

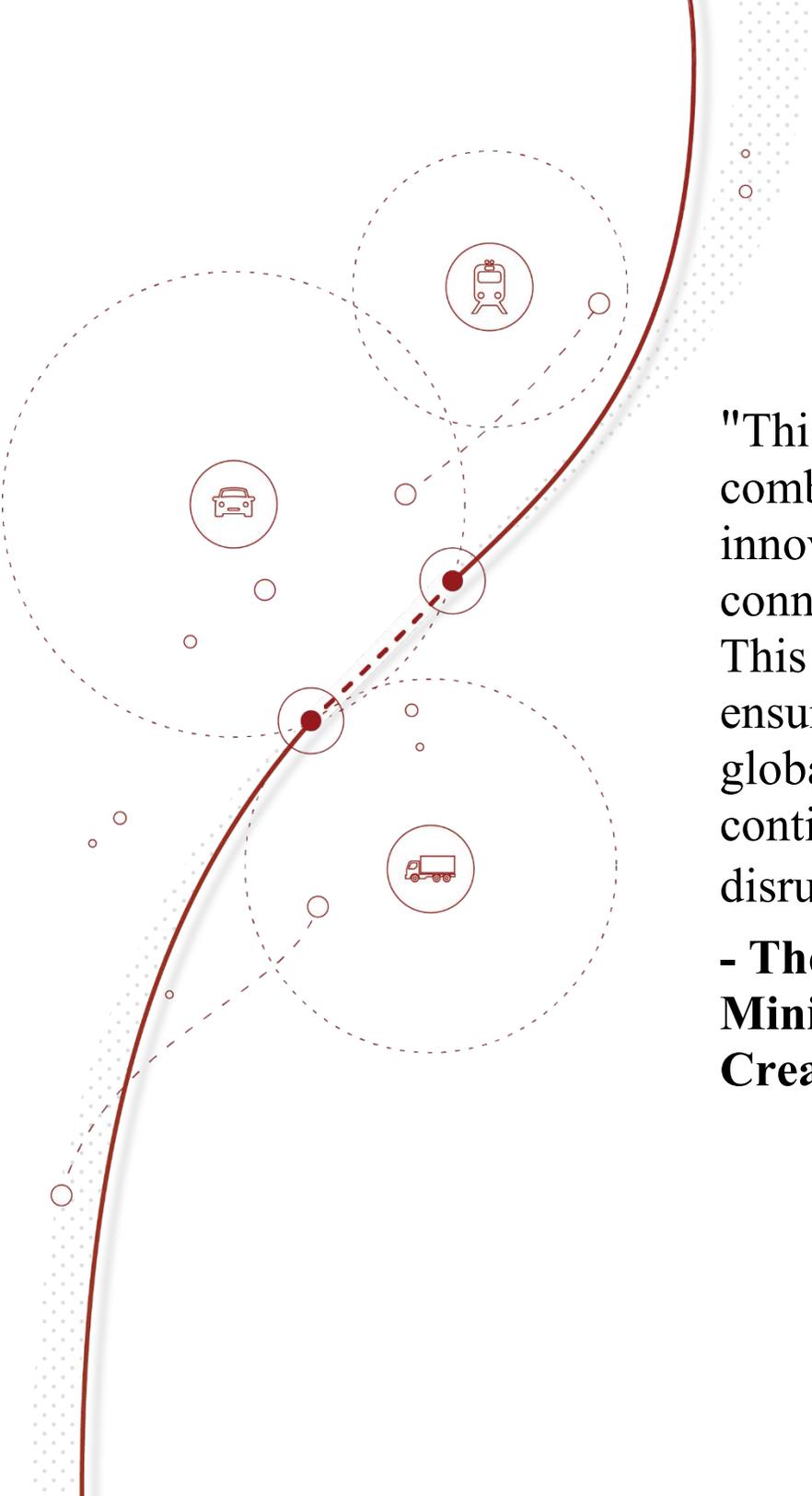


Connecting the Dots for Cross-Border Automotive and Smart Mobility Strategies

Quarterly Specialized Report

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"This pioneering collaboration illustrates the combined strengths of Ontario and Michigan as innovation partners at the leading edge of electric, connected, autonomous and mobility technologies. This forward-looking approach is essential to ensure our region remains at the forefront of a global industry that is fiercely competitive and continually subject to the forces of technology disruption."

- The Honourable Victor Fedeli, Ontario Minister of Economic Development, Job Creation and Trade¹

