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The next frontier for climate action

Decarbonizing urban freight in Canada

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All photos by Roberta Franchuk, Pembina Institute, unless otherwise indicated.

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About the Pembina Institute

The Pembina Institute is a national non-partisan think tank that advocates for strong, effective policies to support Canada's clean energy transition. We employ multi-faceted and highly collaborative approaches to change. Producing credible, evidence-based research and analysis, we consult directly with organizations to design and implement clean energy solutions, and convene diverse sets of stakeholders to identify and move toward common solutions.

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The world is at a climate tipping point. Over 470 municipalities across Canada have declared a climate emergency, while Canada is committing to net-zero emissions by mid-century — the action needed to avoid the worst effects of climate change. For Canada to bend its emissions curve, transportation has to be tackled.

The transportation sector represents nearly one quarter of the country's greenhouse gas (GHG) emissions, second only to the oil and gas sector (Figure 1). Of this, freight sources make up almost half of the transportation emissions.

This isn't just a highway or rural problem. In major cities across Canada, we're seeing these trends continue — transportation contributes a notable share of GHG emissions (Figure 2). While transportation emissions come from both passenger and goods movement (freight) vehicles, historically the most focus has been on mitigating emissions from passenger vehicles. However, reducing the environmental impact of freight activity is increasingly important — by 2030, it is expected that freight emissions will surpass passenger vehicle emissions in Canada.[1]

Freight activity has implications for the livability of Canadian cities. As urbanization, online shopping, and the demand for same-day and home deliveries increases, it is expected that more freight vehicles will be on our roads, contributing not only to emissions but also to traffic congestion, noise and air pollution, and greater competition for curbside space. Some research suggests that although e-commerce generates more delivery truck trips, there is an overall decrease in vehicle kilometres travelled and fuel consumption due to a substantial reduction in personal shopping trips.[2] However, other research shows that any GHG emissions reductions from fewer personal shopping trips are cancelled out when other online shopping factors are considered, including how often consumers opt for fast delivery, take complementary trips to a physical store to return delivered items, or make single-item purchases online, resulting in more individual deliveries by truck.[3,4]

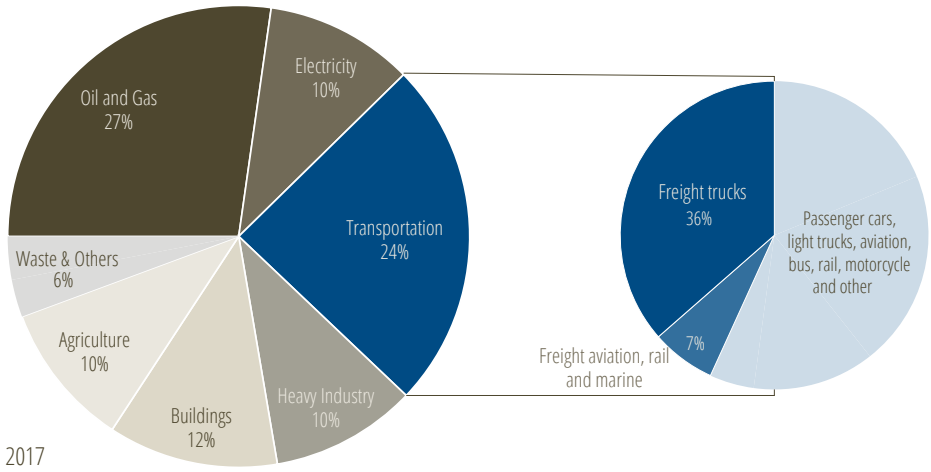


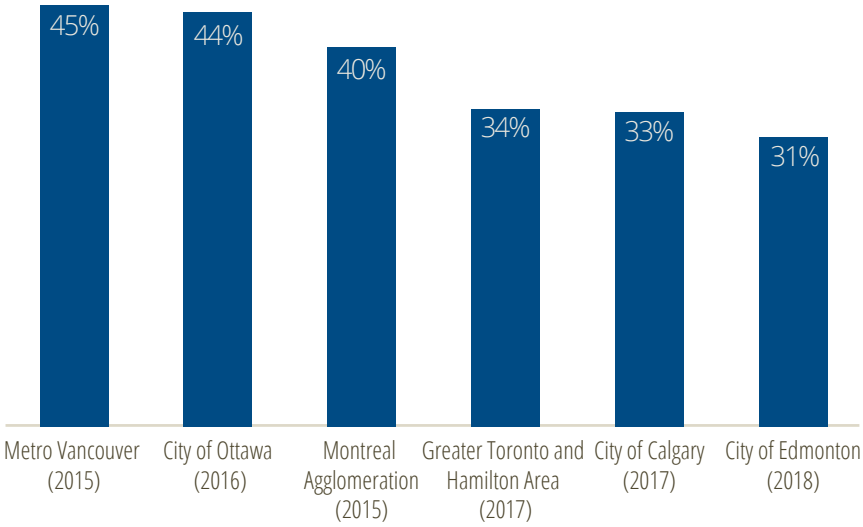
Figure 1: Breakdown of transportation emissions in Canada

Data sources: Environment and Climate Change Canada; Natural Resources Canada[5,6]

Figure 2: Transportation emissions as share of total GHG emissions in selected cities

(based on the most recent reliable data for each city)

Data sources: See specific city sections, pages 7-12.



