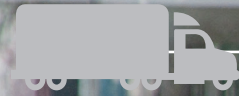




Movement of Goods Series

Report #3: Toronto-Waterloo Corridor Movement of Goods Business & Consumer Impacts

NOVEMBER 2017



FOREWORD

The Board's *Movement of Goods* series, produced with our research partner CPCS, is focused on building an understanding of the Toronto-Waterloo Corridor (the Corridor) transportation networks to help guide a multimodal goods movement strategy—a critical piece to ensure the Corridor remains attractive to business, talent and capital investment.

We need to get the region moving again. Our business competitiveness and quality of life depend on the efficient movement of goods and people throughout the region and beyond.

With this series, the Board has highlighted the critical role goods movement sector plays to the Corridor's economy. In our first report, we revealed these industries contribute 1.4 million direct jobs and \$171 billion in annual GDP—one third of the region's total. Approximately 1 million tonnes—or \$3 billion worth—of goods move in, out and through the Corridor daily on roads alone.

Our second report highlights the congestion bottlenecks impeding the flow of goods movement throughout the Corridor. Unsurprisingly, bottlenecks are most notably visible on our region's highways, and these delays impact the efficiency of all other transportation networks—air, marine, rail and pipeline—contributing to the region's well-known productivity lag.

In this, our third report, we reveal congestion on our Regions roads and highways costs \$500-\$650-million per year in higher prices for

goods right across Canada. The Corridor bears most of the burden of these costs—up to \$400-million per year.

It's not just business: delayed goods hit consumers squarely in the pocketbook. On average, congestion costs each household \$125 per year. While this may not seem like much on its own, it's an additional burden on top of increased consumer prices resulting from rising energy and labour costs.

These rising prices are the result of measures adopted by shippers and receivers to compensate for poor reliability and higher trucking costs overall, and don't include hidden costs coming from the lost opportunity to businesses who choose not to locate or invest less in the Corridor because of congestion.

Given the importance of the Corridor as a manufacturing and distribution hub, movement of goods challenges are not just a regional problem, but a problem for all of Canada. Many businesses of regional and national importance, such as automotive and parts manufacturing, expect reliable, high-quality transportation in their complex supply chains.

Our goods can no longer remain stuck in traffic—we need to get moving.

Jan De Silva
President & CEO
Toronto Region Board of Trade

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INTRODUCTION



Congestion and delay on the roads and highways of the Toronto-Waterloo Corridor (the Corridor) costs us \$500-650 million per year in higher prices for goods right across Canada. The biggest impact is in the Corridor, where businesses and consumers pay \$300-\$400 million more, but these added costs affect the whole country, with businesses and consumers elsewhere across Canada paying an extra \$200-\$250 million per year.



These higher prices result from higher trucking costs and the costs of measures adopted by shippers and receivers to compensate for poor reliability. These added costs do not even include the “hidden” costs associated with business who did not come to the Corridor or who invested less than they otherwise would have because of congestion.



Given the importance of the Corridor as a manufacturing and distribution hub (as shown in the first report *Economic impact of the Movement of Goods in the Toronto-Waterloo Innovation Corridor*), movement of goods challenges in the Corridor are not just a regional problem, but a problem for all of Canada. Many businesses of regional and national importance, such as automotive and parts manufacturing, expect reliable, high-quality transportation in their complex supply chains.



The challenge of getting around the congested transportation network of the Toronto-Waterloo Corridor (the Corridor) is well known to both residents and visitors. From exporters getting goods to international markets to consumers enjoying stocked grocery shelves, the movement of goods underpins the high quality of life the Corridor’s residents enjoy.

This report is the third in a series of four exploring the importance of the movement of goods in the Corridor. The first report in this series, released in August 2017, highlighted the economic impact of movement of goods in the Corridor! The second report, released in November 2017, brought attention to challenges associated with the movement of goods. The fourth

and final report to be released in January will examine potential solutions to movement of goods issues.

This report digs deeper into the economic impacts, focusing on businesses and consumers. The report quantifies the effects of movement of goods challenges –especially traffic congestion–on prices, and discusses how these issues affects business decisions.

HOW DO CHALLENGES IN THE MOVEMENT OF GOODS INCREASE COSTS FOR BUSINESS?



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The second report in this series identified four challenges in the Corridor: road congestion, land use conflicts, last-mile connectivity, and a lack of multimodal strategic vision for the movement of goods. These challenges can drive up the cost of doing business in a number of important ways:



Direct Costs: Increases in travel time within and through the Corridor due to traffic congestion drive up operating costs for trucking companies and result in more time spent on-road. This means more drivers, more trucks on the road, and more wasted fuel.



Reliability Costs: Traffic congestion not only causes longer travel times, but also less predictable travel times. Last-mile issues such as lack of available truck parking also add to unreliability, which can be particularly costly for time-sensitive goods such as food and medical supplies. Businesses operating in a just-in-time manner need to adopt measures to counter unreliability, including building in larger buffers for trip times and storing more inventory, all of which increases costs.