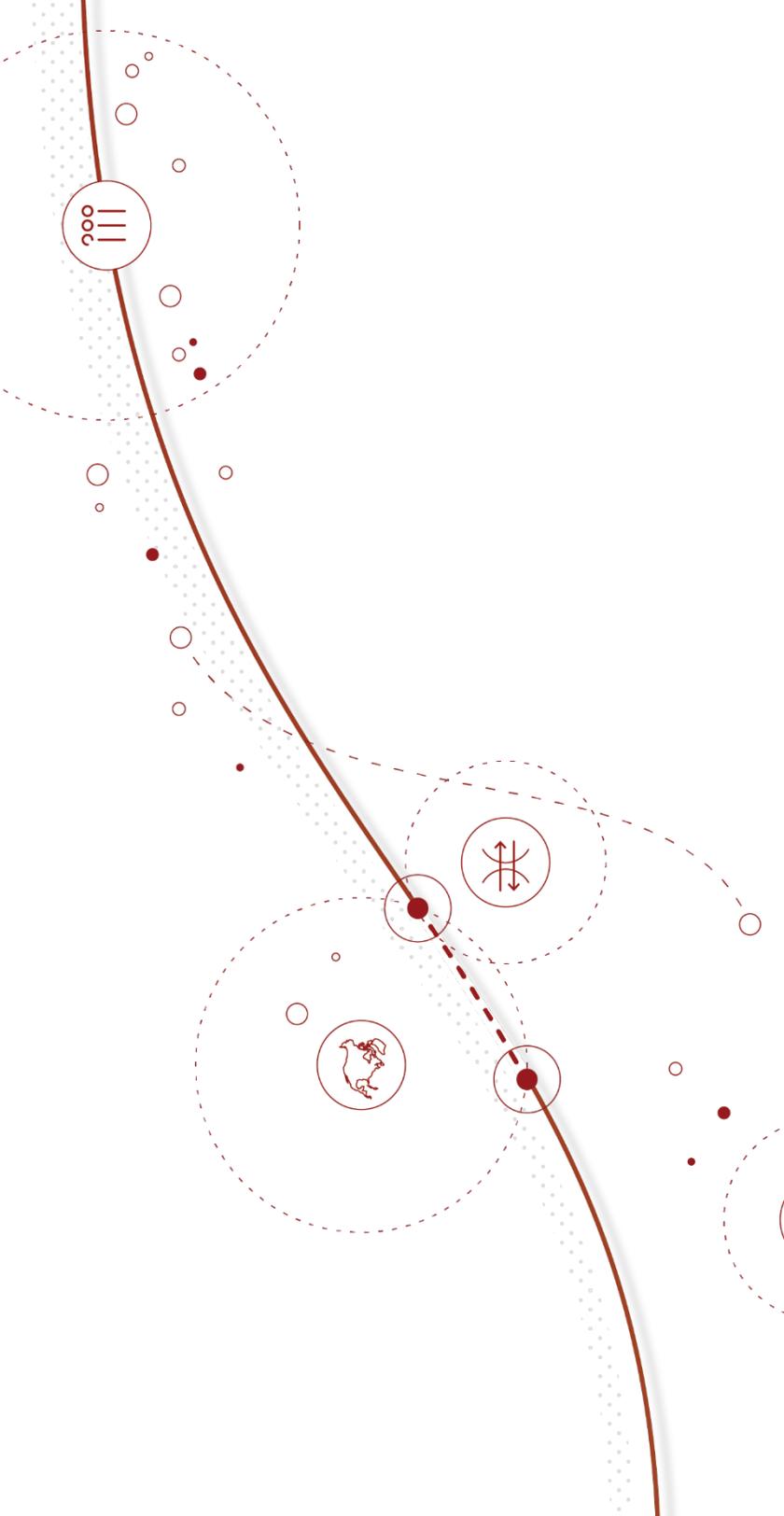
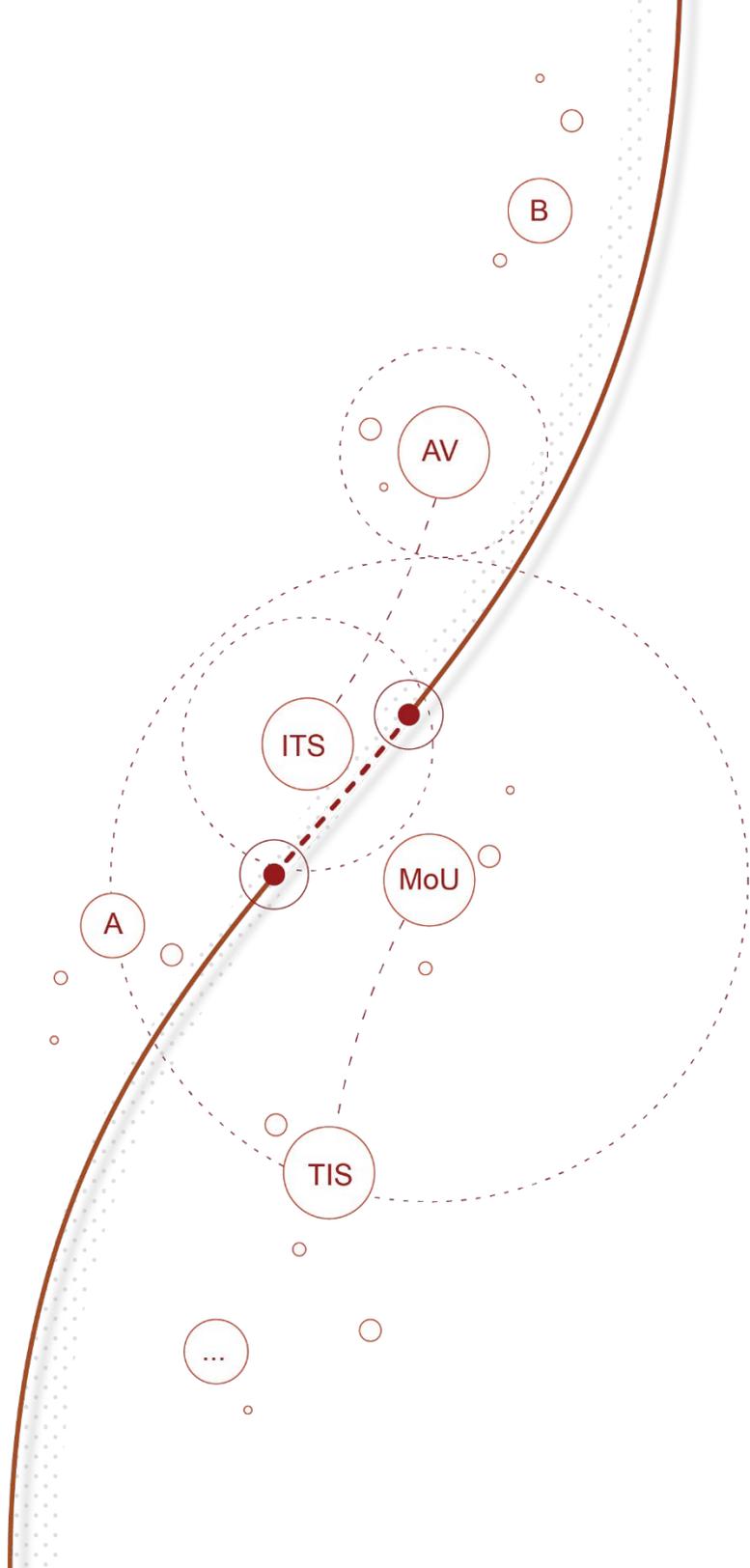


Table of Contents

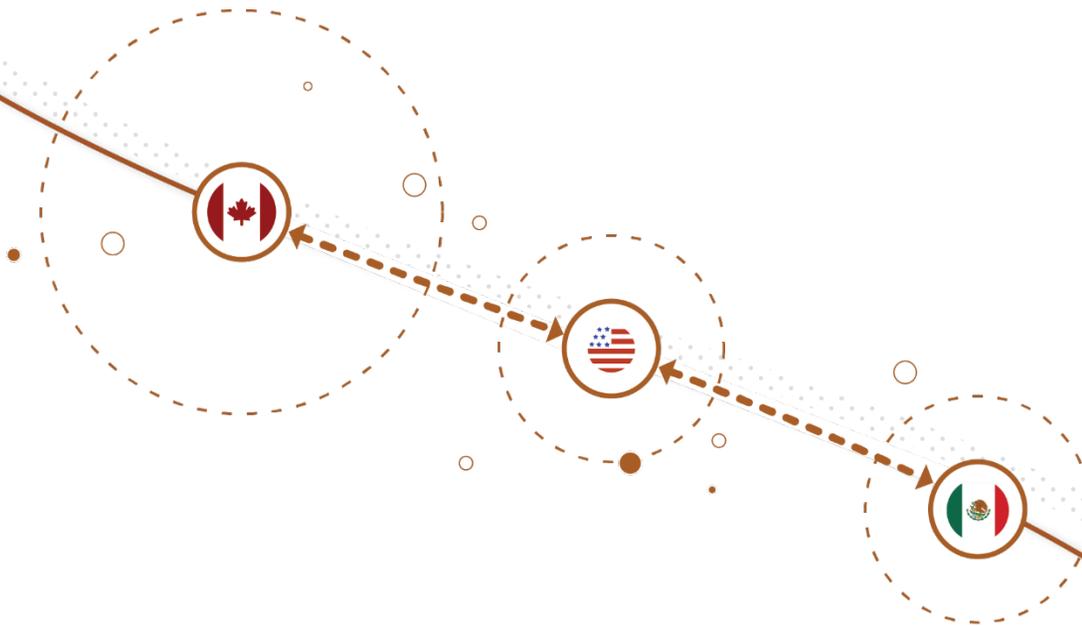
- Introduction** **4**
- Existing cross-border initiatives** **6**
 - North American cross-border trade 10
 - Ontario-Michigan bridges and tunnels 11
 - Ontario-Michigan goods movement 12
 - Ontario-Michigan people movement 13
- Opportunities for future development** **14**
 - Current state 15
 - People movement 16
 - Enhanced collaboration 17
 - Goods movement 18
- About OVIN** **20**



