

Quarterly Specialized Report

Goods Movement in Ontario: Now and in the Future

2022 -2023





“Our government is building roads, highways and transit to connect communities, fight gridlock and keep goods and people moving across the province...”

—The Honourable Caroline Mulroney, Ontario Minister of Transportation ¹

Table of contents

Table of contents.....	2
1 Introduction	4
1.1 Key sectors within the goods movement ecosystem	6
1.2 Key players in Ontario.....	8
2 Overview of Ontario's road-based goods movement	9
2.1 Transportation plans, policies, and regulations.....	12
2.2 Skills, talent & workforce development.....	20
2.3 Research & development.....	23
2.4 Manufacturing	25
2.5 Supportive infrastructure	27
2.6 Piloting, testing, and adoption	29
3 Future opportunities for Ontario's goods movement sector	32
3.1 Modernize infrastructure	33
3.2 Promote supportive policies	34
3.3 Foster technology innovation	35
3.4 Enhance labour development initiatives	36
3.5 Respond to consumer demands	37
About OVIN.....	38

Abbreviations

AI	Artificial Intelligence
AV	Autonomous Vehicle
CUSMA	Canada-United States-Mexico Agreement
DDC	Drone Delivery Canada
EV	Electric Vehicle
GDP	Gross Domestic Product
GGH	Greater Golden Horseshoe
GM	General Motors
GTHA	Greater Toronto and Hamilton Area
HR	Human Resources
MEDJCT	Ministry of Economic Development, Job Creation and Trade
MTO	Ministry of Transportation
NFMC	Nawiinginiima Forest Management Corporation
OCI	Ontario Centre of Innovation
OINP	Ontario Immigrant Nominee Program
OTA	Ontario Trucking Association
OVIN	Ontario Vehicle Innovation Network
R&D	Research and Development
SMEs	Small and medium-sized enterprise
ZEV	Zero Emission Vehicle
ZEZ	Zero Emission Zone

1 Introduction



Goods movement is an essential part of life in the 21st century. Nearly every product we own or use is transported—often several times—as it moves throughout the supply chain. From the sourcing of raw materials to the delivery of final products, goods movement plays an essential role in getting products to end consumers.

Goods movement refers to the distribution of freight (whether raw, intermediate, or finished) by all modes: road, rail, air, marine, and pipeline. The mode used for a given shipment is identified by weighing a range of factors, including cargo size, travel distance, final destination, shipping cost, ease of coordination, and legal or insurance considerations. Regardless of mode, a wide range of actors—including local, provincial, and national governments; carriers or service providers; and third-party logistics providers—have a hand in facilitating goods movement.²

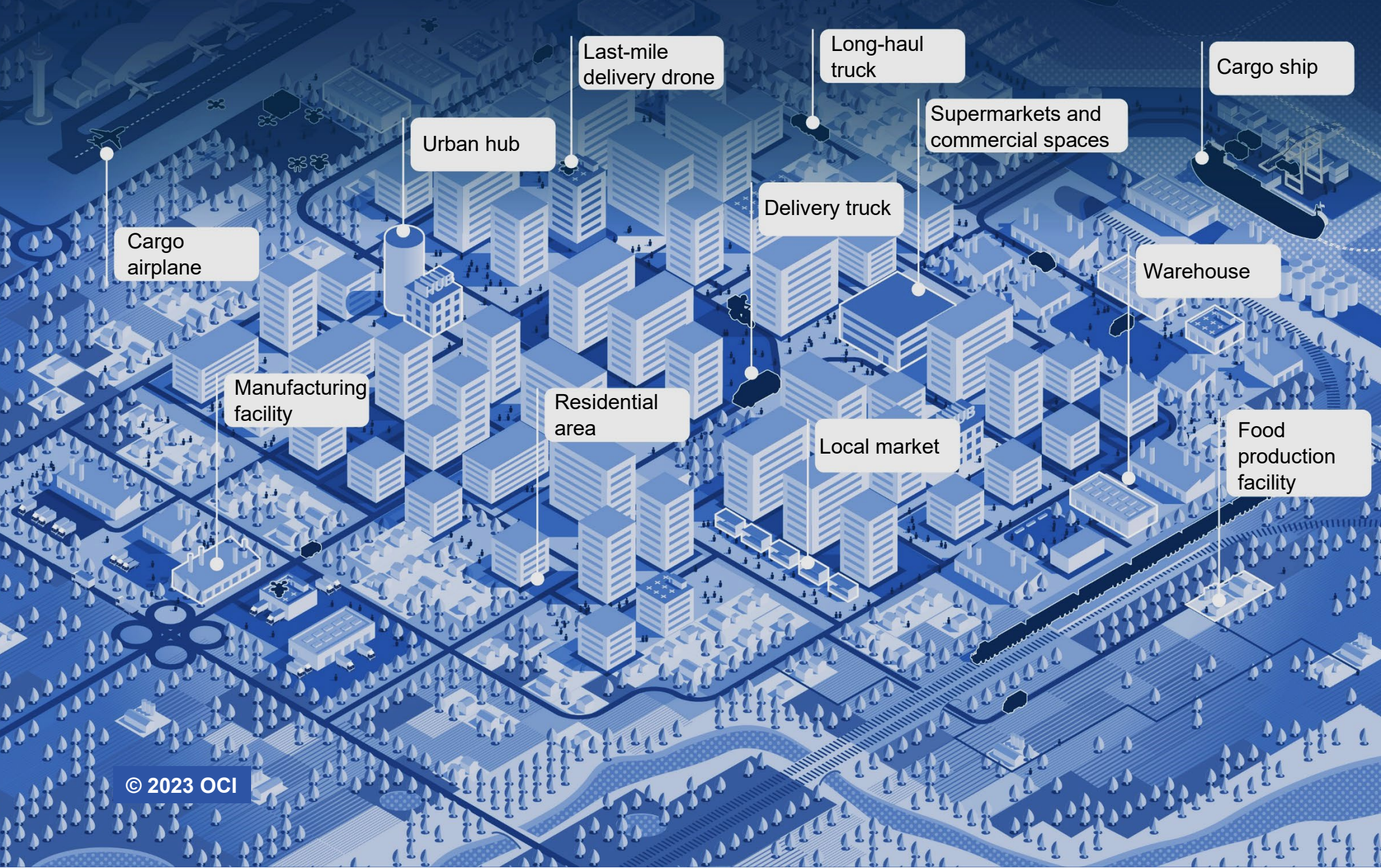
The success of local, national, and international economies is largely dependent on goods movement. As such, the industry is the focus of many plans, policies, and regulations seeking to improve its efficiency while mitigating adverse impacts. The sector is also a hotbed for innovation. Advances in goods movement include the development of remotely piloted aircraft systems (drones), the manufacturing of heavy-duty electric vehicles, and the testing and adoption of autonomous trucks.

In Canada, a country with abundant natural resources and millions of consumers spread across nearly 10M square kilometres, goods movement is of particular importance; as of 2021, the transportation and warehousing sector comprised 3.8% of the national gross domestic product (GDP),³ and employed just under 1M people.⁴ Trucking alone is responsible for 29% of Canada's transportation and warehousing GDP.⁵

Ontario is a key focal point of Canada's goods movement industry. Home to major airports, railways, and highways and adjacent to the shipping channels of the Great Lakes and the St. Lawrence Seaway, Ontario is a critical interface between the United States and Central Canada. In fact, Ontario's Highway 401 is recognized as the busiest highway in North America.⁶

This report presents an overview of Ontario's goods movement industry with a focus on road transportation. The remainder of Section 1 describes the goods movement ecosystem, highlighting key sectors and key players. Section 2 reviews Ontario's freight-supportive plans, policies, and regulations; talent development initiatives; research and development advances; manufacturing progress; infrastructure investments; pilot schemes; and technology adoption. Finally, Section 3 concludes by identifying some opportunities to build upon Ontario's successes in road transportation.

A snapshot of some key elements within the goods movement ecosystem



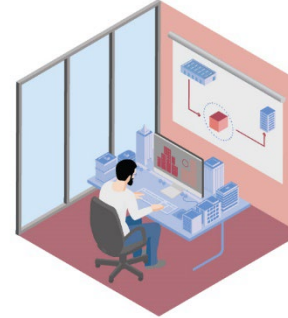
1.1 Key sectors within the goods movement ecosystem

The goods movement ecosystem engages a wide range of sectors. A selection of key sectors within this ecosystem are highlighted below.



Supply Chain

Supply chain refers to the processes required to produce and distribute goods.⁷



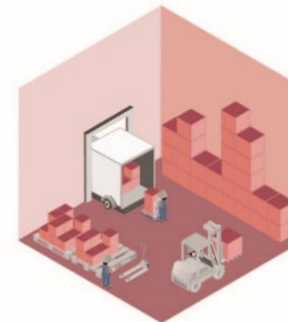
Supply Chain Management

Supply chain management involves optimizing the planning, sourcing, manufacturing, delivery, and returning of goods or services to ensure high quality processes and maximize profits.⁹



Goods Movement

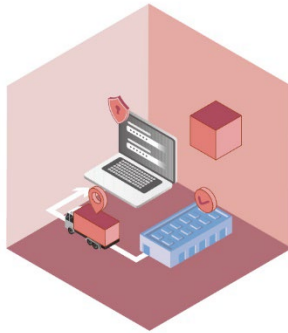
Goods movement refers to the distribution of freight (whether raw, intermediate, or finished) by all modes: road, rail, air, marine, and pipeline.⁸



Warehousing and Fulfillment

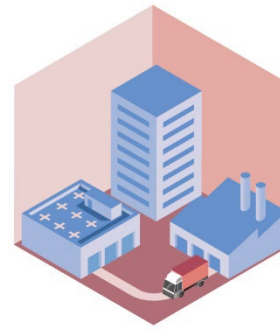
Warehousing refers to the storage of goods or products in a warehouse.¹⁰ Fulfillment involves packaging and sending goods ordered by a customer.¹¹

© 2023 OCI



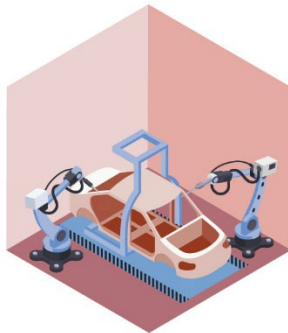
Cybersecurity Supply Chain Risk Management

Cybersecurity supply chain risk management involves the management of cybersecurity risks and the development of various response strategies.¹²



Middle-Mile Delivery

Middle-mile delivery involves the transportation of goods from a port of entry or manufacturer to regional hubs, warehouses, or distribution centres.¹⁵



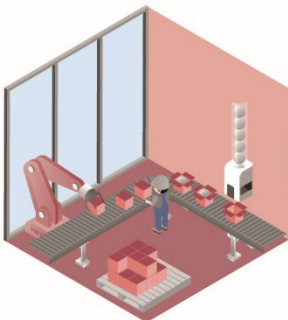
Manufacturing

Manufacturing includes raw material acquisition, product creation, quality control, and packaging for shipping.¹³