Urban freight across Canada

Urban freight, by its very name, may seem like a city problem. In this report, we highlight ways in which businesses and municipalities across Canada are individually seeking to address growing urban freight issues through alternative delivery modes, models and technologies. While the impacts of increased urban freight may be most felt at the city level, in the air we breathe and congestion we endure, the issue is national in scope for a number of reasons. However, the current ad hoc city-by-city approach to solving the urban freight problem means that municipal bureaucrats and politicians are reinventing the wheel, so to speak, all across Canada. By coming together and sharing learnings, cities can move forward faster on solving this growing problem in concert with business and other levels of government, saving much sought-after municipal resources at the same time.

Businesses stand to gain substantially from a national approach, particularly those that have multi-province and/or national operations. Businesses need solutions that can be scaled up economically across the country. Like any other clean economy policy, the business community needs clarity and consistency to achieve efficiencies and economies of scale.

Policy recommendations

From a policy perspective, policies ladder up to the provincial level and beyond. Federal politicians are aware that freight is a national issue from an environmental and economic perspective. In the most recent federal election, all of Canada's major political parties recognized the contribution of freight to Canada's total greenhouse gas emissions and promised to act to reduce emissions from this sector. Furthermore, the federal government plays an important role funding low-carbon infrastructure across Canada, including infrastructure that will have direct impact on municipalities' ability to deliver on urban freight and other related solutions. Transport Canada, in particular, has an interest in making sure Canada's cities are safe and competitive, that goods are able to move quickly and efficiently as an important contributor to Canada's national economy.

Consistent, coherent and co-ordinated policy approaches make sense for all parties involved, and will benefit the majority of Canadians who live in these urban centres.

To that end, Pembina Institute recommends:

- A national dialogue on urban freight to improve the environment and livability of cities across Canada
- Modernized goods distribution in urban centres, developed by combination of policy makers, industry, private sector and the public
- Goods movement strategies that are integrated with existing climate, land use, road safety and transportation strategies with which they are inherently interconnected
- Nationally consistent municipal-level freight data collection programs that inform effective goods movement strategies that can be scaled up across Canada.

Businesses, municipalities act on climate

Many leading companies have recognized their role in transitioning towards a low-carbon economy and are adopting emissions reductions targets.

For example, Amazon has recently committed to net-zero carbon emissions by 2040.[7] Meanwhile, Etsy is offsetting 100% of the carbon emissions stemming from its deliveries and has also committed to powering its operations exclusively with renewable electricity by 2020.[8] Many other companies are interested in exploring how to integrate new technologies and delivery practices such as electric vehicles, electric-assist and pedal-only cargo bikes, off-peak deliveries, and alternative consolidation and pick-up points in dense urban centres (e.g: transit stations, mixed-use buildings, mobile containers stationed in public spaces) as opportunities to improve urban freight activity. For example, Mississauga-based Purolator is investing $1 billion over five years to build a shipping hub in Toronto and upgrade its fleet to include fully electric vehicles.[9]

Increase in amount of freight delivered to major Canadian cities:

26%

between 2011 and 2016[10]

There are also opportunities to deploy emerging technologies such as autonomous vehicles and drones for goods movement in certain circumstances. Questions remain for both industry and government on how these different technologies can and should be used, scaled up, and regulated to ensure safe and efficient goods movement systems.

Canada's largest municipalities are planning and exploring new ways to manage growing demands to move goods and people in their cities and regions. At the same time, municipalities are advancing other initiatives that must be co-ordinated with goods movement, such as land use and road safety strategies, and ambitious climate plans. For example, Metro Vancouver's regional goods movement strategy includes a call to support quieter, cleaner and lower-carbon goods movement by adopting low- and zero-emission vehicles, as well as cargo bicycles for last-mile applications, and to integrate goods movement considerations into community planning and development.[13] Calgary's Goods Movement Strategy identifies seven actions to enhance last-mile deliveries, such as promoting off-street delivery facilities in new or reconstructed non-residential developments and partnering with the private sector to pilot new delivery solutions.[14] The City of Edmonton is updating its city plan to support a low-carbon transportation system. This includes encouraging solutions such as cargo cycles and microhub lockers to mitigate urban freight emissions.[16] Meanwhile, the City of Toronto is currently

Last-mile deliveries

The "last mile" of urban goods movement refers to the delivery of goods from some type of consolidation centre (e.g., a warehouse, distribution centre, or microhub) to its final destination (e.g., a retail store or customer's home). Businesses spend approximately 28% of their total logistics costs on conducting last-mile deliveries due to increasing traffic congestion, a lack of loading zones, and other inefficiencies.[11,12]

Increase in the average number of online purchases made by Canadians:

58%

between 2016 and 2018[15]

implementing its curbside management strategy[17] and its road safety plan Vision Zero[18] alongside the city's climate action strategy, TransformTO.[19] Ottawa has highlighted the need to consider freight in road planning, design and construction in its transportation master plan. In Montreal, a one-year pilot project was launched in the Ville-Marie borough to test electric cargo bikes for last-mile deliveries. A former bus station in Montreal is being used as a transhipment point for delivery trucks to unload and transfer packages onto cargo bikes.[20] Halifax's Integrated Mobility Plan recognizes the implications of urban delivery trips on congestion, noise pollution, and emissions. The plan calls for a review of Halifax's truck route by-law to better serve truck demands and land use, as well as incorporating trucks into complete streets projects when they occur on designated truck routes.[21]

Generally, cities are developing strategies to electrify cars and trucks, implementing new tactics to manage growing curbside demand from commercial delivery vehicles, partnering with businesses to test new delivery technologies and practices, and investigating best practices from around the world to manage goods movement. A notable number of freight trips in major Canadian urban centres are intra-municipal, meaning that goods are sent to a destination in the same metropolitan area from which the freight trip originated. In other words, freight activity within cities, not just between cities, is important. All sectors must work together to facilitate safe, efficient, and low-carbon goods movement across Canada.

