# Economic Impacts of Highway 407 ETR: Implications for Travellers, Transportation and Prosperity

# July 2019 540 CANADIAN CENTRE FOR **ECONOMIC ANALYSIS**

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This information is not intended as specific investment, accounting, legal or tax advice.

This report was commissioned by 407 ETR.

Note: This report was amended in January 2020 to rectify a typographic error in the units shown for CO<sub>2</sub> emissions on page 20.

# Citation:

Economic Impacts of Highway 407 ETR. Canadian Centre for Economic Analysis. July, 2019.



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# **FINDINGS AT A GLANCE**

#### INTRODUCTION

Highway 407 ETR is a route that provides drivers in the Greater Toronto and Hamilton Area (GTHA) with a congestion-free alternative for East-West travel for a toll. Operated by 407 ETR since 1999, it provides transportation across the leading region for job creation in Ontario, contributing to better connectivity and improved flow of people and goods. In addition to connecting employers to employees, Highway 407 ETR is relied upon by businesses and consumers who depend on increasingly fast and reliable shipping of goods.

Highway 407 ETR facilitates commuter travel in personal and public transit vehicles, as well as traffic for commercial purposes. The use of Highway 407 ETR has steadily increased since 1999 and the highway averaged 413,000 weekday trips in 2017. Drivers on the highway benefit from consistently higher traffic speeds than on alternate routes and a collision rate that is lower relative to the provincial freeway average. Due to consistently high average speeds, drivers on Highway 407 ETR can expect similar travel times at all hours of the day.

# APPROACH

The objective of this study is to quantify the economic benefits from the use of Highway 407 ETR, as well as the economic impacts of its operation and investments by 407 ETR. This analysis was conducted using CANCEA's socio-economic simulation platform and outputs from the GTHA Emme Network model<sup>1</sup> calibrated to reflect changes in traffic volumes and speeds due to changing toll levels. Inputs for the analysis provided by 407 ETR include travel data, such as speed, number of trips, vehicle kilometres travelled and collision rates on Highway 407 ETR, along with investment and operations expenses.

# **KEY FINDINGS**

From 1999 to 2017, Highway 407 ETR has supported economic benefits totalling \$15.89 billion within Ontario. This includes all GDP contributions from 407 ETR's investments and operations, the business activity generated by the time saved, social cost savings, and the savings to provincial and municipal governments. If 2017 trends persist, this benefit is expected to be \$724 million annually going forward.

Personal users of the highway save almost 23 million hours of driving annually, on average. This amounts to 12,100 full-time equivalents (FTEs) per year<sup>2</sup>. In addition, within the 407 ETR corridor, a 12-kilometre-wide area in which Highway 407 ETR is contained, about \$16.5 billion of residential economic activity and \$2.6 billion of commercial real estate activity occurs annually.

<sup>&</sup>lt;sup>2</sup> Based on 1,800 work hours per year.



<sup>&</sup>lt;sup>1</sup>Emme is a complete travel demand modelling system for urban, regional and national transportation forecasting. It is used in travel demand forecasting, transit planning, traffic planning, as well as for economic, emissions and environmental analyses. For more information, visit the <u>INRO website</u>.

Key findings are presented in the tables below:

	1999-2017 Total	Annual Average	2017
Total Time Saved	577 million hours	30.4 million hours	32.8 million hours
Commuter & personal user hours saved	430M	22.7M	23.8M
Commercial hours saved	146M	7.7M	9.0M
Total Value of Time Saved	\$20.6 billion	\$1.1 billion	\$1.2 billion
Commuters & personal users total value of time saved	\$13.5B	\$713M	\$749M
Business value of time saved	\$7.0B	\$371M	\$431M
Total Social Value	\$1.4 billion	\$75 million	\$84 million
Social cost savings of CO <sub>2</sub> Emissions reduction	\$121M	\$6.4M	\$7.2M
Social cost savings of accidents avoided	\$1.3B	\$68.6M	\$76.9M
Total Support to GDP	\$14.1 billion	\$744 million	\$623 million
GDP contribution from investment and operations	\$7.1B	\$374M	\$192M
Value of commercial time saved	\$7.0B	\$371M	\$431M
Employment Support			
Total wages from investment and operations	\$4.7B	\$247M	\$128M
Total Full-Time Equivalents	72,000	3,789	2,015

	Total growth since 2001	% Change 2001-2016
Growth Support to 407 ETR Corridor		
Increase in residential population	506,000	39%
Increase in number of households	187,000	39%
Increase in number of jobs	199,000	28%
Increase in commercial space associated with increase in jobs (sq. ft)	53.6M	21%



# **1.0 INTRODUCTION**

# 1.1 BACKGROUND

#### 1.1.1 HIGHWAY 407 ETR AND THE GTHA ROAD TRANSPORTATION NETWORK

As Ontario's first tolled highway, Highway 407 ETR provides a congestion-free East-West passage through the Greater Toronto and Hamilton Area (GTHA) from Pickering to Burlington. It spans 108 km, passing through the upper-tier municipalities of Durham, York, Peel and Halton.

