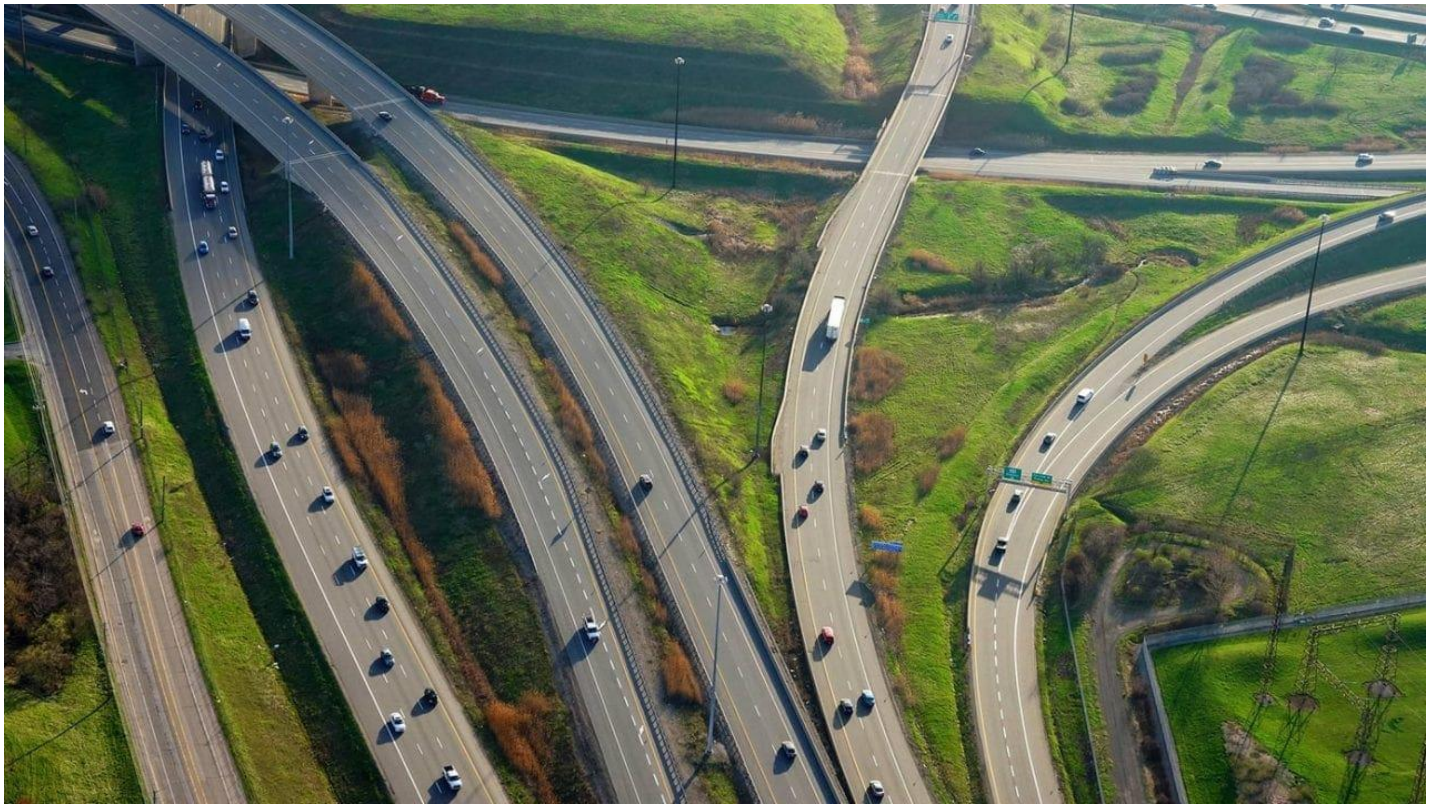
Final Report
March 2024

2022 Economic and Community Impact of Ferrovial Toll Roads: 407 ETR results



Cintra Servicios de Infraestructuras, SA

steer

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2022 Economic and Community Impact of Ferrovial Toll Roads: 407 ETR results

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Appendices

Executive Summary

Overview

This report summarizes 407 ETR's results from the 2022 Economic and Community Impact of Ferrovial Toll Roads, known as Cintra. This analysis includes two key dimensions:

- **Impacts to Regional Economies –** understanding how expenditure generates impacts to employment and economic output, which represents the value of industry production; and
- **Impacts to Travelers and Communities –** understanding how 407 ETR generates value to travelers and the community through the application of standardized transportation benefit-cost analysis.

This report is an extract of Cintra's larger report on the whole portfolio of highways and managed lanes with a focus on 407 ETR. The results presented in this document illustrate 407 ETR's economic performance based on a global methodology applied to all assets. As a result, analysis outputs may vary from a local evaluation and analysis approach.

Methodology

Each asset in the original study, including 407 ETR was analyzed with a consistent methodology to determine its socio-economic benefits and impacts (changes to regional and traveler welfare due to investment in the transportation network) and expenditure impacts (outcomes associated with spending on infrastructure).

Expenditure impacts were estimated using an industry standard Input Output (IO) model calibrated on two data sources:

- **For US assets -** U.S Bureau of Economic Analysis. RIMS II (2019)
- **For other assets -** OECD, Input-Output tables (1995 – 2021)

Impacts to Travelers and Communities were estimated using a blend of asset specific data (such as travel volumes, speeds, and travel time reliability before and after asset delivery) and standard economic factors and parameters (such as value of time or value of greenhouse gas emissions). Results were estimated in line with peer practice applied by infrastructure investors, regulators, and public sector agencies.

This analysis does not substitute project-specific economic evaluations, which are expected to use more in-depth analyses for more detailed economic benefit estimations. As a result, they may differ from the impacts estimations included in this study. The evaluation includes the estimation of benefits to travelers (from faster and more reliable travel times), Impacts to Communities (changes in emissions and health impacts, which could be positive or negative), and Wider Economic Impacts (changes to the overall productivity of a region resulting from improved transportation).

This study includes methodological changes to the estimation of two External Impacts (changes in safety and emissions). These changes have resulted in a significant increase in the economic value of these impacts. The revised safety methodology for North American assets uses new accident severity data. The revised emissions methodology, which used globally, has been improved to

incorporate vehicular speed and its relation to emissions levels. The new methodology retains a conservative and consistent basis of analysis for all assets, but more robustly captures asset performance. For these significant changes in methodology, we have applied the change to all years in the assessment.

