

SOCIAL CONNECTEDNESS
FELLOWSHIP PROGRAM

Low-Income Groups and the Effects of Climate Change on Malnutrition and Food Security

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ABSTRACT

In Canada, the dominant agro-food system is unstable, unsustainable, and a major contributor to global warming and food insecurity. The adoption of resilient and sustainable food systems must become a global priority, and metropolitan areas are a good place to start. Montreal forms an integral part of this system, as it is both a victim and a contributor. Entrenched poverty and increasingly vulnerable minority groups, reliance on fossil fuels and food imports, high carbon emissions, inadequate infrastructure, and the spread of the built environment all prevent the city from fully embracing sustainable development. To remedy this, policy-makers should focus on assisting the development of urban and peri-urban agriculture by building greater collaborative networks; creating a national database on climate change and food security, and rethinking the way we understand and use this information; prioritizing context-specific policies; enabling urban farming to contribute towards the local economy and assisting others in their transition; investing in green energy and green infrastructure, and updating obsolete building regulations; and by breaking bad habits through social awareness campaigns, poverty alleviation policies, and choice editing policies.

INTRODUCTION

Beyond its intimate connection with the right to life, the right to food is a matter of dignity and human welfare, a vital condition for the realization of society's full potential. As such, access to quality food ought to be understood and approached as both an individual right and a collective responsibility. But despite the high stakes and the speed of modernity, malnutrition and food insecurity are far from being eradicated, even in countries with robust liberal welfare systems. This is why the adoption of resilient and sustainable food systems must become a global priority. This urgent need was echoed by Millennial Development Goal #1 on the eradication of extreme poverty and hunger, and #7 on environmental sustainability. More recently, it was re-emphasized in a number of the Sustainable Development Goals, established in 2015 by the United Nations.

Today, the right to food is consistently undermined by our production and

consumption patterns. The problem is also further complicated by the growing challenge of rapid climate change. Unfortunately, in modern economies, the sanctity of the principles of cost-effective production and economies of scale tend to justify a host of environmentally destructive activities. In Canada, the vast majority of food purchases result from intensive farming — commonly perceived as a key driver of national economies — and an important part of those purchases comes from imports. Among the many consequences of this dependence are the excessive use of harmful chemicals, high reliance on fossil fuels, the depletion of natural resources, and volatile food prices. These dynamics leave little space for fresh, healthy, micronutrient rich, and locally grown food sold at competitive yet fair prices. To put it simply, in Canada, the dominant agro-food system is unstable, unsustainable, and a major contributor to global warming and food insecurity, issues which exacerbate one another.

The overarching purpose of this work is to establish a narrative substantiating the importance of sustainable development and social connectedness in building vibrant and prosperous societies. To that end, this report will assess the current situation, both globally and by focusing in on the Montreal metropolitan area so as to build a comprehensive understanding of local realities. In doing so, the report will examine current food systems, urban areas, and climate change in urban areas. Then, it will take into consideration encouraging initiatives, before addressing potential solutions not yet implemented. The latter will aim to find solutions to the failures of existing food systems by securing the access and affordability of nutritious and healthy food, by building urban resilience, and by improving environmental protection (through conscious consumption, waste reduction and so on).

FOOD SECURITY AND FOOD SYSTEMS

During the 1996 World Food Summit, food security was described as a state in which “all people, at all times, have physical, social and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preference for an active and healthy life” (FAO, 2006). This definition puts food security in direct contrast with starvation as well as malnutrition. On one hand, starvation is a “widespread or generalized atrophy (wasting away) of body tissues either because

food is unavailable or because it cannot be taken in or properly absorbed” (Encyclopedia Britannica, 2017). Amartya Sen emphasized the former part of the definition by arguing, “Starvation is the characteristic of some people not having enough food to eat. It is not the characteristic of there being not enough food to eat” (Sen 1981). Malnutrition on the other hand, is the “physical condition resulting either from a faulty or inadequate diet (i.e., a diet that does not supply normal quantities of all nutrients)” (Encyclopedia Britannica, 2017).

Four conditions undermine food security: the adequate supply of food (i.e. physical availability); economic and physical accessibility (which depends on purchasing power and on supply); adequate absorption of necessary nutrients through food (this depends on the quality of food); and the stability of food systems over time. Moreover, before reaching our plate, food generally goes through five distinct stages, which constitute a food system: production, transportation, storage, distribution, and consumption. Every single one of these features is pivotal to food security, as are the activities associated with them, including marketing, packaging, retail, catering, etc. The five stages, the associated activities, and the infrastructures required to feed a population can all be regrouped under the umbrella term, ‘food system’. There is a multitude of food systems operating simultaneously, each responding to a complex interaction of social, political, economic, and environmental contexts. Each dimension of a food system affects, and is affected by, climate change, which means that they can potentially increase individual vulnerability to climate change and capacity for resilience. To a great extent, the effects that food systems have on the environment and on food security depend on the scale on which they operate.

