



environmental  
defence



# PAVING PARADISE

The impact of Highway 413 on  
greenhouse gas emissions,  
air pollution & suburban sprawl



# TABLE OF CONTENTS

Introduction	3
What is the Highway 413?	4
Overview of Highway 413's Impacts on Greenhouse Gas Emissions, Air Pollution and Sprawl	5
Direct Climate Change Impacts of Highway 413	7
GHG Emissions from Vehicles on Highway 413	9
Cumulative GHG Emissions from Highway 413	10
GHG Emissions from Construction and Maintenance of Highway 413	11
Air Pollution Impacts	12
Sprawl, Highways, and Climate Change	14
Highway 413 will Build Out, Not Up	15
Are There Better Ways to Move People in the GTA West Region?	18
#1 Increase Investment in Transit	19
#2 Provide Truck Priority on Highway 407	20
Conclusion – A Critical Decision Needs to be Made	21
References	22

## ACKNOWLEDGEMENTS

This report is by Environmental Defence.

ENVIRONMENTAL DEFENCE is a leading Canadian advocacy organization that works with government, industry and individuals to defend clean water, a safe climate and healthy communities.

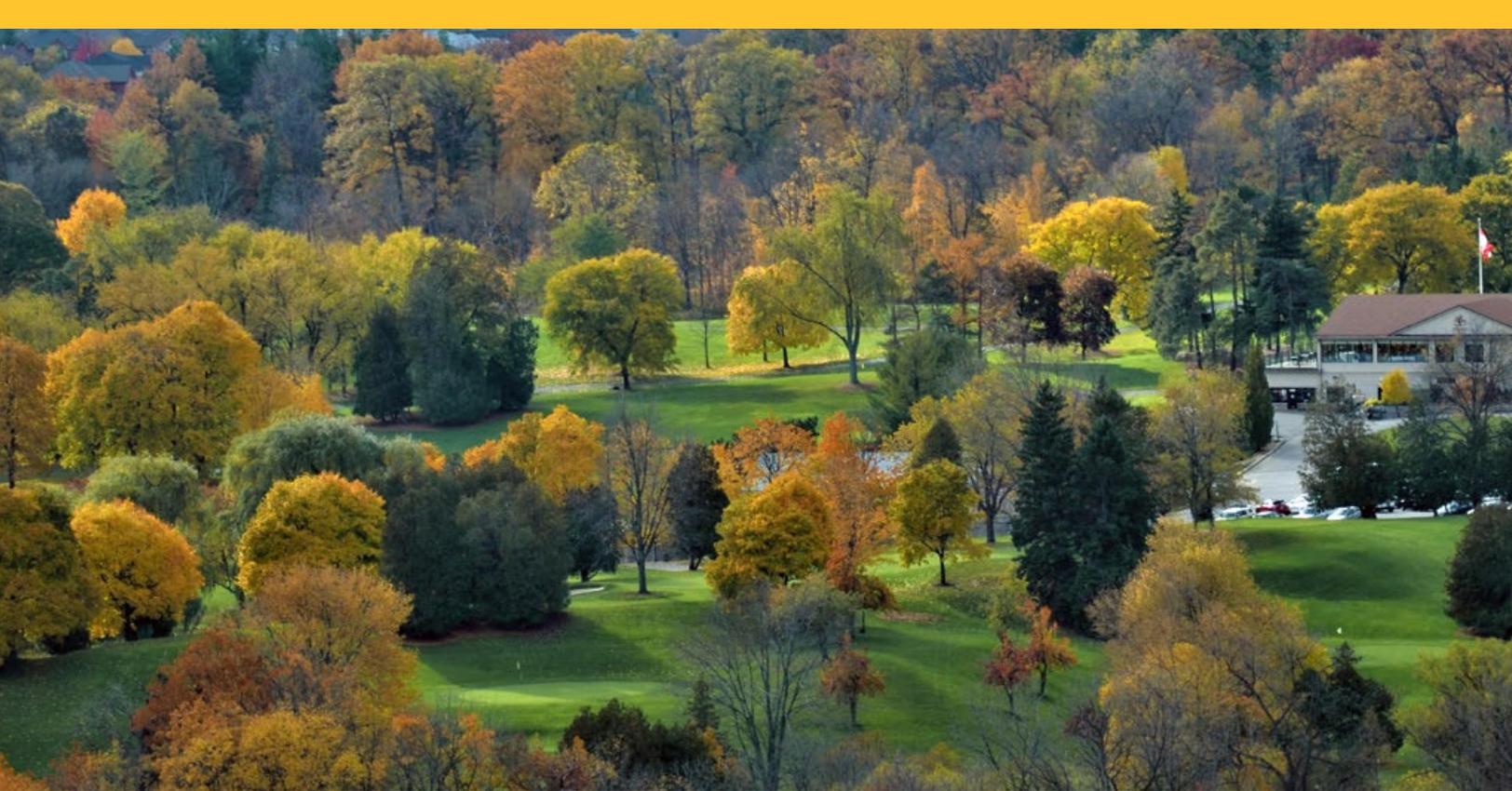


environmental  
defence

This report was generously funded by  
The Atmospheric Fund.



© Copyright April 2021. Permission is granted to the public to reproduce or disseminate this report, in part, or in whole, free of charge, in any format or medium without requiring specific permission. Any errors or omissions are the responsibility of Environmental Defence.



# INTRODUCTION

**Ontario has a big decision to make: to build, or not to build, Highway 413?**

**This decision will determine whether or not Ontarians are locked in for generations of increased greenhouse gas emissions, air pollution and sprawl, and an estimated \$6 billion in construction costs. All to save car commuters an estimated 30-60 seconds in average travel time across the region.<sup>1</sup>**

We wanted to get a sense of the impact this highway could have on climate change and air pollution, so we hired a transportation modelling team to add up how much pollution, and how much sprawl Ontarians could be facing if Highway 413 is built. This evidence shows that by adding hundreds of thousands of polluting cars, SUVs and trucks to Ontario's roads, Highway 413 will make climate change worse and harm the health of people, communities, and sensitive ecosystems. It also shows how a new highway will help developers build out and not up, abandoning sustainable, dense, vibrant cities for sprawling car-dependent subdivisions that force people to travel even farther to get where they need to go.

Highway 413 is still only sketched out on paper. It's not too late to listen to reason and cancel it. Ontario's current government should look at the facts and evidence before them, and cancel this highway again, this time for good.

# WHAT IS HIGHWAY 413?

Ontario is racing to build a new mega-highway west of Toronto from Vaughan down to Milton. It would run for 59 kilometres from Highway 400 (near Kirby Road) in the east, and snake through Caledon and Brampton down to the Highway 401/407 ETR interchange area in the west.

Building this highway would result in 8.8 million square metres of new paved surfaces running right through the Greenbelt, prime agricultural lands, and the sensitive headwaters of four watersheds from east to west, including the Humber River, the entire width of Etobicoke Creek, a stretch of the Credit River, and Sixteen Mile Creek.<sup>2</sup>

In 2018, the previous Ontario government scrapped the highway after their own expert panel concluded that residents would be much better served by alternatives like building better public transit and prioritizing truck traffic on the existing and underused 407 toll highway. But it was revived later that same year when Premier Ford's government was elected. In 2020, the Province went a step further, proposing to weaken the environmental assessment (EA) process for Highway 413 so that construction on "early works" like bridges over waterways could begin before the EA is completed.<sup>3</sup> If these early works go ahead, then important waterways and vital species habitats would be harmed before the impacts would be assessed.



FIGURE 1: PROPOSED ROUTE OF THE GTA WEST HIGHWAY (HIGHWAY 413)

Source: Environmental Defence

# OVERVIEW OF HIGHWAY 413'S IMPACTS ON GREENHOUSE GAS EMISSIONS, AIR POLLUTION AND SPRAWL

Eunomia Research and Consulting was commissioned to perform an assessment of the carbon emission and air pollution impacts of the proposed GTA West Highway. The assessment was based upon the preferred route published in August 2020 as part of the public consultation information released by AECOM.<sup>4</sup>

This assessment took into account emissions from vehicles traveling on the highway, construction emissions, and air pollution from vehicle tailpipes which impact the health of the surrounding population. Eunomia modelled two potential scenarios for the mix of vehicles expected on the highway, with both scenarios assuming 3.7 per cent of the vehicles are diesel buses and trucks;

## Business-as-usual: based on the current mix of vehicles on the road in Ontario, Highway 413 will create:

- ▼ Approximately **17.4 million tonnes of CO<sub>2</sub>e total by 2050** from vehicles
- ▼ Annual vehicle emissions of approximately **0.7 million tonnes by 2050**, about the same impact as energy use from **81,000 homes** for one year<sup>5</sup>
- ▼ Approximately **100,000 tonnes** of CO<sub>2</sub>e from highway construction and maintenance
- ▼ Over **\$1.4 billion dollars** in cumulative damages from air pollution, which increases hospital visits and hurts local ecologies.