“Hidden” Costs of Poor Competitiveness: Many businesses in the Corridor serve the local market and are unlikely to relocate out of the Corridor, even as the cost of doing business rises. However, many other businesses have flexibility in their location decisions, especially those focused on national or export markets. Costs of congestion and other transportation issues can become a drag on the competitiveness of these businesses, leading them to scale down their operations in the Corridor or move away altogether. For example, food manufacturers, whose

costs are measured at the level of “pennies per pound,” may increasingly move to Western Canada to be closer to their inputs, forgoing the advantages of locating around Toronto such as a large diverse labour base and customer market. Moreover, there is a “hidden” aspect to this cost, in the sense that some businesses may elect to not scale up production in the Corridor, or to not move to the Corridor in the first place – a cost that is unknowable but no less important.

All businesses attempt to reduce the costs and risks of transportation, but use different strategies depending on their needs. In the most extreme case, late deliveries can result in production having to be shut down, an extremely costly event that can mean unproductive, idle time for workers and expensive overtime shifts to get back on track. For example, an auto assembly plant producing 500 vehicles per day could incur a cost in the tens of thousands of dollars if delays cause its production on a given day to be off by 20 vehicles.

But similar to how a traveller will factor in “a buffer time” for a trip to the airport, businesses are adept at finding ways to reduce the impact of extreme events. Nonetheless, these mitigation measures have real costs and add up over time to increase the overall cost of doing business. Some examples of methods businesses use to mitigate movement of goods challenges are described in Figure 1.

FIGURE 1: Mitigation Measures that Drive up Costs for Businesses

MITIGATION MEASURE	DESCRIPTION
 <p>More equipment, staff, and fuel</p>	<p>Time that trucks spend in traffic is time that is wasted for both the driver and trucking company. In the big picture, this inefficiency results in trucking companies spending more time on-road, using more fuel, having to redistribute or hire more workers, and sometimes having to buy or lease more trucks—all of which drive up costs.</p> <p>To a large extent, traffic congestion is driven by high demand for key transportation corridors from passenger vehicles. Accidents, lane closures due to construction, and inconsistent or outdated truck restrictions also cause delays.</p> <p>Hours of service (HOS) regulations are an important factor. The Ontario Ministry of Transportation (MTO) regulates the number of hours that truck drivers can drive, for example mandating a maximum 13 hours of driving in a day, among other limitations. Other provinces as well as the US Department of Transportation have similar HOS regulations. For origins and destinations (referred to as “lanes” in the industry) that are near the HOS limits, traffic unreliability can sharply increase costs—a few extra hours stuck in congestion can mean having to take measures such as switching out drivers, using team drivers instead of solo drivers, “dropping” trailers at a customer’s facility overnight, or using local drivers to pick up and deliver to a central distribution centre, and then long-haul truckers to deliver to the out-of-town customer. Each of these measures adds complexity and cost.</p>
 <p>Investments in mitigation technology and processes</p>	<p>Businesses involved in the movement of goods, across all modes, invest in measures to mitigate safety and quality of life impacts to other road users and to the general public. For example, a manufacturing plant may invest in noise and odour abatement (such as insulating fans, or placing silencers on intakes) and change their production processes to keep noisy equipment out of nighttime hours. These costs of mitigation are higher where poor land use planning exacerbates conflicts between movement of goods facilities and neighbouring land uses.</p>
 <p>Increased inventory (buffer stock)</p>	<p>Many businesses operate according to “just in time” principles, meaning that deliveries are received only as they are needed. This widespread practice reduces the cost of having to keep excess inventory on hand, particularly in areas in which land value limits capacity. As the movement of goods becomes less predictable and reliable, shippers are forced to store more inventory to reduce the risk of shortages of key inputs, parts, or products. This is a problem for all industries, as the overall reliability of a supply chain is only as good as its weakest link. For example, air cargo supply chains are highly time-sensitive and require good road links to connect shippers and receivers to the airport. The greatest challenge to air cargo supply chains in the Corridor is not the capacity of the airports, but rather traffic congestion on highways and roads leading to Pearson Airport.</p>

