.
270 Istrate et al. 2021.
271 Ibid.
272 Ibid.
273 Damery et al., 2008; Ncube et al. 2017.
274 Martuzzi et al. 2010.
275 Fryzuk 1996; Human Rights Council 2020; Waldron 2018.
276 Waldron 2020.
277 Human Rights Council 2020; Waldron 2018.
278 Bharadwaj et al. 2006.
279 Ibid.
280 Bharadwaj et al. 2006; Keske et al. 2018; Weichenthal et al. 2015.
281 Baijius & Patrick 2019; Bharadwaj et al. 2006.
282 Bharadwaj et al. 2006.
283 Human Rights Council 2020.
284 Keske et al. 2018.
285 Ibid.
286 Ibid.
287 Ibid.
288 Damery et al. 2008.
289 C40 Cities Climate Leadership Group 2020; Damery et al. 2008.
290 Damery et al. 2008.
291 Zagozewski et al. 2011.
292 Ibid.
293 Keske et al. 2018
294 It bears mentioning that Recommendation 1 is distinct from a Health in all Policies approach. This report only analyzed green recovery projects and in that context, a HIA before decision-making is recommended. This may or may not be the case for all other policy decisions.
295 McCallum et al. 2015.
296 Collins & Koplan 2009.
297 HIA is embedded into the IAA which specifically requires "baseline information…on existing human health conditions, [the inclusion of] the current state of physical, mental and social well-being and [the incorporation of] a social determinants of health approach to move beyond biophysical health considerations".
298 Physical Activities Regulations 2019; Government of Canada 2020b; Government of Canada 2020c.
299 Diallo & Freeman 2020.
300 Regulations Amending the On-Road Vehicle and Engine Emission Regulations and Other Regulations Made Under the Canadian Environmental Protection Act, 1999.
301 Reduction of Carbon Dioxide Emissions from Coal-fired Generation of Electricity Regulations 2012.
302 McCallum et al. 2015.
303 Savic & Hoicka 2021.
304 Sultana & Ravanera 2020.
305 Ministry of Finance, Government of Canada 2020.
306 Harvey & Orvis 2019.
307 Keating 2020.
308 Strand & Toman 2010.
309 Ramos & Hynes 2020.
310 Howard & Edge 2013.
311 Ibid.

REFERENCES

Adgate, J. L.; Goldstein, B. D., & McKenzie, L. M. (2014). Potential public health hazards, exposures and health effects from unconventional natural gas development. Environmental Science & Technology, *48*(15), 8307–8320. https://doi.org/10.1021/es404621d

Agriculture and Agri-Food Canada. (2020, December 18). Government of Canada rolling out $100M in added support to food security organizations during COVID-19 pandemic [News releases]. Government of Canada. https://www.canada.ca/en/agriculture-agri-food/news/2020/12/government-of-canada-rolling-out-100m-in-added-support-to-food-security-organizations-during-covid-19-pandemic.html

Alaimo, K., Packnett, E., Miles, R. A., & Kruger, D. J. (2008). Fruit and vegetable intake among urban community gardeners. *Journal of Nutrition Education and Behavior*, *40*(2), 94–101. https://doi.org/10.1016/j.jneb.2006.12.003

Alberta Energy (2021). Oil and gas liabilities management. Retrieved March 26, 2021, from https://www.alberta.ca/oil-and-gas-liabilities-management.aspx

Ali, A. M., & Kunugi, H. (2020). COVID-19: A pandemic that threatens physical and mental health by promoting physical inactivity. *Sports Medicine and Health Science*, *2*(4), 221–223. https://doi.org/10.1016/j.smhs.2020.11.00

Ali, J., Lapos, N., Fitzpatrick, S., & Stasiuk, L. (2015). *Health Benefits and Potential Risks of Urban Agriculture* (p. 36). Region of Peel. https://www.peelregion.ca/health/library/pdf/urban-agriculture-fpq.pdf

Amann, M.; Derwent, D.; Forsberg, B., Hänninen, O., Hurley, F., Krzyzanowski, M., de Leeuw F., Liu S. J., Mandin, C., Schneider, J., Schwarze P., & Simpson D. (2008). *Health risks of ozone from long-range transboundary air pollution* (p. 93). WHO Regional Office for Europe. Copenhagen, Denmark. https://www.euro.who.int/__data/assets/pdf_file/0005/78647/E91843.pdf

Arcaya, M. C., Arcaya, A. L., & Subramanian, S. V. (2015). Inequalities in health: Definitions, concepts, and theories. *Global Health Action*, *8*(1). https://doi.org/10.3402/gha.v8.27106

Audate, P. P., Fernandez, M. A., Cloutier, G., & Lebel, A. (2019). Scoping review of the impacts of urban agriculture on the determinants of health. *BMC Public Health*, *19*(1). https://doi.org/10.1186/s12889-019-6885-z

Badash, I., Kleinman, Nicole P.; Barr, S., Jang, J., Rahman, S., & Wu, B. W. (2017). Redefining Health: The Evolution of Health Ideas from Antiquity to the Era of Value-Based Care. *Cureus*, *9*(2), e1018. https://www.cureus.com/articles/6185-redefining-health-the-evolution-of-health-ideas-from-antiquity-to-the-era-of-value-based-care

Baijius, W., & Patrick, R. J. (2019). "We Don't Drink the Water Here": The Reproduction of Undrinkable Water for First Nations in Canada. *Water*, *11*(5). https://agris.fao.org/agris-search/search.do?recordID=US201900443996

Bains, R. (2013). *Opportunities for First Nations Prosperity through Oil and Gas Development* (p. 33). Fraser Institute. https://www.fraserinstitute.org/sites/default/files/opportunities-for-first-nation-prosperity-through-oil-and-gas-development.pdf

Bharadwaj, L., Nilson, S., Judd-Henrey, I., Ouellette, G., Parenteau, L., Tournier, C., Watson, D., Bear, D., Ledoux, G., & Bear, A. (2006). Waste disposal in First-Nations communities: The issues and steps toward the future. *Journal of Environmental Health*, *68*(7), 35–40. https://pubmed.ncbi.nlm.nih.gov/16583553/

Black, S. E., Devereux, P. J., & Salvanes, K. G. (2015). Losing Heart? The Effect of Job Displacement on Health. *ILR Review*, *68*(4), 833–861. https://doi.org/10.1177/0019793915586381

Bloemen, H., Hochguertel, S., & Zweerink, J. (2018). Job loss, firm-level heterogeneity and mortality: Evidence from administrative data. *Journal of Health Economics*, *59*, 78–90. https://doi.org/10.1016/j.jhealeco.2018.03.005

Brand, J. E. (2015). The Far-Reaching Impact of Job Loss and Unemployment. *Annual Review of Sociology*, *41*(1), 359–375. https://doi.org/10.1146/annurev-soc-071913-043237

Browning, M., & Heinesen, E. (2012). Effect of job loss due to plant closure on mortality and hospitalization. *Journal of Health Economics*, *31*(4), 599–616. https://doi.org/10.1016/j.jhealeco.2012.03.001

Buffel, V., Missinne, S., & Bracke, P. (2017). The social norm of unemployment in relation to mental health and medical care use: the role of regional unemployment levels and of displaced workers. *Work, Employment and Society. 31*(3), 501–521. https://doi.org/10.1177/0950017016631442

Burgard, S. A., Brand, J. E., & House, J. S. (2007): Toward a Better Estimation of the Effect of Job Loss on Health. *Journal of Health and Social Behavior*, *48*(4), 369–384. https://doi.org/10.1177/002214650704800403