## Optimistic Electrification: If the federal government's current vehicle electrification targets are reached, Highway 413 will create:

- ▼ Approximately **13 million tonnes** of CO<sub>2</sub>e total from vehicles by 2050
- ▼ Annual vehicle emissions peaking in 2030 at approximately **0.4 million tonnes CO<sub>2</sub>e**, and declining to approximately **0.35 million tonnes CO<sub>2</sub>e** by 2050,
- ▼ Approximately **100,000 tonnes** of CO<sub>2</sub>e from the highway's construction phase
- ▼ Over **\$1.1 billion dollars** in cumulative damages by 2050 just from air pollution, which impacts the health of nearby populations and ecologies

The federal government's current vehicle electrification targets are 10 per cent by 2025, 30 per cent by 2030, 100 per cent by 2040. However, Transport Canada recently noted that these targets are not achievable under current policies.<sup>6</sup>



Over a 30-year lifespan, Highway 413 will directly create:



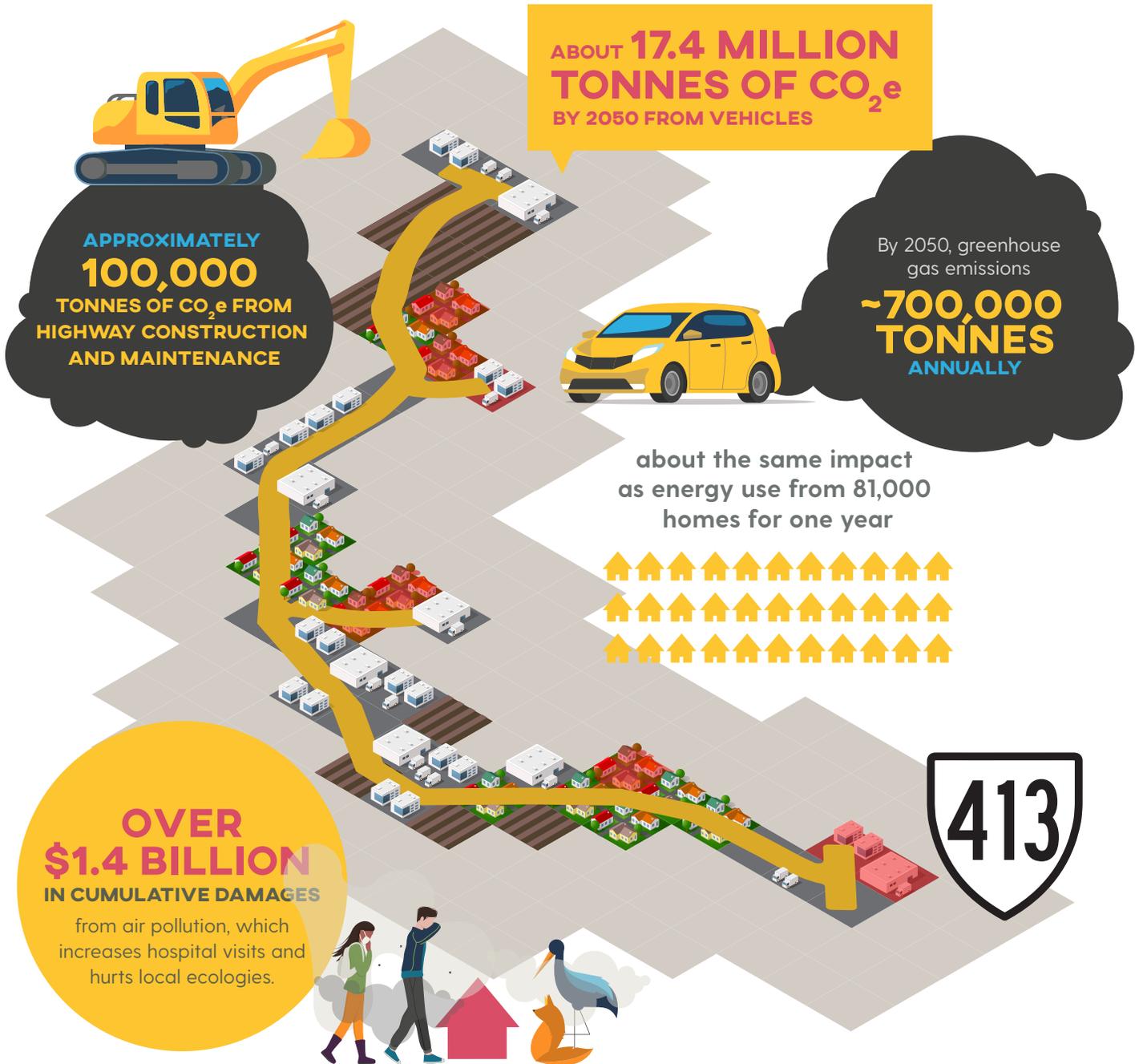
EXISTING DEVELOPMENTS



NEW DEVELOPMENTS, SPRAWL, AND PAVED AREAS

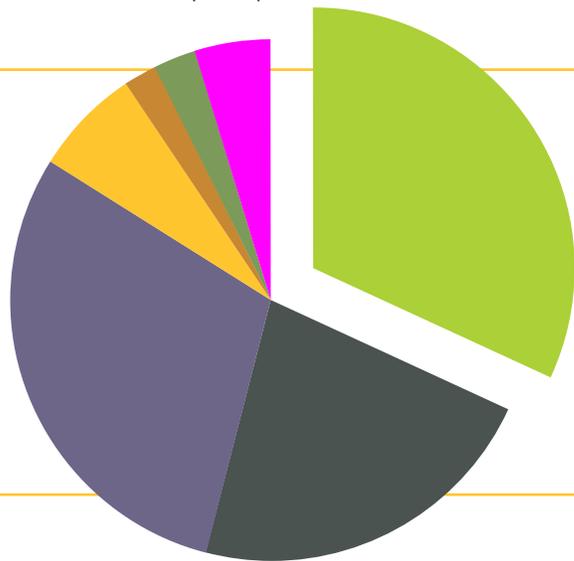


FARMLAND



# DIRECT CLIMATE CHANGE IMPACTS OF HIGHWAY 413

Building Highway 413 will make it harder for Ontario to reign in growing greenhouse gas (GHG) emissions from transportation, and meet the Province's 2030 climate target of a 30 per cent reduction from 2005 levels by 2030. In Ontario, transportation is the biggest source of GHG emissions. In recent years, an increase in the number of SUVs and pickup trucks on the road has driven up transportation emissions more quickly.<sup>7</sup>