Considering that the majority of the region's population relies on cars as their primary mode of transportation, traffic congestion is a persistent problem. As the leading region for job creation in Ontario over the past 10 years and home to over half of Ontario's population (Reevely, 2018), the GTHA's road infrastructure network is heavily relied upon by commuters, industry and residents alike. Figure 1 presents the main highways and major roads in the network.







A report released by the Canadian Automobile Association found that half of the 20 worst bottlenecks in Canada, defined as stretches of highway that are routinely and consistently congested, are found within the GTHA. According to the report, the annual cost of these delays amounts to \$197.36 million. The stretch of Highway 401 between Highway 427 and Yonge Street is found to be the worst bottleneck in the country, costing drivers over 3.2 million hours in lost time annually. Highway 407 ETR provides drivers with the option to bypass this particularly congested stretch. Highlighted by the report is the notable absence of bottlenecks on any stretch of Highway 407 ETR, which makes it the longest "non-bottleneck" in the GTHA (CPCS Transcom Limited, 2017).

Highway 407 ETR is adjacent to or passes through all three employment "megazones" in the GTHA, making it a free-flow alternative for daily commuters seeking to avoid congested routes. Megazones, indicated by the yellow circles in Figure 2, are large suburban employment areas straddling multiple municipal jurisdictions that have seen large employment growth, particularly in "core employment," i.e. jobs that produce goods and services that can be exported. These include the airport megazone, located around Pearson International Airport, Toronto-York East, centred around Highways 401 and 407 ETR interchange, and Toronto-York West, located between the intersection of Highways 400 and 407 ETR, east to Keele Street and south into Toronto (Blais, 2015). In 2011, the three megazones generated 475,000 daily car trips in the morning peak period.







The GTHA's road network not only serves to connect employers and employees but also to transport goods. The reliability of this transportation network is important to the regional economy as both businesses and consumers depend on increasingly fast and reliable shipping. Highway 407 ETR provides a congestion-free route for the movement of goods across and within the region and is used by major commercial courier services. In fact, the number of trips made by commercial courier services on Highway 407 ETR has increased by 61% from 2008 to 2017.

# 1.1.2 HISTORY OF HIGHWAY 407 ETR

Highway 407 was opened in 1997 and initially spanned 68 kilometres from Mississauga to Markham. It was operated by Canadian Highways International Corporation and was the first all-electronic, open access toll highway. In 1999, it was leased to a private operator for a period of 99 years for more than double the cost of building the initial 68 km at \$3.107 billion. At the end of the 99-year lease, the operation and maintenance of the highway will revert back to its owner, the Government of Ontario.

The current private operator is the 407 ETR Concession Company Limited, a subsidiary of 407 International Inc. The latter is owned by Cintra Infraestructuras Internacional S.L, a wholly owned subsidiary of Ferrovial S. A (43.23%), by indirectly owned subsidiaries of Canada Pension Plan Investment Board (total 40%) and by SNC-Lavalin (16.77%).

Highway 407 ETR was built to alleviate traffic congestion. For that reason, the lease agreement for 407 ETR includes traffic and toll thresholds to ensure that 407 ETR continues to fulfil this duty for the duration of the lease.<sup>3</sup> The lease agreement also required that the highway be extended to the east and west and that new lanes be added to accommodate traffic increases, all at no cost to taxpayers. In 2001, a 25-kilometre extension to the west and 15-kilometre extension to the east were completed. Since 2004, more than 250 lane-kilometres have been added. See Figure 3 for a history of extension and expansion projects. A CANCEA report on public-private partnerships for infrastructure projects found evidence that a significant economic benefit of public-private partnerships is reduced delays in the completion of large infrastructure projects (2016). This finding supports that the involvement of the private sector in extensions, expansions and maintenance of the highway has helped with the highway's timely growth to meet demand.

<sup>&</sup>lt;sup>3</sup> Under the Tolling Agreement, 407 ETR has the flexibility to manage the basis on which tolls will be established and the freedom to establish higher tolls while avoiding Congestion Payments if prescribed traffic levels are achieved. The Toll Threshold was the principal limit on the toll rates until the completion of the Highway 407 West Extension and Highway 407 East Partial Extension. At that point, a base traffic flow (the "Traffic Threshold") was established based upon peak-hour traffic by Highway segment over the 2002 calendar year. This Traffic Threshold was then to grow at a rate between 1% and 3% per year, depending upon the Traffic Threshold in the prior year, to a maximum of 1,500 vehicles per lane per hour. If actual peak-hour traffic levels in a calendar year are below the relevant Traffic Threshold and toll rates are above the Toll Threshold, 407 ETR is required to make Congestion Payments to the Province. In some circumstances, that payment will be equal to two times the excess of actual toll revenue charges over the Toll Threshold during the applicable calendar year. Provided observed peak hour traffic flows during the calendar year are greater than the relevant Traffic Threshold, tolls may be raised by 407 ETR without any payment being made by 407 ETR to the Province.