Today, global food security remains an elusive ideal. Despite broad consensus that enough food is being produced to feed the entire world, there is currently 870 million chronically undernourished people worldwide (FAO et al., 2012), and this is merely a fraction of the total amount of people who do not have adequate access to healthy food (Vermeulen et al., 2012). This is paralleled by slowing agricultural productivity and a growing concern that that production will soon need to increase substantially in order to accommodate the world’s growing population. The other issue is that changes in incomes can influence consumption patterns in negative ways, leading people to encourage unstable and unsustainable industries. For example, lower incomes can push people to consume cheaper, highly caloric processed foods, while income growth can lead to an increasing consumption of high-priced goods

such as meat (Stage et al., 2009; von Braun and Tadesse, 2012). In the future, these trends are likely to intensify.

Background

Global trade liberalization, which took place during the second half of the 20th century, largely explains the dominance of global food supply chains. Because, in order for food to be traded internationally, it must be produced in massive quantities. This process can involve, among other things, the use of large amounts of pesticides, deforestation, the slaughtering of millions of animals, etc. Food traded on the global market also often goes through extensive industrial processing, various methods of preservation, packaging, and long distance transportation. Furthermore, food crops are being increasingly converted into biofuel production in order to sustain our dependency on fuel. All of these activities have disastrous effects on the environment by generating air pollution, greenhouse gas emissions, long term environmental impacts, dependence on energy, and excessive food waste. According to recent research, worldwide, roughly 30 to 40 percent of food is wasted in the process (Godfray et al., 2010). In countries like Canada, most of this waste is created by the purchasers and the retailers (IMECHE, 2013).

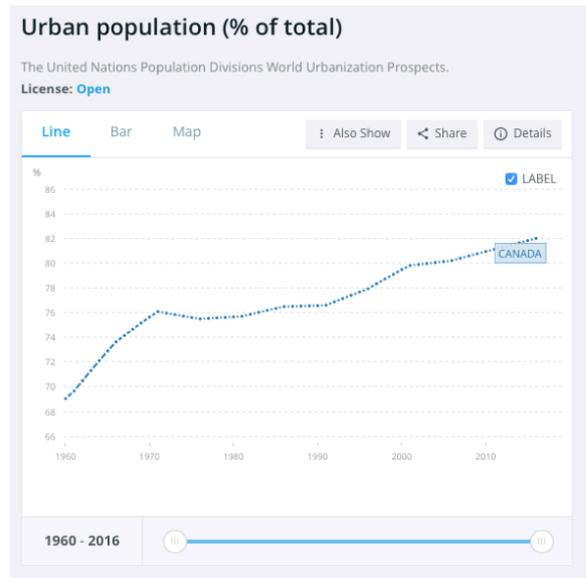
With increased consolidation and corporate concentration of the food industry, the food sector has come to be dominated by large, privately owned, commercial farms, agri-businesses, transnational food companies, and supermarkets. Another issue is that prices that are set internationally, and are subject to speculation, are extremely volatile and ill-adjusted to local contexts. The 2007-2008 financial crisis and the resulting spikes in prices demonstrated just how dangerous dependency on food imports can really be (von Braun and Tadesse, 2012). But when speaking of food affordability, one must be careful not to dismiss the fact that international prices are also often too low for local producers to be able to stand a chance, or even to ensure that workers receive decent wages and enjoy a good quality of life. For these reasons, even in high-income countries, many remain food insecure.

This is not to say that local food systems have gone extinct. In fact, connected to larger food systems through whole sales and retails, informal sector vending has always been a source of income, and has played an important role in ensuring access to food for low-income groups. Besides, in the aftermath of industrialization, there appears to be a growing desire to shorten the distance between the producer and the

consumer and to protect local food systems. This is due in part to the increasing realization that local systems play an especially important role in food security and growing environmental consciousness.

URBAN AREAS

While urban populations tend to enjoy higher incomes and better living conditions, they are facing considerable inequality. In addition, over half of the world’s population is concentrated in urban areas. This is due in part to the steady pattern of individuals migrating from rural areas to crowded cities in search of new opportunities, only to find more often than not that little is being done to secure these opportunities for them. Cities are also an important area of focus because urbanization is only expected to continue in the near and distant future.



Source: World Bank

With over 1.7 million residents, Montreal is the second most populated city in Canada. Although it has fluctuated over the years, the city’s population density has always been very high, especially when compared to the 2016 national record of 3.9 people per square kilometer. After a period of decline, Montreal’s population density has started to increase again since 2011. In 2016, it approximated 4,662 thousand persons per square kilometer. Both the overall population and the population density of Montreal are expected to continue to grow steadily in the years to come. This is a challenge for city planners and policy-makers alike.