Acronyms

AV	Autonomous Vehicle
CAV	Connected and Autonomous Vehicle
CBP	United States Customs and Border Protection
CBSA	Canada Border Services Agency
CUSMA	Canada-United States-Mexico Agreement
FAST	Free and Secure Trade
FBCL	Federal Bridge Corporation Limited
ITS	Intelligent Transportation Systems
MOU	Memorandum of Understanding
NAFTA	North American Free Trade Agreement
NITTEC	Niagara International Transportation Technology Coalition
OEM	Original Equipment Manufacturer
OVIN	Ontario Vehicle Innovation Network
TIS	Traveller Information Systems
TOC	Traffic Operations Centre

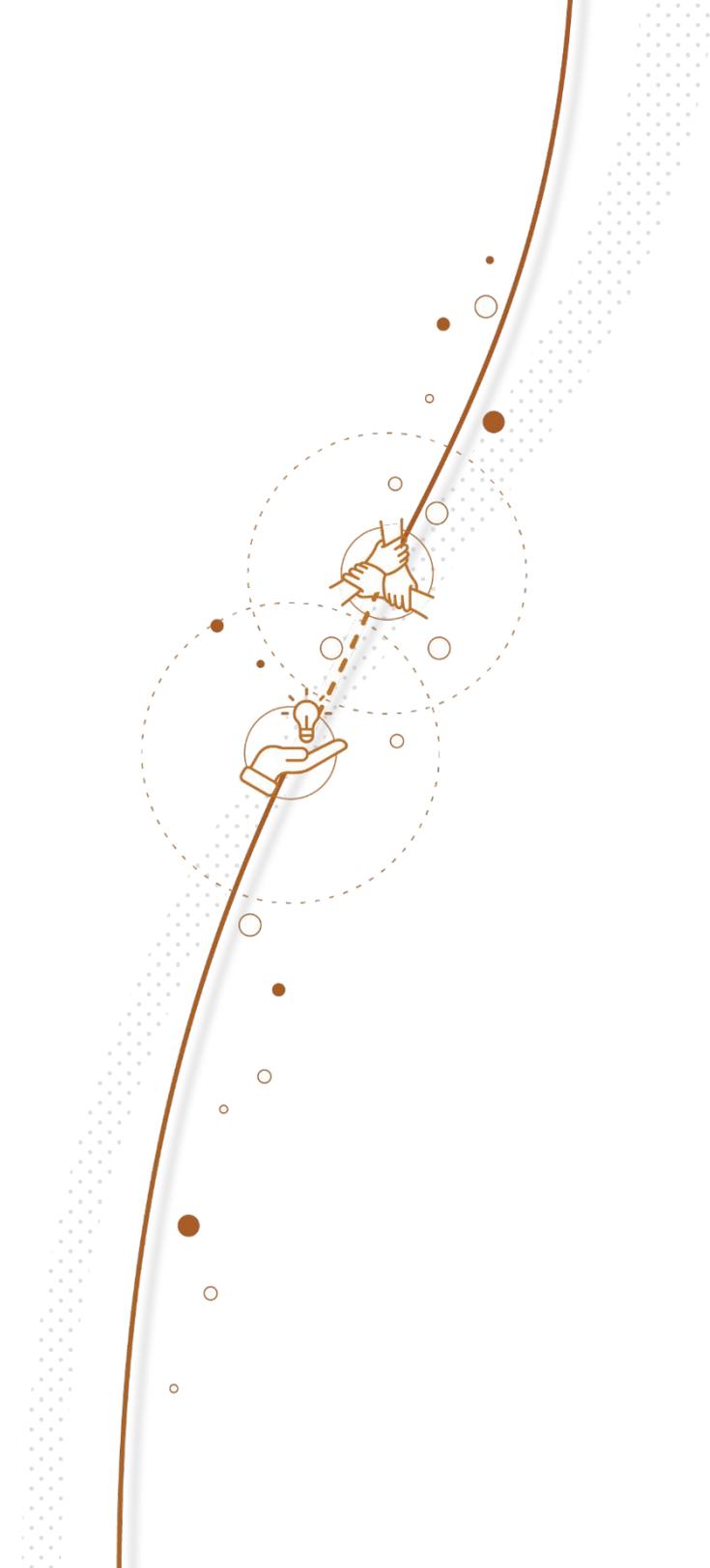
Introduction



The cross-border movement of people and goods is a key driver of economic growth. Canada's ports of entry play a major role in cross-border movement, facilitating both international trade and tourism. As trends towards globalization continue and advances in transportation encourage movement, effective cross-border processes and infrastructure will be increasingly important for ensuring the safe and efficient movement of people and goods.

Canada collaborates closely with other jurisdictions to manage mobility at border crossings. Several ongoing partnerships between national agencies and between subnational jurisdictions endeavour to improve the cross-border movement of people and goods while maximizing social, economic, and environmental benefits. Ontario's and Canada's strong cross-border partnerships are complemented by a burgeoning internal ecosystem of research, testing and piloting focused on connected and autonomous vehicle (CAV) technology for cross-border movement.

This report provides an overview of Ontario's existing cross-border initiatives and presents several opportunities to further improve the cross-border movement of people and goods. The opportunities—which include a range of operational and technological enhancements and physical and digital infrastructure—can be championed by border agencies, infrastructure operators, and organizations like the Ontario Vehicle Innovation Network (OVIN). The opportunities are grouped into three categories—people movement (the movement of private vehicles, transit, cyclists, and pedestrians), goods movement (the movement of commercial trucks), and enhanced collaboration (increased coordination between jurisdictions on both sides of the border)—in reflection of the key areas of operation they aim to improve.



Existing cross-border initiatives



Canada has strong ties to its North American partners, the United States and Mexico. Linked both culturally and economically, a significant amount of people and goods move across the countries' borders each year. The countries' strong economic ties have been formalized through trade agreements such as the Canada-United States-Mexico Agreement (CUSMA) and its predecessor, the North American Free Trade Agreement (NAFTA). These agreements have contributed to the creation of a stable commercial environment that benefits manufacturers, producers, investors, and consumers.²

The Canada Border Services Agency (CBSA) and United States Customs and Border Protection (CBP) operate several joint programs to improve the cross-border flow of people and goods. For example, the two agencies founded NEXUS, an expedited border control program, to speed up processing for pre-approved travellers entering Canada or the United States.³ The CBSA and CBP continue to improve NEXUS, announcing in January 2023 new enrolment options to increase the program's enrolment capacity.⁴ The two border agencies also jointly operate the Free and Secure Trade (FAST) program, which enables faster clearing of eligible goods into Canada and the United States.⁵



Subnational cooperation is common amongst North American provinces and states as well, as exemplified by the longstanding collaboration between Ontario and Michigan. In 2016, Ontario and Michigan signed a memorandum of understanding (MOU) to bolster the competitiveness of the Great Lakes automotive industry, with an emphasis on facilitating technological advancement, supply chain integration and the sharing of best practices.⁶

In 2021, bilateral cooperation between the jurisdictions was expanded further when Michigan and Ontario (through OVIN) signed a MOU to formally explore the creation of a cross-border testing environment for new mobility technologies. The MOU outlines several objectives including identifying potential economic, social, and environmental benefits from increased collaboration between Ontario and Michigan in the automotive and mobility industry; identifying opportunities for transportation technology to remedy challenges faced by people and goods crossing the border; exploring the regulatory and policy considerations of cross-border testing; and developing a roadmap for implementation of the testing environment.⁷