FIGURE 1: Mitigation Measures that Drive up Costs for Businesses Cont'd

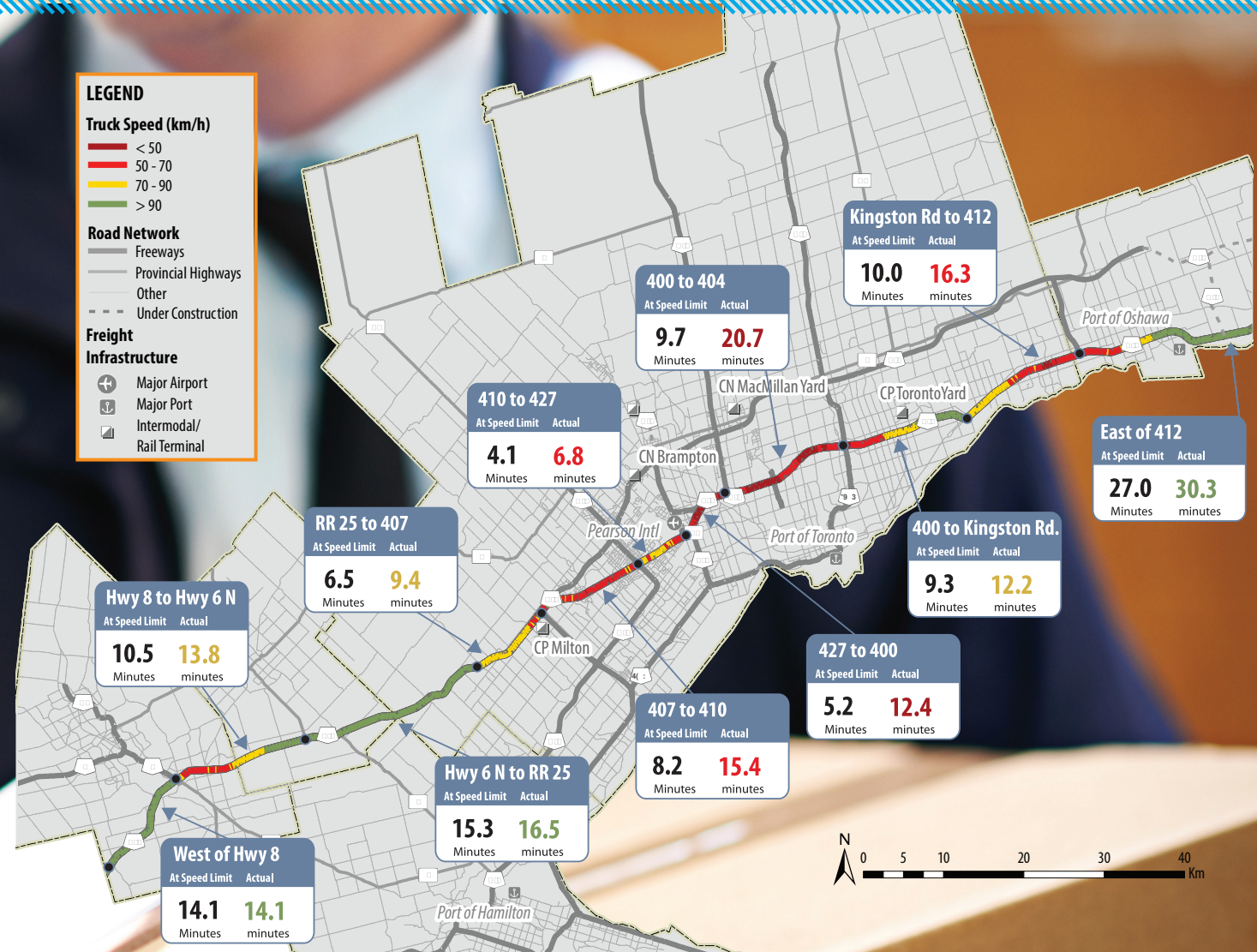
MITIGATION MEASURE	DESCRIPTION
Off-peak deliveries	Utilizing off-peak deliveries (OPD) allows trucking companies to reduce costs by avoiding traffic congestion on the roads. As well, some receivers (such as certain retail outlets) find it easier to receive products off-peak, allowing them to stock shelves before customers arrive for the day. Many businesses in the Corridor already use OPD to a significant extent, particularly in areas where noise impacts on surrounding land uses are less of a concern. However, off-peak deliveries are not a solution for all supply chains; in some cases they may increase costs (such as if a receiver is not equipped to handle deliveries off-peak). Furthermore, OPD remains an unsuitable option for most residential and individual package recipients. Noise bylaws can be a significant issue affecting the feasibility of OPD at a localized level. Trucks are required by law to utilize beepers while backing up, and “cold chain” deliveries (e.g. food products) rely on diesel-powered refrigerated units which also emit noise. Inconsistent or outdated bylaws, and a lack of municipal support, can add costs to businesses by restricting the availability of OPD. The Region of Peel is currently commencing a six-month OPD pilot, following up on a successful pilot carried out by the Ministry of Transportation (MTO) during the Pan Am Games.

Re-optimizing location decisions	DESCRIPTION
	Businesses make location decisions to optimize the service they can provide to their customers while also controlling costs. Depending on the industry, businesses periodically or constantly re-evaluate their location decisions to ensure these remain optimal. For example, a courier company will operate a hub-and-spoke network of central processing centres for consolidation, complemented by secondary (smaller) delivery depots from which delivery runs are made directly to customers' addresses. The location of these delivery depots is tied to service quality metrics, such as proximity to customer addresses. As congestion increases, the ability to serve customers at a high level of service declines, and the courier needs more depots and more delivery runs, all else equal.