Population of Montreal, Metropolitan Area, and Canada by year

	City of Montreal		Montreal Metropolitan Area	
	Population	% Increase	Population	% Increase
2001	1,039,534		3,426,350	
2006	1,620,693	35.9%	3,635,571	5.76%
2011	1,649,519	1.75%	3,824,221	4.95
2016	1,704,694	3.3%	4,098,927	6.7%
Total		39%		16%

Urban Areas and Food Security

In urban areas, food insecurity and malnutrition can be attributed to an array of social issues, leading people to face difficult challenges, including low and irregular incomes, inadequate housing and skyrocketing housing prices, inadequate infrastructures, and limited access to services. In addition, overall, members of low-income groups are net-buyers of food, which makes access and affordability their primary concern. This also means that quality tends to be relegated to the background. While the ability to secure one's access to food is cause for concern in cities, the risk of food shortages remains greater in rural areas. Food insecurity in urban areas is therefore brought on by increasing food prices, periods of low income, and spending on other necessities such as health, housing, and heating.

Urban populations are nonetheless vulnerable to external shocks because urban consumers tend to rely on a complex combination of different food systems, with both local and distant sources. The effects of social, political, economic, or environmental crises can easily affect food systems, and therefore consumers, jeopardizing food security. Such shocks also have a cumulative effect, which increases their destructive potential and makes isolating the effects of a particular event more challenging. People living in low-income urban settlements are usually the first and the most affected by events, and with little disposable income, their resilience is much lower.

Low-Income Groups in Montreal

Today, being employed is not nearly enough to rise above poverty. According to Food Banks Canada, 1 in 6 Canadians who turn to food banks have a job. Between 1997 and 2013, the proportion of minimum wage employees to the total workforce has increased from 3.6% to 6.3% (Galarneau and Fecteau, 2014). Moreover, according to a study by Centraide of Greater Montreal and the Institut national de la recherche scientifique (INRS), the number of individuals who consider themselves to be part of the 'working poor' category rose by almost 30% between 2001 and 2012. Meanwhile, employment has only increased on average by less than 1% every year. The 2008 crisis and the recession that followed did not help the situation. In 2012, roughly 126,000 individuals could be counted among the working poor, which represented almost 8.6% of the total Montreal workforce in 2012 and a 7.7% growth rate since 2006. Among them, 38% were single parents, most of whom were women.

Overall, there were roughly 70,000 low-income families, and over 20,000 single-parent families in Montreal between 2010 and 2014. The likelihood of being part of the working poor category was also much higher among immigrants. Furthermore, the Montreal metropolitan area has the highest concentration of low-income neighborhoods in Canada, as well as the highest concentration of low-income persons living in said neighborhoods (33% of the total low-income population). Finally, the 2016 Hunger Count of Greater Montreal estimated that 946,578 requests for food aid had been made in 2016 alone, an 8% increase from the previous year.

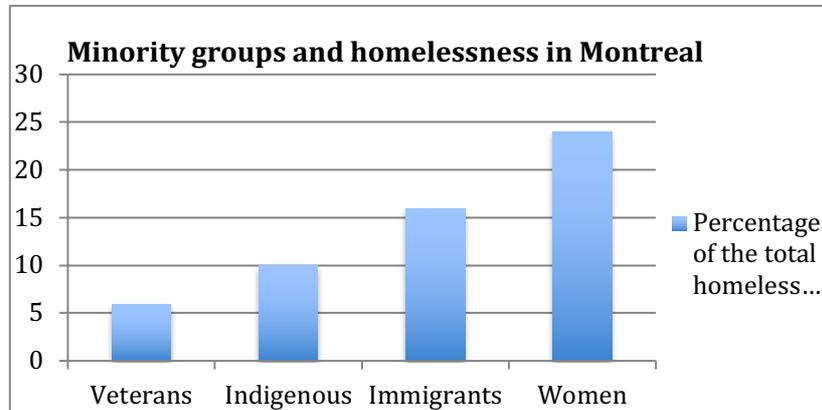
Homelessness

According to the I Count MTL 2015 report, in March 2015, there were 3,016 visibly homeless individuals in Montreal (staying at emergency shelters, transitional housing, or sleeping outside) and 356 ‘hidden homeless’ (staying in hotels, motels, rooming houses, or with other people). Although the focus here is on the visibly homeless, these two categories share a great deal of similarities. It must also be emphasized that these statistics are mere estimates. The actual numbers are extremely difficult to obtain and are probably much higher, especially if the census was conducted during the summer, when the number of people sleeping outside tends to skyrocket. Before this report, the last attempt of this sort was done in 1998, as part of the census. At that time, local community groups estimated that there were nearly 29,000 homeless people living in Montreal between 1996 and 1997 (Chevalier and Fournier, 1998). Nevertheless, the 2015 figure represents a rate of 15.4 homeless persons per 10,000 residents. Roughly one quarter of these people had been homeless for over four years, and half of them had been homeless at least twice during the past three years.