Highway 407 ETR can be considered a special case of a Build-Operate-Transfer contract, whereby a private firm builds and operates one or more roads in a network at its own expense and, in turn, receives the toll revenue for the duration of the lease (Tan, et al., 2010). Once the lease is over, the assets are transferred to the government. This applies to the operation of the highway and all portions built after the highway was leased to 407 ETR. Additionally, as part of its contract, 407 ETR is responsible for all maintenance, construction and customer service and pays for the full cost of police enforcement and winter maintenance along the highway.





#### Figure 3 407 ETR Extensions and Expansion projects, 2004-2017

Source: 407 ETR



# **1.2 HIGHWAY TOLLING AND OPERATIONS**

Highway 407 ETR is the world's first fully electronic, open-access highway that enables drivers to enter the highway barrier-free. Usage is monitored using transponders and cameras set up on gantries at onand off-ramps. Vehicles with transponders are charged through an automatic system. The licence plates of a vehicle without a transponder are recorded via camera, and the user is sent a bill which includes an additional camera charge.

Users of the highway pay a per-trip fee and a variable per-kilometre fee that depends on the direction, highway segment travelled and the day and time of day. The per-kilometre rate reflects traffic volume patterns – it is highest in peak commuting hours and lowest at night and is higher for portions of the highway that are more heavily travelled. The fixed fee for all light vehicles (5,000 kg and under) is \$1 per trip, while heavy single unit and multiple unit vehicles pay \$2 and \$3 per trip, respectively. The variable per-kilometre charge is also scaled up by a factor of 2 and 3 for heavy single-unit and multiple-unit vehicles, respectively. The factor by which these rates are scaled up is a function of the impact that the vehicle class has on the road infrastructure and is mandated by the lease agreement between 407 ETR and the Province of Ontario. Additional charges include leasing a transponder for regular users (\$3.90 a month or \$23.50 a year) or a monthly account fee of \$3.90 and camera charge of \$4.10 per trip for light vehicles without a transponder (heavy vehicles must have a transponder by law or face a camera charge of \$50 per trip).<sup>4</sup>

#### Pricing mechanism example

Consider an employee who works from 9 am to 5 pm and decides to take the 407 ETR eastbound between the QEW to Highway 403 (25 km) to get to work. Assuming that her trip occurs between the hours of 7 and 9 am, she can expect to pay **\$11.66** for that trip if she has a transponder. Without a transponder, the cost would be higher on account of the camera charge, amounting to **\$15.76** per trip. If she makes this same trip at off-peak times (7 pm to 6 am), it would cost her **\$6.65** with a transponder and **\$10.75** without.

Below is a table of approximate per-trip costs for some common morning commutes along Highway 407 ETR for users with a transponder.

Commute Entry and Exit Interchanges	Direction	Length (km)	AM Peak Hour	Off-Peak
400 to Hwy 427	WB	8	\$ 4.37	\$ 2.85
Brock to Hwy 404	WB	24	\$ 11.16	\$ 6.38
Hwy 404 to Hwy 427	WB	25	\$ 11.03	\$ 6.51
Hwy 401 to Hwy 400	EB	33	\$ 14.89	\$ 8.36

Note: these examples are based on the 2017 pricing schedule.

<sup>&</sup>lt;sup>4</sup> These fees are based on the 2017 schedule.



The use of toll pricing on Highway 407 ETR conforms to the two main purposes identified as the reasons that governments implement road pricing (Zhang, 2014):

- reducing congestion on a network by increasing the travel costs for some commuters, thus shifting traffic flows from peak periods to off-peak periods and from congested routes to less congested routes
- 2. recouping the costs of construction and maintenance

Both of these elements are present in the case of Highway 407 ETR. Variable per-kilometre charges that depend on the time of day are a form of congestion pricing. For instance, these can induce users whose travel times are more flexible to travel at off-peak times, thus smoothing out the traffic flows throughout the day. Charging tolls also enables 407 ETR to invest in expansions to increase capacity and maintain and upgrade the road's infrastructure.

# **1.3 HIGHWAY USE**

Highway 407 ETR facilitates commuter travel in personal and public transit vehicles, as well as traffic for commercial purposes, across the GTHA. The use of Highway 407 ETR has steadily increased since 1999, and the highway averaged 413,000 weekday trips in 2017. This represents 50% more trips on the average weekday than on the GO Transit system's entire network (buses and trains) (Metrolinx, 2018). The total vehicle kilometres travelled (VKT) on Highway 407 ETR in 2017 amounted to 2.6 billion. Additionally, public transit systems (including Metrolinx, York Region Transit and Brampton Transit) use Highway 407 ETR for specific routes. On an average workday, there are 1,750 public transit trips that move 86,000 passengers on Highway 407 ETR. Highway 407 ETR is also used in the transport of goods through the region. In 2011, 6.4% of all VKT by heavy (single- and multi-unit) vehicles in the Toronto and Hamilton Census Metropolitan Areas were on Highway 407 ETR.