Burt, K. G., Mayer, G., & Paul, R. (2021). A systematic, mixed studies review of the outcomes of community garden participation related to food justice. *Local Environment*, *26*(1), 17–42. https://doi.org/10.1080/13549839.2020.1861589

Bushnik, T., Tjepkema, M., & Martel, L. (2020). Socioeconomic disparities in life and health expectancy among the household population in Canada. Statistics Canada. https://www.doi.org/10.25318/82-003-x202000100001-eng

Butterworth, P., Leach, L. S., Strazdins, L., Olesen, S. C., Rodgers, B., Broom, D. H. (2011). The psychosocial quality of work determines whether employment has benefits for mental health: results from a longitudinal national household panel survey. *Occupational and Environmental Medicine*, *68*(11), 806–812. https://oem.bmj.com/content/68/11/806

C40 Cities Climate Leadership Group. (2020). *Technical Report: The case for a green and just recovery* (p. 33). C40 Cities. https://www.c40knowledgehub.org/s/article/The-Case-for-a-Green-and-Just-Recovery?language=en_US

CCDI Steering Committee. (2018). At-a-glance How Healthy are Canadians? A brief update. *Health Promotion and Chronic Disease Prevention in Canada : Research, Policy and Practice*, *38*(10), 385–390. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6197609/

Chan, E., Worthy, D. E. J., Chan, D., Ishizawa, M., Moran, M. D., Delcloo, A., & Vogel, F. (2020). Eight-Year Estimates of Methane Emissions from Oil and Gas Operations in Western Canada Are Nearly Twice Those Reported in Inventories. *Environmental Science & Technology*, *54*(23), 14899–14909. https://doi.org/10.1021/acs.est.0c04117

Chang, K. M., Hess, J. J., Balbus, J. M., Buonocore, J. J., Cleveland, D. A., Grabow, M. L., Neff, R., Saari, R. K., Tessum, C. W., Wilkinson, P., Woodward, A., & Ebi, K. L. (2017). Ancillary health effects of climate mitigation scenarios as drivers of policy uptake: A review of air quality, transportation and diet co-benefits modeling studies. *Environmental Research Letters*, *12*(11), 113001. https://doi.org/10.1088/1748-9326/aa8f7

Chang, K. M., Hess, J. J., Balbus, J. M., Buonocore, J. J., Cleveland, D. A., Grabow, M. L., Neff, R., Saari, R. K., Tessum, C. W., Wilkinson, P., Woodward, A., & Ebi, K. L. (2017). Ancillary health effects of climate mitigation scenarios as drivers of policy uptake: A review of air quality, transportation and diet co-benefits modeling studies. *Environmental Research Letters*, *12*(11), 113001. https://doi.org/10.1088/1748-9326/aa8f7b

Chapman, R., Keall, M., Howden-Chapman, P., Grams, M., Witten, K., Randal, E., & Woodward, A. (2018). A Cost Benefit Analysis of an Active Travel Intervention with Health and Carbon Emission Reduction Benefits. *International Journal of Environmental Research and Public Health, 15*(5), 962. https://doi.org/10.3390/ijerph15050962

Chin, F. (2020, September 18). The boom in household waste and what our garbage tells us about the COVID economy | CBC Radio. CBC. https://www.cbc.ca/radio/costofliving/household-waste-boom-covid-1.572842

Climate Change and Human Health. (2019). Canadian Public Health Association. https://www.cpha.ca/climate-change-and-human-health

Clough, E. (2018). Environmental justice and fracking: A review. *Current Opinion in Environmental Science & Health, 3*, 14–18. https://doi.org/10.1016/j.coesh.2018.02.005

Collins, J., & Koplan, J. P. (2009). Health Impact Assessment: A Step Toward Health in All Policies. *Journal of the American Medical Association*, *302*(3), 315. https://doi.org/10.1001/jama.2009.1050

Collins, P. A., Power, E. M., & Little, M. H. (2014). Municipal-level responses to household food insecurity in Canada: A call for critical, evaluative research. Canadian Journal of Public Health, *105*(2), e138–e141. https://doi.org/10.17269/cjph.105.4224

Cox, S. (2020, February 28). 'A massive liability': B.C.'s orphan fracking wells set to double this year. The Narwhal. https://thenarwhal.ca/a-massive-liability-b-c-s-orphan-fracking-wells-set-to-double-this-year/

Craig, K., & van Hemert, J. (2012). *Healthy Communities Practice Guide* (p. 76). Canadian Institute of Planners. https://www.cip-icu.ca/Files/Resources/CIP-Healthy-Communities-Practice-Guide_FINAL_lowre.aspx

Damery, S., Petts, J., Walker, G., & Smith, G. (2008). Addressing environmental inequalities: Waste management (p. 134). Environment Agency. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/291065/scho0507bmrv-e-e.pdf

Deaton, B. J., & Deaton, B. J. (2020). Food security and Canada's agricultural system challenged by COVID-19. *Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie*, *68*(2), 143–149. https://doi.org/10.1111/cjag.12227

Deaton, B. J., Scholz, A., & Lipka, B. (2020). An empirical assessment of food security on First Nations in Canada. *Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie, 68*(1), 5–19. https://doi.org/10.1111/cjag.12208

Deb, P.; Gallo, W. T., Ayyagari, P., Fletcher, J. M., & Sindelar, J. L. (2011): The effect of job loss on overweight and drinking. *Journal of Health Economics*, *30*(2), 317–327. https://pubmed.ncbi.nlm.nih.gov/21288586/

DeLuca, P. F., Buist, S., & Johnston, N. (2012). The Code Red Project: Engaging Communities in Health System Change in Hamilton, Canada. *Social Indicators Research*, *108*(2), 317–327. https://www.jstor.org/stable/23260313

Diallo, T., & Freeman, S. (2020). Health impact assessment—Insights from the experience of Québec. *Environmental Health Review*. https://doi.org/10.5864/d2020-002

Dixon, J., Omwega, A. M., Friel, S., Burns, C., Donati, K., & Carlisle, R. (2007). The Health Equity Dimensions of Urban Food Systems. *Journal of Urban Health*, *84*(1), 118–129. https://doi.org/10.1007/s11524-007-9176-4

Draper, C., & Freedman, D. (2010). Review and Analysis of the Benefits, Purposes, and Motivations Associated with Community Gardening in the United States. *Journal of Community Practice*, *18*(4), 458–492. https://doi.org/10.1080/10705422.2010.519682

Edger, R., Howard, C., Lem, M., Zigby, J., Pétrin-Desrosiers, C., Marie Doyle, H., Kitching, G. T., Luo, O. D., Cohen, A., Wu, K., Kirsch Carbon, J. J., Létourneau, S. G., & Kuhl, J. (2020). *Healthy Recovery Plan: For a Safe and Sustainable Future* (p. 30). Canadian Associations of Physicians for the Environment. https://drcourtneyhoward.ca/cape-healthy-recovery-plan-for-a-safe-and-sustainable-future/

Eliason, M., & Storrie, D. (2009a). Does Job Loss Shorten Life? *Journal of Human Resources*, *44*(2), 277–302. https://www.jstor.org/stable/20648898, checked on 12/18/2020

Eliason, M., & Storrie, D. (2009b): Job loss is bad for your health – Swedish evidence on cause-specific hospitalization following involuntary job loss. *Social Science & Medicine*, *68*(8), 1396–1406. https://pubmed.ncbi.nlm.nih.gov/19243870/