Beyond the methodological changes mentioned above, this study builds upon the study released in 2021, by including an additional year of analysis (2022) and by including changes in asset usage and traffic as travel patterns continue to evolve alongside wider macro-economic trends. As a result, volumes and travel speeds may be different for some assets compared to the previous analysis. Additionally, as macro-economic changes occur, the value of impacts and level of economic impact from expenditure can change as well, which has an impact on the study results. It should also be noted that the number and types of assets included in this study have changed alongside Cintra's commercial involvement in assets around the world. The price base in which impacts are reported has also been adjusted from 2021 prices to 2022 prices.

Overarching Findings

Across the 34-asset portfolio, the following overall impacts were observed:

- **Impacts to Regional Economies –** $64.3 billion in Economic Output (spread across all countries included in the study) and $15.7 billion in direct salary earnings. Combined, over the lifecycle of all 34 assets to date, there have been an estimated 344,700 job-years of labor generated to construct and maintain/operate the assets.
- **Impacts to Travelers and Communities –** $36.2 billion in value realized to date, including nearly $25.4 billion of direct Traveler Impacts (from faster and more reliable travel times), $6.4 billion in External Impacts (changes in collisions and emissions), and $4.5 billion in Wider Economic Impacts (reflecting improved productivity due to decreased travel times).

The specific results for 407 ETR noted that the potential impacts to date of the toll road are:

- A total of $23.3 billion CAD ($17.3 billion USD) in Traveler and Community Impacts
- $18.0 billion CAD ($13.3 billion USD) in GDP and $4.7 billion CAD ($3.5 billion USD) in direct earnings, supporting over 73,300 job years of labor.

1 Introduction

Overview

1.1 Steer conducted an economic analysis of Cintra's portfolio of highway and managed lanes assets in North America, Latin America, and Europe with a focus on:

- **Impacts to Regional Economies –** understanding how expenditures on these assets generate regional impacts, including economic output, earnings, and employment.
- **Impacts to Travelers and Communities –** understanding how each project generates value to travelers, and communities through the application of standardized transportation benefit-cost analysis.

This document is the final report for this study and has been prepared to summarize the methodology and main findings. This report is an extract of Cintra's larger report on the whole portfolio of highways and managed lanes with a focus on 407 ETR. The results presented in this document illustrate 407 ETR's economic performance based on a global methodology applied to all assets. As a result, analysis outputs may vary from a local evaluation and analysis approach.

Study Purpose

1.2 This study assessed the global economic impact of 34 highway and managed lane assets using a comprehensive approach that applied three principles:

- **Consistent –** the same methods and overall approach to analysis are applied to all assets in the world. Some assets may use specific methods or data sets, but efforts have been made to standardize the analysis.
- **Robust –** the methods draw upon relevant practice from peer studies and public agencies who conduct economic appraisal of transportation investment. Methods are directly traceable to accepted practice for both the Impacts to Travelers and Communities and the Impacts to Regional Economies.
- **Scalable and repeatable –** the methods can be applied to other assets and used for future year analysis.

1.3 A methodology was developed that balances these principles against available data and asset specific context across a wide range of assets in North America, Europe, and Latin America.

Study usage and Limitations

1.4 This study draws upon available evidence and information on historic asset performance alongside regional and national data to estimate economic impacts. The outputs of this analysis can be used for a range of purposes, including internal asset planning, investment engagement, and project reviews.

This study is not intended for use as a future-looking forecast of continued asset performance and does not provide insight as to how COVID-19 will impact future performance.

Report Structure

1.5 The remainder of this report is structured as follows:

- **Chapter 2 – Asset Portfolio –** an overview of the assets included in this analysis
- **Chapter 3 – Impact Estimation Methodology –** a summary of the methodology used to analyze each asset
- **Chapter 4 – Results –** the detailed results for whole Cintra portfolio and Highway 407 ETR
- **Chapter 5 – Conclusions –** a summary of the study

2 Asset portfolio

2.1 The asset portfolio selected for the economic and Traveler/Community Impact evaluation consists of 34 assets from ten countries. Cintra has noted a total investment under management as of 31st December, 2022 of $22.4 billion USD, excluding Indian assets. This portfolio includes all of Cintra's road infrastructure projects that have had a financial closure and are either in operation or in construction with a full year of ownership up to 31st December, 2022.

2.2 The first year of Impacts to the Regional Economy is generally represented by the beginning of the construction period. The first year of Impacts to Travelers and Communities, however, is generally not represented by the opening year of operations, as our analysis of this impact begins with the first full calendar year of operation. The analysis of Indian assets begins in 2022 for both the Impacts to Travelers and Communities and the Impacts to Regional Economies in order to align with Cintra's investment in these assets in December 2021. The full impacts of all assets were assessed and reported on regardless of the proportion of equity of those assets that belongs to Cintra.

Table 2.1: Summary of Cintra asset portfolio analyzed for economic impacts

	Asset	Location	Length (Miles)	Beginning of Concession (First Year of Impact to Regional Economy)*	Opening Year*,**
1	NTE	TX, US	13	2009	2014
2	LBJ	TX, US	13	2009	2015
3	NTE35W	TX, US	17	2013	2018
4	I77	NC, US	26	2014	2019
5	407 ETR	Canada	67	1999	1999
6	407 Ext 1	Canada	20	2012	2016
7	407 Ext 2	Canada	20	2015	2019
8	Autema	Spain	30	1986	1989
9	A66	Spain	30	2012	2015
10	Azores	Portugal	58	2006	2011
11	M4-M6	Ireland	22	2003	2005
12	M3	Ireland	31	2007	2010
13	M8	UK	18	2014	2019
14	Toowoomba	Australia	25	2015	2019
15	I-66	VA, US	23	2016	2023
16	Silvertown	UK	1	2019	2025
17	D4-R7	Slovakia	37	2016	2022
18	Western Roads Upgrade	Australia	149	2019	2025
19	Ruta del Cacao	Colombia	94	2016	N/A
20	IRB Infrastructure Developers Ltd. (15 assets)	India	980	2022 (15 assets)	2022 (12 of 15 assets)

*All India assets reflect start date of Cintra's investment and not actual construction and operational period of assets.
**The opening year may differ from first full year of Impact to Travelers and Communities as we have started the analysis with the first full calendar year of operations.