Most trips on the highway are associated with personal accounts, while business/commercial trips have increased at a higher rate than personal trips over the years. Since 2003, the number of business trips and business-related VKT have almost doubled (see Figure 4 and Figure 5). Additionally, the average trip length has steadily increased since 2003. The significant and steady growth in trips and VKT on Highway 407 ETR by courier services highlight the increased reliance of business on the reliable service provided by the highway over time. Between 2008 and 2017, the number of trips made by these account types increased by 61%, while the VKT have nearly doubled (see Figure 6).

















The interchanges most commonly used as points of entry and exit for trips are Highways 400, 404 and 427, which correspond to the Toronto East, Toronto West and Airport employment megazones, respectively. On weekdays, the highest volume of traffic occurs in the peak hours, 7 to 9 am and 3:30 to 6 pm, reflecting daily commuter patterns (see Figure 7).

Traffic speeds on Highway 407 ETR are consistently higher than on alternate routes, and the collision rate is low relative to the provincial freeway average. During peak hours in both directions and in all sections, 85% of vehicles on Highway 407 ETR are travelling at or over 100 km/h. In comparison, 85% of vehicles travel below 50 km/h on the central part of Highway 401 during peak hours in both directions and markedly lower during the afternoon peak hours.





Since Highway 407 ETR has consistently high average speeds at all hours of the day, the highway's congestion index is close to zero at all times, including in morning and afternoon peak hours. In contrast, in 2017, the average congestion index in the Greater Toronto Area (GTA) was measured at 52% in the busiest one-hour period in the morning and 65% in the busiest one-hour period in the evening (TomTom). This means that, on average, a trip taken during the morning peak hour on non-tolled highways will take 52% longer than it would under free-flow conditions and in evening peak hour, it would take 65% longer.

The average annual collision rate in both directions has remained under 0.30 collisions per million VKT since 2009. In comparison, the collision rate on freeways reported by the Ministry of Transportation of Ontario ranged from 0.5 to 0.6 between 2001 and 2010.<sup>5</sup> Additionally, fatal accidents on Highway 407 ETR

<sup>&</sup>lt;sup>5</sup> 2010 is the most recent data available.



Source: 407 ETR 2018

occur much less frequently than average. From 2016 to 2017, there were 0.37 fatal accidents for every 100 million kilometres travelled on all Ontario roads (Ministry of Transportation, 2016; Transport Canada, 2017), compared with 0.075 on Highway 407 ETR.

# **1.4 DATA AND ANALYSIS**

The analysis of the economic impact of Highway 407 ETR is broken down into two parts. In section 2, we analyse the system effects associated with the use of Highway 407 ETR, namely the economic benefits to commuters and casual users, to business and to society. In section 3, we consider the economic benefit specifically associated with the construction, maintenance and continued operation of Highway 407 ETR to regional GDP. Section 3 also reports growth and economic activity within the Highway 407 ETR corridor.

All historical speed and accident-related data, as well as the data on the number of trips by origin and destination and VKT necessary to this analysis, were provided by 407 ETR.

In addition, Statistics Canada supply-use tables and labour productivity tables were used in the inputoutput economic model, along with 2016 Canadian Census data. These include:

- Statistics Canada. Table 36-10-0438-01 Supply and use tables, summary level, provincial and territorial (x 1,000,000)
- Statistics Canada. Table 36-10-0478-01 Supply and use tables, detail level, provincial and territorial (x 1,000)
- Statistics Canada. Table 36-10-0489-01 Labour statistics consistent with the System of National Accounts (SNA), by job category and industry
- Statistics Canada, 2016 Census of Population.

These data were supplemented with 2001, 2006, 2011, and 2016 Transportation Tomorrow Survey data (Data Management Group, University of Toronto).



# 2.0 VALUE OF USING HIGHWAY 407 ETR

# 2.1 METHODOLOGY

This section reports the system effects associated with the use of Highway 407 ETR. System effects focus on how an asset is used and how its use changes the behaviour and welfare of residents and the community. These include effects on commuters and casual users, on business productivity, and the costs that are borne by society.

This analysis considers all historical trips taken on Highway 407 ETR (by VKT and number of trips) by origin and destination, time of day, duration and type, as well as the speeds on each road segment. Using these inputs, we estimate trip durations as well as carbon dioxide emissions and the number of collisions generated by these trips, as described in the subsections below. This set of trips is considered the base case.