Last-Mile Delivery

Last-mile delivery describes the transportation of goods to end stores or to customers.¹⁶

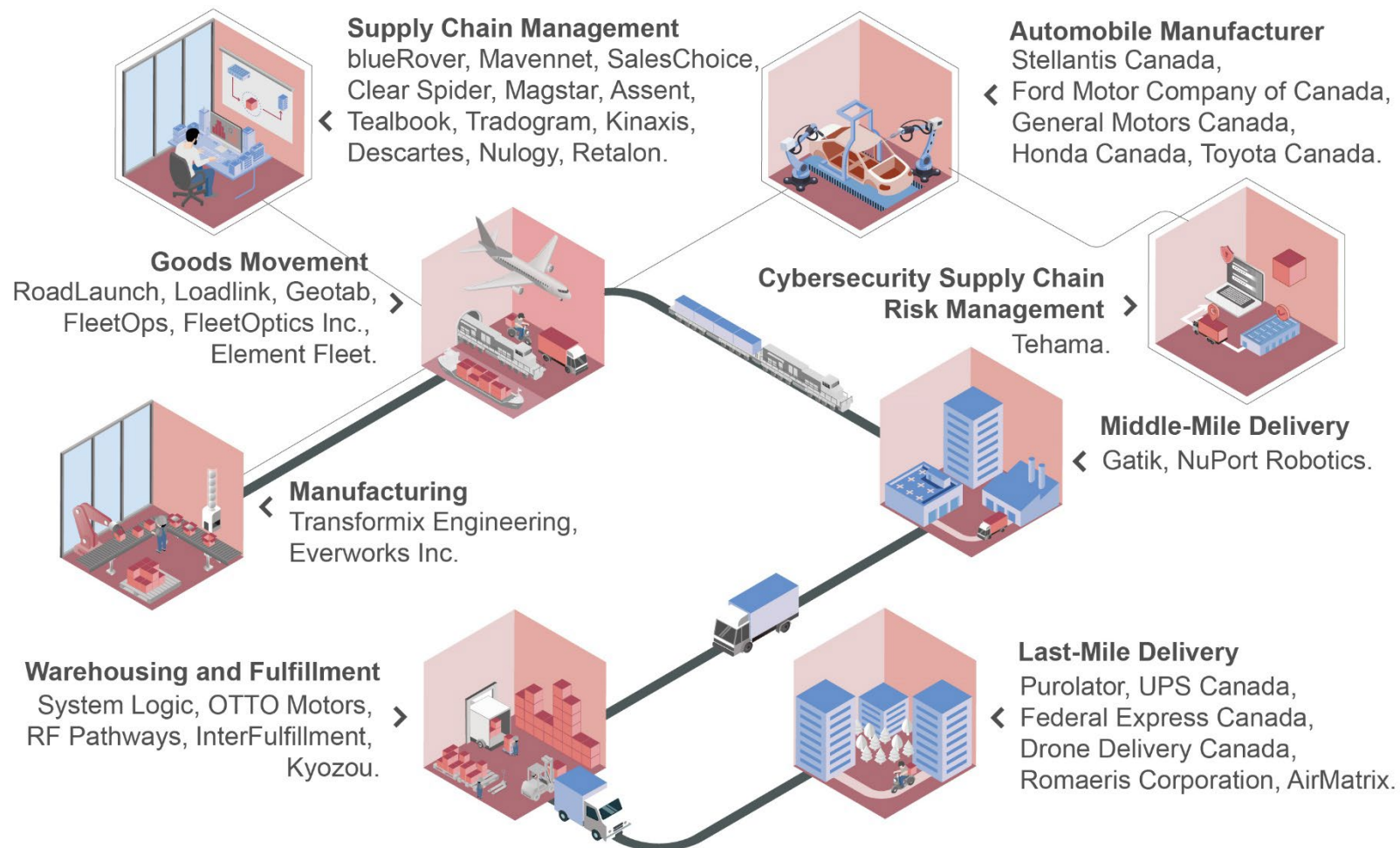


Automobile Manufacturer

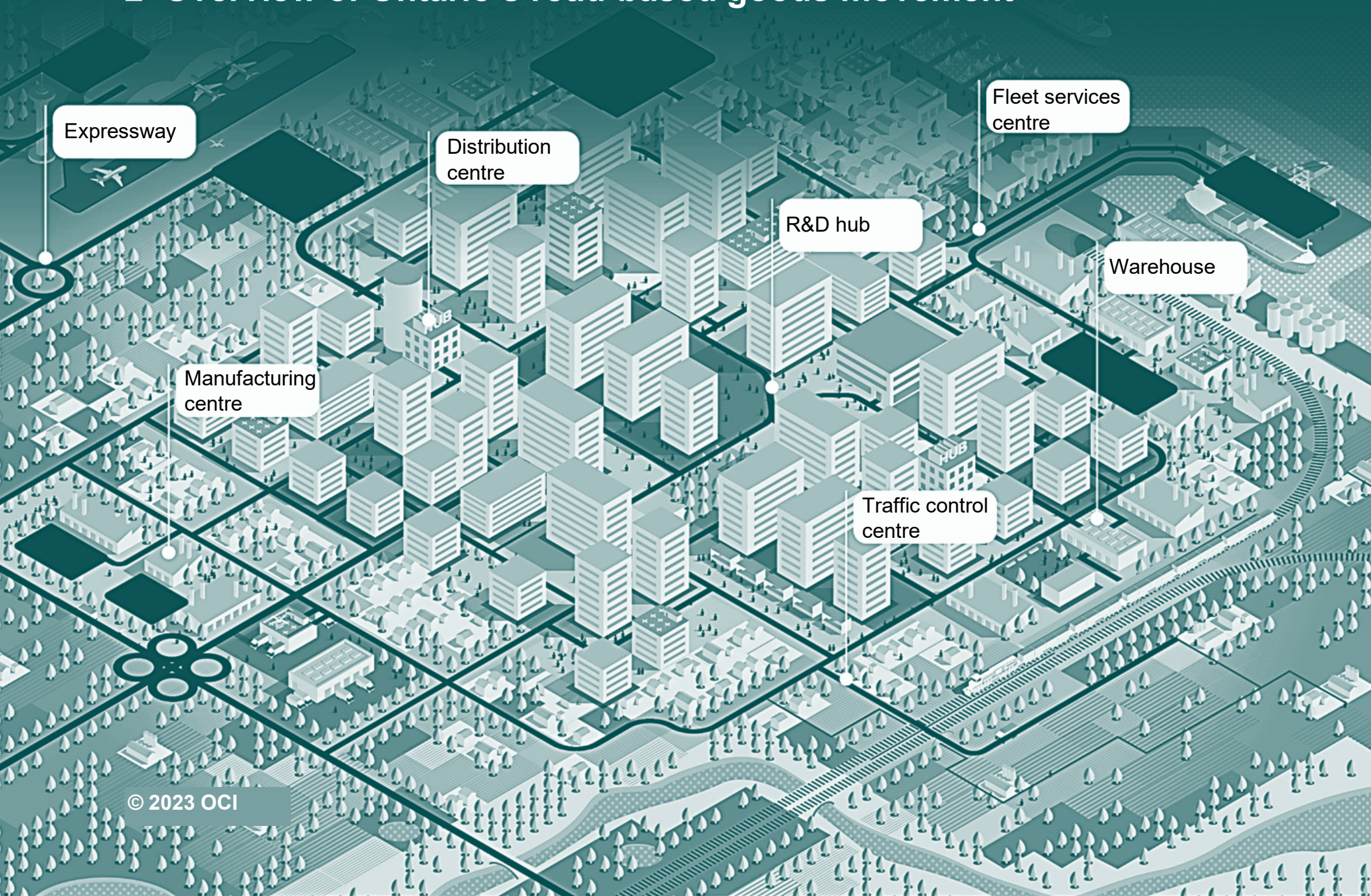
Automobile manufacturer refers to any businesses which manufacture or assemble passenger cars and trucks.¹⁴

1.2 Key players in Ontario

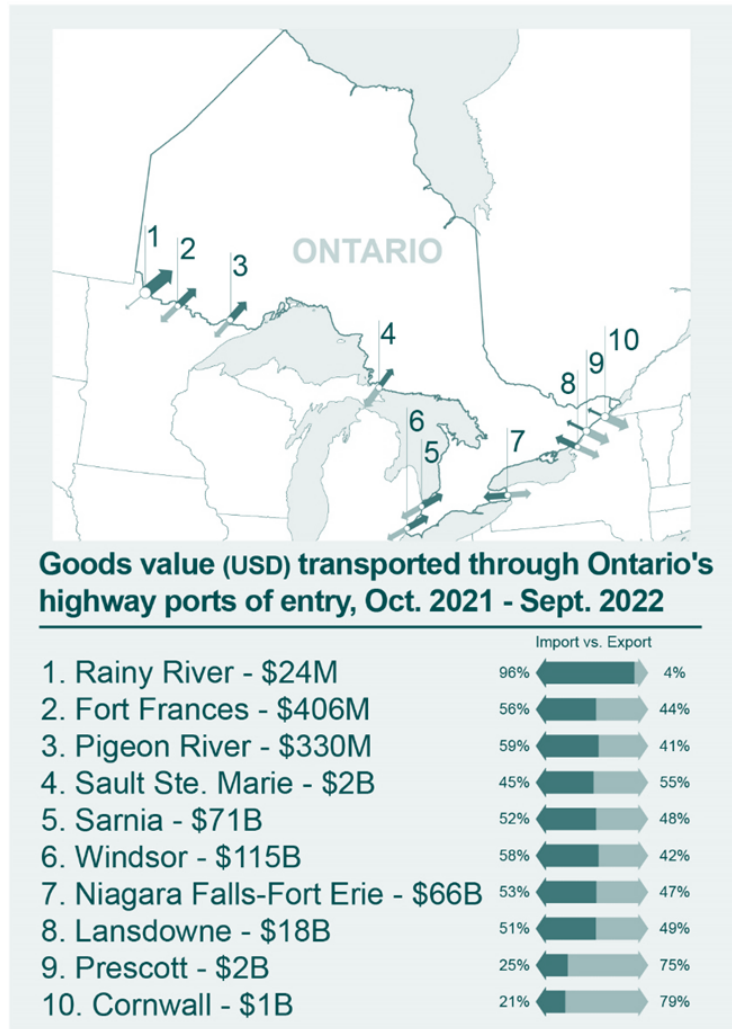
A broad range of actors and players are required to ensure that the goods movement ecosystem functions cohesively. A selection of ecosystem players in Ontario are highlighted below.