**FIGURE 3: ONTARIO GREENHOUSE GAS EMISSIONS, 2018**

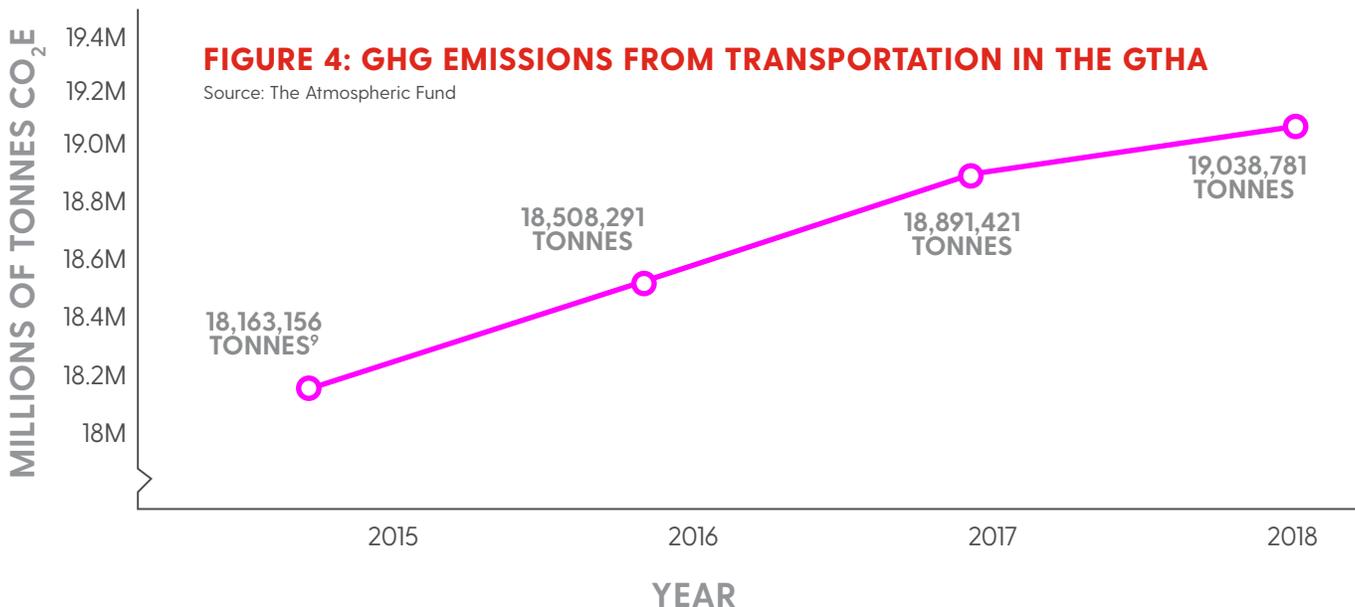
Source: Government of Canada

ONTARIO 2018 GHGS: (165 MT CO<sub>2</sub>e)

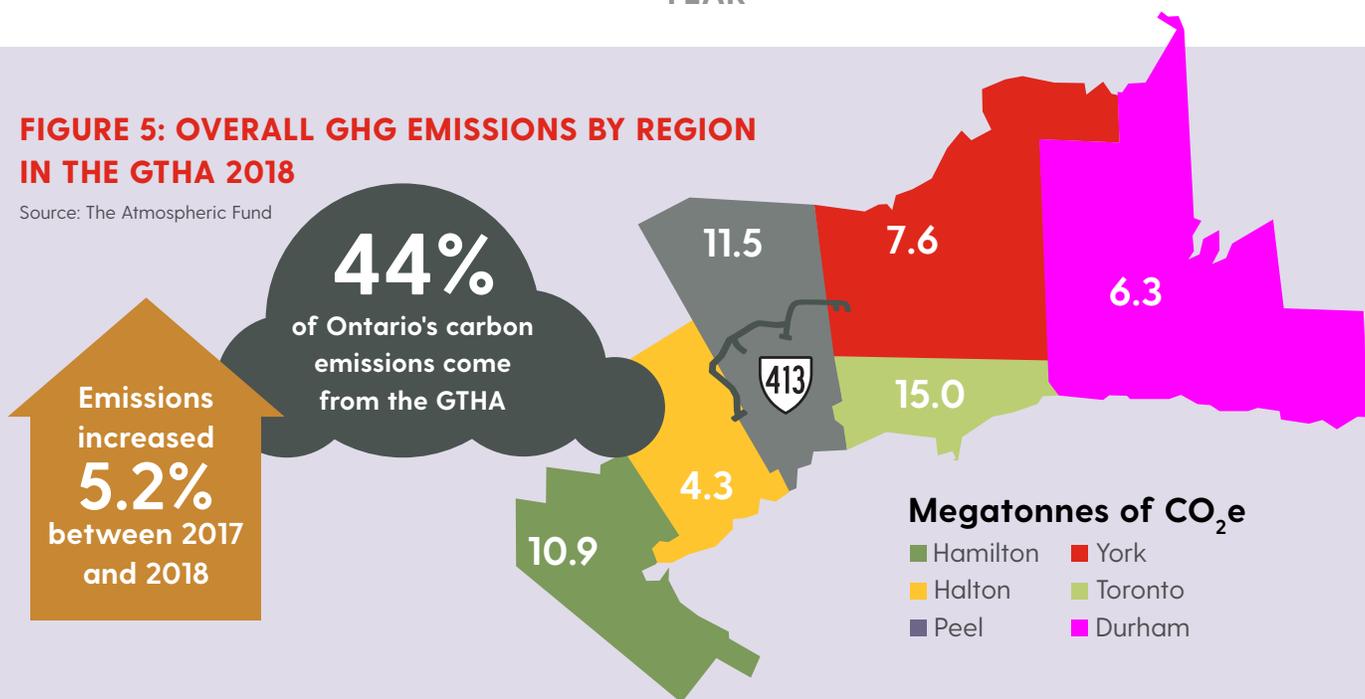
- Transportation: 57.4 Mts - 35%
- Buildings: 40 Mts - 24%
- Industry: 38.7 - 23.5%
- Agriculture: 12.4mts - 7.5%
- Electricity: 3.8 Mts - 2%
- Waste: 4.6 Mts - 3%
- Oil and Gas: 8.1 MTs: 5%



Transportation emissions increased by nearly 5 per cent in the GTHA between 2015 and 2018. This sector contributes one-third of region-wide emissions, so increases in transportation emissions have a noticeable effect on overall GTHA emissions.<sup>8</sup>



**FIGURE 5: OVERALL GHG EMISSIONS BY REGION IN THE GTHA 2018**  
 Source: The Atmospheric Fund



Although Toronto is the biggest overall emitter, Peel Region and York Region have outsized carbon footprints relative to their populations. Their per capita transportation emissions are the highest in the GTHA and rising.<sup>10</sup> Peel already hosts multiple 400-series highways. Adding another highway will ramp up transportation emissions even further in Peel and York Regions.

# GHG EMISSIONS FROM VEHICLES ON HIGHWAY 413

## HOW THE GHG EMISSIONS WERE CALCULATED

Eunomia's analysis considered GHG emissions created by construction and maintenance of Highway 413, and the tailpipe emissions from the estimated number and type of vehicles expected to use the highway. Eunomia's methodology can be found on page 22.

## WHAT THE CALCULATIONS DID NOT INCLUDE AND THE IMPACT OF INDUCED DEMAND

This analysis did not calculate or predict traffic volume impacts on adjacent roads and highways, and was not intended to model the impacts on local traffic. However, a mounting body of evidence suggests that the emissions calculated in this analysis will quickly become additional to current vehicle emissions in the region instead of displacing other vehicle traffic. Recent evidence from highway projects around the world has documented a phenomena called "induced demand," in which new road space is quickly filled by additional drivers, often within just a few years of construction.<sup>11</sup> Instead of relieving pressure on existing roads and highways, evidence suggests that building new road space often encourages more people to drive and increases total GHG emissions and air pollution. Recent literature reviews have rightly pointed out that although this phenomena has been rigorously documented, "transportation planning practice does not fully account for this phenomenon, with the result that estimates of the potential congestion-reducing benefits of added highway capacity may be overstated and estimates of potential environmental impacts understated."<sup>12</sup>

## THE IMPACT OF VEHICLE TYPE ON HIGHWAY 413'S GHG EMISSIONS

The amount of GHG emissions created by Highway 413 will vary based on the mix of vehicles using it. The Business-as-usual scenario below is based on Ontario's current fleet mix, while the Optimistic Electrification scenario is based on achieving the federal government's targets for electric vehicle (EV) sales for passenger vehicles in Canada (10 per cent by 2025, 30 per cent by 2030, and 100 per cent by 2040), which would mean significantly more EVs traveling on Ontario's highways.