To obtain the benefit from travelling on Highway 407 ETR, we estimate these values once again for the same trips using simulated traffic speeds under toll-free conditions, i.e. for the case in which Highway 407 ETR was operated as a toll-free highway.<sup>6</sup> The model used assumes that the total number of cars on the road network remains constant. Therefore, any additional travellers on Highway 407 ETR under tollfree conditions would be pulled from alternate routes and are not counted in the analysis. Simulated travel time, emissions and collisions under the toll-free scenario are compared to the base case to obtain the difference, which is multiplied by the value of time, cost of emissions and cost of collisions, respectively.

# 2.1.1 TIME SAVED

To understand the value of using Highway 407 ETR for business and personal trips, we first estimate the difference between the number of hours spent in travel on Highway 407 ETR given historical toll rates and the number of hours that would be spent in travel if the highway were toll-free. This difference is an estimate of the hours saved by taking Highway 407 ETR. The travel times under toll-free conditions are estimated using the GTHA Emme Network model<sup>7</sup> that has been calibrated to model changes in traffic volume and speeds on Highway 407 ETR between the Highway 410 and Yonge street interchanges at peak hours, whose output is combined with data on total annual trips on Highway 407 ETR and average daily trips by origin and destination. Travel time estimates account for the time of day, the direction of the trip, variation in speeds along the highway and type of vehicle.

# 2.1.2 VALUE FOR PERSONAL TRIPS

<sup>&</sup>lt;sup>7</sup> Emme is a complete travel demand modelling system for urban, regional and national transportation forecasting. It is used in travel demand forecasting, transit planning, traffic planning, as well as for economic, emissions and environmental analyses. For more information, visit the INRO website.



<sup>&</sup>lt;sup>6</sup> Note that we assume no changes in the provision and timing of highway widenings and extensions. Considering that tolls help fund continuing highway improvements, results may understate the difference between speeds under full-toll and toll-free conditions.

The economic value of using Highway 407 ETR for personal trips, i.e. commuting or casual use, is determined following the standard methodology outlined in the 2008 Metrolinx report entitled *Costs of Road Congestion in the Greater Toronto and Hamilton Area*. The value of an hour of time is considered to be 50% of the regional average hourly wage. For peak-period traffic, this value is scaled up by a factor of 2.5 as an allowance for unreliability, i.e. to account for the extra time budgeted by commuters to ensure they arrive on time (HDR, 2008). The analysis considers the time saved by all personal users in the vehicles travelling on Highway 407 ETR using average vehicle occupancy rates for the region.<sup>8</sup>

# 2.1.3 BUSINESS PRODUCTIVITY CHANGES

The productivity gained by businesses using Highway 407 ETR is determined by multiplying the hours saved by taking Highway 407 ETR by the average hourly wage and a GDP multiplier. The GDP multiplier is equivalent to the economic benefit of injecting the value of wages for the time not spent in traffic into the economy.

# 2.1.4 SOCIAL COSTS

All vehicle transportation involves social costs, i.e. costs that are borne by people who do not participate in the activity generating the cost as well. In this analysis, we consider environmental costs that stem from carbon dioxide emissions (CO<sub>2</sub>) and social costs associated with traffic collisions (including but not limited to traffic delays and healthcare costs).

We estimate the difference between CO<sub>2</sub> emissions from vehicles travelling on Highway 407 ETR and the emissions that these vehicles would have generated had they travelled at a lower speed on a toll-free highway. The relationship between vehicle speed and CO<sub>2</sub> emissions is approximated for different vehicle classes in the GTHA using data from a 2014 study by the McMaster Institute for Transportation and Logistics. To obtain the difference in social cost (social cost savings), the difference in emissions is multiplied by the year-specific social cost of carbon used by the United States Environmental Protection Agency (EPA, 2010; EPA, 2016).<sup>9</sup>

The social cost of traffic collisions on Highway 407 ETR compared to the cost on an equivalent toll-free highway is measured by using the collision rate on Highway 407 ETR to obtain an average number of collisions by year. The number of collisions in the alternative case is calculated using the relationship between highway speed and the observed collision rates on major highways using the collision rate data for provincial highways from the Ministry of Transportation of Ontario. The difference in the number of collisions on Highway 407 ETR and the number that would have occurred if Highway 407 ETR were toll-free is multiplied by the average social cost of a traffic accident in Ontario reported by the Ministry of Transportation of Canada. (Vodden, et al., 2007).

<sup>&</sup>lt;sup>9</sup> The department of Environment and Climate Change of the Government of Canada follows this approach in computing the social cost of carbon. See <u>http://ec.gc.ca/cc/default.asp?lang=En&n=BE705779-1</u>.



<sup>&</sup>lt;sup>8</sup> Based on 2016 Census data.

# 2.2 PERSONAL TRIPS

# 2.2.1 VALUE OF TIME SAVED

The annual average time saved from all personal trips taken on Highway 407 ETR is almost 23 million hours. The total time saved is comparable to 12,100 full-time job equivalents (FTEs) per year. The number of hours saved has followed an increasing trend since 2008 (see Figure 8). The total value of the annual average time saved by all personal travellers on Highway 407 ETR is approximately \$713 million. This includes the value of time saved by commuters thanks to increased reliability under historical toll conditions. This is because Highway 407 ETR's consistent free-flow state enables commuters to reduce the amount of extra buffer time needed to ensure on-time arrival.