For companies involved in delivering goods to businesses and consumers across the Corridor, reliability and high-quality service is paramount. A failure to deliver on-time means a resident's favourite sandwich is unavailable at their local

restaurant, or it could mean medical supplies do not reach a hospital when they are needed. Trucking companies and shippers take on extra costs to make sure they can provide reliable service to their customers.

FIGURE 2: Average Weekday Peak-Hour Truck Travel Times on Highway 401



FOCUS ON: CONGESTION

The issues of congestion across the Corridor is discussed in the second report in this series, Movement of Goods

Challenges in the Toronto-Waterloo Corridor. Despite being the most important truck corridor (by volume of trucks), Highway 401 is also the most congested.

Source: MTO iCorridor truck travel speed data (2016). Example shown is the average daily truck speed for the peak hour of 4:00-5:00 pm (both directions combined).



FIGURE 3: Foodservice Distributor Supply Chain. How a Distributor Mitigates Against Congestion. Optimized Route to Avoid Bottlenecks: Story of One Trucking Firm Delivering Overnight

A WIDER VIEW: INTERMODAL RAIL



This series of reports focuses primarily on issues and solutions within the Corridor. It is important to remember that there are also national-level transportation challenges that impact movement of goods stakeholders in the Corridor, for example those related to federal regulations or to the Canada-US border.

been coupled by higher than expected Canadian economic growth. This problem has been more acute in certain markets, notably the cold chain (such as food products), which has very specific climatic requirements. Having to use long-haul trucks drives up the cost of transportation for food manufacturers in the Corridor that serve Western customers, offsetting other advantages of locating in the Corridor. Similar issues are in play for cross-border transportation, where intermodal capacity is currently lacking. Simply put, Canadian investment in inland intermodal capacity has not kept pace with that of the U.S. Shifting more of this traffic to intermodal rail would improve the competitiveness of food manufacturers in the Corridor while removing trucks from the road and reducing greenhouse gas emissions. Investments, such as CN's proposed Milton Logistics Hub, will help to improve fluidity throughout the corridor and, more broadly, Canadian and U.S. trade corridors.

One uniquely Canadian issue—stemming from the large distances between population centres—is the high cost of transporting goods across the country. One potential solution involves shifting more long-distance truck trips to intermodal rail. Given hours-of-service limits on truck drivers and the industry shortage of long-haul truck drivers, truck travel is more expensive and often not any faster than intermodal, for travel between major cities such as Toronto and Calgary. However, according to consultations with logistics companies, railway container capacity is constrained in the Greater Toronto and Hamilton Area. This has



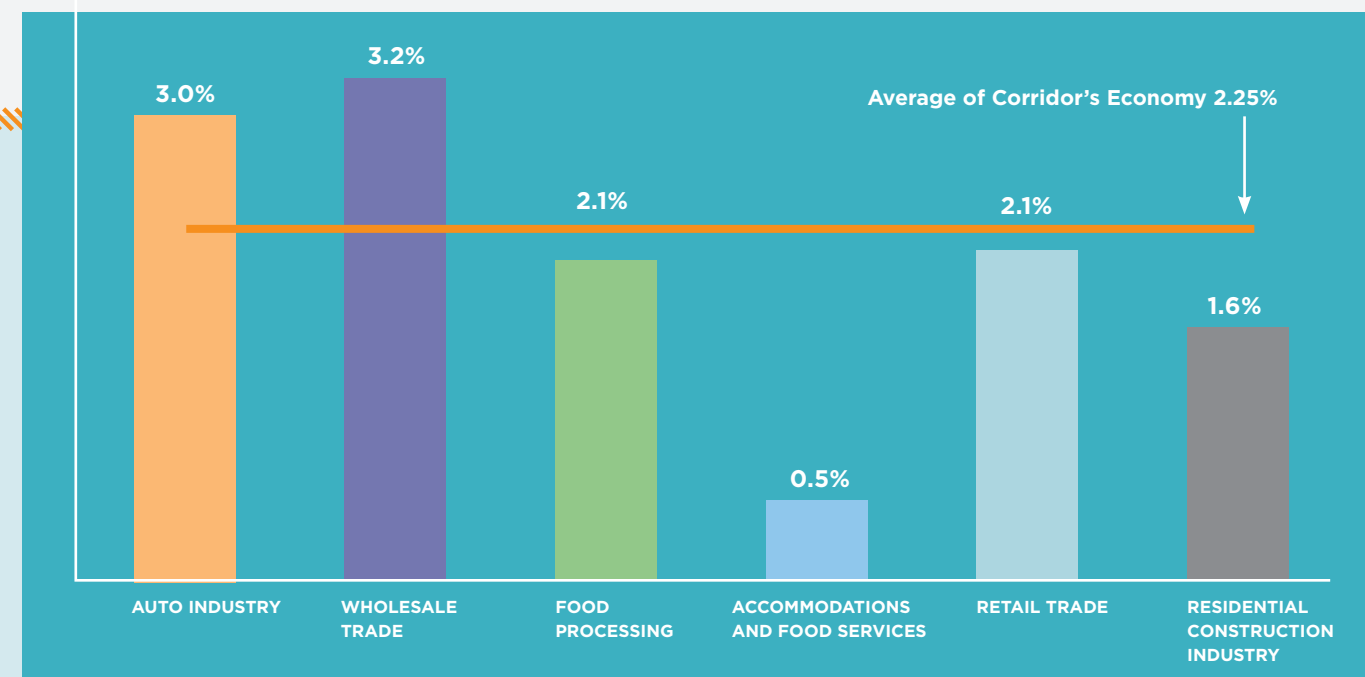
Source: CPCS.