2 Overview of Ontario's road-based goods movement

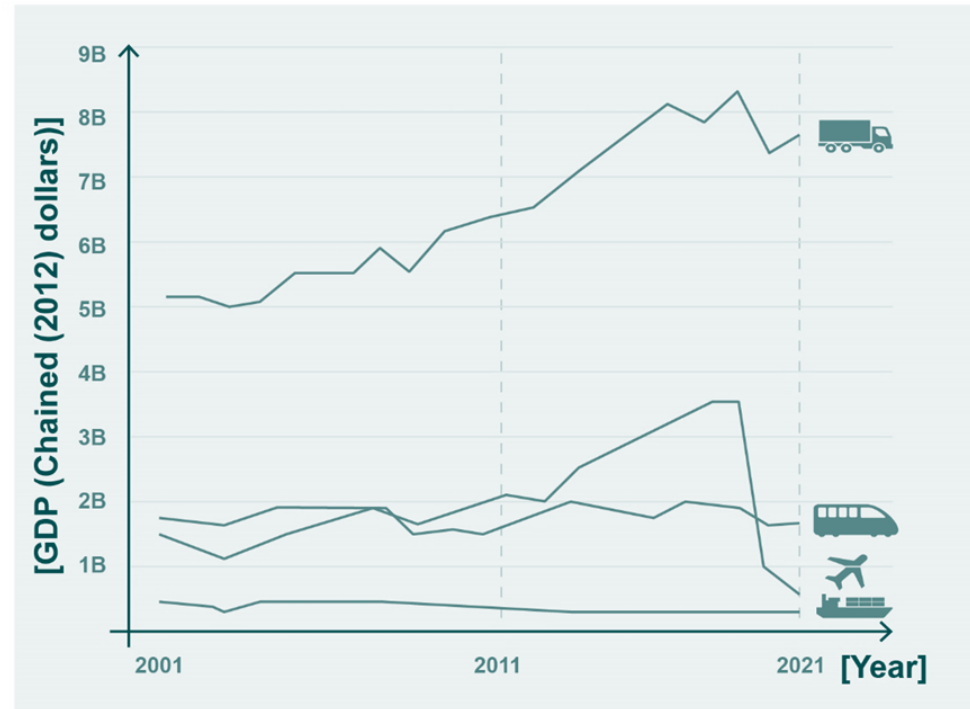


Overview of Ontario's goods movement



Source: Bureau of Transportation Statistics, 2022

© 2023 OCI



\$7.7B

Ontario's GDP
from truck
transportation in
2021

51%

increase in Ontario's
GDP from truck
transportation between
2001 and 2021

Source: Statistics Canada, 2022

Ontario's freeways and expressways

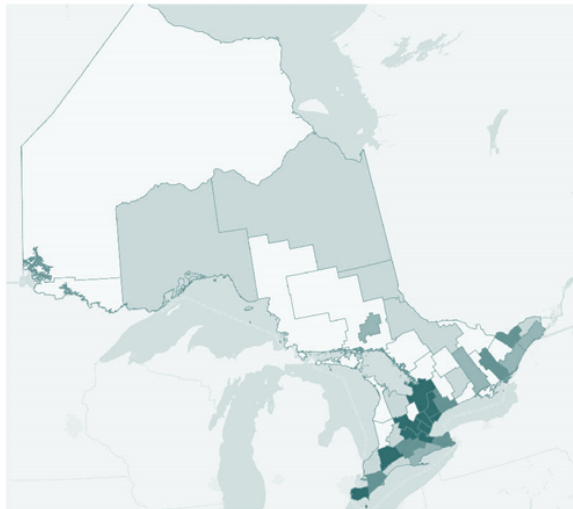


Legend

- Freeways and expressways
- Water bodies

Source of road network map:
Ontario Road Network, 2019

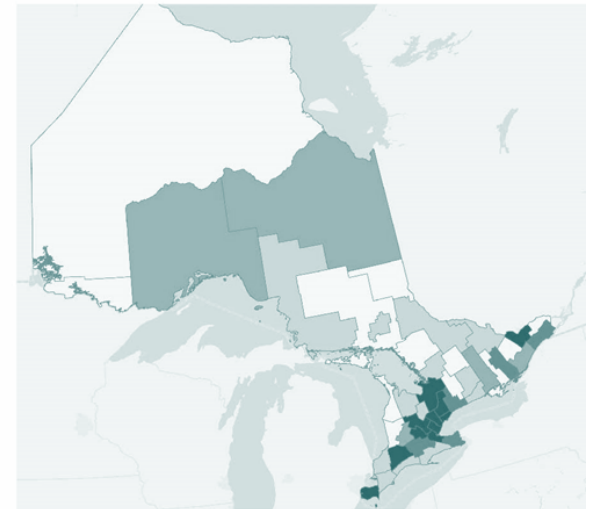
Annual commodity value by commercial vehicle trip origins



Legend

- \$0B - \$2.5B
- \$2.5B - \$5B
- \$5B - \$10B
- \$10B - \$20B
- \$20B - \$205B

Annual commodity value by commercial vehicle trip destinations



Legend

- \$0B - \$2.5B
- \$2.5B - \$5B
- \$5B - \$10B
- \$10B - \$20B
- \$20B - \$205B

Source of commodity value maps: Commercial Vehicle Survey, 2019

Base map source: Province of Ontario, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada

2.1 Transportation plans, policies, and regulations

The success of local, national, and international economies is largely dependent on goods movement. As such, the industry is the focus of many plans, policies, and regulations seeking to improve its efficiency while mitigating adverse impacts.

4

regional transportation plans with implications for logistics in Ontario

5

key themes in Canada's Transportation 2030 plan, including one focused on trade corridors and global markets

16

National Safety Codes developed to ensure road safety and facilitate the safe and efficient movement of people and goods across Canada



A range of plans, policies, and regulations guide and govern the goods movement sector, helping to encourage efficiency and ensure safety. As the impacts of the goods movement sector cut across a range of jurisdictions, supportive policies can apply municipally, provincially, nationally, or internationally. In Ontario, communities may be subject to policies implemented by local and regional municipalities as well as by the Government of Ontario and the Government of Canada. Goods movement in Ontario is also influenced by international free trade agreements.

Plans with implications for goods movement tend to share a common vision of realizing a transportation system that supports a thriving economy. As the plans are written by a range of authorities, the angle from which they tackle goods movement varies. Specific initiatives include improving roads, implementing digital solutions, and actioning freight-related strategies such as the use of electric trucks.

Similarly, the policies and regulations have a shared goal of facilitating the safe and efficient movement of goods. From free trade agreements—which include provisions for moving goods internationally—to municipal curbside policies, the policies and regulations work in concert to ensure seamless, safe, and reliable goods movement from origin to destination.

The following pages summarize a select sample of the key plans, policies, and regulations with impacts for goods movement in Ontario.

“Nearly one in five Ontario jobs depend on trade, and approximately \$400 billion CAD in two-way trade in goods travels across the U.S. and Canadian border in Ontario every year. We know that ensuring strong trade ties is vital to businesses and the communities they support on both sides of the border.”

**—The Honourable Victor Fedeli,
Ontario Minister of Economic
Development, Job Creation and
Trade.¹⁷**

2.1.1 Transportation plans

National



Transportation 2030: A Strategic Plan for the Future of Transportation in Canada | 2016 | Transport Canada¹⁸

- **VISION:** A safe, secure, green, innovative and integrated transportation system that supports trade and economic growth, a cleaner environment, and the well-being of Canada's middle class.
- **GOODS MOVEMENT FOCUS:** Aims to grow the country's economy by improving performance and reliability of Canada's transport through a suite of initiatives bundled under the theme "Trade Corridors to Global Markets". Initiatives include investing \$180B in infrastructure over 12 years as part of the Investing in Canada Plan; increasing data availability for all who operate, oversee, and use the transportation system; and looking at new ways to finance transportation infrastructure projects.

Provincial



2041 Regional Transportation Plan for the Greater Toronto and Hamilton Area | 2018 | Metrolinx¹⁹

- **VISION:** The GTHA will have a sustainable transportation system that is aligned with land use, and supports healthy and complete communities. The system will provide safe, convenient, and reliable connections, and support a high quality of life, a prosperous and competitive economy, and a protected environment.
- **GOODS MOVEMENT FOCUS:** Discusses the importance of a multimodal perspective to transportation planning which entails optimizing road networks for connections to intermodal yards and freight clusters, and other freight-related strategies such as off-peak freight movement, bicycle delivery, and urban freight hubs.

Provincial (continued)



Connecting the GGH: A Transportation Plan for the Greater Golden Horseshoe

| 2022 | Government of Ontario²⁰

- **VISION:** A connected transportation system that provides safe, efficient and convenient options for people and businesses and supports the wellbeing and economic prosperity of the region into the future.
- **GOODS MOVEMENT FOCUS:** Includes a suite of actions to keep goods moving, including expanding truck parking locations and improving the sustainability and efficiency of the freight sector by encouraging use of off-peak delivery.²¹

Connecting the East: A draft transportation plan for eastern Ontario

| 2022 | Government of Ontario²²

- **VISION:** Individuals, families and businesses across eastern Ontario have access to safe and reliable options within a transportation system that connects local communities, and contributes to the health, wellbeing, and economic prosperity of the entire region.
- **GOODS MOVEMENT FOCUS:** Highlights actions to help highways that are heavily used for goods movement run more smoothly and to explore opportunities to maximize the potential of the multimodal transportation system including rail, marine, air, and road transport modes.



Connecting the Southwest: A draft transportation plan for southwestern Ontario

| 2020 | Government of Ontario²³

- **VISION:** Individuals, families and businesses across southwestern Ontario have access to a safe and reliable transportation system that connects local communities, and contributes to the health, wellbeing, and economic prosperity of the entire region.
- **GOODS MOVEMENT FOCUS:** Supports a competitive business environment by noting actions to improve roads and highways so that businesses can keep goods moving. Reviews locations for alternative fueling stations, including electric and hydrogen.



Provincial (continued)



Connecting the North: A draft transportation plan for northern Ontario

| 2020 | Government of Ontario²⁴

- **VISION:** People and businesses, including Indigenous communities, across Northern Ontario have access to a safe and reliable transportation system that connects smaller communities to large centres and other areas, contributing to the health, wellbeing, and economic prosperity of the entire region.
- **GOODS MOVEMENT FOCUS:** Discusses actions to support economic recovery and competitiveness in Northern Ontario, including developing a new integrated emissions and safety testing program for truck and bus owners and implementing digital solutions to make it easier and more convenient for truck drivers to access government services.

Municipal



City of Toronto Freight and Goods Movement Strategy Framework

| 2020 | City of Toronto²⁵

- **VISION:** Provide a goods movement system that is safe, reliable and sustainable, connecting people and products while protecting Toronto's vibrant and thriving economy and quality of life.
- **GOODS MOVEMENT FOCUS:** Includes short-, medium-, and long-term actions for freight and goods movement related to system performance, access performance, environment, equity, economic competitiveness, safety, and adaptability.