Without further actions from government, a realistic outcome will likely fall somewhere between these two scenarios. While electric vehicle uptake is expected to increase eventually, Ontario's EV sales have recently declined due to the cancellation of provincial programs to support EV uptake.<sup>13</sup> Transport Canada has also indicated that the country is not on track to meet Canada's EV sales targets, despite the EV purchase rebates offered by the federal government.<sup>14</sup>

The trend towards consumers buying larger vehicles like SUVs and light trucks, and automakers aggressively marketing these products, is also causing transportation emissions in Canada to rise.<sup>15</sup> A recent study from the International Energy Agency revealed that Canadians drive the most carbon-intensive vehicles in the world.<sup>16</sup>

A lag in strong policy action from all levels of government means that more than 98 per cent of vehicles purchased in Ontario are gas powered today, locking these drivers in to another decade of greenhouse gas emissions. Without stronger action, the vehicle mix on Highway 413 could see little change in the next ten, twenty, or even thirty years.

# CUMULATIVE GHG EMISSIONS FROM HIGHWAY 413

The vehicles travelling on Highway 413 would create about 17.4 million tonnes of CO<sub>2</sub>e in cumulative emissions by 2050 under the Business-as-usual scenario. That’s about the same amount of emissions produced by the City of Toronto in a year. Under the Optimistic Electrification scenario, Highway 413 would create approximately 13 million tonnes of CO<sub>2</sub>e by 2050 - about the same as one year of emissions from Hamilton.<sup>17</sup>

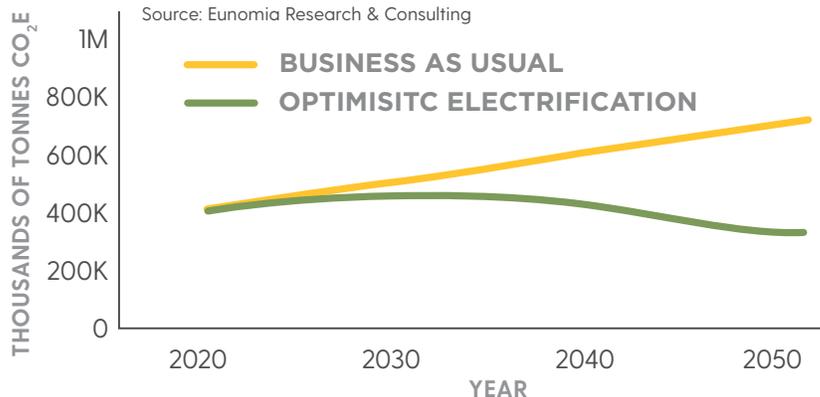
## ANNUAL GHG EMISSIONS FROM HIGHWAY 413

The total annual GHG emissions from vehicles travelling on Highway 413 will add approximately 700,000 tonnes of CO<sub>2</sub>e every year by 2050. As a comparison, Ontario’s entire carbon footprint from electricity in 2018 was about 4 million tonnes.<sup>18</sup>

In the Optimistic Electrification scenario, the vehicles on Highway 413 would add approximately 350,000 tonnes of CO<sub>2</sub>e every year by 2050. This is still significantly higher than the federal government’s current goal of reaching net-zero emissions by 2050.<sup>19</sup>

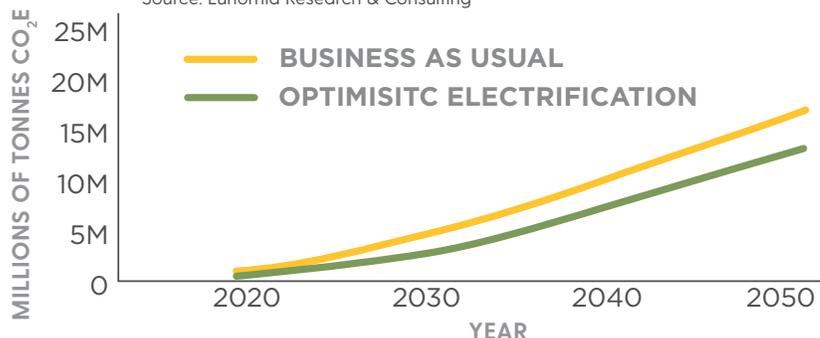
**FIGURE 6: PROJECTED ANNUAL CO<sub>2</sub>e EMISSIONS FROM VEHICLE MILES-TRAVELLED**

Source: Eunomia Research & Consulting



**FIGURE 7: PROJECTED CUMULATIVE CO<sub>2</sub>e EMISSIONS FROM VEHICLE MILES-TRAVELLED**

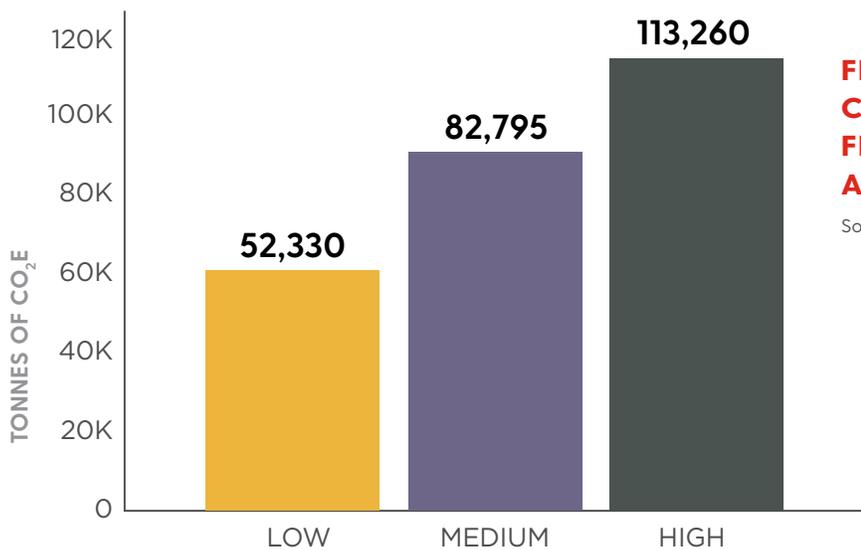
Source: Eunomia Research & Consulting



# GHG EMISSIONS FROM CONSTRUCTION AND MAINTENANCE OF HIGHWAY 413

The construction process for Highway 413 will also create GHG emissions. This analysis includes the carbon footprint of the building materials and the vehicles used to construct the highway.

Preliminary plans suggest the highway will be composed of a mix of asphalt and concrete, though the exact proportion is not yet public. Eunomia modelled a low, medium, and higher emissions scenario based on the carbon footprint of the mix of materials used.



**FIGURE 8: PROJECTED CUMULATIVE CO<sub>2</sub>e EMISSIONS FROM CONSTRUCTION AND MAINTENANCE**

Source: Eunomia Research & Consulting

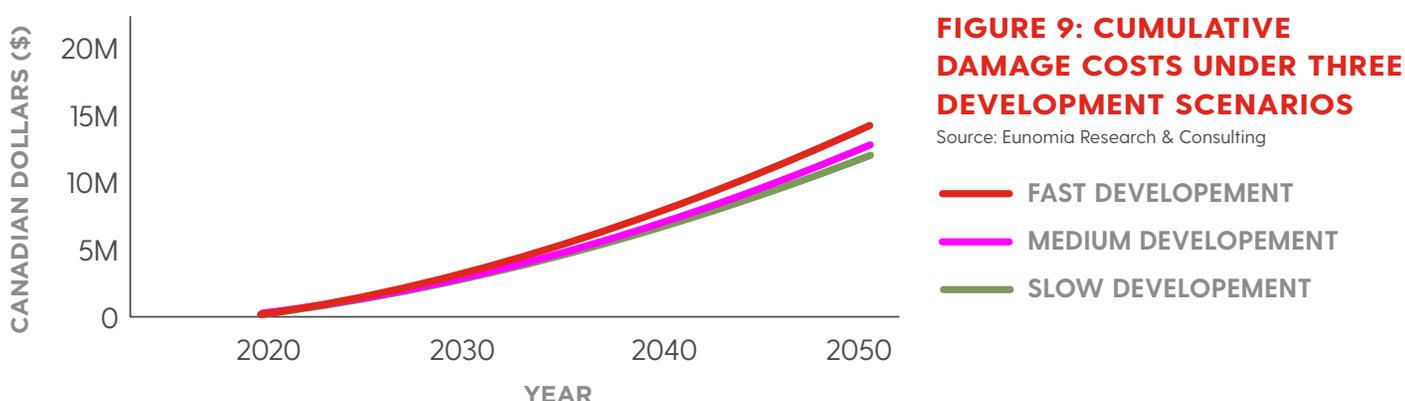


# AIR POLLUTION IMPACTS

Cars and trucks emit more than just greenhouse gas emissions, they also emit nitrogen oxides, black carbon, and other toxic substances which harm our health when we breathe them in.