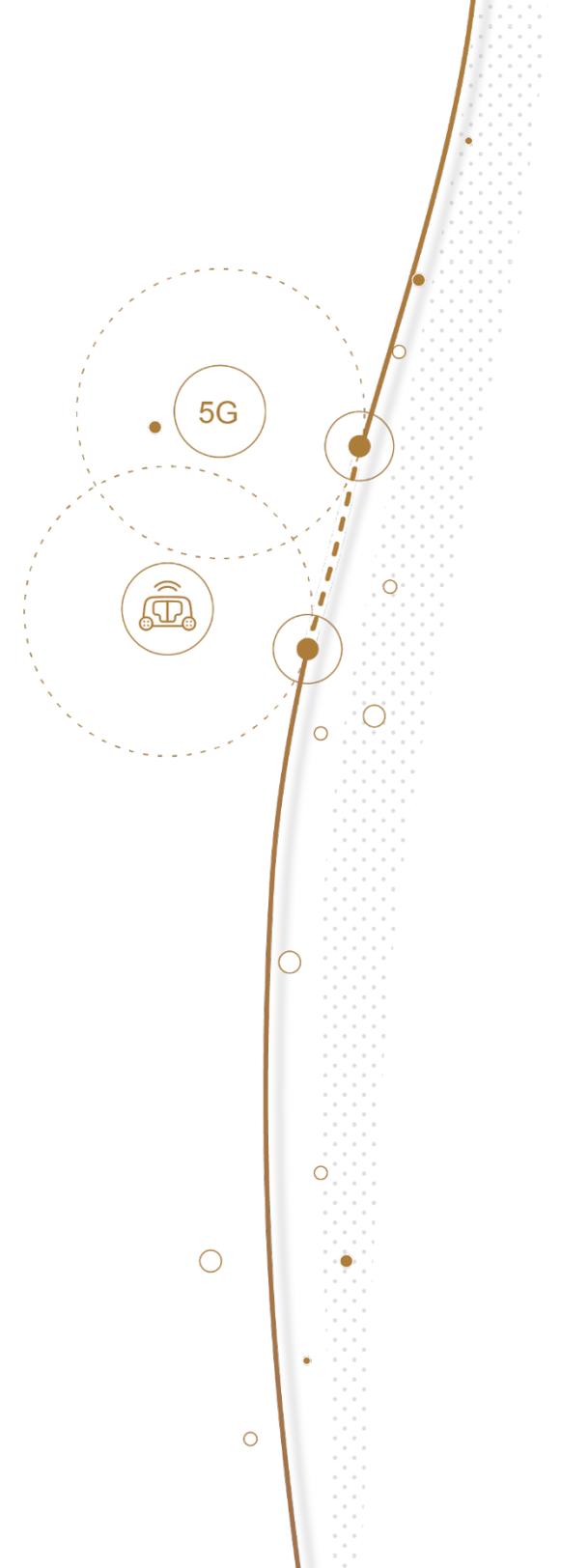
More recently, Ontario and Michigan announced a joint feasibility study to examine the potential for a drone corridor that would enable commercial goods movement across the border. The initiative will explore infrastructure needs, economic impacts, environmental factors, and travel impacts.⁸

In January 2023, OVIN also signed a MOU with the Federal Bridge Corporation Limited (FBCL)—a Crown corporation that looks after Canadian interests for the Thousand Islands International Bridge, the Sault Ste. Marie International Bridge, the Seaway International Bridge, and the Blue Water Bridge—to identify, test, and adopt new technologies to improve people and goods movement across borders. Ultimately, the partnership aims to facilitate the commercialization of smart mobility technology, boost trade, and promote economic growth in Ontario.⁹



Ontario's cross-border partnerships with various jurisdictions and organizations are complemented by a strong internal ecosystem of research, testing and piloting. In 2022, Invest WindsorEssex—a Regional Technology Development Site funded by OVIN—showcased new test tracks for cross-border CAV technology and infrastructure simulation. The test tracks—which are a digital twin of the Detroit-Windsor Tunnel—allow companies to test connected and autonomous vehicle technologies in a cross-border environment without disrupting operations of the physical tunnel.¹⁰ The new test tracks have been deployed in the Invest WindsorEssex Virtual Reality CAVE,¹¹ which enables teaching, training, and research in support of connected and autonomous vehicle development.¹²

In January 2023, TELUS announced a \$5M investment to create a 5G connected campus and lab at the University of Windsor. Cross-border applications of 5G technology will be the focus of one of the lab's first projects. In coordination with OVIN, original equipment manufacturers (OEMs), and policymakers, this project will identify how 5G can be used to help connected vehicles tackle cross-border challenges such as congestion and supply chain obstacles.¹³



North American cross-border trade

Cross-border trade plays a major role in Canada's economy by enabling access to new resources and markets for Canadian companies. The United States and Mexico are among Canada and Ontario's largest trading partners, making efficient movement of goods to and from these countries particularly important.