Freight shipments in major Canadian urban centers that begin and end within the same metropolitan area:[22]

29-62%

Vancouver

Freight activity over time

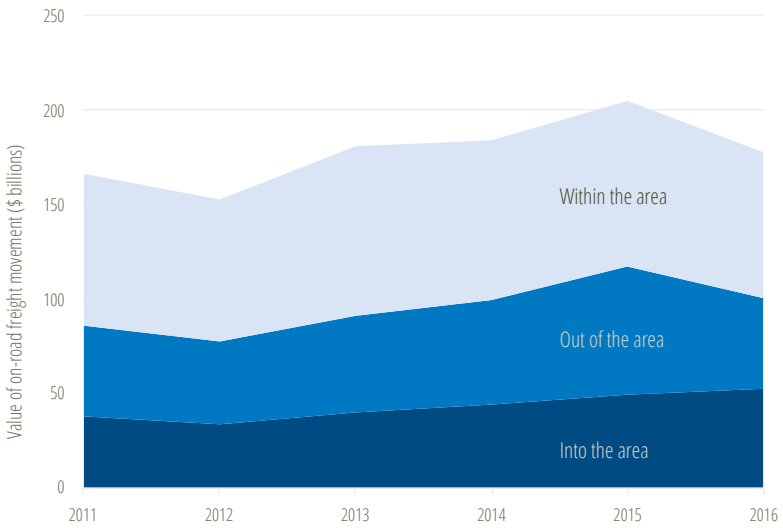


Figure 3. Value and destination of freight carried by for-hire trucks in the Vancouver CMA

Data source: Statistics Canada[23,24]

Freight policies

Metro Vancouver is already tackling freight emissions through its regional goods movement strategy, which includes a call to support quieter, cleaner and lower-carbon goods movement by adopting low- and zero-emission vehicles, as well as cargo bicycles for last-mile applications. It also looks to integrate goods movement considerations into community planning and development.[25]

Population and employment projections

Data is for Metro Vancouver[26]

Population	
Baseline (2015)	2,494,000
Projection (2040)	3,400,000
Projected increase	36%

Employment	
Baseline (2015)	1,278,000 jobs
Projection (2040)	1,800,000 jobs
Projected increase	41%

Greenhouse gas (GHG) emissions

Data is for Metro Vancouver[27]

GHG emissions (2015)	
Total GHG emissions	14.7 Mt CO_2e
GHG emissions from transportation	6.5 Mt CO_2e
Percent of total emissions from transportation	45%
Per capita transportation emissions	2.6 t CO_2e per person

Calgary

Freight activity over time

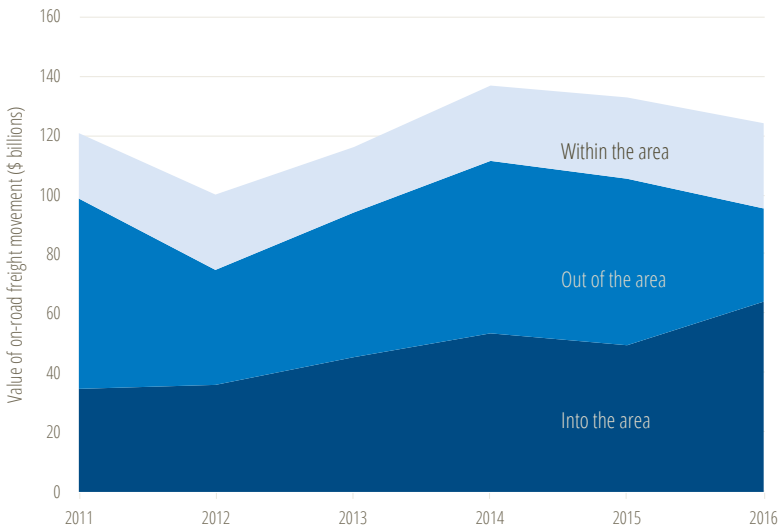


Figure 4. Value and destination of freight carried by for-hire trucks in the Calgary CMA

Data source: Statistics Canada[28,29]

Freight policies

Calgary's Goods Movement Strategy identifies actions to enhance last-mile deliveries, such as promoting off-street delivery facilities in new or reconstructed non-residential developments and partnering with the private sector to pilot new delivery solutions.[30]

Population and employment projections

Data is for the City of Calgary[31,32]

Population	
Baseline (2014)	1,195,200
Projection (2024)	1,380,400
Projected increase	15%

Employment	
Baseline (2014)	857,100 jobs
Projection (2040)	1,000,700 jobs
Projected increase	17%

Greenhouse gas (GHG) emissions

Data is for the City of Calgary[33,34]

GHG emissions (2017)	
Total GHG emissions	18.8 Mt CO_2e
GHG emissions from transportation	6.3 Mt CO_2e
Percent of total emissions from transportation	33%
Per capita transportation emissions	5.0 t CO_2e per person