**Building a new 400-series highway with heavy truck traffic would mean direct health impacts to nearby communities.** How close you live to a highway or major road is the biggest risk factor determining how much traffic-related air pollution harms your health. The risk of premature death from respiratory illnesses like asthma or lung cancer skyrockets for people who live within 200 metres of a highway or major road.<sup>20</sup> But studies show the impacts linger for kilometres.<sup>21</sup>

**Our modelling shows that Highway 413 could cause between \$1 – \$1.4 billion dollars in cumulative damages from air pollution by 2050. The amount depends on how much residential growth occurs close to the highway, and whether more action is taken to get more electric vehicles on the road.**



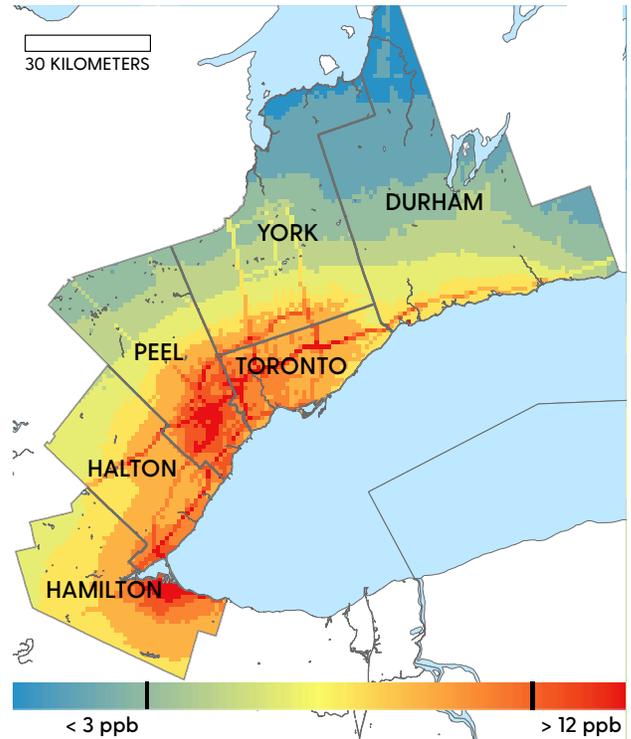
These costs take into account the harm caused by vehicle air pollution, including damages to human health, ecological health, crop losses, and aesthetic conditions. This does not include the economic cost of paving over farmland and green spaces, which bring billions of dollars in economic activity to the Greater Golden Horseshoe every year.<sup>22</sup>

If developers build housing right next to the highway, the air pollution from vehicles on Highway 413 will impact more people and cause greater damage. Air pollution could be somewhat reduced if more vehicles are electric. We've calculated three scenarios based on the pace of suburban sprawl along the highway corridor. These percentages were determined by applying the estimated annual rate of urbanization from the areas surrounding Highway 407 and Highway 410 to the proposed Highway 413 route.



**Traffic-related air pollution from vehicles is responsible for 872 deaths in the GTHA every year.**<sup>23</sup> Peel is already a major pollution hotspot due to the number of major highways crisscrossing within its borders – almost 200 premature deaths every year in Peel are from vehicle related air pollution.<sup>24</sup> It's the same story close to Highway 400 in Vaughan – there's much greater exposure close to busier highways with more vehicles, making more people sick.

These results make a strong case against knowingly causing billions of dollars worth of damages to the health of GTA West residents and nearby ecosystems to save commuters an average of 30-60 seconds in travel time across the region.<sup>25</sup> Highway 413 should be cancelled.



**FIGURE 10: NITROGEN DIOXIDE CONCENTRATIONS IN THE GTHA ON AN AVERAGE WEEKDAY IN PARTS PER BILLION (PPB)**

Environmental Defence, Charging Forward: The Future of Ontario's Electricity Grid, 2020. <https://environmentaldefence.ca/wp-content/uploads/2020/05/Charging-Forward-Ontario-Electricity-Backgrounder-ED.pdf>



# SPRAWL, HIGHWAYS, AND CLIMATE CHANGE

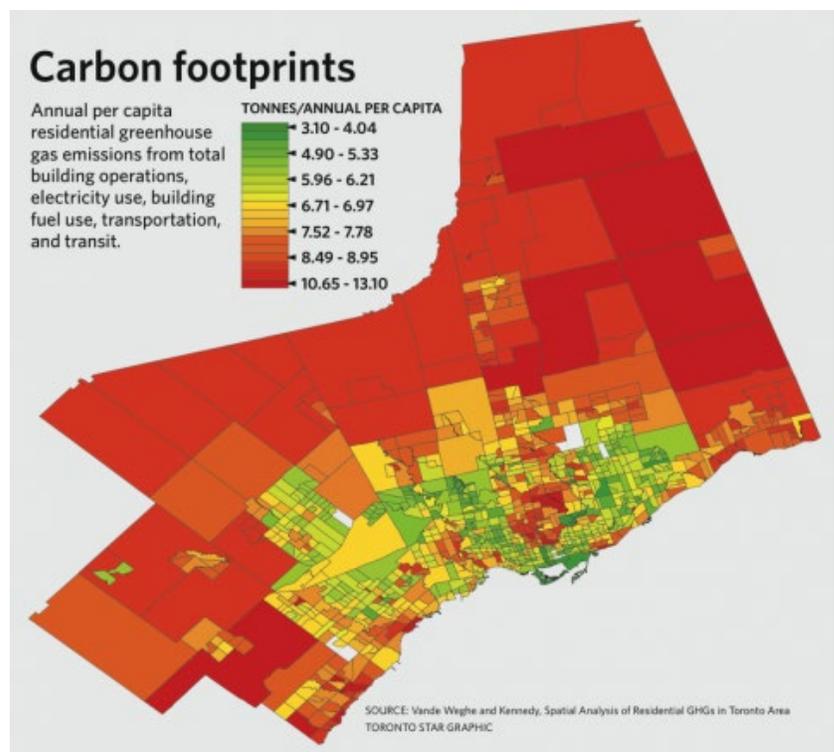
The scenarios we've calculated tally direct GHG emissions from Highway 413's construction and vehicle traffic, but this tells only part of the story. The impacts become exponentially worse when you consider the sprawling developments which will follow the route, replacing existing green spaces and farmland. This style of growth will add more carbon pollution as people get locked into long car commutes instead of living in walkable, dense cities.

GTA residents already spend an average of 8 hours every week commuting, more than residents in L.A. and New York City.<sup>26</sup> This is because many of our communities are designed to sprawl outwards, forcing people to travel longer distances to get to work, school, or other destinations, which means a whole lot more carbon pollution from transportation.

The graphic below shows how people in population-dense regions with better transit options tend to have lower carbon footprints, while people in highway-dependent areas are locked into higher carbon footprints per capita. To make matters worse, the number of people commuting in SUVs or pickup trucks is growing every year, causing more pollution per commuter.

These per capita carbon footprints need to drop significantly if GTA West regions plan to meet their climate targets. For example, current per capita emissions in Peel average out to 7.8 tonnes CO<sub>2</sub>e/year.<sup>27</sup> If Peel's population grows as expected<sup>28</sup> out to 2030 and per capita emissions don't change, total GHG emissions would rise from their current 11.5 million tonnes CO<sub>2</sub>e<sup>29</sup> to 13.8 million tonnes CO<sub>2</sub>e.

This increase in emissions would seriously threaten Peel Region's commitment to cut GHG emissions 45 per cent by 2030.<sup>30</sup> To meet their goals, Peel needs to cut down on vehicle emissions by offering more walkable, dense, transit-friendly communities. Building a new mega-highway will have the opposite effect, forcing people in newly built sprawling housing subdivisions to drive farther to get where they need to go.