Peel Goods Movement Long-Term Plan | 2019 | Region of Peel²⁶

- **VISION:** A safe, convenient, efficient, multi-modal, sustainable and integrated goods movement transportation system that supports a vibrant economy, respects the natural and urban environment, meets the diverse needs of industries and residents and contributes to a higher quality of life.
- **GOODS MOVEMENT FOCUS:** Strives to realize a goods movement system that is safe, economically competitive, innovative, sustainable, and high performing.

2.1.2 Policies and Regulations

International



Canada-United States-Mexico Agreement (CUSMA)²⁷

- **JURISDICTION:** Canada, USA, and Mexico
- **SCOPE:** The Canada-United States-Mexico Agreement (CUSMA) is a free trade agreement that reinforces Canada's strong economic ties with the United States and Mexico.
- **GOODS MOVEMENT FOCUS:** Discusses customs administration and trade facilitation to improve the ease with which goods multilaterally pass through international borders.

National



Pan-Canadian Competitive Trade Corridor²⁸

- **JURISDICTION:** Canada
- **SCOPE:** Proposes 27 actions to the federal, provincial and territorial governments for improving trade-supporting transportation systems in Canada.
- **GOODS MOVEMENT FOCUS:** Presents a framework for a coordinated effort to optimize national goods movement and improve international competitiveness of Canadian trade.

National Safety Codes²⁹

- **JURISDICTION:** the member jurisdictions of the Canadian Council of Motor Transport Administrators
- **SCOPE:** A set of 16 standards developed to ensure road safety and facilitate the safe and efficient movement of people and goods across Canada.
- **GOODS MOVEMENT FOCUS:** Focuses on the responsible operation of commercial vehicles on the roads through codes related to commercial vehicle drivers' hours of service, cargo securement, on-road inspections and more.

Provincial



Highway Traffic Act³⁰

- **JURISDICTION:** Ontario
- **SCOPE:** Regulates the licensing of vehicles, classification of traffic offenses, administration of loads, classification of vehicles and other transport-related issues.
- **GOODS MOVEMENT FOCUS:** Regulations under the act deal with commercial vehicle inspections, vehicle weights and dimensions, transport of goods, etc.

Freight-Supportive Guidelines³¹

- **JURISDICTION:** Ontario
- **SCOPE:** Assists in the creation of communities, individual developments and transportation networks that are capable of supporting freight industries while integrating and balancing the compatibility of surrounding land uses and the needs of other transportation system users.
- **GOODS MOVEMENT FOCUS:** Highlights best practices, examples and implementation tools that are applicable to a wide range of communities and municipalities, and also provides direction for long-term and local implementation of freight-supportive policies and practices across Ontario.

Cooperative Truck Platooning Pilot Program³²

- **JURISDICTION:** Ontario
- **SCOPE:** Allows for truck platoons involving commercial motor vehicles retrofitted with advanced driver-assistance systems and Level 1 and Level 2 automation technology.
- **GOODS MOVEMENT FOCUS:** The pilot program aims to demonstrate the potential of truck platoons, verify their compatibility with existing road users and infrastructure, and confirm their overall safety.

Municipal



City of Toronto Curbside Management Strategy³³

- **JURISDICTION:** City of Toronto
- **SCOPE:** Comprehensive high-level policy approach and implementation plan to provide the strategies and tools necessary to effectively manage curbside uses that support the robust economic activity of an area while effectively managing related impacts on traffic movement.
- **GOODS MOVEMENT FOCUS:** Notes need for provision of designated loading/delivery areas near businesses.

City of Ottawa Small Business Identity Card Parking Permit³⁴

- **JURISDICTION:** City of Ottawa
- **SCOPE:** The small business identity card permit provides special short-term parking privileges for drivers of commercial or delivery and pick-up vehicles in the downtown and business districts of the City.
- **GOODS MOVEMENT FOCUS:** Permit holders are allowed to stop for purposes of delivery, pick-up, or loading in No Parking Zones or Loading Zones for a short period of time.

2.2 Skills, talent & workforce development

Changes to labour force dynamics in Ontario's logistics sector require action. By addressing an ongoing driver shortage—in part by increasing the sector's inclusivity—Ontario is actively working to expand its logistics capacity.

381,300

jobs in Ontario's transportation and warehousing sector as of October 2022

28,000+

vacant Transport Truck Driver jobs in Canada in the second quarter of 2022



Ontario's robust transportation and warehousing sector employed 381,300 people as of October 2022.³⁵ The sector's overall expansion requires workforce development across a range of jobs as the trucking industry has experienced a shortage of drivers in the past few years. A 2022 report released by Trucking HR Canada notes that there were over 28,000 vacant Transport Truck Driver jobs in Canada in the second quarter of 2022.³⁶ A recent Nanos Research poll conducted in spring 2022 found that nearly 100% of Canadian trucking executives saw driver shortage as the biggest threat to the industry.³⁷

Members of the Ontario Trucking Association (OTA), along with the Government of Ontario, have advocated for improvements to the trucking industry's access to key federal and provincial immigration programs as a potential solution to combat the issue of labour shortage. Monte McNaughton, Ontario's Minister of Labour, Immigration, Training and Skills Development, recently called for the federal government to increase the number of Ontario Immigrant Nominee Program (OINP) applications from 9,700 to 18,000 to increase the recruitment of skilled workers into the province, especially for critical industries like trucking. The inclusion of the trucking industry in the 'In Demand Skills Stream' of the OINP since 2019 has already been successful, with almost 700 drivers being nominated through the program.³⁸

Ontario is also making investments to improve diversity and representation in the trucking industry. Women comprise just over 22% of the labour force in Canada's Transportation and Warehousing Industry.³⁹ In trucking specifically, women represent just 3.5% of employees.⁴⁰ To help women and other underrepresented groups develop the skills for a rewarding career in the trucking industry, the Workforce Planning Board of Waterloo Wellington Dufferin and the Women's Trucking Federation of Canada—with support from the Government of Ontario—organized a 14-week training program. The program, which began in May 2021, provided free training and commercial truck driver licensure to participants, with childcare and support available.⁴¹

“Our government is taking deliberate steps to make sure anyone who wants to work can get the training they need to establish rewarding careers right now.”

—The Honourable Monte McNaughton, Ontario Minister of Labour, Immigration, Training and Skills Development⁴²

Case study: Leveraging real-time mood insights to protect delivery couriers

North America's key players in technology and logistics are joining forces to deliver made-in-Ontario solutions to today's most challenging and complex problems in goods movement, making Ontario's roads safer and its essential workers healthier in the process.

SalesChoice is an Ontario-based company focused on leveraging the capabilities of AI to deliver critical market insights to clients. In September 2021, they teamed up with Canadian logistics giant Purolator in order to capture the benefits of AI-informed insights into the health of courier drivers by deploying an AI Mood Insights Mobile Application for use across Purolator's fleet.⁴³ The Mood Insights Application allows employees to submit anonymous wellbeing status updates and feedback on factors affecting their mood.⁴⁴

Stress, in addition to being a major factor in the long-term development of chronic illnesses, is a significant contributor to workplace accidents across industries. This is of particular importance in trucking, a sector where the workplace is the public roadway and accidents on the job can pose a threat to public safety. On-the-job stress has been found to be an even greater concern over the course of the pandemic, especially for essential workers.⁴⁵

In line with an overall paradigm shift in the health sector favouring preventative instead of reactive measures, the SalesChoice and Purolator's joint initiative aims to reduce the incidence of workplace accidents by identifying early signs of risk in drivers based on real-time mood insights.⁴⁶

Initially, the application will be used by 125 of Purolator's over 5,000 couriers in order to evaluate its scalability and effectiveness, before eventual commercialization and widespread deployment. The project—which received \$100K in funding each from SalesChoice, Purolator and OVIN, for a total of \$300K in investment—will make use of SalesChoice's proprietary AI technology. The deployment of the application will serve an informative purpose both in testing the application of AI to Health Mood Insights—a relatively new undertaking on SalesChoice's part—and in identifying other data sources that can potentially be correlated to increase intelligence on health, stress and safety indicators. This will further refine the ability of the software to detect early signs of risks to health and safety.⁴⁷

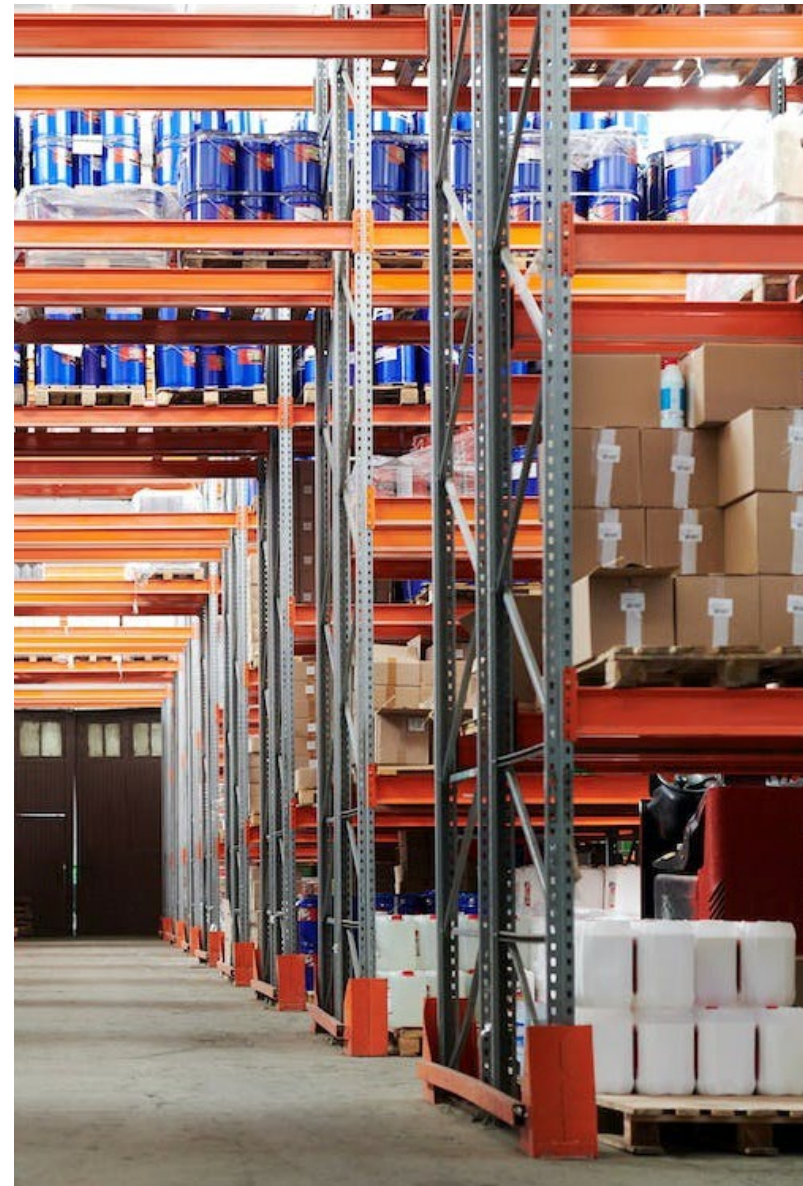
SalesChoice

2.3 Research & development

A suite of new research in Ontario is focused on relieving the mounting supply chain pressure introduced by the ever-increasing demand on the e-commerce industry.