Edmonton

Freight activity over time

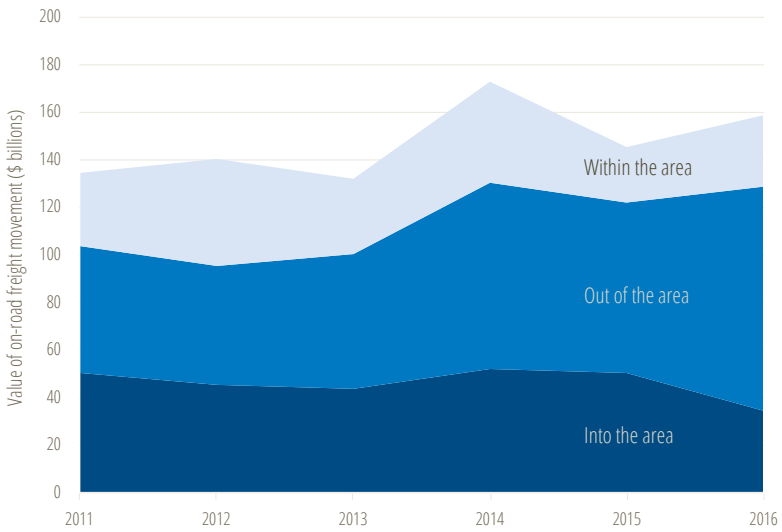


Figure 5. Value and destination of freight carried by for-hire trucks in the Edmonton CMA

Data source: Statistics Canada[35,36]

Freight policies

The City of Edmonton is updating its city plan to support a low-carbon transportation system. This includes encouraging solutions such as cargo cycles and microhub lockers to mitigate urban freight emissions.[37]

Population and employment projections

Data is for the City of Edmonton[38]

Population	
Baseline (2014)	877,900
Projection (2044)	1,470,800
Projected increase	68%

Employment	
Baseline (2014)	564,098 jobs
Projection (2044)	909,065 jobs
Projected increase	61%

Greenhouse gas (GHG) emissions

Data is for the City of Edmonton[39,40]

GHG emissions (2018)	
Total GHG emissions	18.7 Mt CO_2e
GHG emissions from transportation	5.8 Mt CO_2e
Percent of total emissions from transportation	31%
Per capita transportation emissions	6.2 t CO_2e per person

Greater Toronto and Hamilton Area

Freight activity over time

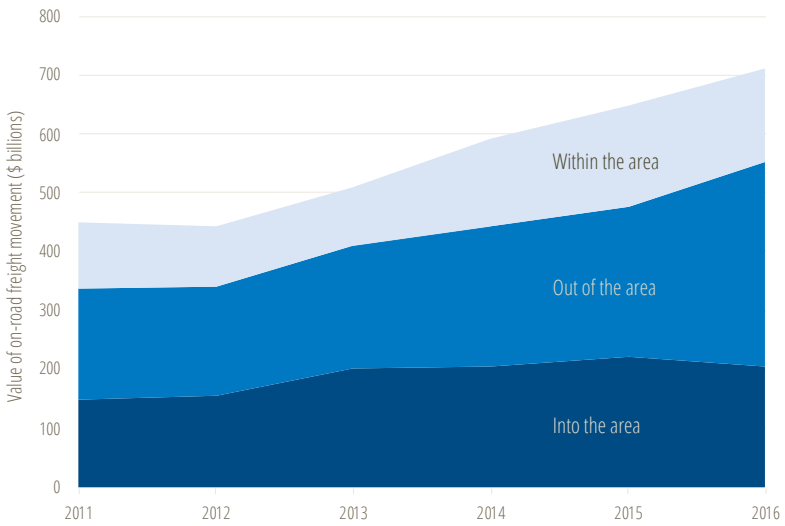


Figure 6. Value and destination of freight carried by for-hire trucks in the Toronto CMA + Hamilton CMA

Data source: Statistics Canada[41,42]

Freight policies

The GTHA is integrating goods movement into its city plans in a variety of ways. The City of Toronto is currently implementing its curbside management strategy[43] and its road safety plan Vision Zero,[44] alongside its climate action strategy, TransformTO.[45] The City of Hamilton is reviewing its Goods Movement Study, recognizing the importance of emerging trends and technologies in goods movement, such as deliveries made by alternative modes of travel.[46]

Population and employment projections

Data is for the GTHA[47]

Population	
Baseline (2011)	6.8 million
Projection (2041)	10.1 million
Projected increase	49%

Employment	
Baseline (2011)	3.3 million jobs
Projection (2041)	4.8 million jobs
Projected increase	45%

Greenhouse gas (GHG) emissions

Data is for the GTHA[48]

GHG emissions (2017)	
Total GHG emissions	49.2 Mt CO_2e
GHG emissions from transportation	16.6 Mt CO_2e
Percent of total emissions from transportation	34%
Per capita transportation emissions	2.3 t CO_2e per person


Photo: Julia Kilpatrick, Pembina Institute

Ottawa

Freight activity over time

No data was available for freight activity at this time.

Freight policies

Ottawa has highlighted the need to consider freight in road planning, design and construction in their transportation master plan. The city will consider the inclusion of features such as on-street loading areas in future road design.[49] Additionally, the City of Ottawa has committed to monitoring and consulting with the freight industry to support knowledge and innovation for both the city and the industry's mutual benefit.

A study with goods movement stakeholders in Ottawa acknowledged that the greatest challenges associated with goods movement in the city arise within the last mile.[50] The same study identified the importance of managing the movement of goods across bicycle lanes and considering the implementation of off-peak deliveries. The same group of stakeholders agreed that cargo bikes represent an important opportunity for the City of Ottawa.