Overall, homelessness tends to be caused by financial issues as well as drug and alcohol addiction, though among women, violence and abuse are more common causes. The majority of homeless individuals are over 30 years old, and rely on social assistance benefits as their main source of income. Of the services available to them, they tend to turn to shelters and transition housing the most. Next in line are day centres and soup kitchens, followed closely by hospitals.

Because vulnerable populations tend to overlap, it is relevant to consider how that is occurring in Montreal. Veterans represent 6% of the city’s overall homeless population. While Indigenous people only represent 0.6% of the total population, they

make up 10% of its homeless population. In addition, 16% of the city’s homeless are immigrants and 39% of homeless immigrants are women. This percentage is notably higher than the overall percentage of homeless women, which is 24%. Lastly, 22% of homeless immigrant women have underage children under their care.



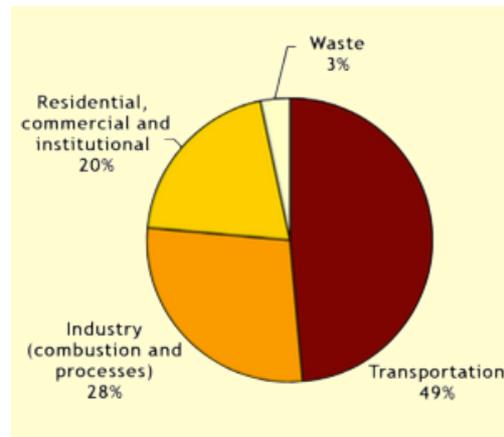
(Latimer et al., 2015)

URBAN AREAS AND CLIMATE CHANGE

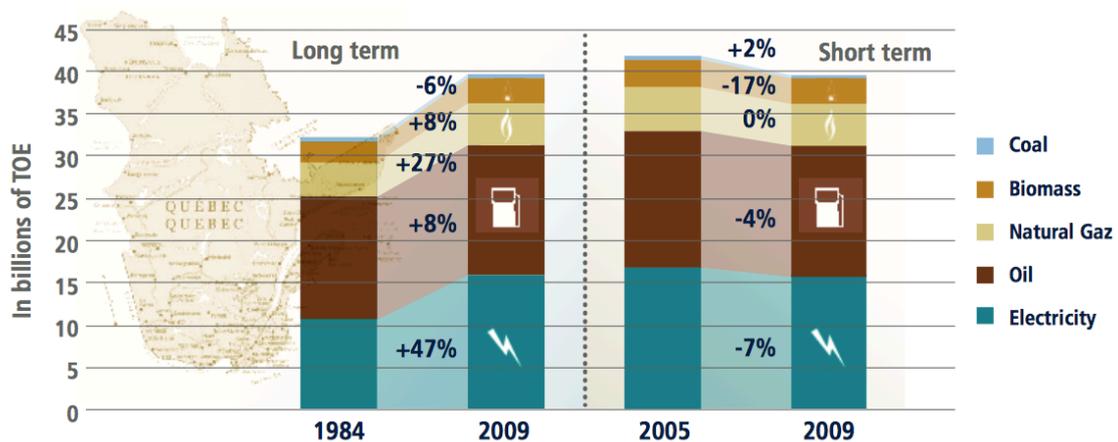
Cities contribute to, and are affected by, climate change in several different ways. The built environment provides the conditions for increased energy consumption and greenhouse gas emissions, which have negative impacts on the surface (creating an urban heat island) and the environment in general. In fact, as areas of concentrated human activity, “Cities are responsible for 67% of the total global energy consumption and more than 70% of greenhouse gas emissions and these trends significantly intensify the severity of some of the two great challenges of our time; climate change and energy security” (UNU-IAS, 2017).

In Montreal, energy consumption has been increasing over the years. There is the typical traffic and industrial activity, as well as increased demand for ventilation, air conditioning, and refrigeration during the summer. But energy consumption really peaks during the winter as Montrealers try to keep warm. Cold waves typically occur from November to March, and the period of extreme cold lasts between December and February. Moving away from oil to electric heating has helped reduce emissions, but oil consumption remains very high. In Quebec, electricity and biomass are sourced locally, while fossil fuels must be imported from other provinces or countries. Once again, infrastructure and population density play an important role in this. In

addition, during this period, reliance on food imports also increases.



Montréal community emissions in 2003, (Logé, 2006).



Note: Proportions are function of consumed energy, converted in TOE, meaning tonnes of oil equivalent.
 Source: Quebec Department of Natural Resources, *Consommation finale par forme d'énergie (1984-2009)*, data available online at <http://mrn.gouv.qc.ca/energie/statistiques/statistiques-consommation-forme.jsp>.