\$961B CAD

total **U.S. – Canada**
trade in 2022

\$50B CAD

total **Mexico – Canada**
trade in 2022

\$231B

2022 Ontario–U.S. imports

\$177B

2022 Ontario–U.S. exports

\$31B

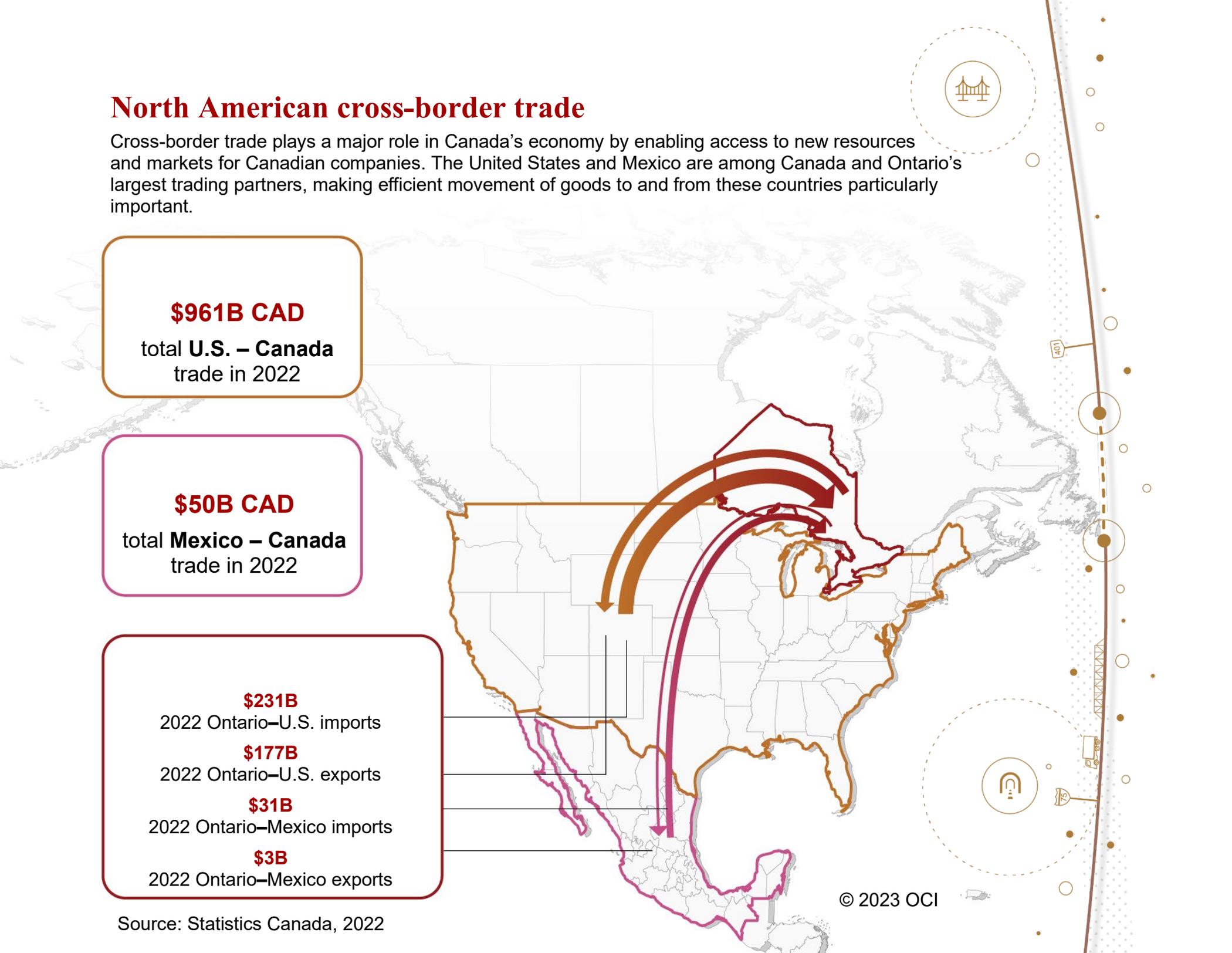
2022 Ontario–Mexico imports

\$3B

2022 Ontario–Mexico exports

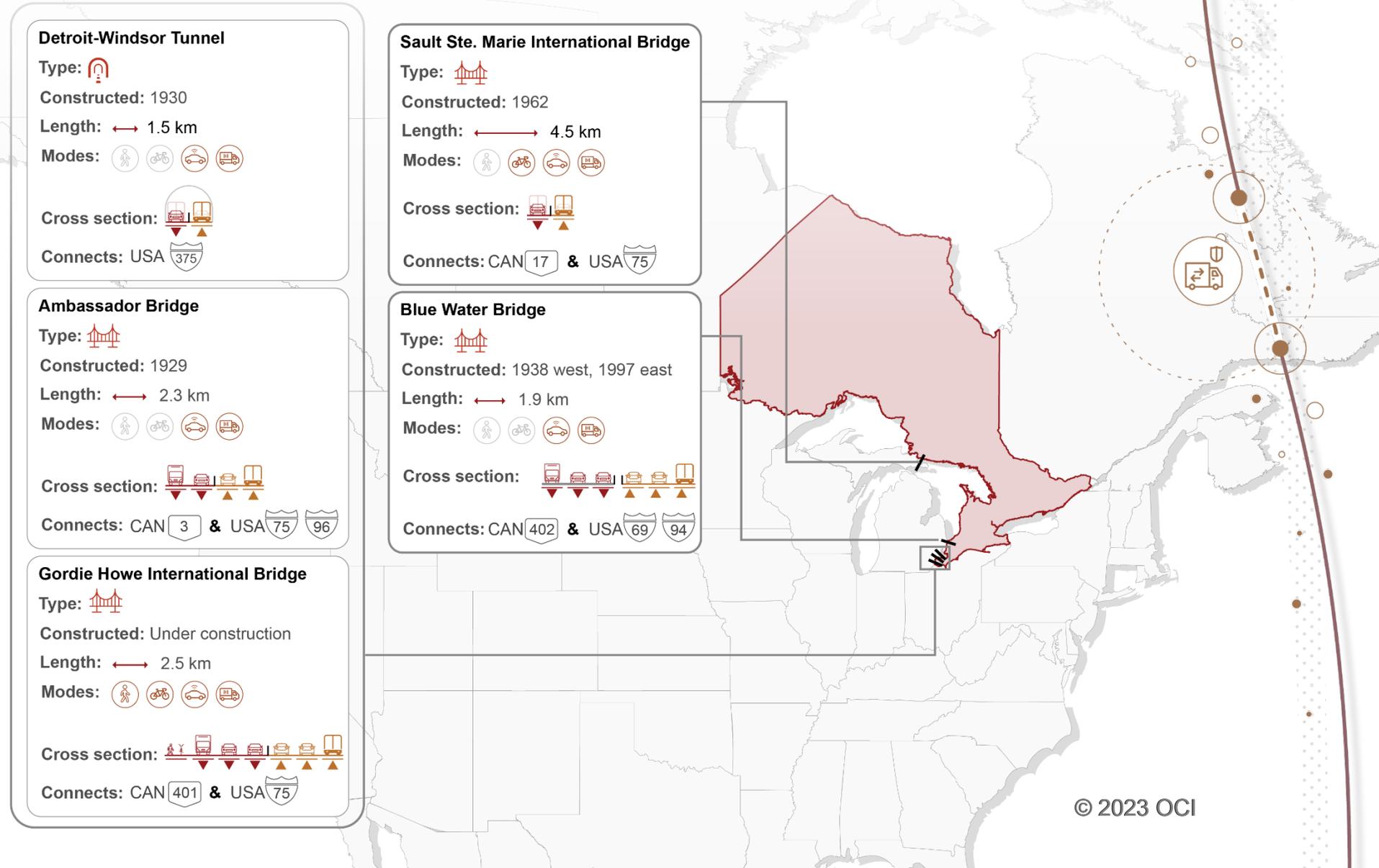
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Source: Statistics Canada, 2022