HOW MUCH IS THIS COSTING US?

How much inefficiency in transportation affects the prices of products depends on how reliant a sector is on transportation. Across the economy as a whole the cost of transportation is equal to about 2.25% of the total value of sales of goods (Figure 4). The importance of transportation varies by sector. For example, the cost of transporting the parts and other inputs that went into making an automobile is roughly 3% of its price, whereas transportation cost represents only roughly 0.5% of the price of a restaurant meal (output of the accommodations and foods services sector).

FIGURE 4: Share of the Average Price of Goods by Sector of the Economy Attributable to the Movement of Goods



All told, higher prices that result from congestion in the Corridor are costing Canadian consumers and businesses across the country an extra \$500-\$650 million per year. Of this amount, consumers and business in the Corridor are spending an extra \$300-400 million.

These increased costs do not just impact everyday purchases such as food and clothing, but also big-ticket items

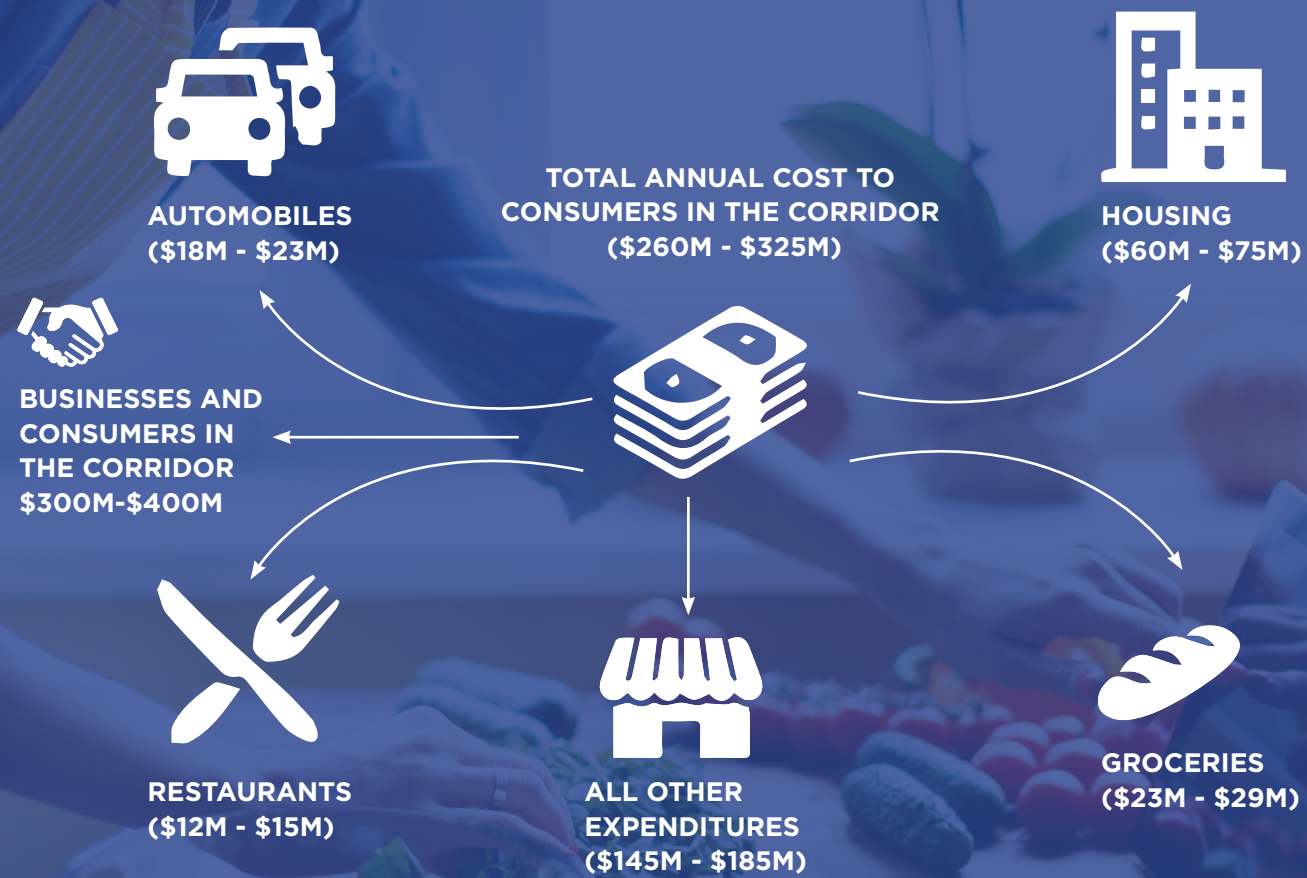
like automobiles and even housing. The residential construction industry is dependent on dump trucks, cement mixers, and other vehicles to deliver machinery and materials to work sites.