Elliott, P., Richardson, S., Abellan, J. J., Thomson, A., Hoogh, C. de, Jarup, L., & Briggs, D. J. (2009). Geographic density of landfill sites and risk of congenital anomalies in England. *Occupational and Environmental Medicine*, *66*(2), 81–89. https://doi.org/10.1136/oem.2007.038497

Emery, J. C. H., Fleisch, V. C., & McIntyre, L. (2013). How a Guaranteed Annual Income Could Put Food Banks Out of Business. *The School of Public Policy Publications*, *6*. https://doi.org/10.11575/sppp.v6i0.42452

Environment and Climate Change Canada (2018): Canada's methane regulations for the upstream oil and gas sector. Retrieved March 1, 2021, from https://www.canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/proposed-methane-regulations-additional-information.html

Environment and Climate Change Canada. (2019). About methane emissions. Retrieved March 1, 2021, from https://www.canada.ca/en/environment-climate-change/services/climate-change/global-methane-initiative/about-methane-emissions.html

Environment and Climate Change Canada. (2020, November 19). *Government of Canada charts course for clean growth by introducing bill to legislate net-zero emissions by 2050* [Press release]. Ottawa, Ontario. https://www.canada.ca/en/environment-climate-change/news/2020/11/government-of-canada-charts-course-for-clean-growth-by-introducing-bill-to-legislate-net-zero-emissions-by-2050.html

Environmental Defense Fund (2015): Economic analysis of methane emission reduction opportunities in the Canadian oil and natural gas industries. Retrieved March 5, 2021, from, https://www.edf.org/sites/default/files/content/canada_methane_cost_curve_report.pdf

Environmental Entrepreneurs, American Council on Renewable Energy, Clean Energy Leadership Institute, BW Research Partnership. (2020). *Clean jobs, Better jobs. An examination of clean energy job wages and benefits* (p. 60). https://e2.org/wp-content/uploads/2020/10/Clean-Jobs-Better-Jobs.-October-2020.-E2-ACORE-CELI.pdf

FAO, IFAD, UNICEF, WFP and WHO. (2020). The State of Food Security and Nutrition in the World 2020. Transforming food systems for affordable healthy diets. Rome, FAO. https://doi.org/10.4060/ca9692en

Foley, J. (2013). Defining Healthy Communities. Health Resources in Action. Retrieved February 13, 2021, from https://hria.org/wp-content/uploads/2016/10/defininghealthycommunities.original.pdf

Frumkin, H. & McMichael, A. J. (2008): Climate change and public health: thinking, communicating, acting. In *American Journal of Preventive Medicine*, *35*(5), 403–410. https://pubmed.ncbi.nlm.nih.gov/18929964/

Fryzuk, L. A. (1996). Environmental Justice in Canada: An Empirical Study and Analysis of the Demographics of Dumping in Nova Scotia [Dalhousie Univeristy]. https://www.collectionscanada.gc.ca/obj/s4/f2/dsk3/ftp04/mq24966.pdf

Giang, A., & Castellani, K. (2020). Cumulative air pollution indicators highlight unique patterns of injustice in urban Canada. *Environmental Research Letters*, *15*(12), 124063. https://doi.org/10.1088/1748-9326/abcac5

Giles-Corti, B., Foster, S., Shilton, T., & Falconer, R. (2010). The co-benefits for health of investing in active transportation. *New South Wales Public Health Bulletin*, *21*(6), 122. https://doi.org/10.1071/NB10027

Giroux, L. (2014). *State of Waste Management in Canada.* Giroux Environmental Consulting. https://www.ccme.ca/files/Resources/waste/wst_mgmt/State_Waste_Mgmt_in_Canada%20April%202015%20revised.pdf

Giusti, L. (2009). A review of waste management practices and their impact on human health. Waste Management, *29*(8), 2227–2239. https://doi.org/10.1016/j.wasman.2009.03.028

Goldberg, M. S., Siemiatyck, J., DeWar, R., Désy, M., Riberdy, H. (1999). Risks of developing cancer relative to living near a municipal solid waste landfill site in Montreal, Quebec, Canada. *Archives of Environmental Health*, *54*(4), 291–296. https://doi.org/10.1080/00039899909602488

Goodman, J. E.; Prueitt, R. L.; Sax, S. N., Lynch, H. N., Zu, K., Lemay, J. C., King, J. M., Venditti, F. J. (2014): Weight-of-evidence evaluation of short-term ozone exposure and cardiovascular effects. *Critical Reviews in Toxicology*, *44*(9), 725–790. https://doi.org/10.3109/10408444.2014.937854

Government of Canada, (2020a). Food insecurity and mental health during the COVID-19 pandemic. https://www150.statcan.gc.ca/n1/pub/82-003-x/2020012/article/00001-eng.htm

Government of Canada. (2017). *2017 Nunavut Food Price Survey* (p. 1). Nunavut Bureau of Statistics. http://www.stats.gov.nu.ca/Publications/Historical/Prices/Food%20

Price%20Survey,%20Select%20Items%20Comparison%20Nunavut_CanadaCPI%20StatsUpdate,%202017.pdf

Government of Canada. (2020b). Impact Assessments in Canada: Frequently Asked Questions. https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/impact-assessments-canada-faq.html

Government of Canada. (2020c). Tailored Impact Statement Guidelines Template for Designated Projects Subject to the Impact Assessment Act and the Nuclear Safety and Control Act. https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/tailored-impact-statement-guidelines-projects-impact-assessment-nuclear-safety-act.html#_Toc16256527

Green Budget Coalition. (2020). *Recommendations for Recovery and Budget Actions in 2020-2021* (p. 108). Green Budge Coalition. https://greenbudget.ca/wp-content/uploads/sites/4/2020/10/Green-Budget-Coalitions-final-Recommendations-for-Recovery-and-Budget-Actions-in-2020-2021-Advance-copy-September-30-2020-web-site.pdf

Gregis, A., Ghisalberti, C., Sciascia, S., Sottile, F., & Peano, C. (2021). Community Garden Initiatives Addressing Health and Well-Being Outcomes: A Systematic Review of Infodemiology Aspects, Outcomes, and Target Populations. *International Journal of Environmental Research and Public Health*, *18*(4), 1943. https://doi.org/10.3390/ijerph18041943

Gumede, P. R., & Savage, M. J. (2017). Respiratory health effects associated with indoor particulate matter (PM2.5) in children residing near a landfill site in Durban, South Africa. *Air Quality, Atmosphere & Health*, *10*(7), 853–860. https://link.springer.com/article/10.1007/s11869-017-0475-y

Gundersen, C., & Ziliak, J. P. (2015). Food Insecurity And Health Outcomes. *Health Affairs*, *34*(11), 1830–1839. https://doi.org/10.1377/hlthaff.2015.0645

Haines, A., Kovats, R. S., Campbell-Lendrum, D., Corvalan, C. (2006). Climate change and human health: impacts, vulnerability and public health. *Public Health*, *120*(7), 585–596. https://pubmed.ncbi.nlm.nih.gov/16542689/

Hall, G., Laddu, D. R., Phillips, S. A., Lavie, C. J., & Arena, R. (2020). A tale of two pandemics: How will COVID-19 and global trends in physical inactivity and sedentary behavior affect one another? *Progress in Cardiovascular Diseases*, *64*, 108-110. https://doi.org/10.1016/j.pcad.2020.04.005

Hamburg, S. (2021). Methane: The other important greenhouse gas. Environmental Defense Fund. Retrieved March 26, 2021, from https://www.edf.org/climate/methane-other-important-greenhouse-gas

Hamelin, A. M., & Hamel, D. (2009). Food insufficiency in currently or formerly homeless persons is associated with poorer health. *Canadian Journal of Urban Research*, *18*(2), 1–25. https://homelesshub.ca/resource/food-insufficiency-currently-or-formerly-homeless-persons-associated-poorer-health

Hamer, M., & Chida, Y. (2008a). Active commuting and cardiovascular risk: A meta-analytic review. *Preventive Medicine*, *46*(1), 9–13. https://doi.org/10.1016/j.ypmed.2007.03.006

Hamer, M., & Chida, Y. (2008b). Walking and primary prevention: A meta-analysis of prospective cohort studies. *British Journal of Sports Medicine*, *42*(4), 238–243. https://doi.org/10.1136/bjsm.2007.03997

Harvey, H., & Orvis, R. (2019). Designing climate solutions. A policy guide for low-carbon energy. Washington, DC: Island Press.