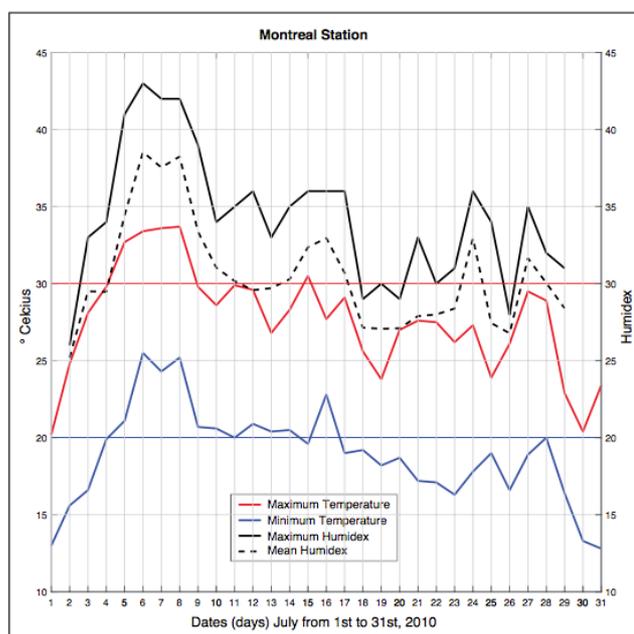
Quebec trend in energy consumption, (Chassin, 2013).

One of the bigger dangers of the built environment — i.e. asphalt roads and sidewalks, concrete buildings, etc. — is that it induces an urban heat island effect. The conversion of land cover from grassland, forested areas, or agricultural areas into built environments negatively affects the natural cooling of the planet by decreasing evapotranspiration (i.e. the phase in the natural cycle of water in which water is transferred from the earth to the atmosphere by evaporation), and by affecting the albedo effect of the earth's surface (i.e. its capacity to reflect energy from sun rays back into space). The built environment absorbs this infrared radiation, which creates a warming effect. During the peak of summer, nighttime is not enough to cool down the cities, then during the day, the absorption of radiation resumes, creating an

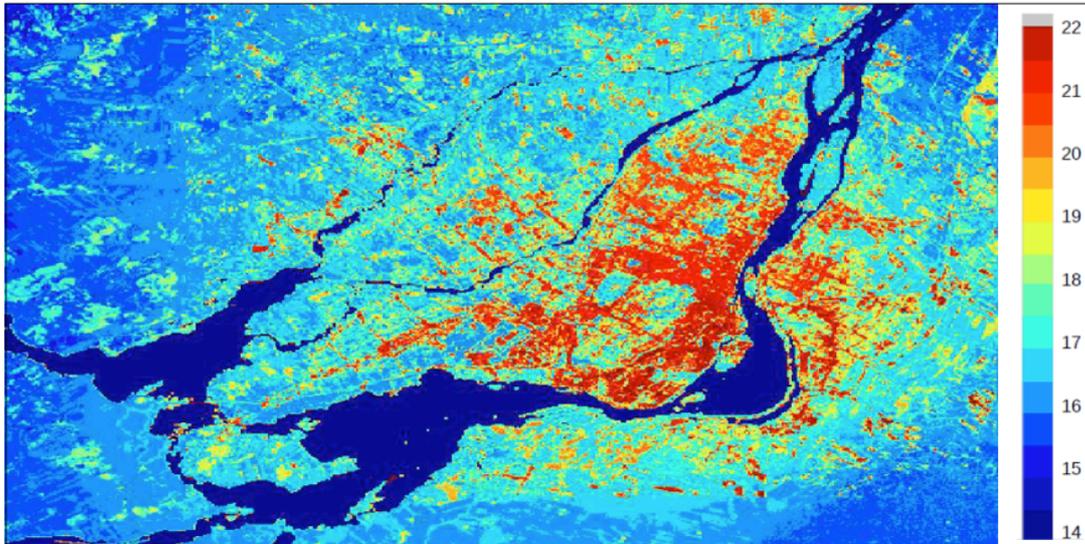
accumulative effect. This gets even worse when there is not enough wind to displace the hot air created by urban heat islands.

Several other factors exacerbate individual exposure and vulnerability to heat islands, including building height, quality of infrastructure (in terms of ventilation, insulation, etc.), access to cool places, health conditions, and social marginalization. Socio-economic factors are also at play, which is why young children, older people, low-income households, and the homeless are the most at risk. In low-income neighborhoods with high crime rates, people tend to lock themselves in and try to protect their homes from intruders at the cost of appropriate ventilation. They can also some times lack access to adequate support networks, which increases their vulnerability (Klinenberg 1999).