CONSUMER PRICES: BREAKING IT DOWN

Figure 5 shows the impact movement of goods challenges have on consumer prices in the Corridor.



FIGURE 5: Additional Cost from Movement of Goods Challenges on Consumer Prices



SOURCE: CPCS Analysis of MTO Commercial Vehicle Survey and Statistics Canada Make Use Table and Household Expenditure Survey.



BUSINESS COSTS: FOCUS ON MANUFACTURING

As large as the cost to consumers is, the values presented in this report do not fully describe the impacts of inefficient movement of goods in the Corridor. As referred to earlier in the report, some businesses are less captive to the Corridor than others.

Manufacturing is the sector that is likely to be disproportionately affected by traffic congestion for at least three reasons:⁴

- Manufacturers tend to sell to export markets and chose strategically where to locate to minimize traffic delays.
- Movement of goods costs are higher as a share of total output value (Auto Industry in Figure 4).
- The sector is highly competitive and has low margins. Every dollar is valuable, and driving down excess costs is important for remaining competitive. In fact, food manufacturers are so sensitive to cost that reducing costs by a few pennies per pound is considered a substantial savings.⁵

As described in the first report in this series, manufacturing in the Corridor accounts for \$64.3 billion of the Corridor's gross domestic product (GDP), making it the most economically significant movement of goods sector. Manufacturing also accounts for 397,000 jobs across the Corridor, ranking second among sectors behind Wholesale and Retail Trade. Furthermore, manufacturing has a high labour income of approximately \$100,000 per employee, making it a

provider of high quality jobs across the Corridor. Not only do these industries support many families with well-paying jobs, they also tend to support a large number of retired individuals with pensions and support, as well as providing demand for spinoff economic activity and jobs through reinvestment of wages in the regional economy.

Ontario accounts for 91% of Canada's output and 83% of jobs (or over 100,000 jobs) in the automotive manufacturing sector,⁶ with most of that in the Windsor-to-Oshawa corridor. A single plant can provide thousands of jobs, and large suppliers thousands more. The days of a single plant reliably producing new models of the same vehicle year-over-year are gone. Manufacturers assign new products on three-to-five year contracts and re-evaluate plant performance regularly.⁷ In this competitive environment, every advantage is important.





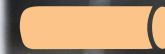
FOCUS ON: MANUFACTURING INDUSTRIES



AUTO INDUSTRY

The auto industry currently operates an immensely complex supply chain involving parts and semi-finished truck bodies, all of which need to arrive to car assembly plants on time. The Corridor boasts assembly plants for Honda, Toyota, Chrysler, Ford, and General Motors. These are supported by a large network of plants manufacturing parts and components for assembly plants here and across North America. The region that includes the Corridor and stretches along Highway 401 to Windsor is Canada's pre-eminent automotive cluster and one of the largest in North America. Assembly plants and large suppliers are located throughout the entire Corridor, including in Oshawa, Guelph and Kitchener-Waterloo, making up a large share of the manufacturing base for cities and regions across the Corridor.

A single auto assembly plant can produce hundreds of thousands of vehicles per year worth up to \$10 billion.



STEEL MILLS

Hamilton is the largest steel manufacturing city in Canada. Together, Stelco and Dofasco produce 60% of all steel in Canada. More than 80% of 'Primary Metallic Products' manufactured in Ontario are destined for international markets. Despite issues in the past, the industry is profitable again. As an upstream product in the supply chain, ensuring steel products remain accessible to manufacturers is crucial to the survival of the industry.

The steel industry is heavily dependent on the Port of Hamilton. 71% of the port's volume relates to the steel industry (raw materials and steel products).



FOOD MANUFACTURING

The food industry is a significant part of the the Corridor's manufacturing sector. Toronto's historic moniker, Hogtown, was due to large-scale processing of pork in Toronto. In modern times, the food processing industry is more aptly represented by companies like Nestle, Mondelez and Redpath Sugar. The Corridor's food and beverage manufacturing cluster is one of the largest in North America, along with Los Angeles, New York and Chicago.

The corridor's food manufacturing cluster extends across the entire Corridor, including Guelph and Kitchener-Waterloo.

SOURCE: City of Toronto website, "Food & Beverage".