2

mini delivery hubs deployed in Toronto as part of a last-mile delivery research program between the University of Toronto, Purolator, and the City of Toronto



The University of Toronto, Purolator, and the City of Toronto joined forces in October 2022 to establish two 'Urban Quick Stop' facilities within the university campus in response to the rise of online shopping and demands for last-mile solutions. These facilities, housed within a 40-foot shipping container, act as hubs for nearby Purolator customers to pick-up or drop-off packages. They also function as 'living laboratories' that facilitate data collection and allow researchers to observe the impacts of the new system. In addition to the pick-up locations, the initiative also includes door-to-door delivery service that uses three-wheeled delivery e-bikes instead of traditional delivery trucks that occupy more space on the road, generate harmful emissions, and are more difficult and time consuming to park. The e-bikes—which are equipped with Bosch's AI enabled traffic cameras and Geotab's emission sensors—collect data on the traffic and environmental impacts of the initiative. It is anticipated that the information gathered through this project will fuel further technological innovations, enabling greener deliveries and addressing last-mile challenges.⁴⁸

Another start-up, LoopX AI, developed a fleet of autonomous delivery robots designed to bring inexpensive delivery services to local homes and businesses. The start-up has been testing its robots in Waterloo's Research & Technology Park, which is close to the University of Waterloo and the large student population the robots are intended to serve. The service is designed to reduce the cost of food delivery as a result of driverless operation and will improve access to food for users. In June 2022, the LoopX AI was awarded the top prize in the 5G Transportation Challenge sponsored by OVIN and Rogers.⁴⁹

"Through the Government of Ontario's initiative OVIN, we are leveraging technology and innovative companies in Ontario to increase efficiency, trade and movement across borders. Trade and movement across borders is not only critical to supply chains and goods on both sides, but it is also part of the daily lives of the people that live in border communities. Through OVIN we strive to provide companies with an opportunity to innovate and solve real-world challenges that will support safer, more efficient movement of people and goods at our border crossings. "

—Raed Kadri, Head of OVIN

2.4 Manufacturing

The manufacturing of vehicles and other delivery-related products and services is set to become a key part of Ontario's complete logistics offering.

\$1B

invested by General Motors to retrofit its CAMI assembly plant in Ingersoll, Ontario to produce electric delivery vehicles



Automotive manufacturer General Motors invested \$1B to retrofit its CAMI assembly plant in Ingersoll, Ontario to produce electric delivery vehicles.⁵⁰ The first model, an electric light commercial vehicle intended for long-range delivery, has been in production since December 2022.⁵¹ Production of a second model, a smaller version of the first, is slated to begin in 2023.⁵² When production started in December, General Motor's CAMI plant became Canada's first full-scale EV manufacturing plant.⁵³

These electric delivery vehicles are part of BrightDrop, General Motor's integrated ecosystem of EV-related products aimed at facilitating sustainable, efficient, and low-cost delivery for businesses.⁵⁴ The ecosystem also includes the BrightDrop Trace, a propulsion-assisted electric delivery pallet for goods movement across short distances that was largely developed and tested in Ontario,⁵⁵ and an integrated software platform that provides real-time management, access and insight for customers into BrightDrop products.⁵⁶ BrightDrop customers include FedEx Express, which participated in an early pilot to test the BrightDrop Trace and is the first customer to purchase the ZEVO 600,⁵⁷ and Verizon, which is putting ZEVO 410s to use as service vehicles.⁵⁸

“Watching the first BrightDrop vehicles roll off the assembly line, it is clear that Ontario will build the cars of the future. Our government continues to attract transformative investments by creating the right economic conditions and reducing red tape.”

**—The Honourable Victor Fedeli,
Ontario Minister of Economic
Development, Job Creation and
Trade⁵⁹**

2.5 Supportive infrastructure

Ontario's investments in transportation infrastructure are helping facilitate goods movement throughout the province.

\$3B

committed to improving Ontario's highways between April 2022 and March 2023

15,300

direct and indirect jobs created or sustained by Ontario's 2022 – 2023 Highway Program



Infrastructure for zero-emissions heavy-duty vehicles will become increasingly important as the use of zero-emissions vehicles continues to grow. Efforts to upgrade and prepare Ontario's electric-vehicle charging infrastructure include a pilot by Hydro One that is investigating electric truck charging facilities. The pilot, which aims to develop a model that can be used by other businesses and utilities in the future, received almost \$5M in funding through Natural Resource Canada's Green Infrastructure – Electric Vehicle Infrastructure Demonstration Program.⁶⁰ Further improvements to the province's EV charging infrastructure are enabled by a \$91M provincial investment in Ontario's charging network. This initiative includes the introduction of new EV chargers at highway rest stops, carpool parking lots, parks, and other kinds of community hubs – with an emphasis on improving EV charging access in the province's rural municipalities through Ontario's Rural Connectivity Fund.⁶¹

Efforts to improve Ontario's hydrogen infrastructure—which provides support for vehicles powered by hydrogen fuel cells—are also being advanced. For example, the province is supporting a proposal from Atura Power for a hydrogen production facility in Niagara Falls that is anticipated to be a prominent hub for heavy-duty trucking and heavy industrial consumers.⁶²

Ontario's improved infrastructure for zero-emissions vehicles will be complemented by overall improvements to highway rest areas and service stations – many of which will be targeted for safety, comfort and efficiency improvements for logistic sector workers.⁶³ Improvements include upgrades at 14 existing truck rest stop areas, the construction of 10 new rest areas, and the addition of 178 truck parking spaces across 4 existing ONroute travel plazas.⁶⁴

Approximately \$3B has been committed to improving highways between April 2022 and March 2023 as part of Ontario's Highways Program. The expansion and repair projects will create or sustain around 15,300 direct and indirect jobs while improving safety and facilitating goods movement.⁶⁵

"Truck drivers spend long hours moving goods of every type and description on our roadways and we need to ensure they have a modern, safe and welcoming place to stop and rest."

—The Honourable Caroline Mulroney, Ontario Minister of Transportation⁶⁶

2.6 Piloting, testing, and adoption

Ontario's supportive piloting and testing legislation is facilitating the commercialization and adoption of new goods movement technologies.

\$3M

joint investment by OVIN, NuPort Robotics Inc., and Canadian Tire to develop automated technology for heavy-duty trucks

6

patents awarded to Drone Delivery Canada for its drone delivery solution



Piloting and testing—and ultimately adopting—new technologies present opportunities to substantially increase the safety, efficiency, and economic competitiveness of the logistics sector. NuPort Robotics Inc., Canadian Tire, and OVIN are investing \$3M in a pilot project to develop automated technology for heavy-duty trucks. The project aims to make middle-mile trips safer and more efficient by retrofitting two semi-tractor trailers with artificial intelligence technology for use on a route between a Canadian Tire distribution centre and nearby rail terminals.⁶⁷

In some cases, the adoption of new technologies is helping to address the trucking industry's workforce gap. Nawiinginokiima Forest Management Corporation (NPMC) and Provectus Robotics Solutions Inc. partnered in 2021 to deploy semi-autonomous trucks for use in the forestry industry. NPMC—which manages a forest area of 1.5M hectares and is a key supplier of wood—was experiencing a shortage of truck drivers willing to transport timber in bad weather and on poor roads. Through their partnership with Provectus Robotics Solutions Inc., NPMC deployed an innovative solution to this problem; they used one truck operated by an experienced driver followed by two autonomous trucks closely imitating the lead truck's route and speed.⁶⁸

Drones are also being piloted for use in last-mile deliveries in Ontario. In November 2022, Drone Delivery Canada (DDC)—whose drone delivery solution has been awarded six patents⁶⁹—partnered with Halton Healthcare, DSV Air & Sea, McMaster University, and Air Canada to begin Care by Air, a 6-month pilot project to conduct defined-route drone deliveries of healthcare goods from DSV to Halton Healthcare's Oakville Trafalgar Memorial Hospital. Looking forward, the project seeks to optimize healthcare supply chains by expanding to all Halton Healthcare hospitals and delivering time-critical medical supplies, such as medical isotopes from McMaster University.⁷⁰

“Connected and automated vehicle technologies have the potential to transform how goods are delivered in Ontario.”

—The Honourable Caroline Mulroney, Ontario Minister of Transportation.⁷¹

Case study: Commercializing autonomous deliveries

There is a substantial business interest that can be served by a shift from conventional delivery vehicles to autonomous delivery vehicles, especially as the logistics industry looks to respond to increasing labour gaps. However, despite trends and interest towards greater AV uptake, a number of barriers continue to exist for autonomous vehicle use in the logistics space, many of which can only be addressed with increased public and private sector investment in R&D, innovation and piloting.

Gatik, a leader in autonomous logistics, has partnered with grocery chain Loblaw in order to test driverless delivery of Loblaw products. Initially launched in 2017, Gatik is an autonomous technology company that uses autonomous medium-duty trucks to optimize logistics operations while reducing labour costs.⁷²

The announcement of fully driverless deliveries follows the successful completion of more than 150,000 deliveries of Loblaw's products by Gatik trucks, all of which were accompanied by a safety driver, and which had a 100% safety record. The operation of autonomous vehicles with safety drivers on board served as a proof-of-concept for the eventual operation of these vehicles under more autonomous conditions. After a third-party safety review commissioned by Loblaw, the decision was made in October 2022 to introduce fully-driverless service – a first in Canada for commercial delivery. The fully driverless deliveries will enable Loblaw to increase