With new peripheries increasingly infringing upon green areas, urban heat islands are becoming increasingly more of a threat in Montreal, especially during the months of June, July, and August, when heat waves occur. More broadly, warm spells can take place between April and October. The map below displays pockets of land where wind speeds are lower and temperatures and humidity are higher during the day. Ultimately, risk levels are a function of the frequency of occurrence of these events, the exposure to such conditions, and the level of individual vulnerability. Montreal scores fairly high on this scale, especially when taking into account the city’s population density and aging infrastructure networks. However, it is encouraging to see that, in general, per capita energy consumption has decreased in Canada between 1980 and 2009.



Tmax, tmin and humidex (maximum and daily average) observed for stations in Montréal (McTavish) from July 1 to 31, 2010,(Gachon et al., 2016).



Map: Simulation of air temperature (at 2 m, in °C) at 120 m resolution over Greater Montréal on July 6, 2008, (Gachon et al., 2016).

CURRENT POLICY FRAMEWORK AND PROGRAMMING

Poverty Alleviation

The province of Quebec has had a long and earnest commitment to reducing economic disparities among its citizens. This is demonstrated in part by the 2015-2020 Interdepartmental Action Plan on Homelessness, as well as the Last-Resort Financial Assistance program, which delivers social benefits to over 300,000 individuals across the province every year. In 2016, Quebec received an extra \$17 million of federal spending on the fight against homelessness, as well as increased provincial autonomy in addressing the matter. This has greatly contributed to the success of Montreal's poverty alleviation strategies, on top of the city's own 2014-2017 Action-Plan on Homelessness. This plan focused on the creation of a position at city hall tasked with oversight of the programs and protection of individual rights. It also endeavored to assist homeless people who are going to court, increase the number of available beds by a thousand, and train police officers in responding to homeless people's needs. Further, the plan focused on improving the city's data gathering efforts. Overall, the plan is a great step towards acknowledging the existence of homeless people and understanding their needs. The city has also increased its annual expenditure on homelessness from \$1.4 million to \$2.4 million.

Overall, Montreal offers many services aimed at fulfilling people's basic

needs so they can thrive. In 2014, the city counted 135 shelters and roughly 1,926 beds. For longer-term needs, transition housing offers adequate and affordable housing, and provides people with other resources in order to assist with their re-insertion in communities. Transition housing initiatives include the Welcome Hall Mission's Transitional Housing program, which has a three-year maximum limit and offers 26 housing units, with about 26 units each. Others are Logifem, which welcomes women with children for up to 5 years, and *Office municipal d'habitation de Montréal's* low-rent housing (HLM) program, which rents 20,567 rooms overall.

For many, community food centres, soup kitchens, and food banks are a critical life-line. In Quebec, the network of food assistance services is largely run by Moisson members — regional food banks that are in charge of linking food suppliers with local organizations. For example, Moisson Montreal operates on the Island of Montreal, where it supplies 244 community organizations. In 2015, it was responsible for helping feed 146,230 people. Despite all of this, according to a recent Ipsos poll, 91% of Canadians report seeing no progress being made on food insecurity and 74% think that Ottawa must take stronger action to address the issue.

Beyond food and housing, low-income Montrealers with mental or physical health problems also have access to hospitals, emergency rooms, ambulatory care, and local community service centers (CLSCs) at no cost. This is because the Quebec Health Insurance Plan covers most health care needs and is very inclusive. Some of the other services worth mentioning are day centres, sexual assault services, counseling services, immigrant services, crisis centres, youth centres, and other rehabilitation centres. Moreover, recently, three safe injection sites have opened in Montreal. This represents an important move towards non-punitive action, and demonstrates the city's commitment to prevention and harm reduction policies.

While the very existence of these services and programs is extremely important, they are over-capacitated, underfunded, and often struggle to meet people's needs, let alone stay open. In fact, housing assistance services are sometimes forced to turn people away and have long waiting lists. Faced with the fact that donations are not keeping up with increasing demand, food assistance services, which endeavor to distribute fresh food, are often forced to turn a blind eye to the quality and the origin of the food they are distributing. It appears that poverty alleviation initiatives in general are forced to focus on short-term horizons. This means that not many resources are left for strategies focusing on prevention and building resilience.

Infrastructure and Waste Management

Cities have a strong impact on the environment simply by way of bringing people closer together. But their contribution to global warming is also the result of decades, if not centuries, of flawed decision-making. Montreal is no exception and the city's current policies surrounding facilities and infrastructure is far from satisfactory. At the turn of the 20th century, the city went through a rapid industrialization period, the remnants of which are scattered throughout its landscape. Intense weather variations create an additional strain on the city's aging infrastructure network. As a consequence, the municipality spends huge amounts of money each year on temporary repairs in an effort to buy more time. Finally, the fact that some of the current building regulations date back to the 1950s not only represents a hazard, but it also blocks the implementation of sustainable projects.