**FIGURE 11: ANNUAL PER CAPITA CARBON FOOTPRINTS IN THE GTA**

# HIGHWAY 413 WILL BUILD OUT, NOT UP

**The decisions Ontario makes now on how and where to grow will impact our carbon footprints for decades to come. Bad transportation and land use planning will lock in more vehicle travel, undermining even the strongest climate change plans.**

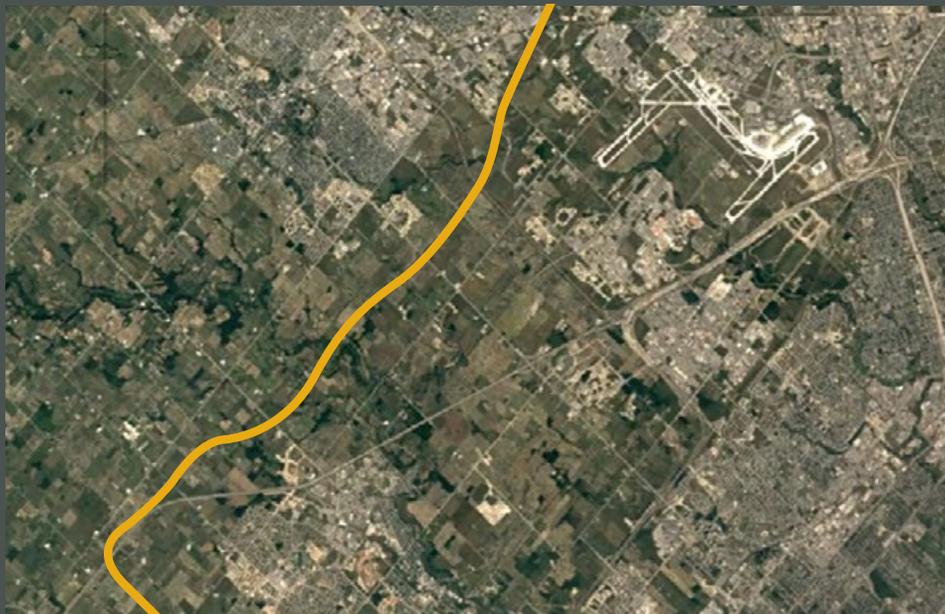
Building out instead of up damages ecosystems, water sources, and farmlands. It also costs cities and towns much more, since water pipes and other infrastructure must be built over longer distances to reach the same number of people.

Many cities have imagined a future where their streets are more walkable, vibrant, sustainable places to live. This means shifting away from long commutes on highways towards transit, cycling, walking, and shorter commutes. Brampton's 2040 Vision imagines local shops lining vibrant boulevards with lots of room for pedestrians and cyclists, and dense housing built near transit. But in Brampton's case, Highway 413 will quite literally pave over important parts of this vision. The Highway would make a boulevard planned for the same lands impossible, destroying the adjacent communities rather than building them up sustainably, which would generate more local economic activity, and house more people.<sup>31</sup>

Sprawl also eats up farmland that is the driver of billions of dollars in economic activity in Ontario. According to the Ontario Federation of Agriculture, farmland makes up about half of the land area of the Greater Golden Horseshoe and represents one of the most important economic sectors of the region, contributing \$11 billion and 38,000 jobs to Ontario's economy. This economic activity generates \$1.7 billion in tax revenue for the three levels of government.<sup>32</sup>

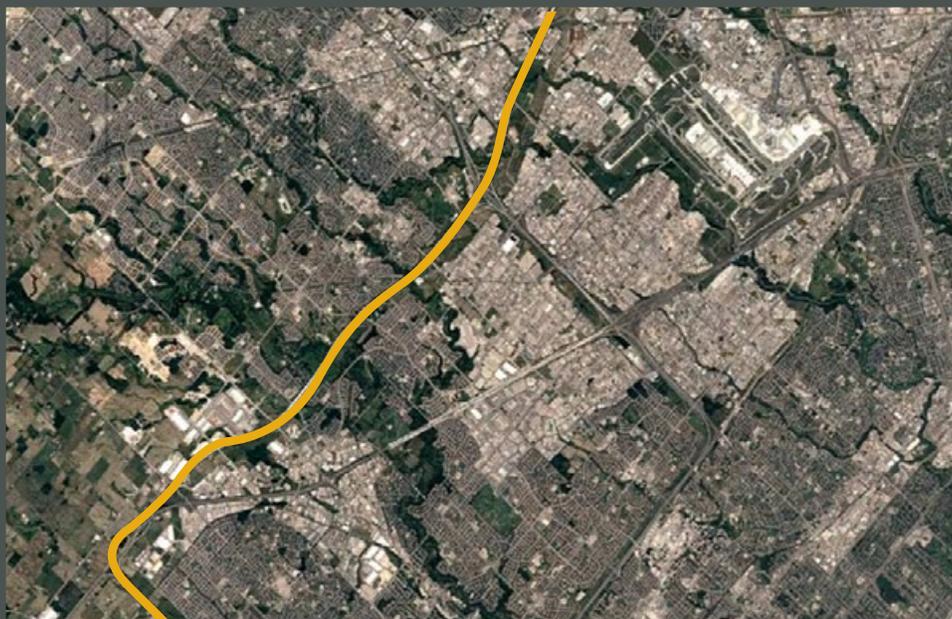


Highway 413 is a textbook example of how bad transportation planning could supercharge urban sprawl, air pollution and carbon pollution in the GTA West region. To get a sense of its potential for sprawl, we don't need to look far. Before the 407 toll highway was built, the surrounding lands were relatively undeveloped. Fast forward thirty years and you can see all the development the highway brought along with it. The loss of farmland is particularly notable.



**FIGURE 12: HIGHWAY 407 ROUTE IN 1984 - BEFORE CONSTRUCTION BEGAN**

Prior to the construction of Highway 407, the majority of the land near the highway was farmland.