Population and employment projections

Data is for the City of Ottawa[51]

Population	
Baseline (2014)	946,344
Projection (2036)	1,213,553
Projected increase	28%

Employment	
Baseline (2016)	514,787 jobs
Projection (2036)	618,915 jobs
Projected increase	20%

Greenhouse gas (GHG) emissions

Data is for the City of Ottawa[52,53]

GHG emissions (2017)	
Total GHG emissions	6.2 Mt CO_2e
GHG emissions from transportation	2.6 Mt CO_2e
Percent of total emissions from transportation	44%
Per capita transportation emissions	2.9 t CO_2e per person

Montreal

Freight activity over time

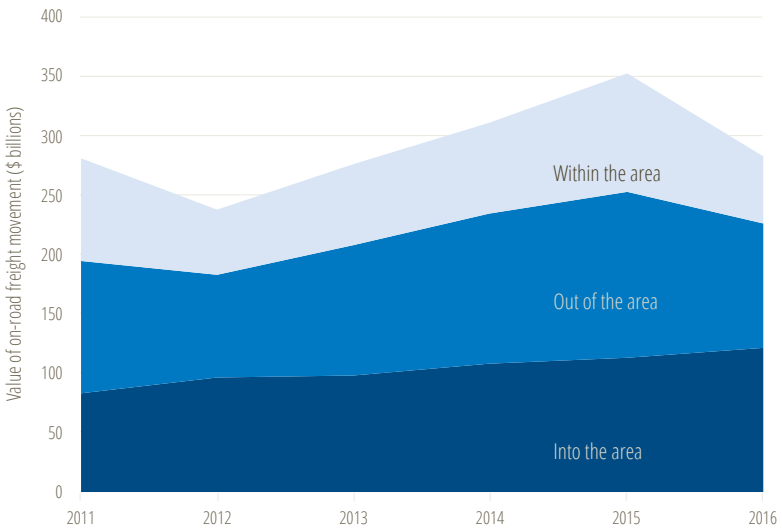


Figure 7. Value and destination of freight carried by for-hire trucks in the Montreal CMA

Data source: Statistics Canada[54,55]

Freight policies

The City of Montreal is already tackling freight emissions. A one-year pilot project was launched in the Ville-Marie borough to test electric cargo bikes for last-mile deliveries. A former bus station is being used as a transhipment point for delivery trucks to unload and transfer packages onto cargo bikes.[56]

Population and employment projections

Data is for the Montreal Agglomeration[57]

Population	
Baseline (2015)	1,999,800
Projection (2036)	2,240,000
Projected increase	12%

Data is for the Montreal CMA[58,59]

Employment	
Baseline (2017)	2,184,100 jobs
Projection (2036)	2,739,700 jobs
Projected increase	25%

Greenhouse gas (GHG) emissions

Data is for the Montreal Agglomeration[60]

GHG emissions (2015)	
Total GHG emissions	11.1 Mt CO_2e
GHG emissions from transportation	4.5 Mt CO_2e
Percent of total emissions from transportation	40%
Per capita transportation emissions	2.3 t CO_2e per person

Halifax

Freight activity over time

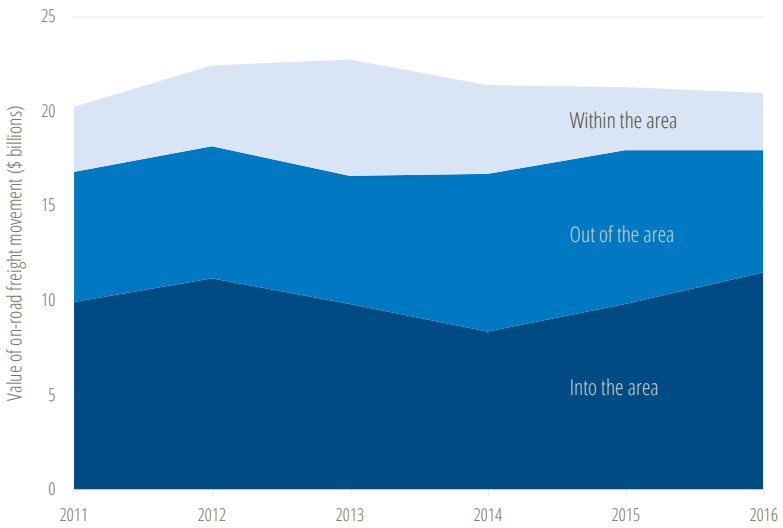


Figure 8. Value and destination of freight carried by for-hire trucks in the Halifax CMA

Data source: Statistics Canada[61,62]

Population and employment projections

Data is for the Halifax Regional Municipality[64]

Population	
Baseline (2011)	390,328
Projection (2031)	482,625
Projected increase	24%

Employment	
Baseline (2011)	231,320 jobs
Projection (2031)	273,070 jobs
Projected increase	18%

Greenhouse gas (GHG) emissions

No recent data was available for emissions at this time.

Freight policies

Halifax's Integrated Mobility Plan recognizes the implications of urban delivery trips on congestion, noise pollution, and emissions. The plan calls for a review of Halifax's Truck Route By-Law to better serve truck demands and land use, as well as incorporating trucks into complete streets projects when they occur on designated truck routes.[63]

Benefits of better urban freight management

Well-managed goods movement systems support livable, efficient cities by helping relieve congestion, which in turn alleviates noise, air, and carbon pollution.

Costs of congestion

Traffic congestion plagues Canadian cities. Nearly one third of North America's 15 most congested cities are in Canada, having an impact on businesses and families alike.[65] The more goods are stuck in traffic en route to their final destinations, the more it costs businesses, and in turn, consumers. Transport Canada estimates the annual cost of recurrent congestion in our major cities, including Quebec City, Montreal, Ottawa-Gatineau, Toronto, Hamilton, Winnipeg, Calgary, Edmonton and Vancouver, at $2.3 to $3.7 billion.[66]

Congestion is problematic for businesses' delivery operations due to trip delays and increased fuel and vehicle operating costs.[67] More time stuck in traffic paired with limitations on driver working hours can also result in increased labour costs per shipment.[68]

Existing congestion is being exacerbated by growing populations and the associated growth in demand for goods movement. The World Economic Forum estimates that by 2030, the top 100 cities globally will require a 36% increase in the total number of delivery vehicles leading to an estimated 21% increase in congestion[69] —equivalent to an additional 6 Mt of CO_2 emissions by 2030.