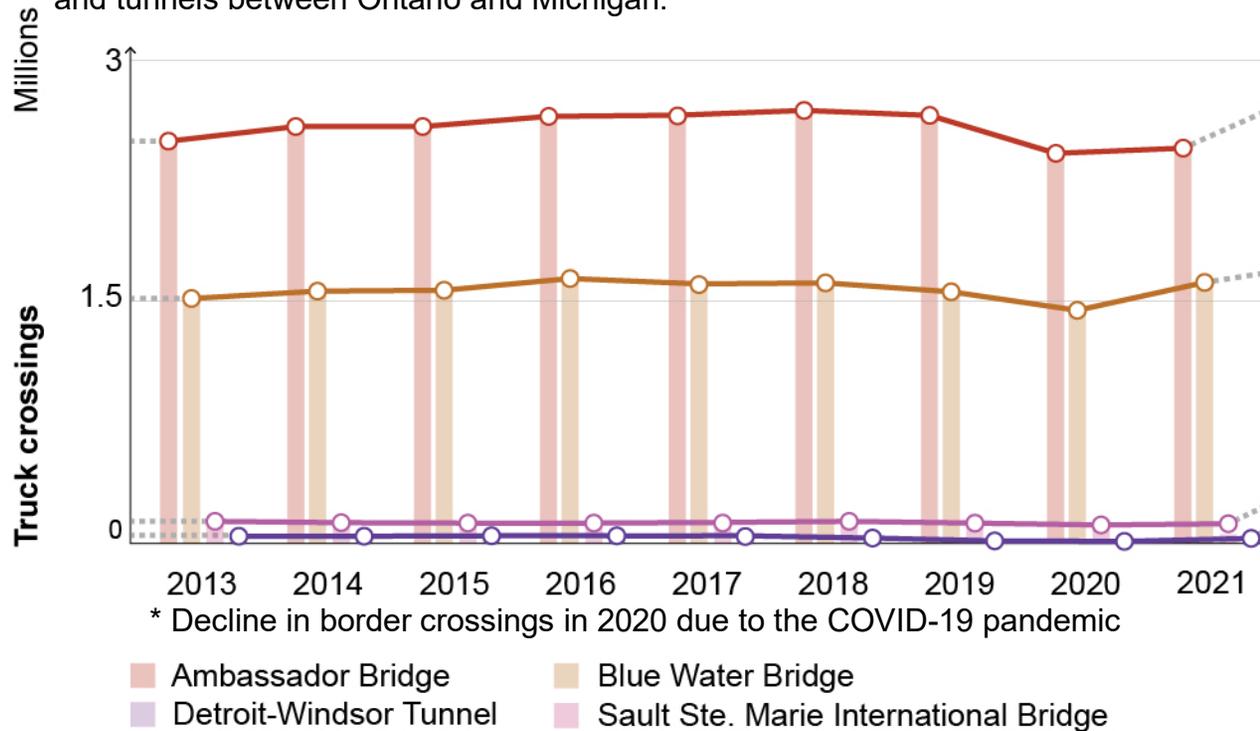
Ontario-Michigan bridges and tunnels

The remainder of this report focuses on cross-border initiatives between Ontario and Michigan, due in part to the longstanding collaboration between these two jurisdictions. The map below summarizes the key characteristics of the existing and under-construction cross-border infrastructure between Ontario and Michigan, all of which provide essential connections that support cross-border goods and people movement.



Ontario-Michigan goods movement

The graph and figures below illustrate the relative importance for goods movement of each of the existing bridges and tunnels between Ontario and Michigan.



57%

of truck crossings at the Ontario-Michigan border used the Ambassador Bridge in 2021

41%

of truck crossings at the Ontario-Michigan border used the Blue Water Bridge in 2021

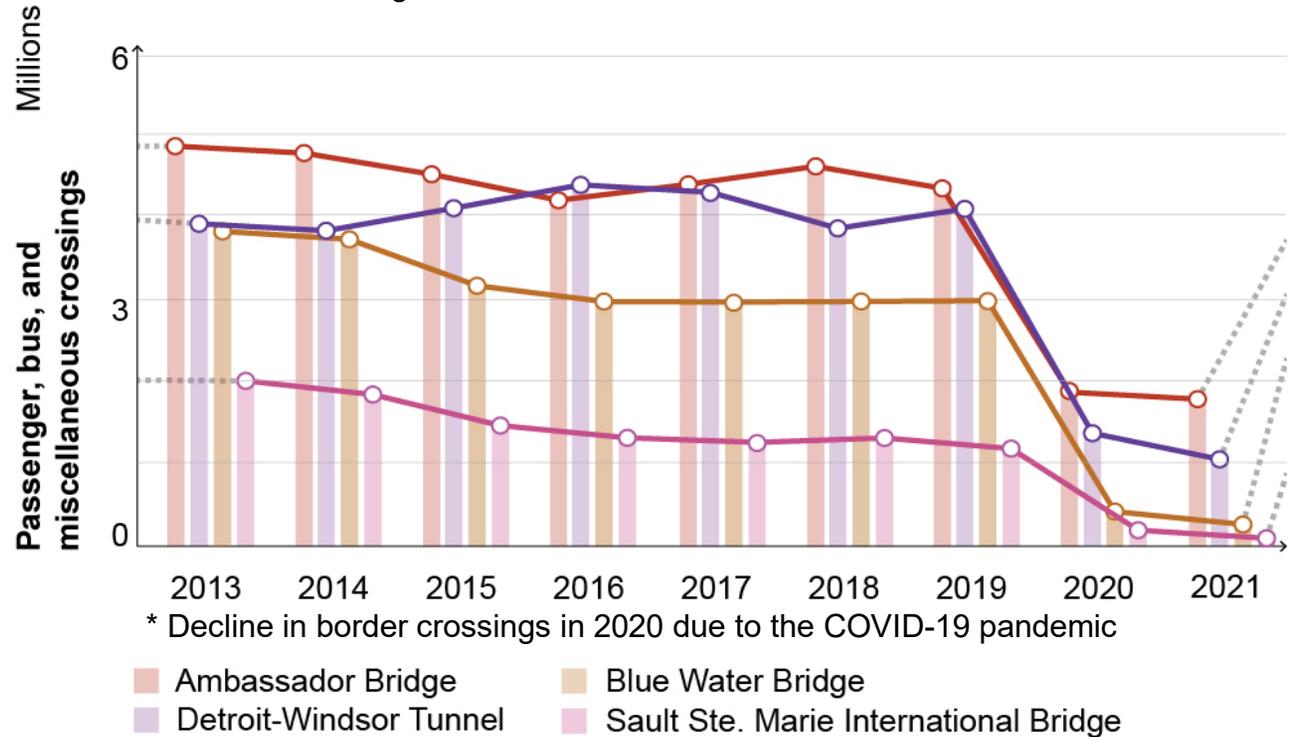
2%

of truck crossing at the Ontario-Michigan border used the Detroit-Windsor Tunnel or the Sault Ste. Marie International Bridge in 2021

Source: Bridge and Tunnel Operators Association

Ontario-Michigan people movement

The graph and figures below illustrate the relative importance for people movement of each of the existing bridges and tunnels between Ontario and Michigan.



Source: Bridge and Tunnel Operators Association

54%

of passenger, bus & miscellaneous crossings at the Ontario-Michigan border used the Ambassador Bridge in 2021