Figure 8 Annual Hours Saved for all Personal Trips

These results are reflected in the 2017 407 ETR user survey, where over 96% of users reported finding the highway to be a good way to save time. Almost all survey respondents (95%) agreed that it is always less congested than other highways. Using the highway saved 60% of respondents 20 to 60 minutes per trip in 2017.<sup>10</sup> Furthermore, the importance of increased reliability is highlighted by 90% of surveyed users who agreed that Highway 407 ETR is more reliable than their primary alternative.

Although not measured in this study, user perception of time saved is an important factor driving highway use. A driver's subjective perception of time saved can be shaped by factors such as speed consistency, i.e. "smoothness" of commute, which can make a trip more pleasant. Indeed, 94% of the respondents in the 2017 407 ETR user survey found driving on Highway 407 ETR less stressful than on other highways.

# 2.3 **BUSINESS PRODUCTIVITY**

Highway 407 ETR continues to provide benefits to business, as shown by increased use of the highway by business accounts over time. Business trips on Highway 407 ETR have increased by 86% since 2003, and

<sup>&</sup>lt;sup>10</sup> Note that the survey respondents are light-vehicle personal users only.



business VKT have increased by 95%, meaning that business trips are more frequent and longer, on average. Breaking this growth down by type of vehicle, we find that total kilometres travelled by heavy single-unit vehicles and multi-unit vehicles increased by 63% and 8%, respectively.

Comparing the travel time spent by business users on Highway 407 ETR at historical toll rates with the estimated travel time under toll-free conditions (i.e. similar travel speeds to alternate routes), we estimate that, on average, 7.7 million hours of travel time is saved annually. This amounts to 3,700 FTEs. Furthermore, the number of hours saved by business for trips taken on Highway 407 ETR continues to grow and reached almost 9 million in 2017, amounting to 4,300 FTEs.

The hours that would have otherwise been spent driving can be used either to increase output or be reinvested into the economy in other forms. The economic benefit of time saved amounts to a \$371 million annual contribution to Ontario's economy through greater business productivity<sup>11</sup>. This benefit has increased over time, reaching \$431 million in 2017.

# 2.4 SOCIAL COSTS

The costs of driving are not entirely borne by drivers themselves. The cost that drivers impose on other road users, infrastructure, the environment and on society as a whole can be considered social costs. Tolled highways, in contrast to non-tolled roads, help distribute social costs more appropriately. For instance, their tolls pay for the wear and tear that their vehicles cause to the infrastructure, as well as for the service of policing which otherwise would be shared by all taxpayers. This makes trips on Highway 407 ETR less costly for society as a whole. The \$17 million spent by 407 ETR for policing and winter maintenance can be considered savings in social costs that would otherwise be financed by taxpayers.

Accidents and vehicle emissions, however, have social costs that cannot be paid for by individual drivers through tolls. This analysis considers the past and current social costs associated with these factors on Highway 407 ETR at historical toll rates compared to the social costs that these trips would have generated under toll-free conditions. We find that the cumulative savings since 1999 amount to \$1.4 billion or \$75 million annually, on average. In 2017, savings in social costs were slightly higher, at \$84 million.

Emissions of CO<sub>2</sub> are lower, on average, for trips on Highway 407 ETR because of higher, consistent speeds that are closer to the speed at which emissions are minimized than the prevailing speeds on toll-free highways and major roads. On average, this means that 108 million kg of CO<sub>2</sub> emissions are avoided per year. The annual average savings in social cost from this difference is \$6.37 million.

<sup>&</sup>lt;sup>11</sup> This analysis does not take into account the value of reliability for business specifically, which could further increase the total benefit to business of using Highway 407 ETR. Decreased variability in travel times can result in tangible savings to business, which include a reduced need for inventory or storage space as a buffer against delivery time unreliability.



Highway 407 ETR is safer than the rest of the network of major roads in the GTHA, as measured by a lower collision rate. This is due in part to more consistent speeds and lower traffic volumes, but may also be influenced by road quality and maintenance. This analysis only considers the impact of speed and volume on traffic collisions. Assuming that the relationship between highway speed and the accident rate would be the same as on other major Canadian highways, we find that on average, the number of collisions per year would be higher by 689 under toll-free conditions, due to the lower highway speeds.<sup>12</sup> This would mean about twice as many collisions as the current average. Multiplying these additional accidents by the average social cost of traffic collisions, we estimate that social costs are \$69 million lower than would be the case under toll-free conditions. The relatively low collision rate on Highway 407 ETR is perceived by its users. In the 2017 user survey, 78% percent of survey respondents reported finding the highway safer than their primary alternative.