Health Canada (2020): Social determinants of health and health inequalities. Retrieved February 13, 2021, from https://www.canada.ca/en/public-health/services/health-promotion/population-health/what-determines-health.html

Health Canada (2021b): Carbon monoxide poisoning. Retrieved February 13, 2021, from https://www.canada.ca/en/health-canada/services/air-quality/indoor-air-contaminants/keep-carbon-monoxide-out-your-home.html

Health Canada. (2021a). Health impacts of air pollution in Canada: Estimates of premature deaths and nonfatal outcomes - 2021 report. https://epe.lac-bac.gc.ca/100/201/301/weekly_acquisitions_list-ef/2021/21-21/publications.gc.ca/collections/collection_2021/sc-hc/H144-51-2021-eng.pdf

Hijzen, A., Upward, R., & Wright, P. W. The Income Losses of Displaced Workers. *Journal of Human Resources*, *45*(1), 243–269. https://doi.org/10.1353/jhr.2010.0000

Hoare, E., Milton, K., Foster, C., & Allender, S. (2016). The associations between sedentary behaviour and mental health among adolescents: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, *13*(1), 108. https://doi.org/10.1186/s12966-016-0432-4

Horst, M., McClintock, N., & Hoey, L. (2017). The Intersection of Planning, Urban Agriculture, and Food Justice: A Review of the Literature. *Journal of the American Planning Association*, *83*(3), 277–295. https://doi.org/10.1080/01944363.2017.1322914

Hou, F., Picot, G., & Zhang, J. (2020, August 20). Transitions into and out of employment by immigrants during the COVID-19 lockdown and recovery. Statistics Canada. https://www150.statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00070-eng.htm

Howard, A., & Edge, J. (2013). *Household Food Security in Canada* (p. 66). The Conference Board of Canada. https://tfss.ca/wp-content/uploads/2017/11/Enough-for-All_Household-Food-Security-in-Canada_-CBoC.pdf

Human Rights Council. (2020). *Report of the Special Rapporteur on the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes on his visit to Canada* (p. 23). http://www.srtoxics.org/wp-content/uploads/2020/09/Canada-HRC-45_AUV.pdf

Istrate, I.R., Galvez-Martos, J. L., & Dufour, J. (2021). The impact of incineration phase-out on municipal solid waste landfilling and life cycle environmental performance: Case study of Madrid, Spain. *Science of The Total Environment*, 755, 142537. https://doi.org/10.1016/j.scitotenv.2020.142537

Jerome, A. M. (2018, May). Improving Individual And Community Health Through Better Employment Opportunities. Health Affairs Blog. Advance online publication. https://doi.org/10.1377/hblog20180507.274276

Jo, J. Y., Kwon, Y. S., Lee, J. W., Park, J. S., Rho, B. H., & Choi, W.-I. (2013). Acute respiratory distress due to methane inhalation. *Tuberculosis and Respiratory Diseases*, *74*(3), 120–123. https://doi.org/10.4046/trd.2013.74.3.120

Johnston, J. E., Chau, K., Franklin, M., & Cushing, L. (2020). Environmental Justice Dimensions of Oil and Gas Flaring in South Texas: Disproportionate Exposure among Hispanic communities. *Environmental Science & Technology*, *54*(10), 6289–6298. https://doi.org/10.1021/acs.est.0c00410

Kamerāde, D., Wang, S., Burchell, B., Balderson, S. U., & Coutts, A. (2019). A shorter working week for everyone: How much paid work is needed for mental health and well-being? *Social Science & Medicine*, *241*, 112353. https://doi.org/10.1016/j.socscimed.2019.06.006

Katsouyanni, K., Samet, J. M., Anderson, H. R., Atkinson, R., Le Tertre, A., Medina, S., Samoli, E., Touloumi, G., Burnett, R. T., Krewski, D., Ramsay, T., Dominici, F., Peng, R. D., Schwartz, J., & Zanobetti, A. (2009*). Air Pollution and Health: A European and North American Approach* (APHENA) (HEI Research Report 142). Boston, MA. Health Effects Institute. https://www.healtheffects.org/system/files/APHENA142.pdf

Ke, J., & Ford-Jones, E. L. (2015). Food insecurity and hunger: A review of the effects on children's health and behaviour. *Paediatrics & Child Health*, *20*(2), 89–91. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4373582/

Keating, C. (2020, October 19). Study: Green recovery plans can unlock millions more jobs than "return-to-normal" stimulus. Business Green. https://www.businessgreen.com/news/4021857/study-green-recovery-plans-unlock-millions-jobs-return-normal-stimulus

Keefe, V., Reid, P., Ormsby, C., Robson, B., Purdie, G., Baxter, J., & Incorporated, Ngäti Kahungunu Iwi (2002). Serious health events following involuntary job loss in New Zealand meat processing workers. *International Journal of Epidemiology*, *31*(6), 1155–1161. https://doi.org/10.1093/ije/31.6.1155

Keske, C. M. H., Mills, M., Godfrey, T., Tanguay, L., & Dicker, J. (2018). Waste management in remote rural communities across the Canadian north: Challenges and opportunities. *Detritus*, *2*(1), 63. https://doi.org/10.31025/2611-4135/2018.13641

Kim, T. J., & Knesebeck, O. von dem (2015). Is an insecure job better for health than having no job at all? A systematic review of studies investigating the health-related risks of both job insecurity and unemployment. BMC Public Health, 15, 985. https://doi.org/10.1186/s12889-015-2313-1

Kirby, J. (2015, January 16). Putting the last three big oil crashes in perspective - Macleans.ca. Maclean's. https://www.macleans.ca/economy/economicanalysis/putting-the-last-three-oil-crashes-in-perspective/

Krzyzanowski, J. (2012). Environmental pathways of potential impacts to human health from oil and gas development in northeast British Columbia, Canada. *Environmental Reviews*, *20*(2), 122–134. https://doi.org/10.1139/A2012-005

Kuku, O., Garasky, S., & Gundersen, C. (2012). The relationship between childhood obesity and food insecurity: A nonparametric analysis. *Applied Economics*, *44*(21), 2667–2677. https://doi.org/10.1080/00036846.2011.566192

Laraia, B. A. (2013). Food Insecurity and Chronic Disease. *Advances in Nutrition*, *4*(2), 203–212. https://doi.org/10.3945/an.112.003277

Lee, R. J., Sener, I. N., & Jones, S. N. (2017). Understanding the role of equity in active transportation planning in the United States. *Transport Reviews*, *37*(2), 211–226. https://doi.org/10.1080/01441647.2016.1239660