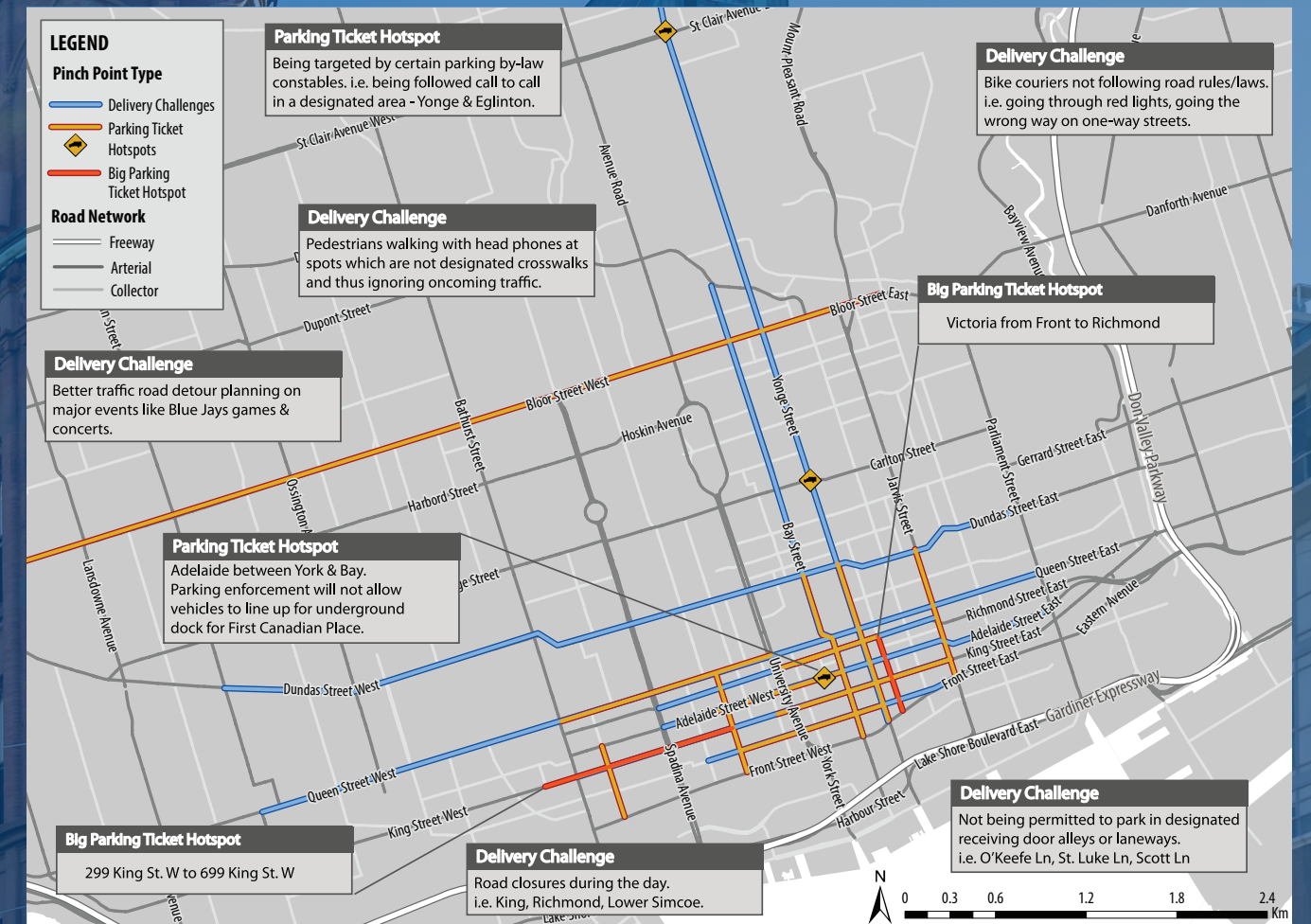


FOCUS ON URBAN ISSUES: PARKING TICKETS

Trucking companies that deliver to urban centres in the Corridor—most notably Downtown Toronto—face a number of challenges related to “last mile deliveries.” One of these is the cost of parking tickets, which one distributor noted costs them \$150,000 to \$200,000 every year for Downtown Toronto alone. Many companies

involved in delivering goods find that parking tickets are often used as a cash grab, whereas municipalities do not provide adequate unloading spaces for deliveries; one driver observes that sometimes parking enforcement officers will follow them call-to-call in a designated area. One way or another, these costs filter through in the form of higher prices for goods and services.

FIGURE 6: A Truck Driver’s Perspective: Delivery Pinch Points in Downtown Toronto.



Source: CPCS consultations with a large regional distributor - observations listed by a team of truck drivers.

Figure 6 shows major pinch points in central Toronto identified by a team of drivers from a large trucking company that delivers frequently downtown Toronto.



CONCLUSION

Challenges associated with the movement of goods in the Corridor cost Canadian businesses and consumers real money—\$500-650 million annually. Not only are residents of the Corridor paying more for the goods they buy, the Corridor may well suffer a “hidden cost” of lost or forgone investment.