3 Impact estimation methodology

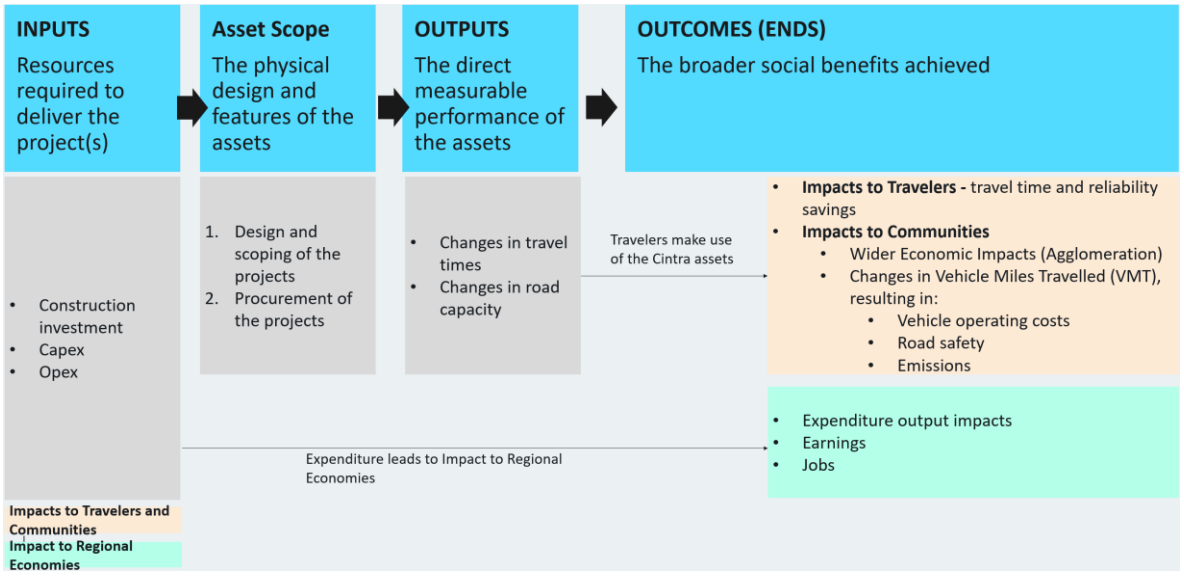
Logic framework

3.1 The evaluation of the economic impact of Cintra assets is based on the logic framework presented in Figure 3.1. This framework describes the process where the investment of resources to build and operate the road assets in the portfolio transforms into outcomes for the society and the economy.

3.2 For example, for the economy, investing in a new road leads to additional expenditure in the local/regional economy. This effect results in additional economic output, earnings, and jobs for workers.

3.3 Similarly, these same investments will lead to changes in travel times and distances for travelers. These variations will lead to changes in travel time, vehicle operating costs, road safety, emissions, and agglomeration (productivity), which provide impacts to roadway travelers and community members.

Figure 3.1: Logic framework to evaluate the economic impact of Cintra assets



Source: Steer

Methodology overview

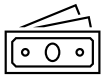
3.4 The methodology to estimate the impact to regional economies and travelers and communities of Cintra assets was designed to achieve the following goals:

- Provide an overarching, consistent, standardized, and comparable evaluation framework for all of Cintra's road assets across different countries.
  - The framework is designed to make use of available national, regional, and project data to understand impacts across assets and regions.
  - This analysis does not substitute project-specific economic evaluations, which are expected to use more in-depth analyses for more detailed economic benefit estimations.
- Quantify the outcomes identified in the logical framework on a year-by-year basis, from the beginning of the concession, up to 2022, and then forecast outcomes over a reasonably foreseeable period from 2023 to 2032.

3.5 The proposed methodology presented in

3.6 Table 3.1 quantifies the Impacts to Regional Economies and the Impacts to Travelers and Communities produced by the investment in road infrastructure across the portfolio.

3.7 Table 3.1: Methodology summary for the economic impact estimation of Cintra assets

Type of impact	Definition	Overarching methodology	Impacts/benefits quantified
 **Impact on Regional Economies**	**Direct, secondary and induced impacts of project expenditures** on the economy of the region of influence.	Apply **Input | Output models** to convert each asset capital and operational expenditures into economic outputs through economic multipliers.	• Economic output • Earnings • FTE Jobs
 **Impact on Travelers and Communities**	**Improved welfare in the region as a result of the project,** compared to a scenario without the investment.	Use a hypothetical no-project scenario and compare the incremental impacts between this and the project situation for each asset.	**Traveler Impacts** • Travel time and reliability • Vehicle operating costs **External Impacts** • Safety • Emissions **Wider Economic Benefits** • Agglomeration (productivity)

Source: Steer

3.12 The Impacts on Regional Economies are estimated for all assets in the portfolio (including costs to deliver and operate the assets across the entire asset lifecycle to date) whereas the Impacts to Travelers and Communities are only quantified for projects that have at least one full year of operations (for example: Western Roads Upgrade and I-66 are excluded since they were fully opened to traffic after 1st January, 2022). A single year was considered for the Indian Assets (2022) as Cintra's ownership of those assets began in December 2021. This is summarized in Table 3.2.

Table 3.2: Impact quantification by asset

	Asset	Location	Impacts on Regional Economies	Impacts on Travelers and Communities
1	NTE	TX, US	●	●
2	LBJ	TX, US	●	●
3	NTE35W	TX, US	●	●
4	I77	NC, US	●	●
5	407 ETR	Canada	●	●
6	407 Ext 1	Canada	●	●
7	407 Ext 2	Canada	●	●
8	Autema	Spain	●	●
9	A66	Spain	●	●
10	Azores	Portugal	●	●
11	M4-M6	Ireland	●	●
12	M3	Ireland	●	●
13	M8	UK	●	●
14	Toowoomba	Australia	●	●
15	I-66	VA, US	●	
16	Silvertown	UK	●	
17	D4-R7	Slovakia	●	●
18	Western Roads Upgrade	Australia	●	
19	Ruta del Cacao	Colombia	●	
20	IRB Infrastructure Developers Ltd. (15 assets)	India	● (15 assets)	● (12 of 15)

Source: Steer

Forecasted asset performance (2023-2032 period) is based on the most recent economic data for both the Impacts to Regional Economies and the Impacts to Travelers and Communities and, future projections of expenditure and traffic growth data that were provided by Cintra.

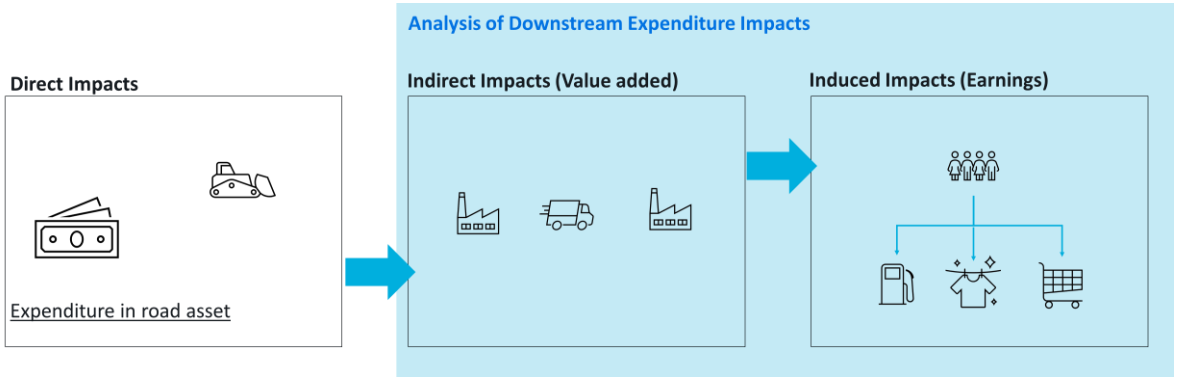
3.13 The sections below describe the impacts and their assumptions for each impact type.