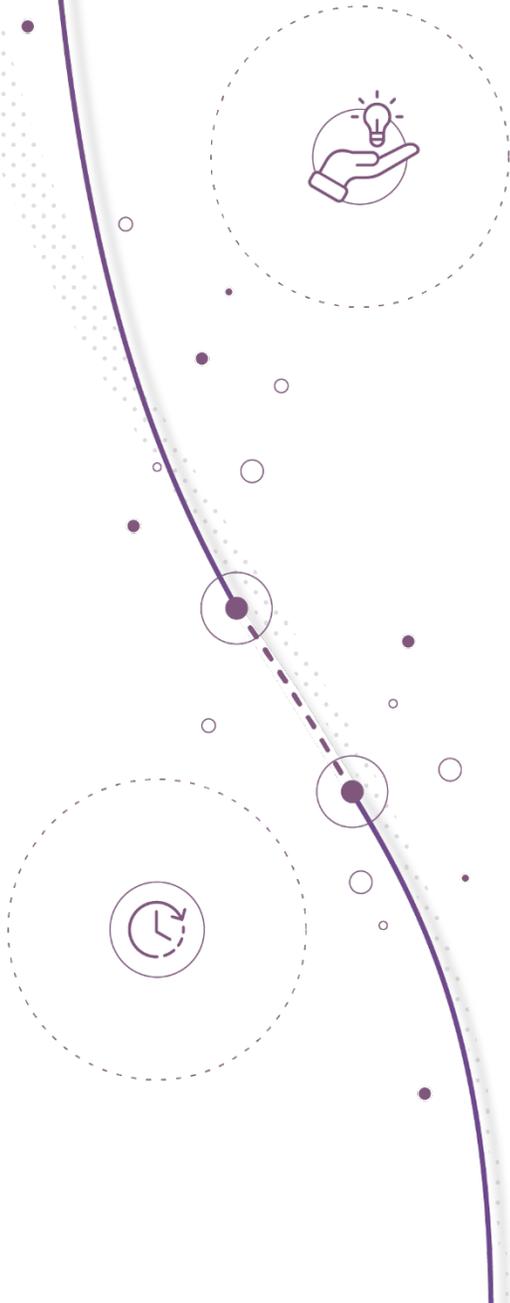
31%

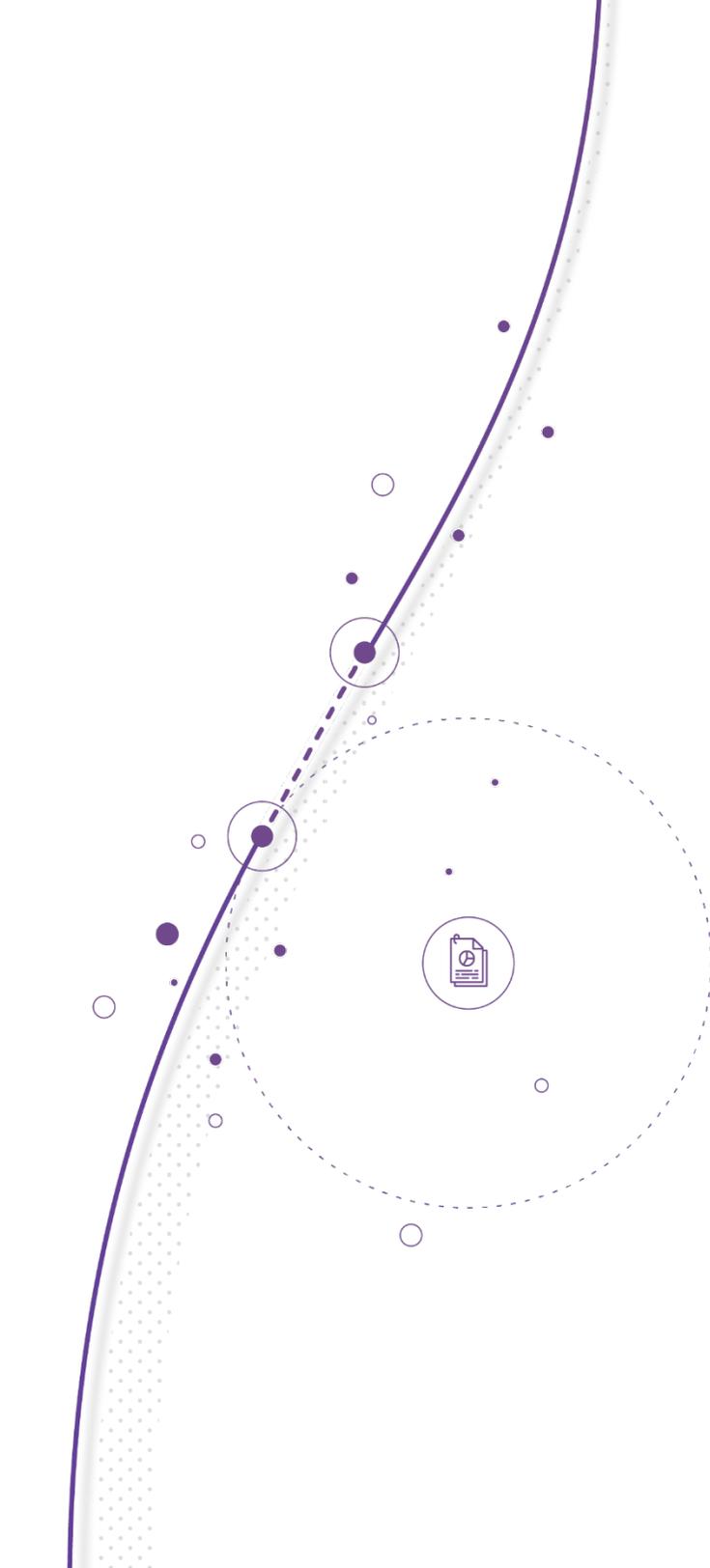
of passenger, bus & miscellaneous crossings at the Ontario-Michigan border used the Detroit-Windsor Tunnel in 2021

15%

of passenger, bus & miscellaneous crossings at the Ontario-Michigan border used the Blue Water Bridge or the Sault Ste. Marie International Bridge in 2021

Opportunities for future development





Current state

Maintaining and improving the cross-border relationship between Canada and the United States is important for economic growth in both countries. Cross-border infrastructure such as bridges and tunnels play an essential role in enabling the import and export of goods and facilitating international tourism. However, there are several existing constraints that reduce the efficiency of existing cross-border infrastructure and present opportunities for improvement.

Delay is one of the major constraints currently impacting cross-border movement of people and goods. Increases in tourism trips (following the reopening of the US-Canada border) have led to higher numbers of border crossings. This increase in trips—alongside capacity limitations and overburdened administration procedures—has led to delays at border crossings. Additional factors reducing efficiency at the border include the lack of harmonized Intelligent Transportation Systems (ITS), integrated traffic management systems, and border-crossing wait-time estimates.¹⁴

Delays at border crossings negatively impact the economy and the environment by creating travel time delays and increasing fuel consumption. Since the pandemic, price increases have resulted in rising fuel costs.¹⁵ This has further exacerbated the impact of existing border delays.

The existing border-crossing constraints emphasize the need for extended collaboration between border jurisdictions, innovative technological solutions, and increased investment. The following sections present several opportunities for addressing existing constraints at Ontario-Michigan border crossings organized around three themes of people movement, goods movement, and enhanced collaboration.

Enhancing ArriveCAN

The federal government introduced ArriveCAN immediately following the start of the COVID-19 pandemic to help travellers share information regarding their stay in Canada. The CBSA is working to adapt and build upon the original ArriveCan functionalities to modernize and speed up the border crossing experience. For example, travellers can now use the app to provide their customs and immigration declaration to the CBSA in advance at some Canadian international airports.¹⁶

People movement

Improving the movement of people at border crossings requires solutions that reduce congestion and enhance clarity for users. For example, border agencies and infrastructure operators—both from Canada and the United States—could endeavour to harmonize the calculation and dissemination of wait-time estimates. Additionally, a pre-crossing check-in and integrated traveller information system (TIS) could be implemented to help users predict and plan their travel prior to crossing the border.¹⁷

Harmonization of wait-time estimates, pre-crossing check-in, and integrated traveller information systems would generate societal and economic benefits. Disseminating accurate wait-time estimates can improve travel time reliability, leading to improved user experience. Similarly, pre-crossing check-in and an integrated traveller information system would enable an improved user experience by enhancing reliability and trust—stemming from accurate data communication—between travellers and border agencies. These initiatives would also help manage demand at border crossings by, for example, distributing the number of people using each bridge or tunnel.¹⁸

While regulatory challenges and a lack of supporting infrastructure present potential barriers to implementation, several recent initiatives have modernized border crossings and enabled improved people movement. For example, as part of their Traveller Modernization Initiative, the CBSA is implementing a suite of improvements including advanced customs and immigration declaration and new eGate lanes that enable remote communication with border officers.¹⁹ Additionally, funding from Transport Canada's National Trade Corridors Fund supported the installation of new radio-frequency identification readers at auto primary inspection lanes at the Peace Bridge between Ontario and New York, enabling travellers to scan their identification documents prior to reaching inspection booths and facilitating processing.²⁰

Collaborating internationally

Traffic Operations Centres (TOCs) in Ontario and Michigan already work in close coordination to manage a variety of planned and unplanned events ranging from the Detroit Marathon to the 2022 truck-driver protests.²¹

Enhanced collaboration

A focus on enhanced collaboration could enable improved coordination and communication between infrastructure operators, border agencies and travellers. For example, a collaboration platform for managing incidents could be implemented to support effective coordination between border agencies and infrastructure operators during incidents or major events. Such a platform would facilitate sharing of information about the incident as well as streamline response strategies. Additionally, enhancements to, and standardization of, the calculation and dissemination of border wait-time estimates would provide travellers with better information for trip planning purposes. Ultimately, this information—along with real-time weather conditions and alternate-crossing suggestions—could be shared with connected vehicles and traveller information systems for route optimization purposes.²² Well-coordinated piloting efforts also present an opportunity to increase the speed with which new cross-border technologies are tested and commercialized.