One of the most important infrastructural and logistical issues Montreal faces is its waste management system. Today, the city's recycling program remains virtually non-existent. All household waste collected, including huge quantities of perfectly recyclable products, is distributed among five landfill sites, where it merges into a mountain of detritus before being crushed and buried, though not as fast as it accumulates. On a positive note, it appears that a city-wide compost program is finally in the works, but there are many obstacles to its inception, starting with the issue of finding an acceptable site for a large composting plant.

Urban Agriculture

Food Security

With the 2017 Food Policy for Canada Summit, Canada is finally taking serious steps towards the development of a national food policy, which would give equal consideration to health, the environment, the economy, and local communities. In order for this policy to be successful, decision-makers ought to consider the development of urban and peri-urban agriculture as an effective, multi-faceted approach to both climate change and food security.

In terms of sustainable poverty alleviation and food security, urban agriculture can help decrease Montreal's dependence on far-flung producers and speculation on the global food market, while allowing individuals to consume fresh, healthy, nutritious, and locally produced food. In Montreal, Lufa Farms is leading the way in

demonstrating how these goals can be pursued in conjunction with economic growth. The first of its scale, Lufa grows a large variety of fruits and vegetables in its rooftop greenhouses all year long, and works with local producers in order to offer a wide range of products and to entice people to adopt a more sustainable way of life. In order to maximize the use of space while minimizing nutrient runoff and water consumption, Lufa uses hydroponics, a method of growing food using a mixture of water and mineral nutrients instead of soil. As a result, Lufa's products cannot be organically certified, though they are somewhat more affordable, and nevertheless, Lufa remains a commercial urban farm. On a smaller level, there are also projects like the McGill Farmers' Market. Created and run by students, every Thursday, the market offers healthy food sourced from environmentally conscious local producers, supporting local farmers in the process.

Citizens themselves can engage in self-sufficient consumption and make substantial savings on food expenditures through private and allotment gardens, local community gardens, and community farms. So far, Montreal's community gardening project has proven rather successful, so much so that the city is struggling to keep up with demand. Every single neighborhood has a community garden, but usually, no more than a single plot is allowed per person, and one can spend several years on the waiting list. This is why cooperation among different actors is very important. A great example of this is Centre-Sud's *Quartier Nourricier* project, which works in partnership with several other community organizations and engages in various community events in order to increase its reach. But this is not nearly enough and the city could benefit from larger-scale initiatives like the Toronto Community Garden Network or the Toronto Urban Growers. While urban farming is not necessarily something that everyone is able to engage in, several food assistance services in Montreal, in cooperation with institutional farms and gardens (belonging to companies, churches, schools, etc.) are helping to close the gap.

Environment

As a climate change strategy, increasing urban vegetation in the streets and on rooftops contributes to the protection of biodiversity and the reduction of urban heat island effects through the use of agroforestry systems and integrated landscape management. Urban agriculture offers these benefits, coupled with the production of healthy food. It also helps combat transport-related pollution by considerably

reducing the distance between the consumer and the producer, and by engaging in more environmentally-friendly modes of transportation, as evidenced by the success of Bixi and Téo Taxi. This proximity helps minimize packaging-linked pollution and the harms associated with industrial conservation methods. Many companies, like Lufa farms, take this even further by promoting reusable packaging. Finally, most urban agriculture initiatives strive to diminish food waste by offering excess production to food banks and other charitable food programs, and by creating and using their own compost. However, despite overwhelmingly positive evidence, Montreal has yet to give green spaces the credit they are owed, and follow Singapore's example by covering its streets and buildings in plants.

Education and Social Connection

Urban agriculture projects in Montreal also serve an educational purpose. When gardening, people learn to reconnect with nature and are reminded of how much we depend on it. Urban gardening is therefore a powerful tool for the promotion of sustainable development and responsible consumption. As with the other benefits of urban agriculture, one does not necessarily have to engage in it in order to benefit from it. The simple act of seeing gardens while walking down the street can have a powerful impact on us, but some organizations push this further by offering to educate the population on the benefits of gardening and to share good practices. For example, businesses like Biocyclette and les Urbainculteurs offer consultation services to aspiring gardeners. Urban Seedling offers free public workshops, informing people on everything from biological organic pest control to the fermentation of vegetables. Not only are people taught how to garden, but they learn about what they can do with the fruits of their labor. In addition, Montrealers can benefit from Plant Catching, a platform that helps connect urban gardeners and allows them to exchange tools, seeds, plants, etc.

Urban Seedling is also one of the many initiatives supporting the spread of urban agriculture in schools. Children of all ages are increasingly getting to put their hands in the dirt, learn about nature and the rhythm of seasons, and engage in friendly interactions in a positive environment. In post-secondary education, the growing popularity of environmental studies and the development of academic projects, such as MUSE (McGill Urban Sustainability Experience), is breeding a new generation of individuals who know and love Montreal, and who are yearning to find sustainable

solutions to the challenges the city is facing.