Impacts to Regional Economies

3.14 Impacts to Regional Economies describe the direct, secondary, and induced impacts of spending on the economy. These are estimated with input-output (IO) models which use region-specific multipliers for precise expenditure impacts.

3.15 The IO analysis is a very standard approach to quantify expenditure impacts. These models provide an estimate of the total economic output generated by the initial investment (**Direct Impacts**) that includes the production of intermediate goods and services in the supply chain (**Indirect Impacts**), as well as economic activity generated from the spending of workers (**Induced Impacts)** represented in Figure 3.2. The impacts also include an estimate of the jobs supported by the economic activity above, and the earnings that accrue to workers in the project region.

Figure 3.2: Impacts to Regional Economies



3.16 The methodology to estimate the Impacts to Regional Economies relies on a dual approach that uses region-specific expenditure multipliers for assets located in the United States, and country-level multipliers for the rest of the countries. This approach supports the use of specific data when available and allows for comparability among the impacts estimated in the portfolio.

3.17 Table 3.3 summarizes the multiplier sources for each state and country in the asset portfolio: these are RIMS II model for the United States and OECD input-output tables for the other countries. Both are widely accepted tools in the industry and their application follows economic impact analysis approaches aligned with government agencies – for example the **Federal Highway Administration in the USA**.

Table 3.3: Input-Output models used by country

No.	Input-Output model, multiplier source	Sate/Country
1	U.S Bureau of Economic Analysis. RIMS II (2019)	• United States – North Carolina – Texas – Virginia
2	OECD, Input-Output tables (1995 – 2018)	• Australia • Canada • Colombia • Ireland • Portugal • Slovakia • Spain • United Kingdom

3.18 The estimation of expenditure impacts required the following inputs on an annual basis, which have been provided by Cintra:

- Construction investment
- Capital expenditures
- Operating expenses

Methodology

3.19 The general approach for calculating the impacts to regional economies is outlined below:

- Steer created baseline input output models (industry transaction matrices and multipliers) in an Excel spreadsheet tool for each country.
- All dollar amounts were converted to standard U.S. dollars based on exchange rates from the OECD, and adjusted for inflation based on OECD GDP deflators.
- All of the inputs (construction investment, capital expenditures, operating expenses) were converted to a common price base (2022 USD) to align with the model.
  - To reflect the varying timeline for specific projects, Steer adjusted the baseline estimates to reflect changes in the IO multipliers and other factors.
- The developed tool estimates the year-by-year economic output, earnings and jobs impacts for each asset.

3.20 US projects were analyzed with state-level RIMS II multipliers from the US Bureau of Economic Analysis. The RIMS II multipliers are only available for the US and cannot be used for non-US jurisdictions. The 2019 data for RIMS II, which is the most current dataset, provides multipliers based on the 2012 Benchmark Input-Output Table for the US, which was used for this analysis.

3.21 The final impacts for the U.S. and Non-U.S. projects were all adjusted and standardized to 2022 US Dollars. The existing framework was then applied to calculate impacts for future years to 2032, using data provided by Cintra, along with OECD projections for exchange rates and GDP deflators.

Impacts to Travelers and Communities

3.22 The Impacts to Travelers and Communities measures the value to travelers and the communities in which Cintra's assets are located. It is standard international practice to classify these transportation impacts as follows:

- **Traveler Impacts**
  - Travel time and reliability savings
  - Vehicle operating costs adjusted on a fuel consumption basis
- **External Impacts**
  - Road safety
  - Emissions
- **Wider Economic Benefits**
  - Agglomeration (productivity)

3.23 These methods are comparable to those used by government agencies and departments in the jurisdictions included in this study, such as: **Metrolinx** (Greater Toronto and Hamilton Area), **Federal Highway Administration** (USA), and **Department for Transport** (UK).

Traveler Impacts

3.24 Traveler Impacts measure the economic value of improved welfare experienced by users of a transportation investment – in this case, the new or improved road. Transportation investments may provide travel time and reliability savings to users who switch to using the investment instead of alternative routes or modes.

3.25 Now that the assets are in operation, estimating these benefits requires establishing a counterfactual (no-project) scenario, that reflects what would have happened if the project would have not been built. The Traveler Impacts are then the differential between the counterfactual and the project situation.

3.26 The Cintra road assets portfolio covers projects with different operating characteristics that require different assumptions for their counterfactual scenarios. Table 3.3 summarizes the classification of the road projects in the portfolio and their no-project situation assumptions.

Table 3.4: Summary of counterfactual assumptions per type of road asset

No.	Type of asset	Counterfactual assumption	Assets
1	**Managed lanes** Projects that implement tolled lanes (ML) along the same corridor. The counterfactual alternative is the toll-free project corridor without the MLs.	Calculated 2022 no-project travel times scenario in the project corridor by simulating speed and flow in a situation where traffic evolves over time, and capacity is not increased. This approach uses traffic data from before the asset was delivered to simulate what could have happened in the corridor if the project (ML) was not built. The simulations explore how traffic could have changed without the asset and the corresponding impacts on travel time and reliability on the corridor.	• NTE • LBJ • NTE35W • I-77
2	**Urban toll road** Projects that span within the metropolitan area and have a non-tolled alternative in a separate route.	Calculated 2022 no-project travel times scenario in the non-tolled alternative by simulating speed and flow in a situation where traffic evolves over time and capacity is not increased. This approach simulates what could have happened in the alternative if the project (Urban toll road) would have not existed. The assumption uses available traffic and speed data and simulate how traffic and travel times would have evolved on the alternative road if the Urban toll road was never built.	• 407 ETR • 407 Ext 1 • 407 Ext 2
3	**Interurban toll road** Projects that span across regions and have a non-tolled alternative in a separate route.	Employs 2022 observed travel times in the alternative route and compares them against the current project travel times. This approach addresses the challenge of historic traffic data availability in the alternative route, across assets and countries.	• Autema, A66, M4-M6, M3, M8, Toowoomba, IRB Infrastructure Developers Ltd. (12 of 15 assets: Mumbai Pune, Ahmedabad Vadodara, Kaithal Rajasthan, Agra Etawah, Hapur Moradabad, Kishangarh Gulabpura, Gulabpura Chittorgarh, Udaipur Rajasthan, Palsit Dankuni, Solapur Yedeshi, Yedeshi Aurangabad, Karwar Goa Kundapur)