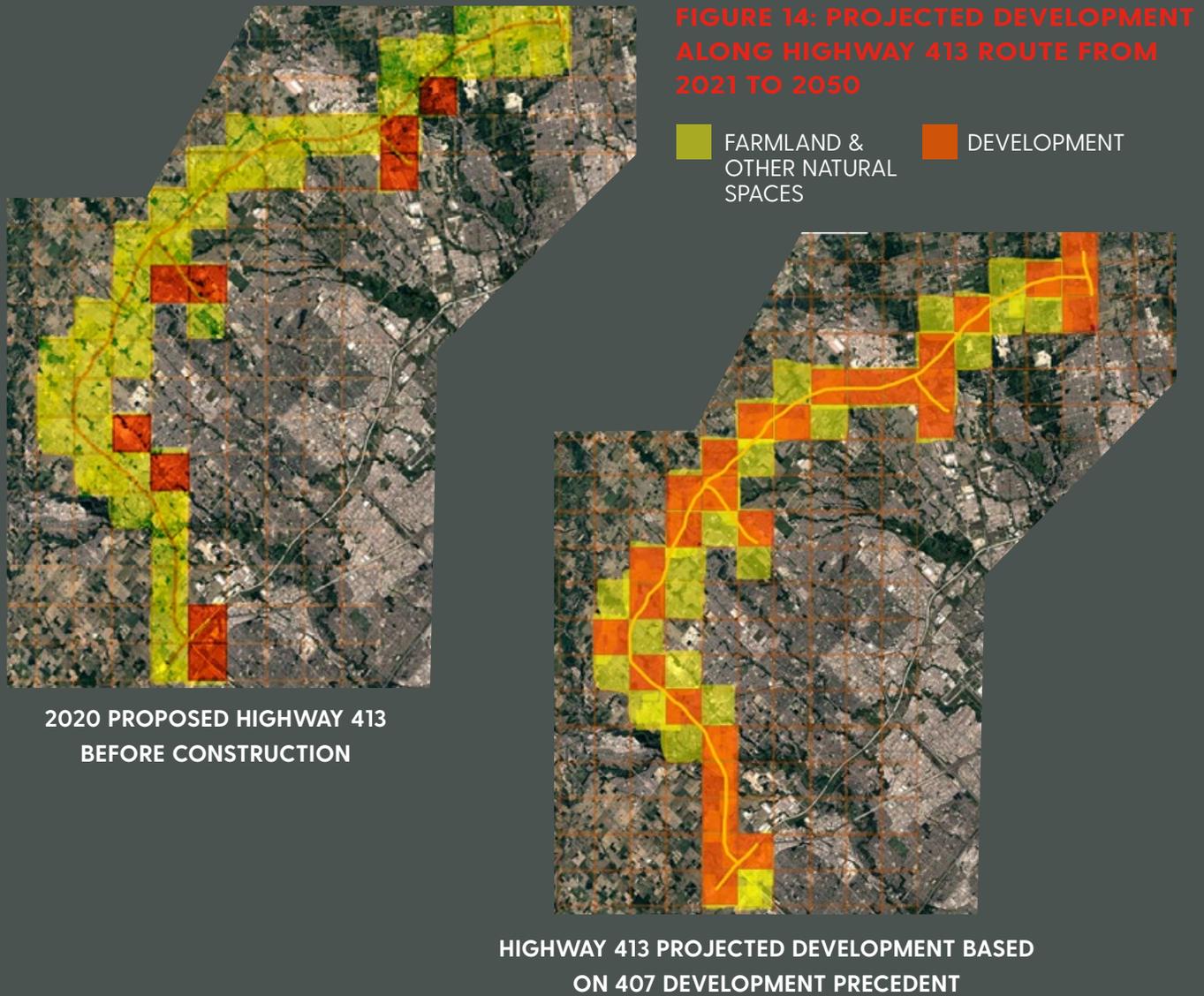


**FIGURE 13: HIGHWAY 407 ROUTE IN 2018**

34 years after the 407 was built, most of the farmland near the highway was converted to residential and commercial sprawl. Based on this, it is expected the same will happen to the farmland near the proposed route of Highway 413

Source: Eunomia Research & Consulting

We analyzed the rate of growth from the lands along the 407 (as well as along Highway 410) and applied the same rate of development to the proposed 413 route.



Is the Province willing to pave over this much prime farmland, despite the fact that farmland brings \$11 billion in economic activity to the Greater Golden Horseshoe every year?<sup>33</sup> Or will Ontario truly value the green spaces and farmland we have left in Southern Ontario, and shelve this highway once and for all?

# ARE THERE BETTER WAYS TO MOVE PEOPLE IN THE GTA WEST REGION?

The GTA West region is growing quickly, and transportation infrastructure needs to grow along with it. But there are better, more cost-effective ways to get people where they need to go than racing to build a new highway.

Here are two viable alternatives to be considered before committing to a new highway:

- #1 INCREASE INVESTMENT IN PUBLIC TRANSIT**
- #2 PROVIDE TRUCK PRIORITY ON HIGHWAY 407**



# #1 INCREASE INVESTMENT IN PUBLIC TRANSIT

Providing better public transit options could relieve a lot of the congestion commuters in the region face. But cash-strapped municipalities are still waiting on funding for many public transit projects promised long ago, like increased bus rapid transit or light rail for Vaughan, Brampton and Mississauga, and full GO Regional Express Rail on the Kitchener and Milton corridors. The Province could better support these communities by spending \$6 billion on transit.<sup>34</sup>

The table below compares the capital cost, people-moving capacity, and greenhouse gas emissions of the suggested transit options versus Highway 413.

**FIGURE 15: SUMMARY OF PUBLIC TRANSIT INITIATIVES VERSUS HIGHWAY 413**

Source: Environmental Defence, Sustainable Vaughan, Transport Action Ontario

Project	Estimated Cost, \$ Billion	Capacity – People/hour in peak direction
GO Kitchener Service Expansion	1.0	2,000-9,000(a)
GO Milton Service Expansion	3.5	4,000(b)
GO Bolton	0.4	2,000 (c)
Brampton Main St. LRT	0.3	5,000(d)
Dundas BRT	0.5	3,000 (e)
Brampton Queen St. BRT	0.6	3,000 (f)
Major Mackenzie BRT/LRT	0.6	3,000 (f)
<b>TOTAL TRANSIT</b>	<b>6.9</b>	<b>22,000-29,000</b>
<b>Highway 413</b>	<b>6.0</b>	<b>7,000 (g)</b>

More information about the calculations in Figure 15 can be found in Environmental Defence's 2020 Report: *Is Building Highway 413 the Best Option?*<sup>35</sup>



# #2 PROVIDE TRUCK PRIORITY ON HIGHWAY 407

Highway 407 is an underused private toll road that runs just south of the planned 413 route and parallel to the 401, for more than 100 kms across the northern GTA. The costly tolls, run by a private company after the Province sold off most of the route, are a barrier which stops most cars and trucks from using the massive highway.

But what if the tolls were reduced or eliminated for trucks, helping speed up goods movement and free up more space on other highways? Truck priority on Highway 407 would be a cheaper, faster, easier alternative which would destroy no additional land.

In 2017, the Province's expert panel advised that "providing truck priority on Hwy. 407 through additional highway capacity or subsidy (e.g., trucks would pay no toll) would deliver travel time benefits that are similar to the new GTAW corridor."

The expert panel suggested even more alternatives, such as congestion pricing, better land use planning, and maximizing other existing highways in the region. A list of these can be found in our 2020 report "*Is Building Highway 413 the Best Option?*"<sup>36</sup>

Photo Credit: Highway 407 by Danielle Scott via Flickr Creative Commons



# CONCLUSION

**It's time for the provincial government to take a look at the evidence on the table and prioritize the well-being of Ontario residents. The responsible decision is to cancel Highway 413 and carefully consider viable alternatives like improved transit and more effective use of Highway 407.**

The stakes are high. The world is facing an undeniable climate catastrophe. The cars and trucks spewing out greenhouse gases are also spewing out toxic air pollution, making the GTA home to some of the dirtiest air in the country due to its many existing mega-highways.

Sprawl is running rampant through Ontario's green spaces and farmlands as the province changes laws to help wealthy developers skirt around the rules that limit unchecked development. Warehouses and Distribution Centres are going up on wetlands and farms at an alarming rate.

The evidence is this report shows that Highway 413 would make all of these problems substantially worse, for very little gain. It's clear that developers want to cash in on building alongside Highway 413. But our farmlands, our green spaces, our rivers, our climate, our air, and our future is not for sale.

It's time for the Province to stand up and say this once and for all by cancelling Highway 413.



# Methodology

Eunomia Research & Consulting's methodology is available at this link: <https://d36rd3gki5z3d3.cloudfront.net/wp-content/uploads/2021/04/Eunomia-GTA-West-Highway-Report-METHODOLOGY-Apr27.pdf>