<sup>&</sup>lt;sup>12</sup> Lower average speeds entail higher congestion, which increases accident risk. Note that this estimate only represent the additional accidents that would have been experienced by the population of actual 407 ETR users.



# 3.0 HIGHWAY 407 ETR CONTRIBUTIONS TO PROSPERITY

# 3.1 ECONOMIC CONTRIBUTIONS OF CONSTRUCTION, MAINTENANCE AND OPERATION OF HIGHWAY 407 ETR

The analysis of how Highway 407 ETR's continued operation contributes to the Ontario economy is based on operational and capital expenses provided by 407 ETR. These include operational expenses, leased and purchased equipment and additions made to the highway infrastructure, as well as the lease payment made to the Province of Ontario.

# 3.1.1 THEORY, METHODOLOGY AND ASSUMPTIONS

The economic impact analysis of Highway 407 ETR's continued operation was conducted using CANCEA's statistical analysis platform.<sup>13</sup> Using over 170 Statistics Canada tables, including Statistics Canada inputoutput data and over 56,000 Canadian census dissemination areas, the platform takes into account the demand and supply for commodities across industry sectors and combines it with data on demographic patterns, labour force dynamics, government finances, private capital investment and production interdependencies to quantify and forecast the economic impacts of operating the highway.

The findings can be classified into three main effects: direct, indirect and induced.

- **Direct effects** are the economic impacts that add value to the Ontario economy that can be directly attributed to the operation of the highway. This includes the income and value of the production of contributing economic agents (i.e., workers and firms).
- Indirect effects are the economic impacts that arise through business-to-business interactions within the supply chain. Indirect effects comprise the input expenditures made by agents who operate the highway, as well as the follow-on expenditures generated further up the supply chain in all sectors of the economy.
- Induced effects include the economic activity generated through the spending of wages earned by the workers who operate the highway. Induced effects also include expenditures on increased capacity or the replacement of depreciating capital stock that result from reinvesting business profits (Heintz, et al., 2009). These purchases or activities can lead to further hiring, resulting in income and tax revenues that reverberate throughout the economy.

Our statistical analysis platform is capable of capturing the direct, indirect and induced effects of building, maintaining and operating Highway 407 ETR on the Ontario economy. These contributions are also broken down at the municipal level. By incorporating household, industry and firm behaviour, as well as federal and provincial tax rates, our platform is capable of translating this economic impact into changes in

<sup>&</sup>lt;sup>13</sup> For more detailed information on CANCEA's statistical analysis platform, please refer to "The Economic Impact of Canadian P3 Projects" and the report on Bill 148: Fair Workplaces, Better Jobs Act, 2017 (The Canadian Centre for Economic Analysis, 2016; 2017).



economic indicators, such as GDP (real and nominal), employment, wages, government revenue and household income.

To conduct the analysis, several key assumptions about the evolution of Ontario's economy over the time period are required. They are the following:

- 1. No significant changes occurred in the structure of the economy over the time period of the analysis. This includes industry supply chains, import/export markets, and the consumption behaviour of individuals, such as the rate at which individuals spend their earned income.
- 2. Economic activity diffuses across the province at a rate proportional to the geographic proximity for any particular company within a sector or along any particular transportation corridor without bias.

The analysis applies to the 1999-2017 period.

# 3.1.2 INDUSTRY IMPACTS

Since 1999, 407 ETR has invested \$4.6 billion into capital and operations. This has generated direct, indirect and induced effects that have contributed a combined total of \$7.1 billion to provincial GDP (70% direct and indirect, 30% induced). This means that every \$1 invested by 407 ETR has resulted in a GDP increase of \$1.54.

Although the highway's economic influence extends to all sectors in the province, the bulk of the economic activity is attributable to the construction sector. Figure 9 lists the eight industries that have received the largest direct, indirect and induced economic benefit.







Furthermore, the largest contribution to GDP is in the Region of York, as evident in Figure 10, followed by Peel and Toronto. To a lesser extent, benefits extend outwards to the surrounding municipalities. For each municipality, the largest GDP impact is in the manufacturing, construction and trades industry, followed by the professional, management and technical industry, then by retail sales and service.





# GDP Impact by Region and Industry

Across all industry sectors, based on 2017 trends, the continued operation of Highway 407 ETR is expected to contribute an average of \$685 million annually.

# 3.1.3 JOBS AND INCOME

Since 1999, investments into Highway 407 ETR, as well as ongoing operation and maintenance activity has generated an average of 72,000 years of employment and \$4.7 billion in wages. Figure 11 presents the annual average number of jobs by region and income level. Most of these jobs have wages above the provincial median wage of \$22.50 an hour. The top five industries for job creation are in the following sectors: construction; transportation and warehousing; retail trade; manufacturing; and finance, insurance, real estate, rental and leasing and holding companies.





Figure 11 Average Annual Contribution to Jobs by Region

#### 3.1.4 TAX REVENUES

Ongoing operations and the maintenance of Highway 407 ETR generates, on average, \$43 million dollars in tax revenue for the provincial and federal governments (see Table 1).