4	**Network of roads** Projects that consist of a network of new or improved road infrastructure. The alternative is a non-tolled option for each section of the new or improved road network.	Employs 2022 distance-weighted observed travel times in the alternative routes and compares them against the current project travel times. This approach addresses the challenge of multiple road section changes and provides consistency in the evaluation period for the assets.	• D4-R7

Source: Steer

3.27 Traveler Impacts for toll road investments primarily cover three effects:

- **Travel time –** The average time to use the whole asset, compared with the counterfactual situation, by time period.
- **Trip reliability –** The difference between the maximum and the average travel time to use the whole asset, compared with the counterfactual situation, by time period.
- **Vehicle operating costs –** Observed fuel and maintenance costs to use the project, compared to a no-project situation, based on distance travelled in miles.[1]

These benefits are quantified for the following travelers:

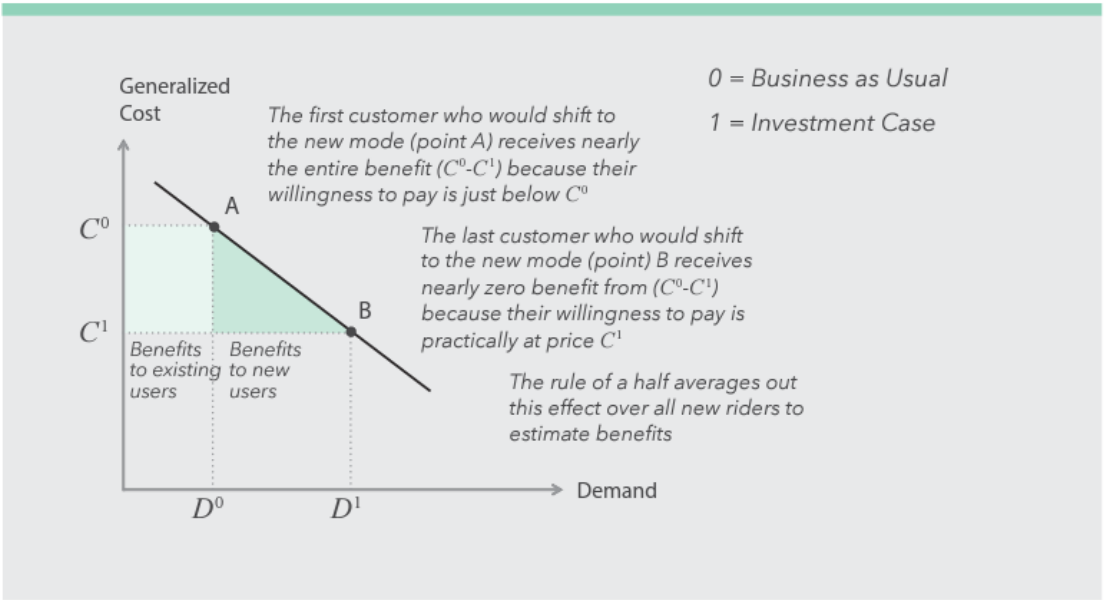
- **Travelers using the asset –** traffic data from each asset was used alongside historic data to estimate impacts.
- **Travelers using the best alternative to the asset** – project data for highways and managed lanes was used to estimate potential benefits to travelers who do not use the asset but make use of alternative roadways. Travelers on these 'alternative roadways' may benefit from reduced congestion when other travelers switch to the roadway asset.

3.28 Table 3.5 summarizes the approach used to collect the data to estimate Traveler Impacts.

3.29 Demand included in this analysis is split into pre-existing demand and new demand. Pre-existing demand includes all trips that were made on the highway network before the asset was delivered. Some pre-existing trips switch to the asset and realize a direct benefit, while other pre-existing trips that do not use the asset could benefit from reduced congestion.

3.30 New demand, or induced demand represents trips that were not made before the asset was delivered. New demand includes two types of trips: those who used to use a non-auto mode and net new trips that were not made previously. Investment in infrastructure can generate net new trips that would not have otherwise occurred by reducing travel time or improving traveler experience. The calculation of induced demand used an elasticity-based methodology that estimates the effect of changes in travel time to additional VMT in a road asset, based in Barr (2000). The Traveler and External Impacts generated from this induced demand are applied the rule of a half approach as per

standard Benefit-Cost Analysis practice (impacts are multiplied by 0.5). The rule of a half is used when a traveler changes mode or when new trips are generated. The analytical framework used in this study compares existing travel times to a 'counter factual' where the investment does not exist to estimate the impact to existing travelers (those who made trips by highway in the counter factual). However, it is unknown at what 'change in generalized cost of travel' a traveler will change behavior. The rule of a half applies a simplifying assumption that the cost-demand curve for transportation is linear. Under this assumption (a linear cost-demand curve) the rule asserts that the benefit each new traveler receives is half that of an existing traveler. This allows benefits to be estimated for new users without having complete information on their willingness to pay and the cost at which they will change mode. This is visualized below:



Source: **Metrolinx Business Case Manual Volume 2: Guidance**

Table 3.5: Traveler Impacts estimation approach

Step	Description	Data Source
1. Identify alternative segments	For each asset, the analysis identified the most appropriate alternative. The evaluation focused on a complete trip across the project and its substitute alternative.	Geospatial process using Google maps
2. Collect 2022 travel times, reliability times and distances for the project and its alternative	Using coordinates from Step 1 and a web-based mapping platform, Step 2 consisted in collecting travel times, reliability times and distances for the project and the alternative. Travel time and reliability data were collected for peak and off-peak periods.	Travel times: Bing and Waze maps. Reliability times: Google maps
3. Process travel and reliability times to build the counterfactual scenarios	Data collected in Step 2 were processed and combined with historical speed and traffic data provided by Cintra to build the counterfactual scenarios described in Table 3.4	Cintra, with analysis from Steer
4. Estimate travel, reliability time savings and vehicle operating cost savings	Built an Excel tool to calculate the yearly benefits in travel time and reliability. The tool also calculated vehicle operating costs changes[1], by estimating differences in total Vehicle Miles Travelled (VMT) between the project and counterfactual scenario. The benefits were estimated by asset, on a yearly basis, for peak and off-peak periods.	Steer analysis
5. Monetize benefits using country specific values of time and automobile operating costs parameters.	The Excel tool monetized the travel time, reliability savings[2] using a country-level value of time for light and heavy vehicles[3]. The tool also calculated the change in vehicle operating costs as a function of change in VMT. Monetized benefits (in 2022 USD) were estimated by the following combination of categories: • Asset • Year-by-year, for every full year of operation of the asset • Peak and off-peak periods • Light and heavy vehicles • Pre-existing and new demand	Country-level socioeconomic analysis guidance documentation

[1] Vehicle operating costs were adjusted for the relationship between speed and fuel consumption using estimates from **Barth and Boriboonsomsin (2009)**. Estimates of the speed-fuel consumption curves were derived using R's Digitized package.