Lewchuk, W., Clarke, M., & Wolff, A. de (2008). Working without commitments: precarious employment and health. *Work, Employment and Society*, *22*(3), 387–406. https://doi.org/10.1177/0950017008093477

Long, C. R., Rowland, B., Steelman, S. C., & McElfish, P. A. (2019). Outcomes of disease prevention and management interventions in food pantries and food banks: A scoping review. *British Medical Journal*, *9*(8), e029236. https://doi.org/10.1136/bmjopen-2019-029236

Malley, C. S., Henze, D. K., Kuylenstierna, J. C. I., Vallack, H. W., Davila, Y., Anenberg, S. C., Turner, M. C., & Ashmore, M. R. (2017). Updated Global Estimates of Respiratory Mortality in Adults ···30Years of Age Attributable to Long-Term Ozone Exposure. *Environmental Health Perspectives*, *125*(8), 87021. https://doi.org/10.1289/EHP1390

Martins, L. C. G., Lopes, M. V. D. O., Diniz, C. M., & Guedes, N. G. (2020). The factors related to a sedentary lifestyle: A meta-analysis review. *Journal of Advanced Nursing*. https://doi.org/10.1111/jan.14669

Martuzzi, M., Mitis, F., & Forastiere, F. (2010). Inequalities, inequities, environmental justice in waste management and health. *European Journal of Public Health*, *20*(1), 21–26. https://doi.org/10.1093/eurpub/ckp216

Maryam, A., & Elham, B. (2010). Deaths involving natural gas inhalation. *Toxicology and Industrial Health*, *26*(6), 345–347. https://doi.org/10.1177/0748233710369122

Mataloni, F., Badaloni, C., Golini, M. N., Bolignano, A., Bucci, S., Sozzi, R., Forastiere, F [Francesco], Davoli, M., & Ancona, C. (2016). Morbidity and mortality of people who live close to municipal waste landfills: A multisite cohort study. *International Journal of Epidemiology*, *45*(3), 806–815. https://doi.org/10.1093/ije/dyw052

Muzumdar, P. (2020, February 26). *Climate change and health equity.* National Collaborating Centre for Determinants of Health. https://nccdh.ca/blog/entry/climate-change-and-health-equity

McCallum, L. C., Ollson, C. A., & Stefanovic, I. L. (2015). Advancing the practice of health impact assessment in Canada: Obstacles and opportunities. *Environmental Impact Assessment Review*, *55*, 98–109. https://doi.org/10.1016/j.eiar.2015.07.007

McKee-Ryan, F., Song, Z., Wanberg, C. R., & Kinicki, A. J. (2005). Psychological and Physical Well-Being During Unemployment: A Meta-Analytic Study. *Journal of Applied Psychology*, *90*(1), 53–76. https://doi.org/10.1037/0021-9010.90.1.53

Michelozzi, P., Fusco, D., Forastiere, F., Ancona, C., Dell'Orco, V., & Perucci, C. A. (1998). Small area study of mortality among people living near multiple sources of air pollution. *Occupational and Environmental Medicine*, *55*(9), 611–615. https://doi.org/10.1136/oem.55.9.611

Ministry of Finance, Government of Canada (2020). Supporting Canadians and Fighting COVID-19: Fall Economic Statement 2020. Department of Finance, Government of Canada. https://www.budget.gc.ca/fes-eea/2020/report-rapport/toc-tdm-en.html (edited)

Modini, M., Joyce, S., Mykletun, A., Christensen, H., Bryant, R. A., Mitchell, P. B., & Harvey, S. B. (2016). The mental health benefits of employment: Results of a systematic meta-review. *Australasian Psychiatry : Bulletin of Royal Australian and New Zealand College of Psychiatrists*, *24*(4), 331–336. https://doi.org/10.1177/1039856215618523

Mohith, M. (2019). (In)Equity in Active Transportation Planning: Toronto's Overlooked Inner Suburbs [York University]. https://fes.yorku.ca/wp-content/uploads/2019/09/Mohith_M_MP.pdf

Morris, J. K., Cook, D. G., & Shaper, A. G. (1992). Non-employment and changes in smoking, drinking, and body weight. *British Medical Journal*, *304*(6826), 536–541. https://doi.org/10.1136/bmj.304.6826.536

Muro, M., Tomer, A., Shivaram, R., & Kane, J. (April 2019). *Advancing inclusion through clean enegy jobs* (Metropolitan Policy Program). Brookings Institution. http://publications.gc.ca/collections/collection_2019/eccc/En4-366-1-2019-eng.pdf

Natural Resources Canada (2016). Oil Sands. A strategic resource for Canada, North America and the global market.

Ncube, F., Ncube, E. J., & Voyi, K. (2017). A systematic critical review of epidemiological studies on public health concerns of municipal solid waste handling. *Perspectives in Public Health*, *137*(2), 102–108. https://doi.org/10.1177/1757913916639077

Niles, M. T., Bertmann, F., Belarmino, E. H., Wentworth, T., Biehl, E., & Neff, R. (2020). The Early Food Insecurity Impacts of COVID-19. *Nutrients*, *12*(7), 2096. https://doi.org/10.3390/nu12072096

Njoku, P. O., Edokpayi, J. N., & Odiyo, J. O. (2019). Health and Environmental Risks of Residents Living Close to a Landfill: A Case Study of Thohoyandou Landfill, Limpopo Province, South Africa. *International Journal of Environmental Research and Public Health*, *16*(12). https://doi.org/10.3390/ijerph16122125

Nogeire-McRae, T., Ryan, E. P., Jablonski, B. B. R., Carolan, M., Arathi, H. S., Brown, C. S., Saki, H. H., McKeen, S., Lapansky, E., & Schipanski, M. E. (2018). The Role of Urban Agriculture in a Secure, Healthy, and Sustainable Food System. BioScience, 68(10), 748–759. https://doi.org/10.1093/biosci/biy071

Nuvolone, D., Petri, D., & Voller, F. (2018). The effects of ozone on human health. *Environmental Science and Pollution Research International*, *25*(9), 8074–8088. https://doi.org/10.1007/s11356-017-9239-3

Ocean Conservancy. (2017). *THE NEXT WAVE: Investment Strategies for Plastic Free Seas* (p. 97). Ocean Conservancy. https://oceanconservancy.org/wp-content/uploads/2017/05/the-next-wave.pdf

Okunola A, A., Kehinde I, O., Oluwaseun, A., & Olufiropo E, A. (2019). Public and Environmental Health Effects of Plastic Wastes Disposal: A Review. *Journal of Toxicology and Risk Assessment*, *5*(2). https://doi.org/10.23937/2572-4061.1510021

Ontario Agency for Health Protection and Promotion (Public Health Ontario) (2020): COVID-19 in Ontario – A Focus on Diversity. Toronto, Ontario. Retrieved March 11, 2021, from https://www.publichealthontario.ca/-/media/documents/ncov/epi/2020/06/covid-19-epi-diversity.pdf?la=en

ParticipACTION. (2018). *ParticipACTION Pulse Report*. ParticipACTION. https://www.participaction.com/en-ca/resources/pulse-report

Patz, J. A., McGeehin, M. A., Bernard, S. M., Ebi, K. L., Epstein, P. R., Grambsch, A., Gubler, D. J., Reither, P., Romieu, I., Rose, J. B., Samet, J. M., & Trtanj, J. (2000). The potential health impacts of climate variability and change for the United States: Executive summary of the report of the health sector of the U.S. National Assessment. *Environmental Health Perspectives*, *108*(4), 367–376. https://doi.org/10.1289/ehp.00108367

Paul, K. I., & Moser, K. (2009). Unemployment impairs mental health: Meta-analyses. *Journal of Vocational Behavior*, *74*(3), 264–282. https://doi.org/10.1016/j.jvb.2009.01.001

Peçanha, T., Goessler, K. F., Roschel, H., & Gualano, B. (2020). Social isolation during the COVID-19 pandemic can increase physical inactivity and the global burden of

cardiovascular disease. *American Journal of Physiology-Heart and Circulatory Physiology*, *318*(6), H1441–H1446. https://doi.org/10.1152/ajpheart.00268.2020

Peters, D. D. (1991, April). Canada: Recession and Recovery. *Business Economics*, *26*(2), 51–55. https://www.jstor.org/stable/23485851

Physical Activities Regulations, 2019–285 SOR 22 (2019). https://laws.justice.gc.ca/eng/regulations/SOR-2019-285/page-1.html

Physical Activity Guidelines Advisory Committee. (2008). *Physical activity guidelines advisory committee report*. Washington, DC: U.S. Department of Health and Human Services.