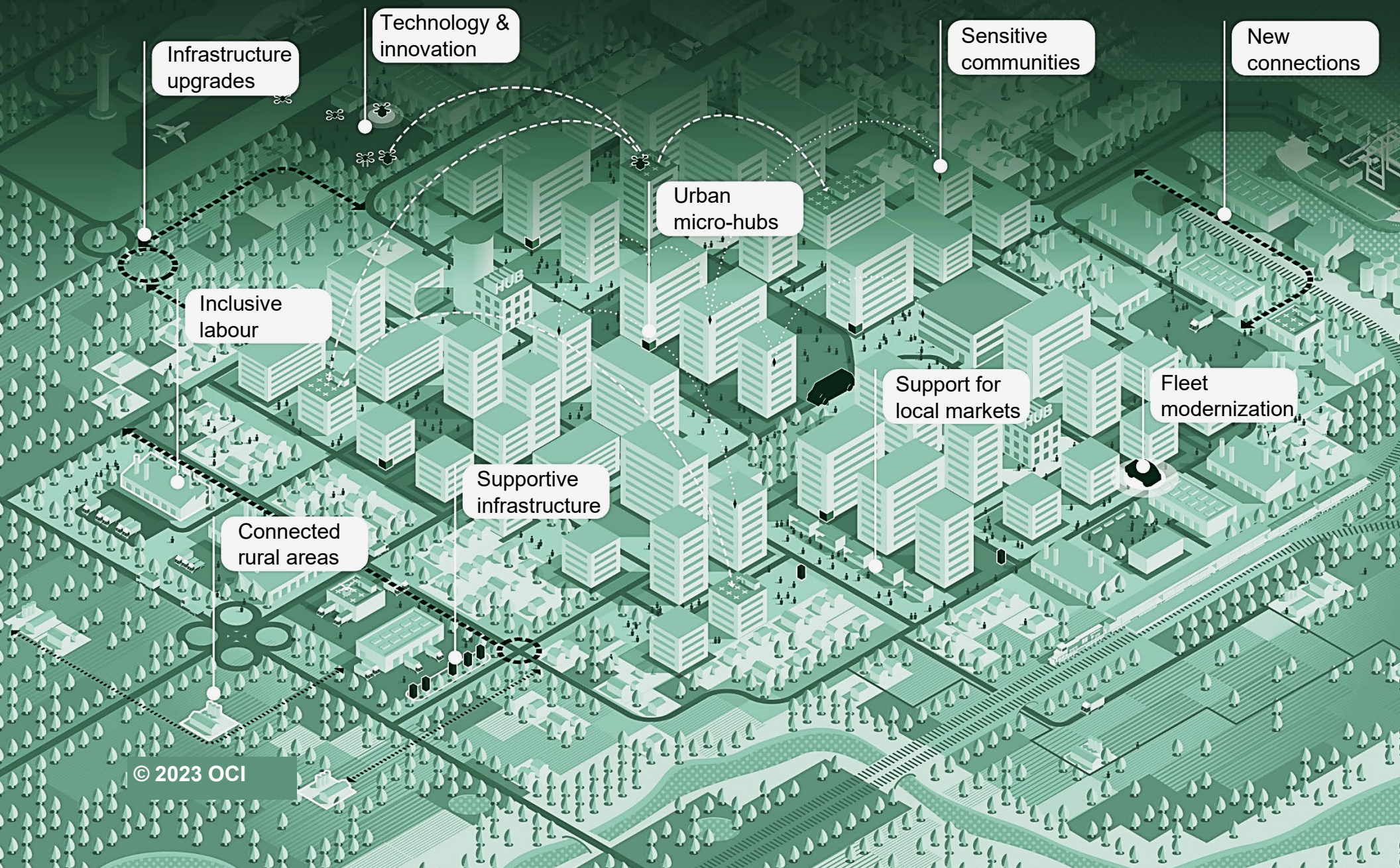
trip frequency and operate more routes, all while creating a safer, more sustainable and more resilient supply chain.⁷³

Presently, Ontario only permits on-street operation of commercial autonomous vehicles up to autonomy Level 3, which require a safety driver. Gatik and Loblaw, however, were able to take advantage of an ongoing automated-vehicle pilot program by the Government of Ontario in order to exceed the level of autonomy currently available to consumers on the market, provided that vehicles operate on fixed routes and within specific areas.⁷⁴

As the Government of Ontario increasingly permits higher levels of autonomy on its streets in response to successful partnerships and pilots like that undertaken by Gatik and Loblaw, the prospects for widespread uptake and commercialization of autonomous vehicle technology in middle-mile and last-mile deliveries will continue to improve.



3 Future opportunities for Ontario's goods movement sector



3.1 Modernize infrastructure

Ontario stands ready to build off past investments in infrastructure upgrades to facilitate fleet modernization and freight-supportive communities.

Fleet modernization—which refers to the use of innovative delivery vehicles such as electric cargo vans, drones, or cargo bikes—poses several benefits including convenience, reliability, and sustainability. The implementation of supportive infrastructure such as electric vehicle charging stations can help increase uptake of these innovative vehicles, thereby reducing pollution and emissions through a reduction in the number of gas- and diesel-powered trucks on the road.

Ontario can increasingly look towards its rural communities for opportunities for innovation in infrastructure development by building on initiatives like the Rural Connectivity Fund,⁷⁵ which will provide provincial funding for EV chargers in rural and remote communities. Targeted funds that support infrastructure development in a range of community types will help ensure that infrastructure is context-sensitive and also deployed holistically.



3.2 Promote supportive policies

Ontario can usher in a cleaner, more sustainable, and more efficient future in logistics and delivery by instituting the policies necessary to incentivize zero-emission deliveries, manage limited resources such as curbside space, and encourage collaboration across the industry.

ZEV uptake is supported by a broad range of policy initiatives. At the federal level, the government is developing a sales mandate that will require 100% of new light-duty vehicle sales to be zero-emission vehicles by 2035 and that will require 100% of medium- and heavy-duty vehicle sales to be ZEVs by 2040 for a subset of vehicle types based on feasibility.⁷⁶ The federal government also offers an incentive program that provides funding to support the purchase or leasing of eligible medium- and heavy-duty zero-emission vehicles.⁷⁷ In Ontario, the province's Low-Carbon Hydrogen Strategy supports a proposal for a new low-carbon hydrogen production facility in Niagara Falls that is anticipated to serve heavy-duty trucks.⁷⁸

To encourage zero-emission deliveries in Ontario, the province could consider additional policies such as the establishment of zero-emission zones (ZEZs) in dense urban cores where high numbers of deliveries have had adverse impacts, such as increased congestion, noise and emissions. The province could also support initiatives for progressive curbside management.

Ontario can also streamline its supply chain through innovative policies that encourage digitalization and data sharing, promote industry standardization, and foster collaboration between governments and the private sector. In 2022, a report from the National Supply Chain Task Force stated that the establishment of digital data hubs by governments and private stakeholders will be crucial to enabling informed planning and real-time decision making in the supply chain sector.⁷⁹ The same sentiment was expressed in responses to a 2017 survey from various municipalities across Ontario, which indicated a lack of goods distribution data as a barrier against municipal goods movement planning.⁸⁰ The provincial government can be a key player in the digitalization of the supply chain by implementing policies that standardize goods movement data emerging from a variety of stakeholders across Ontario.

3.3 Foster technology innovation

Ontario's centres of innovation can lead the technology development needed to usher in the goods movement sector of the future. New developments will only accelerate as the momentum behind goods movement alternatives grows.

Ontario-based companies and research entities can be at the forefront of delivering integrated solutions that promote safe, innovative, and resilient goods movement. For example, the combination of cutting-edge logistics methods (drones, warehousing robots, micro hubs, electric pallets) with traditional logistics methods can be leveraged to optimize efficiency, convenience, and sustainability. One model of this is the concurrent use of drones, which can handle the last part of a delivery journey, with trucks, which can cover longer distances and serve as charging stations for the drones, thereby significantly increase the utility and efficiency of both modes.⁸¹



3.4 Enhance labour development initiatives

The development of policy and technology in Ontario presents an opportunity to address one of the most substantial challenges the logistics industry currently faces: its labour shortage.⁸²

Ontario could look to foster technological advances that support workers' wellbeing, safety, and quality of work environment. Ontario could also build on existing skills development initiatives by improving training through upskilling and reskilling programs, thereby making jobs in the sector more accessible. These initiatives would likely increase the industry's equity, diversity, and inclusion. Additionally, the province could continue to support ongoing efforts to improve the industry's access to key immigration programs.⁸³



3.5 Respond to consumer demands

The increasingly prevalent culture of conscious consumption is poised to play a greater role in dictating consumer choices—and corporate responses—in the realm of goods delivery, especially as the number of retailers offering emission-free delivery increases.

Ontario is well-positioned to facilitate more responsible consumption through policies and initiatives requiring impact-related transparency for consumers at the point of sale. For example, Ontario could require that retailers and other major players in logistics disclose information to consumers about the impact of the delivery—such as packaging materials used and carbon emitted—allowing them to make responsible consumption choices. This has the potential to foster a greater sense of accountability for consumers and producers alike and encourage the increased use and development of emission-free delivery, which involves the use of emission-free modes such as ZEVs, bicycles and e-scooters for goods movement.

Currently, the federal government's Zero-Emission Vehicle Awareness Initiative encourages zero-emission deliveries by supporting outreach, education, and capacity-building projects related to low- and zero-emission medium- and heavy-duty vehicles such as delivery vans and certain long-haul freight trucks.⁸⁴ As more and more consumers request sustainable delivery options, Ontario could implement similar initiatives to provide targeted support that further promotes zero-emission deliveries within the province.



About OVIN

The Ontario Vehicle Innovation Network (OVIN) is a key component of Driving Prosperity, the Government of Ontario's initiative to ensure that the automotive sector remains competitive and continues to thrive. The Government of Ontario has committed \$56.4M for OVIN over four years to support research and development (R&D) funding, talent development, technology acceleration, business and technical support, and testing and demonstration sites. OVIN programs support small- and medium-sized enterprises (SMEs) to develop, test, and commercialize new automotive and mobility products and technologies, and cultivate the capacity of a province-wide network to drive future and green mobility solutions, reinforcing Ontario's position as a global leader.

OVIN, led by Ontario Centre of Innovation (OCI), is supported by the Government of Ontario's Ministry of Economic Development, Job Creation and Trade (MEDJCT) and Ministry of Transportation (MTO).

The initiative comprises five distinct programs and a central hub.

The OVIN programs are:

- Research and Development Partnership Fund
- Talent Development
- Regional Technology Development Sites
- Demonstration Zone
- Project Arrow

The OVIN Central Hub is the driving force behind the programming, province-wide coordination of activities and resources, and Ontario's push to lead in the future of the automotive and mobility sector globally. Led by a dedicated team, the Central Hub provides the following key functions:

- A focal point for all stakeholders across the province;
- A bridge for collaborative partnerships between industry, post-secondary institutions, broader public sector agencies, municipalities, and the government;
- A concierge for new entrants into Ontario's thriving ecosystem; and
- A hub that drives public education and thought leadership activities and raises awareness around the potential of automotive and mobility technologies and the opportunities for Ontario and for its partners.

To find out the latest news, visit www.ovinhub.ca or follow OVIN on social media @OVINhub

OVIN Objectives



Foster the development and commercialization of Ontario-made advanced automotive technologies and smart mobility solutions.