[2] Reliability savings are valued based on **Metrolinx Business Case Manual Volume 2: Guidance**

[3] The analysis also accounted for the proportion of commuting and business travellers to estimate the average value of times for light vehicles.

External Impacts

3.31 The external impacts category consists of the quantification of changes in road safety and emissions associated with the asset.

Road Safety

3.32 Collisions resulting in death or injury are typically measured on a per VMT basis. Standard Benefit-Cost Analysis practice uses a change in VMT to estimate the overall impact in these externalities that results from changes in preferred route distance, and the project accident rates, given an improved infrastructure design.

3.33 The safety methodology for North American assets has been revised from the study published in 2022 to take advantage of the availability of new traffic accident data that allows us to estimate safety impacts using a more sophisticated analysis of accident severity. This change in methodology means that the analysis more accurately reflects the costs to communities associated with collisions involving injuries and fatalities.

3.34 The road safety impacts are calculated using the following approach:

- Estimation of the project and no-project situation VMTs by the following categories:
  - Asset
  - Year-by-year
  - Peak and off-peak periods
- Calculation of accident rates for a no-project situation multiplying VMTs by a no-project accident rate.
  - The no-project accident rates were drawn from state (US) and country-level accident rates per VMT statistics available at the moment of the analysis.
- Calculation of accident rates for a project situation, multiplying VMTs by a project accident rate.
  - The project accident rates were drawn from observed historical VMT accident rates on each Cintra asset.
- Estimation of the differential of number of accidents between the no-project and project situation, using an Excel tool.
- Quantification of the road safety impacts in 2022 USD, using US Department of Transportation 2023 Benefit-Cost Analysis Guidance and the National Highway Traffic Safety Administration. The cost of fatal and injury accidents is represented by an average of the fatal and injury collision dollar values weighted by the number of fatal and injury collisions, respectively.[4]

Emissions

The estimation of emissions externalities follows the US Department of Transportation 2022 Benefit-Cost Analysis Guidance direction to consider greenhouse gases (GHGs), specifically carbon dioxide (CO2), and local air pollutants generated by road traffic (nitrogen oxides (NOx) and fine particle

[4] The weights are taken from the National Highway Safety Administration ***Overview of Motor Vehicle Crashes in 2020*** *report.*

matter (PM2.5). The analysis excluded sulfur dioxide emissions (SO2) as there was no fully wide available statistical information on SO2 emissions per type of vehicle at a country/regional level.

The emissions methodology has been revised from the study published in 2022 to take account of speed within the calculation of emissions. Previously, our methodology relied upon emissions rates per vehicle mile traveled. This change positively affects impacts for some assets and negatively affects impacts for others. However, overall, this represents a significant improvement to accuracy of the methodology as vehicular speed is a key factor that influences level of emissions from automobile use.

The emission impacts are calculated using the following approach:

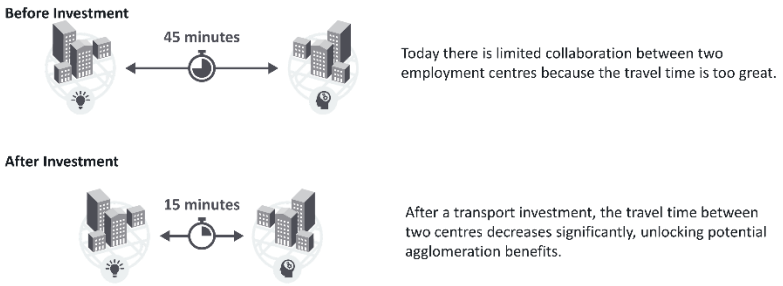
- Calculation of the project and no-project situation VMTs, by the following categories:
  - Asset
  - Year-by-year
  - Light and heavy vehicles
  - Peak and off-peak periods
  - Average vehicle speed
- Calculation of emission rates per type of pollutant for a no-project and project situation multiplying VMTs by a per mile emission rate for each pollutant.[5]
  - The polluting rates were drawn from available sources for the US (MOVES 3), Canada (ICCT), Europe (ACEA) and Australia (Australia National Transport Commission).
- Calculation of the differential emissions per pollutant between the no-project and project situation, using an Excel tool.
- Quantification of the differential emissions in 2022 USD, using a monetary value per pollutant, based in the US DOT guidance.

Wider Economic Benefits

Agglomeration (productivity)

3.35 In addition to Traveler and External Impacts, transportation projects can realize Wider Economic Impacts when they enable faster and more seamless travel between centers of economic activity. Specifically, agglomeration impacts refer to the gains in productivity from clustering by firms/education centers/other economic agents that is possible when travel times reduce between these centers.

[5] Vehicle emissions were adjusted for the relationship between speed and fuel consumption using estimates from **Barth and Boriboonsamson (2009)**. Estimates of the speed-fuel consumption curves were derived using R's Digitized package.



External Impacts

Approaches to calculate agglomeration based on empirical evidence have been set out in academic literature, including Graham et al. (2010). The typical assessment approach (applied by UK Department for Transport and other agencies) involves:

- Calculating the existing 'effective density' of a given activity center – effective density is estimated as the number of jobs accessible from that center divided by the travel time to access them, a decay parameter is used to reflect that productivity gains are not linear (job centers that are twice as far apart are likely to have less than half the productivity gains);
- Calculating a change in travel time from a proposed investment and its impact on effective density; and
- Using the change in effective density to estimate an impact on productivity based on an agglomeration elasticity (which related effective density to GDP per worker).

These impacts are accrued when transportation projects increase the spatial concentration or effective density of regions. These impacts will vary by the industry composition within the localities of the transportation project. The range of data required to estimate agglomeration for the portfolio are not available. An exploratory methodology was developed instead based on available information and peer examples. The methodology estimated agglomeration impacts by applying a 'percent uplift' to the monetized Traveler Impacts of each asset on a year-by-year basis. The agglomeration value employed s an average value between the highest and lowest agglomeration parameters from Graham (2008), of 16.5%.