The other side of these issues and challenges is opportunity. Improving the movement of goods in the Corridor would reduce the price people pay for goods and improve the competitiveness of businesses in the

Corridor. Making smart infrastructure investments, to help solve movement of goods challenges in the Corridor is a topic of not only regional, but indeed national, interest.

TECHNICAL NOTES

1.) CALCULATING THE AMOUNT OF TRUCK DELAY ON THE REGION'S ROADS

We use truck speed data received from the Ministry of Transportation (MTO) through their GPS-based iCorridor program, along with the MTO's estimates of truck volumes for freeways and other major roads (e.g. King's highways) in the region.

We then calculate delay on a directional segment-by-segment basis, for each hour of the day (weekday and weekend separately). Delay is calculated according to the following formula:

$$\text{Delay per hour per truck} = \left(\frac{\text{Distance}}{\text{Actual Speed}} - \frac{\text{Distance}}{90\% \text{ of Free Flow Speed}} \right)$$

Delay is summed up over all hours, taking into account the variation in truck volumes at different hours of the day. We compute average truck delay per vehicle-kilometre travelled (VKT) separately for each census metropolitan area within the region.

2.) CALCULATING TOTAL TRUCK DELAY IN THE REGION

We next use the MTO's Commercial Vehicle Survey (CVS) origin-destination data to compute the distribution of truck activity internally within the region (taking into account varying levels of congestion across the region). We use this to compute the total amount of truck delay in the region.

We further divide the total truck delay into three categories: truck delay impacting trips internal to the region, truck delay impacting trips to/from elsewhere in Ontario, and truck delay impacting trips to/from elsewhere in Canada. This allows us to determine how the supply chain costs may be distributed.

3.) PLACING A VALUE ON TRUCK DELAY

We use operating cost calculations from the American Transportation Research Institute (ATRI), which publishes

annual estimates of the average marginal cost of trucking per hour. This takes into account not only labour (wages and benefits), but also other costs like capital and fuel that can be considered variable in the long run (for example, the more time is wasted in congestion, the larger a fleet a trucking company will need to have). This value is converted to Canadian dollars for a rate of \$85.76 per hour.

The straight cost of truck delay is simply the added cost of labour and other inputs sitting idle in traffic. However, delays also result in a reliability cost, which reflects the risk of late deliveries as well as the costs of extra mitigation measures that companies take to ensure on-time performance. A higher value of reliability is generally observed for perishable items (such as agricultural), as well as higher-value or time-sensitive products and parts. Based on the available literature, we select a reliability multiplier of 2 to 3. The range reflects the wide differences between supply chains and the general lack of a single, consistent number in the literature.

4.) COMPUTING THE SUPPLY CHAIN EFFECTS

We determine congestion's effect on consumer prices by estimating how the value of truck delay flows through the economy. Statistics Canada Input-Output tables provide data on how trucking fits into the overall economy. At the provincial level data on freight transportation is only available at the higher level of aggregate freight transportation, and is not broken down by mode. We use the national level data to estimate the national split by mode, then apply it to the provincial-level data to estimate the quantity of trucking input into different types of production. This is then traced through the model to estimate the impact on different classes of final goods and housing costs. The portion attributed to the region is population-weighted from the provincial data. The Statistics Canada Consumer Expenditure Survey is also used to estimate the cost on specific consumer goods by applying the overall cost to a breakdown of consumer spending.





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ENDNOTES

1. "Economic Impact of the Movement of Goods in the Toronto-Waterloo Innovation Corridor".
2. This value assumes that costs of congestion in the Corridor are generally passed down to consumers in the Corridor. If prices are "levelled" to a greater extent nationally, a smaller percentage of the \$480 million is felt within the Corridor and a larger percentage is borne across the country.
3. This is only the impact of congestion within the Region, and does not include costs of congestion or other transportation issues outside of the Region.
4. Other industries were also examined based on this multi-criteria framework, but were found to be less susceptible to these issues.
5. 15% margins are the difference between sale price and the cost of producing the good. Source for data: Danny Leung (2008), "Markups in Canada: Have They Changed and Why?" Bank of Canada.
6. Andre Leonard (2015), "The Canadian Automotive Manufacturing Sector Since 2001." Library of Parliament Research Publications.
7. Consultations with a large automobile manufacturer.





**TORONTO
REGION
BOARD OF TRADE**

ABOUT THE TORONTO REGION BOARD OF TRADE

Founded in 1845, Toronto Region Board of Trade is the chamber of commerce for Canada's largest urban centre, connecting more than 12,000 members, business professionals and influencers throughout the Toronto region. The Board fuels the economic, social and cultural vitality of the entire Toronto region by fostering powerful collaborations among business, government, thought leaders, and community builders. The Toronto Region Board of Trade's vision is to make Toronto one of the most competitive and sought after business regions in the world. Learn more at bot.com and follow us at [@TorontoRBOT](https://twitter.com/TorontoRBOT).

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