Curbside competition

As transportation patterns and travel behaviours change, many major urban centres are experiencing increased competition for the curbside. More trucks require loading areas to make deliveries in dense residential and commercial neighbourhoods as online shopping and the demand for fast and flexible delivery increases. Delivery vehicles require curbside space, defined as the access point between the road and the sidewalk, to either park or make a temporary stop when making deliveries. To access this space, delivery vehicles compete with other curbside users, including ride-hailing vehicles, wheel-trans services, emergency vehicles, garbage trucks, transit buses, and cyclists.[70]

Due to the high demand for limited curbside space, especially in dense commercial and residential areas, it is not uncommon for delivery vehicles to circle (or "cruise") around a delivery zone in an attempt to find a designated place to load or unload deliveries. This contributes to overall congestion: Anywhere from 8% to 74% of traffic in major cities has been attributed to cruising activity.[71] This is costly for businesses as it increases delivery times and fuel costs, which also increases GHG emissions and air pollution in cities. Moreover, a lack of dedicated curbside space can force delivery operators to double-park or make other illegal stops that can result in hefty parking infraction fines

and impede the right of way for other road users. Solutions to curbside competition do exist, especially in better managing freight parking and loading. Examples include dynamic parking pricing and delivery vehicle staging zones for loading.

Road safety

As population grows, our roads are getting busier. There are more pedestrians, cyclists, transit vehicles, delivery trucks, ride hailing vehicles, and other users competing for road space. When we better manage goods movement, we improve the safety of our streets. Improving the safety of goods movement in Canadian cities will be critical as many municipalities aim to achieve Vision Zero — a term commonly used to reference a strategy to eliminate all traffic-related fatalities and severe injuries. A recent City of Toronto study found that trucks are disproportionately involved in collisions resulting in fatalities and serious injuries to pedestrians (including cyclists).[72] Since 2005, 20%

of cyclist deaths in Montreal have been attributed to collisions with trucks.[73] However, other jurisdictions have seen progress, including Vancouver which has seen a 28% reduction in vehicle collision fatalities involving heavy vehicles between 2005 and 2014.[74] As more people travel by bike in Canadian cities and as freight activity increases, it will be important to understand the risk factors related to truck-cyclist interactions, and use those learnings to improve our transportation system to prevent traffic injuries and fatalities.

Just-in-time delivery trends

Goods distribution is becoming increasingly fast-paced and reactive. More and more, retailers and consumers are operating using a just-in-time philosophy, meaning goods aren't ordered or received until absolutely necessary. In online shopping, expectations for fast shipping shifted from three or four days in 2015 to just two days in 2016.[75] Businesses aren't hesitating to meet or even exceed these expectations: Standard shipping speed for purchases on Amazon Prime recently dropped down to one day,[76] and within three weeks of Amazon's announcement, Walmart announced its plans for next-day delivery.[77] A just-in-time philosophy has impacts on shipment consolidation. Items may be stored in warehouses or retail stores at separate locations making it difficult to ship multiple items in the same package under time constraints.[78] Thus, individual items from multi-item shopping baskets may be shipped separately. This results in a reduced number of consolidated deliveries and potentially increases the number of delivery vehicles on the road, with resulting impacts on cities.

Air pollution

Heavy-duty trucks are a leading source of criteria air contaminants that can contribute to the formation of smog and localized air pollution that can be harmful to human health.[79] A recent study conducted by the Southern Ontario Centre for Atmospheric Aerosol Research (SOCAAR) highlighted the disproportionately large impact of heavy trucks on local air pollution.[80] The study found that concentrations of air pollutant emissions depend more on the proportion of large trucks on the road than the total traffic volume. While the goods movement sector is an important component of the Canadian economy, growing freight activities have major implications on both climate change and the quality of life of Canadians, if they are not adequately managed and planned for.

Key challenges to improving goods movement in cities

Although innovation in technology and delivery operations have and will continue to improve freight activity in Canadian cities, several challenges remain:

Data governance and availability

Freight data in Canada is limited especially compared to the amount of data collected for passenger travel. Many businesses in the freight sector collect their own data to better manage and optimize their delivery operations; however, this data is rarely made public or available to transportation and city planners since it is often sensitive and competitive information. A lack of data makes it difficult to understand and plan for the realities of freight activity in Canadian cities.

Rapidly evolving consumer preferences

Consumers' desires are constantly changing, and they are increasingly demanding more of retail and delivery businesses. For businesses to remain competitive in today's market, they must offer deliveries that are fast, free, flexible, while being environmentally conscious. Given the pace at which consumers' preferences change, it can be difficult to plan a goods movement system that keeps up with customer demands.

Inconsistent regulatory approaches to govern new delivery practices and technologies for commercial use

Regulations around off-peak deliveries, e-assisted cargo bikes, drones, autonomous vehicles, and other delivery technologies are still uncertain, making it difficult for businesses to test and scale up new delivery modes. In particular, questions remain for both industry and government on how these different technologies should be regulated to ensure they contribute to safe transportation and goods movement systems.

Technological readiness and supporting infrastructure

While electric delivery vehicles are starting to be introduced, they are not ready to be deployed at a large scale any time soon. Nor is all the infrastructure (e.g: charging stations) in place to support such technologies; more public and private investment is needed. Although some freight technologies will be ready in time, we must also be prepared with solutions in the near term, recognizing the realities of business operations today.