Table 3.6: Appraisal of agglomeration benefits from transport investments

Mode	Scheme	Agglomeration
Road	Leeds to Bradford Improved Highway	21%
Road	Leeds Urban Area Improved Highway	22%
Road	Leeds to Sheffield Improved Highway	19%
Road	M6 shoulder	12%

Source: Graham (2008)

4 Results

The sections below present the overall results of the Impacts to Regional Economies and Impacts to Travelers and Communities of Cintra's current portfolio – as well as detailed results for Highway 407 ETR.

Impacts to Regional Economies

4.1 The total Impacts on Regional Economies are presented in Table 4.1. Up to 31st December 2022, Cintra's road portfolio investment has produced a total economic output of $64.3 billion 2022 USD. This investment has also led to $15.7 billion 2022 USD of workers earnings and have meant 334 thousand Full Time Equivalent jobs.

4.2 Table 4.2 presents these results as an average annual expenditure impacts per asset, considering the years since the concession started as the base year.

4.3 Table 4.3 present the project Impacts to Regional Economies for the 2023-2032 period. Cintra's road portfolio investment is estimated to produce a total economic output of $13.5 billion (2022 prices). This investment also leads to $3.4 billion (2022 prices) of workers earnings and 80,600 Full Time Equivalent (FTE) job-years. Table 4.4 presents these results as an average annual expenditure impacts per asset, for the forecasted period of 2023-2032.

Table 4.1: Summary of cumulative Impacts to Regional Economies for current Cintra assets up to 2022

	Asset	Location	Years since beginning of Concession	Cumulative impacts up to 2022		
				Economic output in Million 2022 USD	Earnings in Million 2022 USD	FTE Jobs (job years)
	407 ETR[6]	Canada	23	$13,300 (CAD 18,000)	$3,500 (CAD 4,700)	73,300
	Average (34 assets)		7	$1,900	$460	10,100
	Total (34 assets)			$64,300	$15,700	334,700

Source: Steer analysis

[6] 407 ETR results are shown also in Canadian Dollars (CAD) in all tables of this chapter

Table 4.2: Summary of average annual Impacts to Regional Economies for current Cintra assets up to 2022

	Asset	Location	Years since beginning of Concession	Average annual impacts		
				Economic output (Million 2022 USD)	Earnings (Million 2022 USD)	FTE Jobs
	407 ETR	Canada	23	$580 (CAD 780)	$150 (CAD 230)	3,200
	Average (34 assets)		7	$350	$80	1,600
	Total (34 assets)			$7,000	$1,600	32,070

Source: Steer analysis

Table 4.3: Summary of total projected Impacts to Regional Economies for current Cintra assets 2023-2032

	Asset	Location	Years since beginning of Concession	Cumulative outputs		
				Economic output in Million 2022 USD	Earnings in Million 2022 USD	FTE Jobs
	407 ETR[7]	Canada	23	$3,600 (CAD 4,900)	$990 (CAD 1,300)	19,500
	Average (34 assets)		7	$410	$100	2,400
	Total (34 assets)			$13,500	$3,400	80,600

Source: Steer analysis

[7] 407 ETR results are shown also in Canadian Dollars (CAD) in all tables of this chapter

Table 4.4: Summary of average annual Impacts to regional economies for current Cintra assets 2023-2032

	Asset	Location	Years since beginning of Concession	Average annual impacts		
				Economic output (Million 2022 USD)	Earnings (Million 2022 USD)	FTE Jobs
	407 ETR	Canada	23	$360 (CAD 490)	$100 (CAD 130)	2,000
	Average (34 assets)		7	$70	$20	420
	Total (34 assets)			$1,400	$350	8,200

Source: Steer analysis

Impacts to Travelers and Communities

4.4 Table 4.5 summarize the total Impacts to Travelers and Communities calculated category and type of asset up to 2022 for currently owned assets. As a total, the assets that are currently in operation have generated a total of $36.2 billion 2022 USD of benefits, where almost 70% are Traveler Impacts (travel time, trip reliability, and vehicle operating costs).

4.5 The COVID-19 pandemic had a significant effect on the demand for travel which led to a reduction in traffic using Cintra's assets and therefore a reduction in Impacts to Travelers and Communities for 2020 and 2021.

4.6 Table 4.6 presents the Impacts to Travelers and Communities as a yearly average per asset.

4.7 Table 4.7 present the forecast Impacts to Travelers and Communities for the 2023-2032 period. Cintra's road portfolio investment is estimated to produce a total of $55 billion 2022 USD of impact, where roughly 63% are Traveler Impacts.

4.8 Table 4.8 presents the forecast Impacts to Travelers and Communities for the 2023-2032 period as a yearly average per asset.

Table 4.5: Summary of total Impacts to Travelers and Communities to 2022 of current Cintra assets

		Location	Years since first year of full operation of the Concession	Traveler Impacts in Million 2022 USD	External Impacts in Million 2022 USD	Wider Economic Impacts in Million 2022 USD	Total in Million 2022 USD
	407 ETR	Canada	23	$14,200 (CAD 19,000)	$540 (CAD 720)	$2,600 (CAD 3,500)	$17,300 (CAD 23,300)
	Average (34 assets)		7	$940	$240	$170	$1,300
	Total (34 assets)			$25,400	$6,400	$4,500	$36,200

Source: Steer analysis

Table 4.6: Summary of average yearly Impacts to Travelers and Communities to 2022 of current Cintra assets

		Location	Years since first year of full operation of the Concession	Traveler Impacts in Million 2022 USD	External Impacts in Million 2022 USD	Wider Economic Impacts in Million 2022 USD	Total In Million 2022 USD
	407 ETR	Canada	23	$680 (CAD 915)	$30 (CAD 40)	$120 (CAD 160)	$820 (CAD 1,105)
	Average (34 assets)		7	$110	$40	$20	$170
	Total (34 assets)			$2,900	$1,100	$500	$4,500

Source: Steer analysis

Table 4.7: Summary of 2023-2032 projected Impacts to Travelers and Communities of current Cintra assets

		Location	Years since first year of full operation of the Concession	Traveler Impacts in Million 2022 USD	External Impacts in Million 2022 USD	Wider Economic Impacts in Million 2022 USD	Total in Million 2022 USD
	407 ETR	Canada	23	$6,000 (CAD 8,100)	$290 (CAD 390)	$1,100 (CAD 1,500)	$7,400 (CAD 10,000)
	Average (34 assets)		7	$1,300	$560	$230	$2,100
	Total (34 assets)			$34,600	$14,500	$5,900	$55,000

Source: Steer analysis

Table 4.8: Summary of 2023-2032 average annual projected Impacts to Travelers and Communities of current Cintra assets

		Location	Years since first year of full operation of the Concession	Traveler Impacts in Million 2022 USD	External Impacts in Million 2022 USD	Wider Economic Impacts in Million 2022 USD	Total In Million 2022 USD
	407 ETR	Canada	23	$600 (CAD 810)	$30 (CAD 40)	$110 (CAD 150)	$740 (CAD 1,000)
	Average (34 assets)		7	$130	$60	$20	$210
	Total (34 assets)			$3,500	$1,500	$590	$5,500

Source: Steer analysis

5 Conclusions

Overall Impact

5.1 This study conducted an analysis of 34 assets spanning across ten countries, with a total investment value of $22.4 billion USD, excluding Indian assets. Each asset was analyzed with a consistent methodology to determine its Impacts to Travelers and the Community (changes to traveler and community value due to investment in the transportation network) and Impacts to the Regional Economy (outcomes associated with spending on infrastructure)).