Population and Public Health. (2013). *Evidence Review: Food Security* (p. 66). BC Ministry of Health. https://www2.gov.bc.ca/assets/gov/health/about-bc-s-health-care-system/public-health/healthy-living-and-healthy-communities/food-security-evidence-review.pdf

Porta, D., Milani, S., Lazzarino, A. I., Perucci, C. A. & Forastiere, F. (2009). Systematic review of epidemiological studies on health effects associated with management of solid waste. *Environmental Health : A Global Access Science Source*, *8*, 60. https://doi.org/10.1186/1476-069X-8-60

Pourmotabbed, A., Moradi, S., Babaei, A., Ghavami, A., Mohammadi, H., Jalili, C., Symonds, M. E., & Miraghajani, M. (2020). Food insecurity and mental health: A systematic review and meta-analysis. *Public Health Nutrition*, *23*(10), 1778–1790. https://doi.org/10.1017/S136898001900435X.

Price, R. H. (1992). Psychosocial Impact of Job Loss on Individuals and Families. *Current Directions in Psychological Science*, *1*(1), 9–11. https://www.jstor.org/stable/20182115

Public Policy Forum. (2015). *Toward Food Security in Canada's North [Summary Report]*. Public Policy Forum. https://ppforum.ca/wp-content/uploads/2018/05/Toward-Food-Security-in-Canadas-North-PPF-report.pdf

Ramos, G., & Hynes, W. (2020). A systemic resilience approach to dealing with Covid-19 and future shocks (Tackling Coronavirus (COVID-19): Contributing to a Global Effort, p. 18). OECD. https://read.oecd-ilibrary.org/view/?ref=131_131917-kpfefrdfnx&title=A-Systemic-Resilience-Approach-to-dealing-with-Covid-19-and-future-shocks

Ranzi, A., & Dunbar, M. (November 2015). *Waste and human health: Evidence and needs: WHO Meeting* Report (p. 31). World Health Organization Regional Office for Europe. https://www.euro.who.int/__data/assets/pdf_file/0003/317226/Waste-human-health-Evidence-needs-mtg-report.pdf

Rebar, A. L., Stanton, R., Geard, D., Short, C., Duncan, M. J., & Vandelanotte, C. (2015). A meta-meta-analysis of the effect of physical activity on depression and anxiety in non-clinical adult populations. *Health Psychology Review*, *9*(3), 366–378. https://doi.org/10.1080/17437199.2015.1022901

Reduction of Carbon Dioxide Emissions from Coal-fired Generation of Electricity Regulations, SOR/2012-167 (2012). https://canadagazette.gc.ca/rp-pr/p2/2012/2012-09-12/html/sor-dors167-eng.html

Regulations Amending the On-Road Vehicle and Engine Emission Regulations and Other Regulations Made Under the Canadian Environmental Protection Act, 1999, SOR/2015-186 (2015). https://canadagazette.gc.ca/rp-pr/p2/2015/2015-07-29/html/sor-dors186-eng.html

Repetti, R. L., Matthews, K. A., & Waldron, I. (1989). Employment and women's health: Effects of paid employment on women's mental and physical health. *American Psychologist*, *44*(11), 1394–1401. https://doi.org/10.1037/0003-066X.44.11.1394

Riley, S. J. (2020, April 17). 11 things you need to know as Trudeau announces $1.7 billion to clean up 'festering' orphan and inactive wells. *The Narwhal*. https://thenarwhal.ca/11-things-trudeau-1-7-billion-clean-up-festering-orphan-inactive-wells/

Ritchie, H., & Roser, M. (2017a). *$CO_2$and Greenhouse Gas Emissions*. Our World in Data. https://ourworldindata.org/co2/country/canada?country=~CAN#citation

Ritchie, H., & Roser, M. (2017b). *Emissions by sector.* Our World in Data. https://ourworldindata.org/emissions-by-sector

Rodriguez, E. (2002). Marginal employment and health in Britain and Germany: Does unstable employment predict health? *Social Science & Medicine*, *55*(6), 963–979. https://doi.org/10.1016/s0277-9536(01)00234-9

Rojas-Rueda, D., de Nazelle, A., Andersen, Z. J., Braun-Fahrländer, C., Bruha, J., Bruhova-Foltynova, H., Desqueyroux, H., Praznoczy, C., Ragettli, M. S., Tainio, M., & Nieuwenhuijsen, M. J. (2016). Health Impacts of Active Transportation in Europe. *PLOS ONE*, *11*(3), e0149990. https://doi.org/10.1371/journal.pone.0149990

Ross, C. E., & Mirowsky, J. (1995). Does Employment Affect Health? *Journal of Health and Social Behavior*, *36*(3), 230–243. https://doi.org/10.2307/2137340

Rydin, Y., Bleahu, A., Davies, M., Dávila, J. D., Friel, S., Grandis, G. de, Groce, N., Hallal, P. C., Hamilton, I., Howden-Chapman, P., Lai, K.-M., Lim, C. J., Martins, J., Osrin, D., Ridley, I., Scott, I., Taylor, M., Wilkinson, P., & Wilson, J. (2012). Shaping cities for health: Complexity and the planning of urban environments in the 21st century. *Lancet (London, England)*, *379*(9831), 2079–2108. https://doi.org/10.1016/S0140-6736(12)60435-8

Samitz, G., Egger, M., & Zwahlen, M. (2011). Domains of physical activity and all-cause mortality: Systematic review and dose-response meta-analysis of cohort studies. *International Journal of Epidemiology*, *40*(5), 1382–1400. https://doi.org/10.1093/ije/dyr112

Sarofim, M. C., Waldhoff, S. T., & Anenberg, S. C. (2017). Valuing the Ozone-Related Health Benefits of Methane Emission Controls. *Environmental and Resource Economics*, *66*(1), 45–63. https://doi.org/10.1007/s10640-015-9937-6

Saunders, L. E., Green, J. M., Petticrew, M. P., Steinbach, R., & Roberts, H. (2013). What Are the Health Benefits of Active Travel? A Systematic Review of Trials and Cohort

Studies. *PLoS ONE*, *8*(8), e69912. https://doi.org/10.1371/journal.pone.0069912

Savic, K., & Hoicka, C. (2021, January 21). Guest Blog: Post-COVID-19 Indigenous Economic Recovery—Reconciliation in the Energy Transition [Smart Prosperity Institute]. Smart Prosperity Institute Blog. https://institute.smartprosperity.ca/ReconciliationEnergyTransition