Urban freight solutions

A variety of innovative solutions, including new delivery technologies and changes to logistics and supply chain operations, are being tested and adopted in cities across Canada.

Alternative delivery modes

For businesses, the optimal size and composition of a delivery fleet depends on several factors such as the volume of goods to be delivered, the service area of a consolidation or distribution centre, and the number and geographic distribution of delivery locations. Different transportation modes can serve different delivery needs and improve delivery operations. Supportive infrastructure and policies are also needed to encourage the uptake and success of alternative delivery modes.

Electric vehicles

Major delivery and e-commerce companies have announced electric vehicle purchases for their delivery fleets.[81] Last year, Amazon announced it would purchase 100,000 electric delivery vans. More recently, UPS revealed plans to buy at least 10,000 battery-powered delivery trucks over the next five years.[82] Some cities are implementing low emission zones (LEZ) to restrict the use of certain polluting vehicles in specific parts of a city.[83] In London, England, trucks are subject to a high fee for operating within LEZs if they do not meet the city's particulate matter emissions standard. An ultra-low emission zone (ULEZ) was also recently implemented in central London where a congestion charge is also in effect.[84]

Cargo cycles

Cargo cycles are bicycles, tricycles, or other multi-wheeled cycles that are equipped with a cargo unit to store and move goods or people (e.g: children). They are often equipped with an e-assist function to help the cyclist carry and move heavier loads with ease. Many businesses in Europe — and now also in a few North American markets, including Canada — have integrated microhubs and cyclelogistics into their goods movement practices to increase efficiency, reduce

operational costs, and mitigate adverse impacts on cities. In doing so, some businesses have demonstrated significant reductions in last-mile vehicle kilometres travelled and "empty" truck distances, thereby lowering transportation-related emissions and air pollution.[85] In Canada, one barrier to testing and deploying cargo cycles at scale is unclear and inconsistent regulations across municipalities, especially regarding their commercial use.

Drones

More recently, some businesses are looking to drones for last-mile delivery operations. Part of the appeal to companies is that drones could significantly reduce labour costs. A study in the European Union suggests that 7% of EU citizens could have access to drone delivery services under scenarios that are considered the most technologically realistic. This share reaches 30% in scenarios where technological improvements are made.[86] In Canada, companies like Drone Delivery Canada are working to develop commercially viable drone delivery systems.

Alternative delivery models and technologies

As more consumers engage in e-commerce and expect deliveries to be made directly and quickly to their homes or offices, businesses are rethinking their logistics and supply chain operations.

Off-peak deliveries

Performing deliveries during off-peak daytime hours or switching to night-time deliveries can improve freight efficiency. Off-peak hours are generally less congested, and thus, vehicles spend less time on the road burning fuel. The Region of Peel recently completed an off-peak delivery pilot project with participants including Loblaws, Walmart, and the LCBO.[87] Preliminary results suggest that travel times were approximately 15% lower during off-peak hours. Additionally, it's estimated that GHG emissions and other air pollutant emissions including CO, NO_x, PM_{10} and $PM_{2.5}$ were each reduced by over 10% when deliveries were performed outside of peak hours. While the notion of off-peak deliveries often raises concerns about noise, not a single noise complaint was made during the period of study.

Right-size delivery solutions

A crucial step in maximizing capacity utilization is ensuring that vehicles are the appropriate size for the task at hand. For instance, cargo cycles can be used to deliver small volumes of parcels in congested urban centres in order to avoid congestion and contribute less to air pollution. However, right-sizing solutions is much easier for freight companies with large fleets.

Photo: Todd-Fahrner, Flickr CC BY-SA 2.0

Some small for-hire carriers, for instance, may not have a choice between different vehicle sizes. For these carriers, right-sizing delivery solutions may mean ensuring that a sufficient number of less-than-load shipments are combined.

Parcel lockers

These are small storage units that are located close to the final delivery point in urban or rural areas, and which can be conveniently accessed by customers. They are often located in retail banking locations, grocery stores, transit stations, or condominium lobbies.

Parcel lockers are often branded and operated by a single carrier; however, a pilot project in the Seattle Municipal Tower in Seattle, Washington, demonstrates many benefits to a "common carrier locker system" (i.e. lockers can be used by any retailer, carrier, or goods purchaser and can be placed on public land). The pilot project reduced total delivery time in the building by 78% compared to regular floor-to-floor, door-to-door delivery throughout the tower.[88] Furthermore, there were zero failed deliveries using the common carrier locker system.

Microhubs

These are logistics facilities for micro-consolidation, which is the bundling of goods at a location near the final delivery point (e.g: within 1 to 5 km from the final destination).[89,90] In other words, microhubs provide an additional transhipment point in the supply chain that is located in the heart of an urban area.[91] They allow for a mode shift in last-mile deliveries (typically to more nimble, clean vehicles such as cargo cycles and electric light-duty vehicles). Other terms are also used to describe different types of micro-consolidation operations and the facilities where micro-consolidation occurs, including micro-consolidation centres, vehicle reception points, goods reception points, and mobile depots. Microhubs are different than urban consolidation centres, which are logistics facilities that are typically located just outside a city's border or in a city's suburbs where goods coming from outside of the city can be consolidated before being delivered within the city.[92] In many cases, one consolidation centre can serve an entire urban area.[93]

Software, analytics and artificial intelligence

Leveraging innovations in software, analytics and artificial intelligence (AI) can lead to improvements in urban freight efficiency. Improved data and analytics can allow companies to improve their operations by, for instance, identifying opportunities to improve fuel consumption and reduce GHG emissions. Geotab's vehicle tracking devices have allowed fleets to do just this,[94] as well as identify opportunities for electrification by analyzing a fleet's operational data, such as maximum range and dwell time.[95] Fleet Optics use data and analytics to optimize delivery routing and drive down costs for last-mile delivery fleets.[96] Meanwhile, Uber has developed new software that leverages artificial intelligence to more easily connect carriers with shippers through their platform Uber Freight.[97] Ultimately, improvements in software, analytics and artificial intelligence enable better understanding of the urban freight landscape, identify possible areas of improvements, and facilitate the implementation of these improvements.