These enhanced collaboration initiatives would enable increased travel time savings, improved transport-network resiliency, and increased safety due to streamlined incident management. Increased time savings (and reduced fuel consumption) could also facilitate some cost savings and economic growth.²³

As the enhanced-collaboration initiatives rely upon existing technology and infrastructure,²⁴ their deployment can help realize benefits in the short- to medium-term. Similar initiatives implemented by the member agencies of the Niagara International Transportation Technology Coalition (NITTEC) have already resulted in improved mobility between Ontario and New York. Following the installation of new border wait-time technologies at many of the Ontario-New York bridges and the distribution of real-time wait-time estimates, NITTEC has reported decreased congestion as travellers make informed decisions about which crossing to use. NITTEC has also worked with partners to develop harmonized performance metrics related to delay.²⁵

Goods movement

Enhancements to border-crossing systems and physical infrastructure can be implemented to improve the efficiency and safety of goods movement. For example, the use of dynamic lane assignment can be leveraged to direct traffic to lanes based on vehicle type, thereby streamlining truck movement. Border crossings can also be upgraded to support autonomous vehicles (AVs) and truck platoons by implementing dedicated lanes for these vehicles.²⁶

Dynamic lane assignment can be implemented in the short-term, building off existing initiatives such as the FAST program to continue addressing concerns related to delay and congestion at border crossings. Dynamic lane assignment can therefore serve as a precursor for the longer-term implementation of dedicated lanes for AVs and truck platoons, since this initiative will be most impactful following the widespread adoption of AV and platooning technology.

Support for dynamic lane assignment at border crossings would improve mobility for trucks by reducing congestion and increasing travel time reliability. In the long-term, the implementation of supporting infrastructure for AVs and truck platoons at border crossings could encourage use of these vehicles. Increased use of AVs and truck platoons would facilitate a reduction in labour costs, as these vehicles often operate without drivers. Additionally, the increased efficiency of these vehicles leads to less fuel consumption, thereby reducing fuel costs and emissions. Safety improvements would likely be realized as well, given the reduction in accidents caused by human error.²⁷

While cross-border truck-platooning pilots are not yet commonplace in North America, the 2016 European Truck Platooning Challenge successfully demonstrated the ability of truck platoons to travel across national borders. In the Canadian context, the National Research Council Canada noted that cross-border truck-platooning pilots will require some regulatory harmonization between the United States and Canada.²⁸ Looking ahead, Transport Canada's National Trade Corridors Fund could be used to implement the physical upgrades needed to support goods-movement initiatives at Ontario's border.²⁹

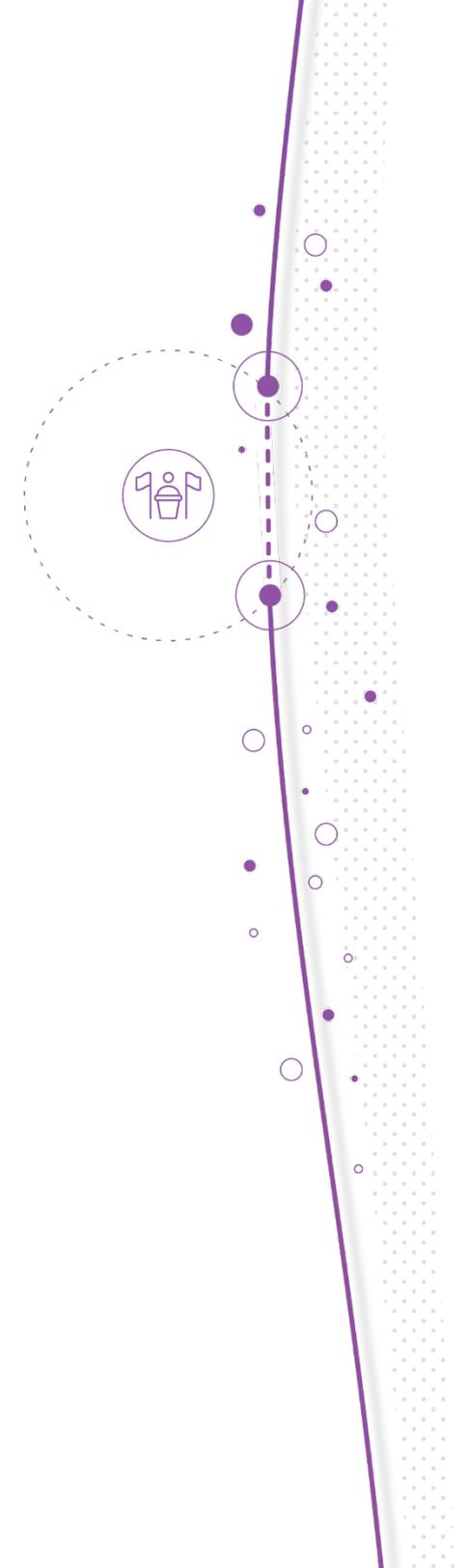
Expediting truck processing

As a part of the Free and Secure Trade (FAST) program, dedicated lanes at border crossings are available for use by pre-approved commercial vehicle carriers. By segmenting the pre-approved carriers from other traffic at border crossings, this program supports expedited processing.³⁰



"Advancements in transportation technology have the potential to make the way we travel and transport goods safer, more efficient and environmentally friendly. By working together to explore and advance new and innovative mobility technologies, we're taking steps to ensure Ontario and Michigan stay at the forefront of the evolving transportation industry."

**- The Honourable Caroline Mulroney, Ontario
Minister of Transportation³¹**



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



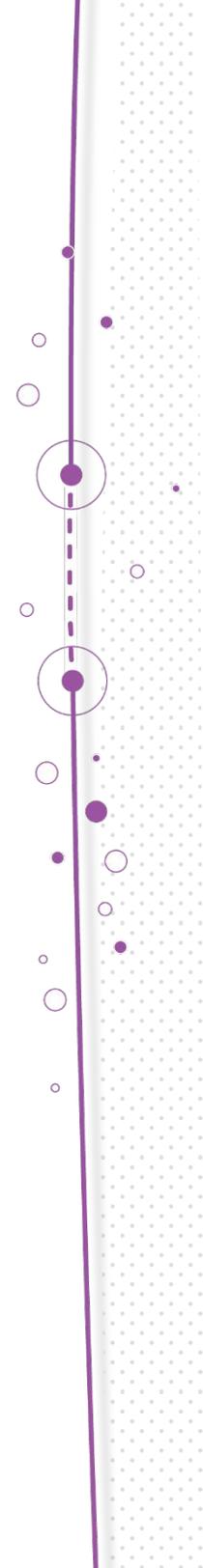
Drive innovation and collaboration among the growing network of stakeholders at the convergence of automotive and technology



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



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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 one 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.

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