Showcase the Province of Ontario as the leader in the development, testing, piloting and adoption of the latest transportation and infrastructure technologies



Drive innovation and collaboration among the growing network of stakeholders at the convergence of automotive and technology



Leverage and retain Ontario's highly skilled talent, and prepare Ontario's workforce for jobs of the future in the automotive and mobility sector



Harness Ontario's regional strengths and capabilities, and support its clusters of automotive and technology

Meet the OVIN Team



Raed Kadri
Head of OVIN.

rkadri@oc-innovation.ca



Kathryn Tyrell
Manager. Automotive and Mobility Strategy.

kyrell@oc-innovation.ca



Natalia Lobo
Project Manager

nlobo@oc-innovation.ca



Mona Eghanian
Director. Strategy and Programs & Automotive and Mobility.

meghanian@oc-innovation.ca



John George
Sector Manager. Electric Vehicles

jgeorge@oc-innovation.ca



Natalia Rogacki
Portfolio Manager. Automotive and Mobility

nrogacki@oc-innovation.ca



Amanda Sayers
Director. Skills, Talent, and Workforce Development.

asayers@oc-innovation.ca



Asad Farooq
Manager. Strategic Initiatives.

afarooq@oc-innovation.ca



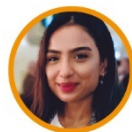
Ghazal Momen
Outreach & Engagement Specialist, Automotive

gmomen@oc-innovation.ca



Shane Daly
Portfolio Manager. Automotive and Mobility.

sdaly@oc-innovation.ca



Maruk Ahmed
Innovation Strategy Specialist.

mahmed@oc-innovation.ca



Alèque Juneau
Project Lead. Workforce Development.

ajuneau@oc-innovation.ca



Christine Stenton
Project Lead. Talent Initiatives

cstenton@oc-innovation.ca



Shannon M. Miller
Project Lead. Strategic Partnerships

smiller@oc-innovation.ca

Disclaimers

This report was commissioned by the Ontario Centre of Innovation (OCI) through a Request for Proposals titled “Ontario Vehicle Innovation Network (OVIN) – Annual Comprehensive Sector Report & Quarterly Specialized Reports,” dated April 26, 2022, and has been prepared by Arup Canada Inc. It is the second of five reports covering an analysis of Ontario’s automotive technology, electric vehicle and smart mobility landscape while incorporating implications for the sector’s skills and talent landscape.

This report contains general information only, and by means of this communication, OCI is not rendering professional advice or services. Accordingly, readers are cautioned not to place undue reliance on this report and to perform their due diligence, investigations, and analysis before making any decision, relying on the report, or taking any action that may affect readers’ finances or business.

No representations, warranties, or undertakings (express or implied) are given as to the accuracy or completeness of the information in this report. OCI shall not be liable or responsible for any loss or damage arising directly or indirectly in connection with any person relying on this report.

Copyright images cannot be used without explicit written consent and must be treated as general illustrations only and not relied upon to accurately describe the scheme.

© 2023 OCI. All rights reserved.

References

-
- ¹ Government of Ontario. (2022, March 10). Ontario Releases Plan to Build Transportation and Transit Infrastructure in the Greater Golden Horseshoe. <https://news.ontario.ca/en/release/1001740/ontario-releases-plan-to-build-transportation-and-transit-infrastructure-in-the-greater-golden-horseshoe>
- ² Lightstone, A., Belony, T., and Cappuccilli, JF. (2021, February). Understanding Goods Movement in Canada: Trends and Best Practices. Transportation Association of Canada. <https://www.tac-atc.ca/sites/default/files/site/doc/publications/2021/ptm-goodsmvmt-e.pdf>
- ³ Statistics Canada. (2022, December 23). Gross domestic product (GDP) at basic prices, by industry, annual average (x 1,000,000). <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610043403>
- ⁴ Statistics Canada. (2022, January 7). Labour force characteristics by industry, annual (x 1,000). <https://doi.org/10.25318/1410002301-eng>
- ⁵ Statistics Canada. (2022, November 29). Gross domestic product (GDP) at basic prices, by industry, annual average (x 1,000,000). <https://doi.org/10.25318/3610043401-eng>
- ⁶ Lightstone, A., Belony, T., and Cappuccilli, JF. (2021, February). Understanding Goods Movement in Canada: Trends and Best Practices. Transportation Association of Canada. <https://www.tac-atc.ca/sites/default/files/site/doc/publications/2021/ptm-goodsmvmt-e.pdf>
- ⁷ Ibid.
- ⁸ Ibid.
- ⁹ International Business Machines. (n.d.). What is supply chain management?. <https://www.ibm.com/topics/supply-chain-management>
- ¹⁰ Oxford Learner's Dictionaries. (n.d.). warehousing. <https://www.oxfordlearnersdictionaries.com/definition/english/warehousing?q=warehousing>
- ¹¹ Oxford Learner's Dictionaries. (n.d.). fulfilment. <https://www.oxfordlearnersdictionaries.com/definition/english/fulfilment?q=fulfillment>
- ¹² National Institute of Standards and Technology (US). (2022, May). Cybersecurity Supply Chain Risk Management Practices for Systems and Organizations. <https://doi.org/10.6028/NIST.SP.800-161r1>
- ¹³ International Business Machines. (n.d.). What is supply chain management?. <https://www.ibm.com/topics/supply-chain-management>
- ¹⁴ Law Insider. (n.d.). Automobile Manufacturer definition. <https://www.lawinsider.com/dictionary/automobile-manufacturer>
- ¹⁵ Amirjamshidi, G., Abdelkhalek, M., and Hassini, E. (n.d.). E-commerce Logistics in Canada. Canadian Transportation Research Forum. https://ctrf.ca/wp-content/uploads/2018/06/CTRF_2018_Amirjamshidi_Abelkhalek_Hassini_5_3.pdf
- ¹⁶ Ibid.
- ¹⁷ Government of Ontario. (2020, July 2). Ontario Marks Historic Implementation of New North American Trade Agreement. King's Printer for Ontario. <https://news.ontario.ca/en/statement/57453/ontario-marks-historic-implementation-of-new-north-american-trade-agreement>
- ¹⁸ Transport Canada. (2016). Transportation 2030: A Strategic Plan for the Future of Transportation in Canada. <https://tc.canada.ca/en/initiatives/transportation-2030-strategic-plan-future-transportation-canada>
- ¹⁹ Metrolinx. (2018). 2041 Regional Transportation Plan For the Greater Toronto and Hamilton Area. https://assets.metrolinx.com/image/upload/v1671552931/Images/Metrolinx/Metrolinx_-_2041_Regional_Transportation_Plan_Final_-_EDIT_kk1qax.pdf
- ²⁰ Government of Ontario. (2022, March 10). Connecting the GGH: A Transportation Plan for the Greater Golden Horseshoe. King's Printer for Ontario. <https://www.ontario.ca/page/connecting-ggh-transportation-plan-greater-golden-horseshoe>

²¹ Ibid.

²² Government of Ontario. (2022, April 21). Connecting the East: A draft transportation plan for eastern Ontario. King's Printer for Ontario. <https://www.ontario.ca/page/connecting-east-draft-transportation-plan-eastern-ontario>

²³ Government of Ontario. (2020, January 17). Connecting the Southwest: A Draft Transportation Plan for Southwestern Ontario. King's Printer for Ontario. <https://www.ontario.ca/page/connecting-southwest-draft-transportation-plan-southwestern-ontario>

²⁴ Government of Ontario. (2020, December 10). Connecting the North: A Draft Transportation Plan for Northern Ontario. King's Printer for Ontario. <https://www.ontario.ca/page/connecting-north-draft-transportation-plan-northern-ontario>

²⁵ City of Toronto. (2020, September 22). Freight and Goods Movement Strategy. <https://www.toronto.ca/legdocs/mmis/2020/ie/bgrd/backgroundfile-157033.pdf>

²⁶ Region of Peel. (2019, March). Goods Movement Long Term Plan. https://peelregion.ca/transportation/goods-movement/_media/pdf/goods-movement-long-term-plan-2019.pdf

²⁷ Government of Canada. (2020, November 26). Canada-United States-Mexico Agreement (CUSMA) - Table of contents. <https://www.international.gc.ca/trade-commerce/trade-agreements-accords-commerciaux/agr-acc/cusma-aceum/text-texte/toc-tdm.aspx?lang=eng>

²⁸ Council of Ministers Responsible for Transportation and Highway Safety. (2022, February). Phase 2 Report for the Pan-Canadian Competitive Trade Corridor Initiative. <https://comt.ca/Reports/Pan%20Canadian%20Trade%20Corridor%20Phase%202.pdf>

²⁹ Canadian Council of Motor Transport Administrators. (n.d.). National Safety Code. <https://ccmta.ca/en/national-safety-code>

³⁰ Government of Ontario. (1990). Highway Traffic Act, R.S.O. 1990, c. H.8. <https://www.ontario.ca/laws/statute/90h08>

³¹ Ministry of Transportation of Ontario. (2017, January 17). Freight-Supportive Guidelines. <https://www.ontario.ca/files/2022-03/mto-freight-supportive-guidelines-en-2022-03-31.pdf>

³² Government of Ontario. (2022, February 10). Cooperative Truck Platooning Pilot Program. King's Printer for Ontario. <https://www.ontario.ca/page/cooperative-truck-platooning-pilot-program>

³³ City of Toronto. (2017, November 14). Curbside Management Strategy: Improving How Curbside Space Is Used. <https://www.toronto.ca/legdocs/mmis/2017/pw/bgrd/backgroundfile-109153.pdf>

³⁴ City of Ottawa. (n.d.). Small business identity card parking permit. <https://ottawa.ca/en/business/permits-and-licenses/parking-permits-business/small-business-identity-card-parking-permit#section-8957ffe8-2a6a-4786-b301-81cb676d3550>

³⁵ Statistics Canada. (2022, December 2). Employment by industry, monthly, seasonally adjusted and unadjusted, and trend-cycle, last 5 months (x 1,000). <https://doi.org/10.25318/1410035501-eng>

³⁶ Trucking HR Canada. (2022, November). Labour Market Snapshot: November 2022. <https://truckinghr.com/wp-content/uploads/2022/11/LMI-Snapshot-NOV-2022.pdf>

³⁷ Nanos. (2022, June 1). Nanos: Driver-Equipment Shortages & Driver Inc. Top Concerns for Trucking Execs. Canadian Trucking Alliance. <https://cantruck.ca/nanos-driver-equipment-shortages-driver-inc-top-concerns-for-trucking-execs/>

³⁸ Ontario Trucking Association. (2022, September 29). OTA: Labour Minister Joins Roundtable; Confirms Improvements to Stabilize Trucking Labour Force and Supply Chain. <https://ontruck.org/ota-labour-minister-joins-roundtable-confirms-improvements-to-stabilize-trucking-labour-force-and-supply-chain/>

³⁹ Statistics Canada. (2022, January 7). Labour force characteristics by industry, annual (x 1,000). <https://doi.org/10.25318/1410002301-eng>

⁴⁰ Smith, JG. (2021, March 5). Women of trucking are still a rarity in Canada. Truck News. <https://www.trucknews.com/features/women-of-trucking-are-still-a-rarity-in-canada/>