Schembri, L. (2021, March 11). *COVID-19, savings and household spending*. Bank of Canada. https://www.bankofcanada.ca/wp-content/uploads/2021/03/remarks-2021-03-11.pdf

Scovronick, N., Budolfson, M., Dennig, F., Errickson, F., Fleurbaey, M., Peng, W., Socolow, R. H., Spears, D., & Wagner, F. (2019). The impact of human health co-benefits on evaluations of global climate policy. *Nature Communications*, *10*(1), 2095. https://doi.org/10.1038/s41467-019-09499-x

Seligman, H. K., Bindman, A. B., Vittinghoff, E., Kanaya, A. M., & Kushel, M. B. (2007). Food Insecurity is Associated with Diabetes Mellitus: Results from the National Health Examination and Nutrition Examination Survey (NHANES) 1999–2002. *Journal of General Internal Medicine*, *22*(7), 1018–1023. https://doi.org/10.1007/s11606-007-0192-6

Shonkoff, S. B. C., Hays, J., & Finkel, M. L. (2014). Environmental public health dimensions of shale and tight gas development. *Environmental Health Perspectives*, *122*(8), 787–795. https://doi.org/10.1289/ehp.1307866

Smith, M., Hosking, J., Woodward, A., Witten, K., MacMillan, A., Field, A., Baas, P., & Mackie, H. (2017). Systematic literature review of built environment effects on physical activity and active transport – an update and new findings on health equity. *International Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 158. https://doi.org/10.1186/s12966-017-0613-9

Smoyer-Tomic, KarenE., Spence, JohnC., & Amrhein, C. (2006). Food Deserts in the Prairies? Supermarket Accessibility and Neighborhood Need in Edmonton, Canada. *Professional Geographer*, *58*(3), 307–326. https://doi.org/10.1111/j.1467-9272.2006.00570.x

Solar, O., & Irwin, A. (2010). *A Conceptual Framework for Action on the Social Determinants of Health: Social Determinants of Health Discussion Paper 2* (Debates, Policy & Practice, Case Studies). Geneva. World Health Organization. https://www.who.int/sdhconference/resources/ConceptualframeworkforactiononSDH_eng.pdf

Solly, J., Poissonnier, G., Petigny, J., Ménigault, C., Luisce, T., Harscoë, E., David, A., Mitsios, A., Laberge, M., Lysenko, D., & Moore, Pat, Dimoff, Adrian. (2019). *Economic study of the Canadian plastic industry, markets and waste*. Environment and Climate Change Canada. http://publications.gc.ca/collections/collection_2019/eccc/En4-366-1-2019-eng.pdf

Spencer, B., Lawler, J., Lowe, C., Thompson, L., Hinckley, T., Kim, S.-H., Bolton, S., Meschke, S., Olden, J. D., & Voss, J. (2017). Case studies in co-benefits approaches to climate change mitigation and adaptation. *Journal of Environmental Planning and Management*, *60*(4), 647–667. https://doi.org/10.1080/09640568.2016.116828

Statistics Canada (2020a): Labour Force Survey, November 2020 (The Daily). Available online at https://www150.statcan.gc.ca/n1/en/daily-quotidien/201204/dq201204a-eng.pdf?st=K2VwriPv.

Statistics Canada (2020b): Labour Force Survey, September 2020 (The Daily). Available online at https://www150.statcan.gc.ca/n1/en/daily-quotidien/201009/dq201009a-eng.pdf?st=xAQ4Ncwa.

Statistics Canada (2021c): Labour force characteristics, monthly, seasonally adjusted and trend-cycle, last 5 months. Statistics Canada. Available online at https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410028701.

Statistics Canada (2021d): Gross domestic product, income and expenditure, fourth quarter 2020 (The Daily). Available online at https://www150.statcan.gc.ca/n1/en/daily-quotidien/210302/dq210302a-eng.pdf?st=TQOz35Lq.

Strand, J., & Toman, M. (2010). *"Green Stimulus," Economic Recovery, and Long-Term Sustainable Development* (p. 30) [Policy Research Working Paper]. World Bank. https://openknowledge.worldbank.org/handle/10986/19956

Subedi, R., Greenberg, L., & Turcotte, M. (2020, October 28). *COVID-19 mortality rates in Canada's ethno-cultural neighbourhoods*. Statistics Canada. https://www150.statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00079-eng.htm

Sullivan, D., & Wachter, T. von (2009). Job Displacement and Mortality: An Analysis Using Administrative Data. *The Quarterly Journal of Economics*, *124*(3), 1265–1306. https://www.jstor.org/stable/40506257

Sultana, A., & Ravanera, C. (2020). *A Feminist Economy Recovery Plan for Canada: Making the economy work for everyone*. The Institute for Gender and the Economy (GATE); YWCA Canada. https://static1.squarespace.com/static/5f0cd2090f50a31a91b37ff7/t/5f205a15b1b7191d12282bf5/1595955746613/Feminist+Economy+Recovery+Plan+for+Canada.pdf

Swanson, A., van Lierop, D., & Kirk, S. (2018). Gender Equity and Cycling in Canada: Background Information and Literature Summary (p. 7). Velo Canada Bikes. https://www.canadabikes.org/wp-content/uploads/2019/04/Gender-Equity-and-Cycling-in-Canada_-Background-information-and-Literature-Summary.pdf

Tainio, M., de Nazelle, A. J., Götschi, T., Kahlmeier, S., Rojas-Rueda, D., Nieuwenhuijsen, M. J., de Sá, T. H., Kelly, P., & Woodcock, J. (2016). Can air pollution negate the health benefits of cycling and walking? *Preventive Medicine*, *87*, 233–236. https://doi.org/10.1016/j.ypmed.2016.02.002

Tait, P. W., Brew, J., Che, A., Costanzo, A., Danyluk, A., Davis, M., Khalaf, A., McMahon, K., Watson, A., Rowcliff, K., & Bowles, D. (2020). The health impacts of waste incineration: A systematic review. *Australian and New Zealand Journal of Public Health*, *44*(1), 40–48. https://doi.org/10.1111/1753-6405.12939

Thakor, A. V. (2015). The Financial Crisis of 2007–2009: Why Did It Happen and What Did We Learn? *Review of Corporate Finance Studies*, *4*(2), 155–205. https://doi.org/10.1093/rcfs/cfv001

Thyfault, J. P., & Booth, F. W. (2011). Lack of regular physical exercise or too much inactivity. *Current Opinion in Clinical Nutrition and Metabolic Care*, *14*(4), 374–378. https://doi.org/10.1097/MCO.0b013e3283468e69

Tomita, A., Cuadros, D. F., Burns, J. K., Tanser, F., & Slotow, R. (2020). Exposure to waste sites and their impact on health: a panel and geospatial analysis of nationally representative data from South Africa, 2008–2015. *The Lancet Planetary Health*, *4*(6), e223-e234. https://doi.org/10.1016/S2542-5196(20)30101-7

Toronto Public Health. (2012). *Road to Health: Improving Walking and Cycling in Toronto* (A Healthy Toronto By Design, p. 109). Toronto Public Health. https://www.toronto.ca/legdocs/mmis/2012/hl/bgrd/backgroundfile-46520.pdf

Transportation and the Environment Task Force. (2018). *Active Transportation: A Survey of Policies, Programs and Experience* (p. 71). https://comt.ca/Reports/Active%20Transportation%202018.pdf

United Nations Development Programme. (November 2016). *Scaling Up Climate Action to Achieve the Sustainable Development Goals*. New York, USA. United Nations Development Programme. https://t.co/BwOt3btKJt?amp=1