# References

- <sup>1</sup> GTA West Advisory Panel Report, May 2017, <https://web.archive.org/web/20190618160500/http://www.mto.gov.on.ca/english/publications/gta-west-report/index.shtml>.
- <sup>2</sup> Ecojustice, Letter to the Honourable Jonathan Wilkinson, Feb 3, 2021, <https://d36rd3gki5z3d3.cloudfront.net/wp-content/uploads/2021/02/2021-02-03-GTA-West-EA-request.pdf>
- <sup>3</sup> Environmental Registry of Ontario, Proposed regulation for a streamlined environmental assessment process for the Ministry of Transportation's Greater Toronto Area West Transportation Corridor project, July 2020, <https://ero.ontario.ca/notice/019-1882>.
- <sup>4</sup> Government of Ontario, Preferred Route Announcement - GTA West Study, August 2020, [https://www.gta-west.com/wp-content/uploads/2020/08/Preferred-Route-and-2020-FAA-Bulletin\\_Aug-2020\\_Final.pdf](https://www.gta-west.com/wp-content/uploads/2020/08/Preferred-Route-and-2020-FAA-Bulletin_Aug-2020_Final.pdf).
- <sup>5</sup> "Greenhouse Gas Equivalency Calculator", U.S. EPA, last modified Oct 2108, <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>
- <sup>6</sup> Hermina Paull, "Canada Not Likely to Meet its Electric Vehicle Sales Target by 2025 Despite Rebates," The Deep Dive, Nov 14, 2020, <https://thedeepdive.ca/canada-not-likely-to-meet-its-electric-vehicle-sales-target-by-2025-despite-rebates/#:~:text=Transport%20Canada%20has%20recently%20revealed,2030%20and%20100%25%20by%202040>.
- <sup>7</sup> Government of Canada, National inventory Report 1990-2018: Greenhouse Gas Sources and Sinks in Canada, 2020, Table A-12, [http://publications.gc.ca/collections/collection\\_2020/eccc/En81-4-2018-3-eng.pdf](http://publications.gc.ca/collections/collection_2020/eccc/En81-4-2018-3-eng.pdf).
- <sup>8</sup> The Atmospheric Fund, Reality Check: Carbon Emissions Inventory for the GTHA, Feb 2020, [https://taf.ca/wp-content/uploads/2021/02/TAF\\_RealityCheck-Emissions-Inventory-2018.pdf](https://taf.ca/wp-content/uploads/2021/02/TAF_RealityCheck-Emissions-Inventory-2018.pdf).
- <sup>9</sup> Ibid
- <sup>10</sup> Ibid
- <sup>11</sup> National Centre for Sustainable Transportation, University of California, Davis, Increasing Highway Capacity Unlikely to Relieve Traffic Congestion, Oct 2015, [https://cal.streetsblog.org/wp-content/uploads/sites/13/2015/11/10-12-2015-NCST\\_Brief\\_InducedTravel\\_CS6\\_v3.pdf](https://cal.streetsblog.org/wp-content/uploads/sites/13/2015/11/10-12-2015-NCST_Brief_InducedTravel_CS6_v3.pdf).
- <sup>12</sup> Ronald T. Milam et al, Closing the Induced Vehicle Travel Gap Between Research and Practice, Jan 2017, <https://journals.sagepub.com/doi/10.3141/2653-02>.
- <sup>13</sup> Environmental Defence, Yours to Recover: A Progress Report on Ontario's Climate Change Actions, Dec 2020, [https://d36rd3gki5z3d3.cloudfront.net/wp-content/uploads/2020/12/YoursToRecover\\_OntarioClimateProgressReport\\_EnvironmentalDefence\\_FINAL.pdf](https://d36rd3gki5z3d3.cloudfront.net/wp-content/uploads/2020/12/YoursToRecover_OntarioClimateProgressReport_EnvironmentalDefence_FINAL.pdf)
- <sup>14</sup> Hermina Paull, "Canada Not Likely to Meet its Electric Vehicle Sales Target by 2025 Despite Rebates," The Deep Dive, Nov 14, 2020, <https://thedeepdive.ca/canada-not-likely-to-meet-its-electric-vehicle-sales-target-by-2025-despite-rebates/#:~:text=Transport%20Canada%20has%20recently%20revealed,2030%20and%20100%25%20by%202040>.
- <sup>15</sup> Government of Canada, National inventory Report 1990-2019: Greenhouse Gas Sources and Sinks: Executive Summary, 2021, <https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/sources-sinks-executive-summary-2021.html>
- <sup>16</sup> From <https://www.nationalobserver.com/2019/09/04/analysis/canadian-cars-are-worlds-dirtiest-ev-age-essential#:~:text=VEHICLE%20LIFESPAN%20EMISSIONS%20%E2%81%A0%E2%80%94%20The,the%20lifespan%20of%20the%20car>.

# References

- <sup>17</sup> The Atmospheric Fund, Reality Check: Carbon Emissions Inventory for the GTHA, Feb 2020, [https://taf.ca/wp-content/uploads/2021/02/TAF\\_RealityCheck-Emissions-Inventory-2018.pdf](https://taf.ca/wp-content/uploads/2021/02/TAF_RealityCheck-Emissions-Inventory-2018.pdf).
- <sup>18</sup> Government of Canada, National inventory Report 1990–2018: Greenhouse Gas Sources and Sinks in Canada, 2020, Table A-12, [http://publications.gc.ca/collections/collection\\_2020/eccc/En81-4-2018-3-eng.pdf](http://publications.gc.ca/collections/collection_2020/eccc/En81-4-2018-3-eng.pdf).
- <sup>19</sup> “Net-Zero Emissions by 2050,” Government of Canada, last modified April 2021, <https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/net-zero-emissions-2050.html>.
- <sup>20</sup> Environmental Defence, Clearing the Air: How electric vehicles and cleaner trucks can reduce pollution, improve health and save lives in the Greater Toronto and Hamilton Area, June 2020, <https://clearingtheair.ca/wp-content/uploads/2020/06/Clearing-The-Air-OPHA-EDC-Final.pdf>.
- <sup>21</sup> Health Effects Institute, Traffic-related air pollution: A critical review of the literature on emissions, exposure, and health effects, Executive Summary, 2010, [https://www.healtheffects.org/system/files/SR17TrafficReview\\_Exec\\_Summary.pdf](https://www.healtheffects.org/system/files/SR17TrafficReview_Exec_Summary.pdf)
- <sup>22</sup> Ontario Federation of Agriculture, Farmland at Risk Report, 2018, <https://ofa.on.ca/resources/farmland-at-risk-report/>.
- <sup>23</sup> Environmental Defence, Clearing the Air: How electric vehicles and cleaner trucks can reduce pollution, improve health and save lives in the Greater Toronto and Hamilton Area, June 2020, <https://clearingtheair.ca/wp-content/uploads/2020/06/Clearing-The-Air-OPHA-EDC-Final.pdf>.
- <sup>24</sup> Environmental Defence, Clearing the Air: How electric vehicles and cleaner trucks can reduce pollution, improve health and save lives in the Greater Toronto and Hamilton Area, Stakeholder Report, June 2020, <https://clearingtheair.ca/wp-content/uploads/2020/06/Clearing-The-Air-Stakeholder-Report.pdf>.
- <sup>25</sup> GTA West Advisory Panel Report, May 2017, <https://web.archive.org/web/20190618160500/http://www.mto.gov.on.ca/english/publications/gta-west-report/index.shtml>.
- <sup>26</sup> Dianne Saxe, “Why Urban Sprawl is Ontario’s Oil Sands,” (blog), Feb 3, 2020, <https://ontarioplanners.ca/blog/planning-exchange/february-en/why-urban-sprawl-is-ontario%E2%80%99s-oil-sands>
- <sup>27</sup> The Atmospheric Fund, Reality Check: Carbon Emissions Inventory for the GTHA, Feb 2020, [https://taf.ca/wp-content/uploads/2021/02/TAF\\_RealityCheck-Emissions-Inventory-2018.pdf](https://taf.ca/wp-content/uploads/2021/02/TAF_RealityCheck-Emissions-Inventory-2018.pdf).
- <sup>28</sup> “Population Growth,” Region of Peel, last modified 2019, <https://www.peelregion.ca/strategicplan/20-year-outcomes/population-growth.asp>
- <sup>29</sup> The Atmospheric Fund, Reality Check: Carbon Emissions Inventory for the GTHA, Feb 2020, [https://taf.ca/wp-content/uploads/2021/02/TAF\\_RealityCheck-Emissions-Inventory-2018.pdf](https://taf.ca/wp-content/uploads/2021/02/TAF_RealityCheck-Emissions-Inventory-2018.pdf).
- <sup>30</sup> Regional Municipality of Peel, Climate Change Master Plan, 2019, <https://www.peelregion.ca/climate-energy/pdf/Climate-Change-Plan.pdf>
- <sup>31</sup> City of Brampton, Heritage Heights: Let’s make it right, (slide presentation), 2020, <https://www.brampton.ca/EN/Business/planning-development/projects-studies/Heritage-Heights/Documents/Heritage%20Heights%20-%20Let's%20make%20it%20right.pdf>
- <sup>32</sup> Ontario Federation of Agriculture, Farmland at Risk Report, 2018, <https://ofa.on.ca/resources/farmland-at-risk-report/>.
- <sup>33</sup> Ontario Federation of Agriculture, Farmland at Risk - Greater Golden Horseshoe, Jan 2018, <https://ofa.on.ca/wp-content/uploads/2018/01/Farmland-at-risk-How-better-land-use-planning-could-help-ensure-a-healthy-future-for-agriculture-in-the-Greater-Golden-Horseshoe.pdf>.
- <sup>34</sup> Environmental Defence, Sustainable Vaughan, Transport Action Ontario, Is Building Highway 413 the Best Option? Aug 2020, [https://d36rd3gki5z3d3.cloudfront.net/wp-content/uploads/2021/04/Report\\_IsBuildingHighway413TheBestOption\\_Updated\\_Final\\_EDC.pdf](https://d36rd3gki5z3d3.cloudfront.net/wp-content/uploads/2021/04/Report_IsBuildingHighway413TheBestOption_Updated_Final_EDC.pdf)
- <sup>35</sup> Ibid