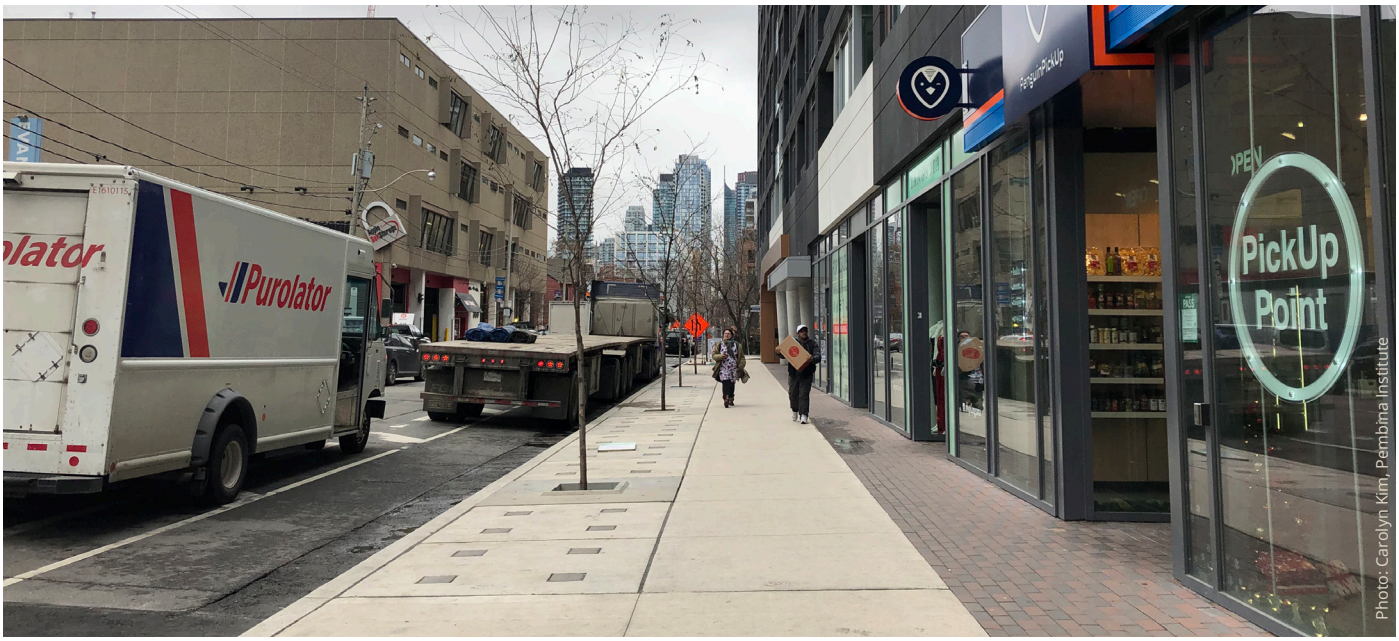


Photo: Carolyn Kim, Pembina Institute

Recommendations

As freight activity becomes increasingly prevalent in Canadian cities, businesses, governments, and researchers must work together to facilitate safe, efficient, and low-carbon goods movement. Collectively, we need to:

1. **Strengthen a national dialogue on low-carbon urban freight**

   While the impacts from increased urban freight may be most felt at the city level, in the air we breathe and congestion we endure, the issue is national in scope. An ad hoc city-by-city approach means that municipal bureaucrats and politicians are reinventing the wheel all across Canada. It's time to have a national conversation about investing in strategic, low-carbon infrastructure and creating policy and regulatory conditions that helps cities across Canada to adapt, innovate, and manage growing urban freight demands.

2. **Work across sectors to solve urban freight challenges.**

   Urban freight challenges cannot be solved by a single sector. It requires a cross sectoral approach — government, business, planning and policy practitioners and civil society — and a balanced approach to achieving multiple public policy objectives: a safe, efficient, competitive, and a low-carbon transportation and goods movement system that helps Canada meet its goal to decarbonize its economy by 2050.

   By coming together and sharing learnings, government can move forward faster on solving the complexities with urban freight, saving sought-after resources at the same time. Each level of government, with their varying planning authorities, plays an important role in encouraging efforts, establishing the right policy and planning conditions, and investing in low-carbon infrastructure across Canada. Businesses, too, benefit from a national approach to goods movement. Like any other clean economy policy, businesses need clear, consistent and reliable policies and regulations in order to test and viably scale up alternative delivery modes, operating models and technologies across the country.

3. **Integrate goods movement strategies with existing climate and energy, land use, road safety, and transportation strategies.**

   The movement of goods and people is both impacted by and affects a number of other policy issue areas. For transformational change, there must be strong coordination across disciplines — climate, energy, land use, infrastructure, and transportation. We must ensure policies that shape our social and economic conditions, built form and environment are supportive of one another.

4. **Improve municipal-level freight data monitoring and reporting.**

   The measurement, monitoring and reporting on how goods move in and around our cities must continue to be funded and prioritized. Providing coherent and standardized data on the goods movement sector would better inform how we plan for our cities in the near and long term.

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