Education plays a pivotal role in changing mindsets for the better. Most of all, urban agriculture has the power of solidifying community ties. Community gardens for example, allow people to overcome the anonymity problem that is plaguing big cities, and learn from each other while gardening side by side. Much like Neighbors Day, people learn to know who lives next door, and combat vulnerability by building stronger support networks.

POLICY OPTIONS AND RECOMMENDATIONS

Although many aspects of the status quo in Montreal are worthy of praise, a lot more progress still needs to be made. The development of urban and peri-urban agriculture ought to be considered by policy-makers as an effective, multifaceted approach to climate change and food security. As such, it must be pursued more diligently, instead of becoming a matter of individual desire. Existing initiatives also need more support, not only in the form of funding, but also by promoting their activities, and by connecting disjointed projects with common goals and targets. Montrealers can benefit from increased pathways to connect with their cities, the environment, and each other. Gardens can do a lot to improve the safety and liveliness of neighborhoods and demand for community plots is very high, which is why more gardens should be created in environmentally problematic or chaotic areas such as rooftops, near highways, or in empty alleys.



Community garden atop a tunnel roof on the Decarie Expressway, Notre Dame de Gr ace (Baudry, 2017).

The creation of collaborative networks must also extend to data gathering. There is a strong need for a better understanding of urban income poverty, climate change, and food security, as well as the relationship between them. This mandates the establishment of a comprehensive national database, offering the public the latest research and general information on climate change and food security, policies seeking to address them, and existing local initiatives, budgets, lists, and maps of local community organizations and community gardens, etc. Montreal could perhaps start by following the example of Toronto Urban Growers' interactive map of the city's green spaces.

Beyond data gathering, there is also the issue of proper interpretation. Cities inevitably have a higher carbon footprint compared to smaller human settlements, which is why it is important to look at per-capita figures. Another interesting, albeit imperfect, way of measuring environmental impact on food is the food mile. Although it may not account for all the negative externalities that can result from the production process, considering all the negative consequences associated with long-distance transportation of food, this variable is worth taking into account when making decisions; for example, when distributors or consumers choose their suppliers.

While urban agriculture alone cannot solve the global food security problem, it does offer an abundance of positive externalities. However, certain adjustments are necessary for this potential to be realized. First, while a global agricultural approach is necessary for substantial change to be implemented, priorities must be drawn from local, regional, and national contexts, and then from international frameworks. In addition to targeting local constraints, policies must create a space for urban agricultural initiatives to contribute towards the local economy in order to spur the shift towards resilient and sustainable food systems. Policies should also aim to remove obstacles to structural adjustment, while offering assistance to those struggling to transition.

Policy-makers must acknowledge the fact that as cost-effective, long-term strategies, investments in sustainable development projects must be given priority. In particular, investments in green infrastructure are necessary to increase the number, size, and capacity of urban farms, and to enable urban farming during the winter (for example by building rooftop greenhouses that can capture residual heat from residential buildings). This also calls for regulations to be adapted to modern needs in

order to reward and encourage sustainable construction projects. Another imperative is to increase investments in clean energy across the board.

While drastically restricting individuals' ability to make their own choices can have unintended consequences, choice editing should also be considered as an important tool for promoting urban agriculture. For example, local markets and supermarkets should start by offering their customers the option of purchasing the products of urban agriculture at competitive prices, and aim to progressively replace foreign suppliers with local ones.

Finally, an important condition for urban agriculture to thrive is for people to be willing to see the value in healthy local products, while resisting the marketing of them as luxury products. This requires social awareness campaigns to be coupled with stronger poverty alleviation policies, focusing more on prevention and reinsertion into society.

CONCLUSION

Food security is without a doubt a key challenge around the world, and it is being increasingly threatened by growing world population, increased urban population density, and climate change. While globalization has successfully created a more connected world, it has also increased interdependence and normalized dynamics that may doom future generations. If we want to fix our food systems and ensure universal access to healthy and nutritious food, while protecting the environment, now is the time to act, and big metropolitan areas are a great place to start.

In Montreal, unsustainable consumption patterns, a faulty infrastructural network and waste management system, and challenging weather conditions, greatly contribute to food insecurity by affecting people's ability to secure other non-food essentials. Furthermore, Montreal has to face the problem of entrenched poverty and its rather large homeless population. All of these issues are strongly interconnected, and add up to produce a disastrous snowball effect.

Some positive changes have taken root over the last decade, but the city of Montreal, as well as the federal government, must double down on both poverty alleviation and environmental protection strategies. Urban agriculture, the main

potential solution explored in this report, can improve people's access to healthy, nutritious, and locally grown food. It can also play a great role in reducing environmental impact, and in educating and connecting people. However, the promotion of urban agriculture ought to be done in conjunction with other eco-friendly poverty reduction and educational strategies in order for Montreal to begin reaping the benefits of its sustainable development efforts.

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