-
- ⁴¹ Today's Trucking. (2021, April 9). Ontario program to help train women, other groups for trucking jobs. <https://www.trucknews.com/transportation/ontario-program-to-help-train-women-other-groups-for-trucking-jobs/1003150304/>
- ⁴² Government of Ontario. (2021, April 8). Ontario Supporting Careers in the Transportation Sector. King's Printer for Ontario. <https://news.ontario.ca/en/release/61053/ontario-supporting-careers-in-the-transportation-sector>
- ⁴³ SalesChoice. (2021, September 20). SalesChoice, in partnership with Purolator, received support from the Ontario government to commercialize a ground-breaking AI-powered driver health and safety solution. <https://www.saleschoice.com/saleschoice-in-partnership-with-purolator-received-support-from-the-ontario-government-to-commercialize-a-ground-breaking-ai-powered-driver-health-and-safety-solution/>
- ⁴⁴ Mood Insights. (n.d.). Know your employee experience like never before. <https://www.saleschoice.com/moodinsights/>
- ⁴⁵ SalesChoice. (2021, September 20). SalesChoice, in partnership with Purolator, received support from the Ontario government to commercialize a ground-breaking AI-powered driver health and safety solution. <https://www.saleschoice.com/saleschoice-in-partnership-with-purolator-received-support-from-the-ontario-government-to-commercialize-a-ground-breaking-ai-powered-driver-health-and-safety-solution/>
- ⁴⁶ Ibid.
- ⁴⁷ Ibid.
- ⁴⁸ Irving, T. (2022, October 13). Urban Quick Stop Provides a Living Laboratory to Study the Challenges of Last-Mile Delivery. Smart Freight Centre. <https://smartfreightcentre.ca/2022/10/13/urban-quick-stop-provides-a-living-laboratory-to-study-the-challenges-of-last-mile-delivery/>
- ⁴⁹ Pereira, M. (2022, September 26). LoopX — Building better autonomous vehicles, one pizza at a time. <https://rtpark.uwaterloo.ca/news/loopx-building-better-autonomous-vehicles-one-pizza-at-a-time/>
- ⁵⁰ General Motors Canada. (n.d.). Background Information GM Canada CAMI Assembly. https://media.gm.com/content/dam/Media/documents/CA/PDF/CAMI_Assembly_backgrounder_Dec%202022.pdf
- ⁵¹ General Motors Canada. (2022, December 5). GM Opens Canada's First Full-Scale EV Plant to Build BrightDrop Zevo Fully Electric Delivery Vans. https://media.gm.ca/media/ca/en/gm/home.detail.html/content/Pages/news/ca/en/2022/dec/1205_canada.html
- ⁵² General Motors Canada. (n.d.). Introducing the newest member of BrightDrop's electric vehicle family: the EV410!. <https://www.gm.ca/en/home/stories/new-brightDrop-ev410-to-be-built.html>
- ⁵³ General Motors Canada. (2022, December 5). GM Opens Canada's First Full-Scale EV Plant to Build BrightDrop Zevo Fully Electric Delivery Vans. https://media.gm.ca/media/ca/en/gm/home.detail.html/content/Pages/news/ca/en/2022/dec/1205_canada.html
- ⁵⁴ General Motors Canada. (n.d.). GM Launches BrightDrop, a New Business That Will Electrify and Improve the Delivery of Goods and Services. <https://news.gm.com/newsroom.detail.html/Pages/news/us/en/2021/jan/ces/0112-brightdrop.html>
- ⁵⁵ General Motors Canada. (2022, April 4). GM Canada's \$2 Billion Transformational Investments Are Creating 2,600 New Jobs Now and Canada's First Electric Vehicle Production by the End of 2022. https://www.gm.ca/en/home/newsroom.detail.print.html/content/Pages/news/ca/en/2022/mar/0404_gm-canadas-2-billion-transformational-investments.html
- ⁵⁶ General Motors Canada. (n.d.). GM Launches BrightDrop, a New Business That Will Electrify and Improve the Delivery of Goods and Services. <https://news.gm.com/newsroom.detail.html/Pages/news/us/en/2021/jan/ces/0112-brightdrop.html>
- ⁵⁷ Ibid.
- ⁵⁸ General Motors Canada. (n.d.). Introducing the newest member of BrightDrop's electric vehicle family: the EV410!. <https://www.gm.ca/en/home/stories/new-brightDrop-ev410-to-be-built.html>
- ⁵⁹ General Motors Canada. (2022, December 5). GM Opens Canada's First Full-Scale EV Plant to Build BrightDrop Zevo Fully Electric Delivery Vans. https://media.gm.ca/media/ca/en/gm/home.detail.html/content/Pages/news/ca/en/2022/dec/1205_canada.html

-
- ⁶⁰ Today's Trucking. (2021, July 29). Hydro One's heavy-duty truck charging pilot included in new EV funds. <https://www.trucknews.com/equipment/hydro-ones-heavy-duty-truck-charging-pilot-included-in-new-ev-funds/1003152578/>
- ⁶¹ Government of Ontario. (2022, March 22). Ontario Making it Easier to Access Electric Vehicle Chargers. King's Printer for Ontario. <https://news.ontario.ca/en/release/1001827/ontario-making-it-easier-to-access-electric-vehicle-chargers>
- ⁶² Government of Ontario. (2022, April 7). Ontario's Low-Carbon Hydrogen Strategy. <https://www.ontario.ca/page/ontarios-low-carbon-hydrogen-strategy>
- ⁶³ Government of Ontario. (2021, January 7). Truck Rest Area Projects. King's Printer for Ontario. <https://news.ontario.ca/en/backgrounder/59886/truck-rest-area-projects>
- ⁶⁴ Government of Ontario. (2021, January 7). Ontario Expanding Truck Rest Areas Across the Province. King's Printer for Ontario. <https://news.ontario.ca/en/release/59888/ontario-expanding-truck-rest-areas-across-the-province>
- ⁶⁵ Government of Ontario. (n.d.). Ontario's highway programs. King's Printer for Ontario. <https://www.ontario.ca/page/ontarios-highway-programs>
- ⁶⁶ Government of Ontario. (2021, January 7). Ontario Expanding Truck Rest Areas Across the Province. King's Printer for Ontario. <https://news.ontario.ca/en/release/59888/ontario-expanding-truck-rest-areas-across-the-province>
- ⁶⁷ Scott, J. (2021, March 16). NuPort robotics receives \$1 million from Ontario for autonomous trucking project with Canadian Tire. <https://betakit.com/nuport-robotics-receives-1-million-from-ontario-for-autonomous-trucking-project-with-canadian-tire/>
- ⁶⁸ Nawiinginokiima Forest Management Corporation. (n.d.). Autonomous Trucking Project-Provectus Robotics Solutions and Nawiinginokiima Forest Management Corporation to Bring Autonomous Logging Trucks to Northern Ontario. <https://nfmforestry.ca/autonomous-trucking/>
- ⁶⁹ Drone Delivery Canada. (2021, November 25). DDC awarded sixth patent for its proprietary drone delivery solution. <https://dronedeliverycanada.com/press-releases/drone-delivery-canada-awarded-sixth-patent-for-its-proprietary-drone-delivery-solution/>
- ⁷⁰ Drone Delivery Canada. (2022, November 7). DDC Care by Air project with Halton Healthcare & DSV Canada commercially operational. <https://dronedeliverycanada.com/press-releases/ddc-care-by-air-project-with-halton-healthcare-dsv-canada-commercially-operational/>
- ⁷¹ Gatik. (2021, March 2). Gatik Partners with Ontario Government to Accelerate R&D for Autonomous Vehicle Technology. Globe Newswire. <https://www.globenewswire.com/en/news-release/2021/03/02/2185084/0/en/Gatik-Partners-with-Ontario-Government-to-Accelerate-R-D-for-Autonomous-Vehicle-Technology.html>
- ⁷² Gatik. (n.d.). About. <https://gatik.ai/about/>
- ⁷³ Loblaw. (2022, October 5). Gatik and Loblaw Make History with First Fully Driverless Deployment in Canada. <https://www.loblaw.ca/en/gatik-and-loblaw-make-history-with-first-fully-driverless-deployment-in-canada>
- ⁷⁴ Simpson, M. (2022, October 5). In Canadian first, Gatik and Loblaw take safety drivers out of autonomous delivery trucks. Betakit. <https://betakit.com/in-canadian-first-gatik-and-loblaw-take-safety-drivers-out-of-autonomous-delivery-trucks/>
- ⁷⁵ Government of Ontario. (2022, March 22). Ontario Making it Easier to Access Electric Vehicle Chargers. King's Printer for Ontario. <https://news.ontario.ca/en/release/1001827/ontario-making-it-easier-to-access-electric-vehicle-chargers>
- ⁷⁶ Government of Canada. (2022, March). 2030 emissions reduction plan: Canada's next steps to clean air and a strong economy. Environment and Climate Change Canada. https://publications.gc.ca/collections/collection_2022/eccc/En4-460-2022-eng.pdf
- ⁷⁷ Government of Canada. (2022, August 30). Medium and heavy-duty zero-emission vehicles. <https://tc.canada.ca/en/road-transportation/innovative-technologies/zero-emission-vehicles/medium-heavy-duty-zero-emission-vehicles>
- ⁷⁸ Government of Ontario. (2022, April 7). Ontario's Low-Carbon Hydrogen Strategy. <https://www.ontario.ca/page/ontarios-low-carbon-hydrogen-strategy>

-
- ⁷⁹ National Supply Chain Task Force. (2022). Action, collaboration, transformation: final report of the National Supply Chain Task Force, 2022. Transport Canada. https://tc.canada.ca/sites/default/files/2022-10/supply-chain-task-force-report_2022.pdf
- ⁸⁰ Pembina Foundation. (2017, October). Local Planning for Goods Movement in Ontario: A survey of current municipal practices and opportunities. <https://www.pembina.org/reports/local-freight-planning-in-ontario-final.pdf>
- ⁸¹ Viniche, B. D. [Rotman School of Management]. (2021, December 6). Truck and Drone Delivery on a Circle – INFORMS Conference, 2021 – Presented by Bahar Dehqani Viniche. <https://www.youtube.com/watch?v=Wp2LTn3fPFo>
- ⁸² Nanos. (2022, June 1). Nanos: Driver-Equipment Shortages & Driver Inc. Top Concerns for Trucking Execs. Canadian Trucking Alliance. <https://cantruck.ca/nanos-driver-equipment-shortages-driver-inc-top-concerns-for-trucking-execs/>
- ⁸³ Ontario Trucking Association. (2022, September 29). OTA: Labour Minister Joins Roundtable; Confirms Improvements to Stabilize Trucking Labour Force and Supply Chain. <https://ontruck.org/ota-labour-minister-joins-roundtable-confirms-improvements-to-stabilize-trucking-labour-force-and-supply-chain/>
- ⁸⁴ Government of Canada. (2022, December 12). Now Open for Project Applications: Calls for the Green Freight Program and the Zero-Emission Vehicle Awareness Initiative. <https://www.canada.ca/en/natural-resources-canada/news/2022/12/now-open-for-project-applications-calls-for-the-green-freight-program-and-the-zero-emission-vehicle-awareness-initiative.html>