U.S. EPA. Integrated Science Assessment (ISA) for Ozone and Related Photochemical Oxidants (Final Report, Apr 2020). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-20/012, 2020.

van der Noordt, M., IJzelenberg, H., Droomers, M., & Proper, K. I. (2014). Health effects of employment: A systematic review of prospective studies. *Occupational and Environmental Medicine*, *71*(10), 730–736. https://doi.org/10.1136/oemed-2013-101891

van der Ploeg, H. P., & Hillsdon, M. (2017). Is sedentary behaviour just physical inactivity by another name? International Journal of Behavioral Nutrition and Physical Activity, 14(1), 142. https://doi.org/10.1186/s12966-017-0601-0

van Loenhout, J., Below, R., & McClean, D. (2020). *Human cost of disasters: An overview of the last 20 years 2000-2019.* UN Office for Disaster Risk Reduction; Centre for Research on the Epidemiology of Disasters. https://cred.be/sites/default/files/CRED-Disaster-Report-Human-Cost2000-2019.pdf

Van Nijnatten, D., Dalby, S., & Roberts, W. (2020, July 22). Green infrastructure can revive post COVID-19 world. IPolitics. https://ipolitics.ca/2020/07/22/green-infrastructure-can-revive-post-covid-19-world/

Violant-Holz, V., Gallego-Jiménez, M. G., González-González, C. S., Muñoz-Violant, S., Rodríguez, M. J., Sansano-Nadal, O., & Guerra-Balic, M. (2020). Psychological health and physical activity levels during the covid-19 pandemic: A systematic review. *International Journal of Environmental Research and Public Health*, *17*(24), 1–19. Scopus. https://doi.org/10.3390/ijerph17249419

Vlavianos, Nickie (2006): Albertans' concerns about health impacts and oil and gas development: A summary. Alberta Civil Liberties Research Centre; Canadian Institute of Resources Law. Retrieved March 5, 2021, from https://cirl.ca/sites/default/files/Human%20Rights%20Papers/Vlavianos_HumanRights_Paper_1.pdf

Vozoris, N. T., & Tarasuk, V. S. (2003). Household Food Insufficiency Is Associated with Poorer Health. *The Journal of Nutrition*, *133*(1), 120–126. https://doi.org/10.1093/jn/133.1.120

Vukic, S. (2020, October 27). Global number of natural disasters increases ten times. Vision of Humanity. https://www.visionofhumanity.org/global-number-of-natural-disasters-increases-ten-times/

Waddell, G., Burton, A. K. (2006). Is work good for your health and well-being?. Department of Work and Pensions, Government of the United Kingdom. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/214326/hwwb-is-work-good-for-you.pdf.

Wagner, T., & Arnold, P. (2008). A new model for solid waste management: An analysis of the Nova Scotia MSW strategy. *Journal of Cleaner Production*, *16*(4), 410–421. https://doi.org/10.1016/j.jclepro.2006.08.016

Waldron, I. (2018). Re-thinking waste: Mapping racial geographies of violence on the colonial landscape. *Environmental Sociology*, *4*(1), 36–53. https://doi.org/10.1080/23251042.2018.1429178

Waldron, I. (2020). *Environmental Racism in Canada*. Canadian Commission for UNESCO's IdeaLab.

Walker, S., Colman, R., Wilson, J., Monette, A., Harley, G., Connett, P., & Wendt, F. (2004). *The Nova Scotia GPI Solid Waste-Resource Accounts* (p. 198). Genuine Progress Index for Atlantic Canada. http://www.gpiatlantic.org/pdf/solidwaste/solidwaste.pdf

Wang, X., Rodríguez, D. A., Sarmiento, O. L., & Guaje, O. (2019). Commute patterns and depression: Evidence from eleven Latin American cities. *Journal of Transport & Health, 14*. https://doi.org/10.1016/j.jth.2019.100607

Walport, M., & Boyd, I. (2017). *From waste to resource* productivity (p. 222). Government Office for Science and Department for Environment, Food & Rural Affairs. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/667480/from-waste-to-resource-productivity-evidence-case-studies.pdf

Warburton, D. E. R. W. E., Katzmarzyk, P. T. K. T., Rhodes, R. E. R. E., & Shephard, R. J. S. J. (2007). Evidence-informed physical activity guidelines for Canadian adults. *Applied Physiology, Nutrition, and Metabolism*. https://doi.org/10.1139/H07-123

Weichenthal, S., Van Rijswijk, D., Kulka, R., You, H., Van Ryswyk, K., Willey, J., Dugandzic, R., Sutcliffe, R., Moulton, J., Baike, M., White, L., Charland, J.-P., & Jessiman, B. (2015). The impact of a landfill fire on ambient air quality in the north: A case study in Iqaluit, Canada. Environmental Research, 142, 46–50. https://doi.org/10.1016/j.envres.2015.06.018

Weiler, A. M., Hergesheimer, C., Brisbois, B., Wittman, H., Yassi, A., & Spiegel, J. M. (2015). Food sovereignty, food security and health equity: A meta-narrative mapping exercise. *Health Policy and Planning*, *30*(8), 1078–1092. https://doi.org/10.1093/heapol/czu109

Weinstein, A. A., Koehmstedt, C., & Kop, W. J. (2017). Mental health consequences of exercise withdrawal: A systematic review. *General Hospital Psychiatry*, *49*, 11–18. https://doi.org/10.1016/j.genhosppsych.2017.06.001

Werner, A. K., Vink, S., Watt, K., & Jagals, P. (2015). Environmental health impacts of unconventional natural gas development: A review of the current strength of evidence. *The Science of the Total Environment*, *505*, 1127–1141. https://doi.org/10.1016/j.scitotenv.2014.10.084

West, J. J., Fiore, A. M., Horowitz, L. W., & Mauzerall, D. L. (2006). Global health benefits of mitigating ozone pollution with methane emission controls. *Proceedings of the National Academy of Sciences of the United States of America*, *103*(11), 3988–3993. https://doi.org/10.1073/pnas.0600201103

Williams, J. P., Regehr, A., & Kang, M. (2021). Methane Emissions from Abandoned Oil and Gas Wells in Canada and the United States. *Environmental Science & Technology*, *55*(1), 563–570. https://doi.org/10.1021/acs.est.0c04265

World Health Organization (2005): Constitution of the World Health Organization 45th ed. Available online at https://apps.who.int/gb/bd/PDF/bd47/EN/constitution-en.pdf?ua=1, checked on 2/3/2021.

World Health Organization; Health and Welfare Canada; Canadian Public Health Association (1986): Ottawa Charter for Health Promotion. International Conference on Health Promotion, November 17-21. Ottawa, Canada.

World Health Organization. Regional Office for Europe. ("2002)". A Physically active life through everyday transport with a special focus on children and older people and examples and approaches from Europe. Copenhagen : WHO Regional Office for Europe. https://apps.who.int/iris/handle/10665/107405

Yazid, M. R. M., & Ladim, M. A. (2015). *Urban Design and Active-Transport*. *4*(3), 4. https://www.ijeat.org/wp-content/uploads/papers/v4i3/C3761024315.pdf

Zagozewski, R., Judd-Henrey, I., Nilson, S., & Bharadwaj, L. (2011). Perspectives on past and Present Waste Disposal Practices: A community-Based Participatory Research Project in Three Saskatchewan First Nations Communities. *Environmental Health Insights*, *5*. https://doi.org/10.4137/EHI.S6974

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