5.2 Across the 34-asset portfolio, the following overall impacts were observed:

- **Impacts to Regional Economics –** $64.3 billion in Economic Output (spread across all countries included in the study) and $15.7 billion in direct salary earnings. Combined, over the lifecycle of all 34 assets to date, there have been an estimated 344,700 job-years of labor generated to construct and maintain/operate the assets.
- **Impacts to Travelers and Communities –** $36.2 billion in value realized to date, including nearly $25.4 billion of direct Traveler Impacts (from faster and more reliable travel times), $6.4 billion in External Impacts (changes in collisions and emissions), and $4.5 billion in wider economic benefits (reflecting improved productivity due to decreased travel times).

5.3 The specific results for 407 ETR noted that the potential impacts to date of the toll road are:

- A total of $23.3 billion CAD ($17.3 billion USD) in Traveler and Community Impacts
- $18.0 billion CAD ($13.3 billion USD) in GDP and $4.7 billion CAD ($3.5 billion USD) in direct earnings, supporting over 73,300 job years of labor.

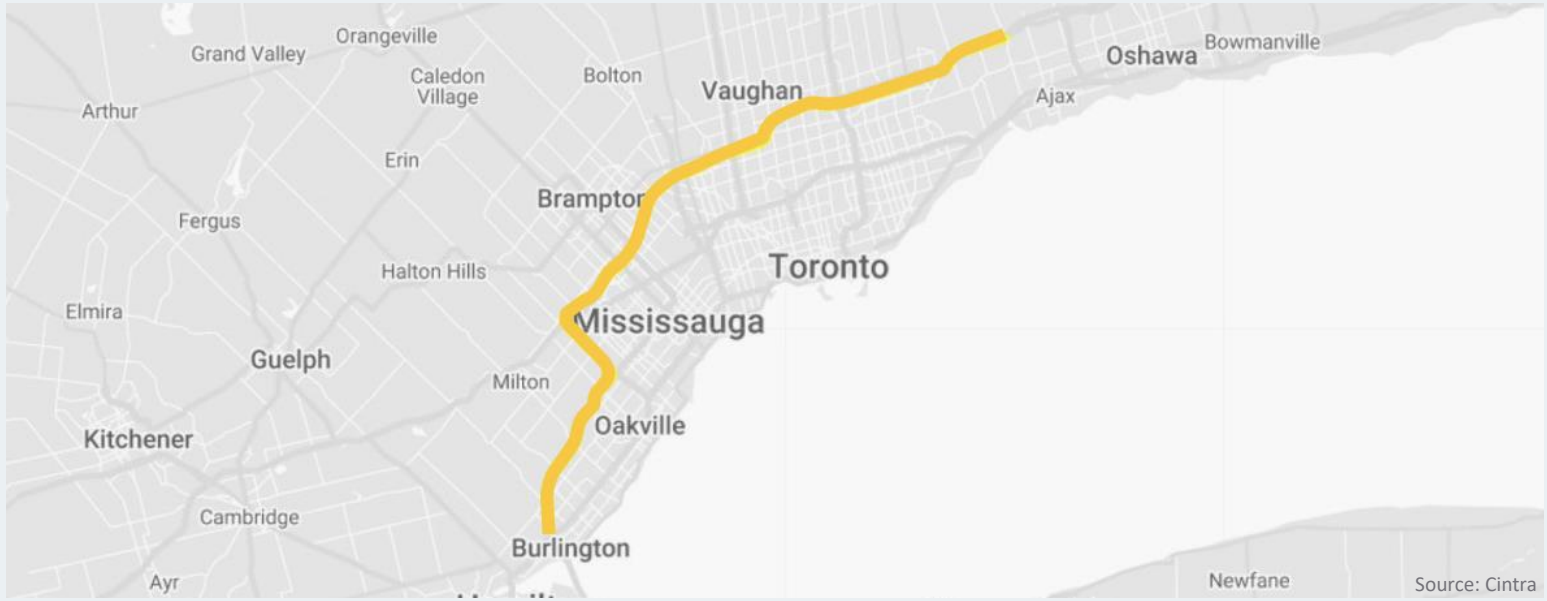
Appendices

A Detailed Asset Results

407 ETR

Highway 407 ETR is the world's first all-electronic, open-access toll highway. It's located in Toronto, Ontario, Canada, runs parallel to the 401, one of North America's most congested highways, and helps drivers reach their destinations quickly and safely.

The "free flow" tolling system detects the vehicle, calculates the route and manages billing automatically. Drivers never have to stop at a toll booth.



Ontario, Canada

67 miles

Concession: 1999 - 2098
Opening year: 1999

Impacts to the Regional Economy†

$13.3 billion USD to 2022* ($18.0 billion CAD)

$3.6 billion USD 2023-2032 ($4.9 billion CAD)

$13.3 billion to 2022*
($18.0 billion CAD)
$3.6 billion 2023-2032
($4.9 billion CAD)
Economic output

$3.5 billion to 2022*
($4.7 billion CAD)
$990 million 2023-2032
($1.3 billion CAD)
Earnings

73,300 to 2022*
19,500 for 2023-2032
FTE jobs‡

Impacts to Travelers and Communities†

$17.3 billion USD to 2022* ($23.3 billion CAD)

$7.4 billion USD 2023-2032 ($10.0 billion CAD)

$14.2 billion to 2022*
($19.0 billion CAD)
$6.0 billion 2023-2032
($8.1 billion CAD)
Traveler Impacts

$540 million to 2022*
($720 million CAD)
$290 million 2023-2032
($390 million CAD)
External Impacts

$2.6 billion to 2022*
($3.5 billion CAD)
$1.1 billion 2023-2032
($1.5 billion CAD)
Wider Economic Impacts

* Cumulated benefits up to December 2022
† 2023-2032 impacts estimated using projected data
‡ Full Time Equivalent (FTE) jobs are measured in job-years.
2022 price base for all $ values

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