	Annual Average (\$M)			
	Federal	Provincial	Both	
Income	\$37	\$32	\$31.7	
Consumption	\$8.3	\$9.7	\$9.7	
Corporate	\$3.1	\$1.6	\$1.6	
Total	\$48.38	\$43.07	\$43.07	

 Table 1
 Annual Tax Revenue from the Operation and Maintenance of Highway 407 ETR

# 3.2 SUPPORT TO REGIONAL GROWTH

As part of the GTHA's regional infrastructure, Highway 407 ETR supports economic development in the municipalities adjacent to it and in the region as a whole. The corridor, a 12 kilometre-wide area in which Highway 407 ETR is contained, is illustrated in Figure 12. The highway supports businesses within the corridor by providing a reliable commuting route for employees and a transportation corridor for logistics and the movement of goods. Population growth, regional employment and commercial businesses across the Highway 407 ETR corridor are also supported by the existence of the highway.







From 2001 to 2016, the population in the Highway 407 ETR corridor has increased by 39%, and the number of jobs has increased by 28% (see Figure 13). Additionally, the total commercial space associated with the increase in jobs across the Highway 407 ETR corridor has grown by over 53.6 million square feet.

The growth in population within the corridor amounts to an increase of about 506,000 residents (roughly 36,000 people more than the population of Kitchener-Waterloo) or 187,000 households. Figure 14 maps the population distribution inside and outside the corridor in the GTHA. The economic activity associated with the operation of households within the Highway 407 ETR corridor exceeds \$16.5 billion annually, which is equivalent to 2% of Ontario's total GDP.

Meanwhile, the number of jobs in the Highway 407 ETR corridor has increased by 199,000 from 2001 to 2016. The commercial space requirements have increased by 21%, and total commercial real estate activity in the corridor is valued at \$2.6 billion annually.





# Figure 13 Population and Jobs in the GTHA Corridor, 2001 and 2016

Population and Jobs in 407 ETR Corridor



# Figure 14Map of Population in GTHA and in Highway 407 ETR Corridor



Population Counts 2016



# 4.0 CONCLUSIONS

Highway 407 ETR is a route that provides drivers in the GTHA with a congestion-free alternative for East-West travel for a toll. It provides a transportation corridor through the three employment megazones, contributing to better connectivity and improved flow of people and goods across the leading region for job creation in Ontario. As the population in the region has grown, 407 ETR has expanded to meet the demands of residents and businesses alike.

Personal trips remain the majority of trips on Highway 407 ETR, and the highway is a route of choice for a large subset of the population, with daily weekday trips exceeding those on the GO Transit network by 50%. Personal users, of which a large share are commuters, have saved on average almost 23 million hours annually. The significance of the time saved is comparable to 12,100 FTEs.

This analysis considered how benefits to existing personal users on Highway 407 ETR would have changed if the highway were toll-free. The increased traffic volumes would have considerably lowered speeds, costing personal users, many of whom are commuters, \$713 million in lost time annually. These results align with users' perception of the value of travelling on Highway 407 ETR. As reported in the 2017 customer satisfaction survey, a great majority of personal account holders find Highway 407 ETR to be a good way to save time and always find it to be less congested than alternatives. Beyond the time saved, the year-over-year increase in survey respondents who noted improvements to Highway 407 ETR's infrastructure (expansions, extensions, and better road conditions) and felt that taking Highway 407 ETR was a good decision demonstrates that it is an alternative that continues to offer increased value for its users.

The inherent business value of travelling on Highway 407 ETR is highlighted by the growth in the length, number and share of business trips year-over-year. In 2017 alone, time savings for all business trips was equivalent to 4,300 FTEs and valued at \$431 million.

The economic impacts of construction, operations and maintenance on Highway 407 ETR since 1999 are estimated at \$7.1 billion. At 2017 trends, these activities are expected to contribute \$192 million to Ontario GDP annually moving forward. The economic benefits predominantly accrue to the regions of York, Peel, and Toronto. The associated economic and job activity has occurred primarily in the construction; transportation and warehousing; retail trade; and financial and real estate industry sectors. Taken together, the economic contributions stemming from construction, operations, and maintenance of Highway 407 ETR, along with the savings to provincial and municipal governments and avoided social costs, as well as the total business productivity gain from total time saved amount to \$15.89 billion since 1999. Using 2017 rates as current trends, this benefit is expected to be \$724 million annually going forward.

In addition, by providing increased connectivity and infrastructure relief, Highway 407 ETR can be seen to play a role in supporting regional growth, namely population growth and employment growth within the region. Since 2001, the population in the 407 ETR corridor has increased by 506,000 residents, while the



number of jobs grew by 199,000. The value of the activity occurring in the Highway 407 ETR corridor includes \$16.5 billion of residential economic activity and \$2.6 of commercial real estate activity annually.



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