

# Sustainable Transportation

## Strategy February 2018



Project No. 102326

# Development of Mode Share Targets

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Region of Peel Sustainable Transportation Strategy



Prepared for Region of Peel  
by IBI Group

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# Table of Contents

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<b>1</b>	<b>Introduction .....</b>	<b>1</b>
1.1	Purpose.....	1
1.2	Approach.....	1
1.3	Context.....	3
1.3.1	Existing trends and conditions .....	3
1.3.2	Future land-use and travel demand .....	4
1.3.3	Forecasting mode share targets in 2041 .....	4
<b>2</b>	<b>Walking Mode Share Targets.....</b>	<b>7</b>
2.1	Trends analysis.....	7
2.2	Potential factors for walking.....	10
2.3	Mode share increase potential for walking in 2041 .....	11
<b>3</b>	<b>Cycling Mode Share Targets .....</b>	<b>14</b>
3.1	Trends analysis.....	14
3.2	Potential factors for future cycling trips.....	17
3.3	Mode share increase potential for cycling in 2041 .....	17
<b>4</b>	<b>Feasibility of Walk and Cycle Mode Share Targets.....</b>	<b>21</b>
<b>5</b>	<b>Transit Mode Share Targets .....</b>	<b>24</b>
5.1	Trends analysis.....	24
5.2	Potential factors for future transit trips.....	28
5.3	Mode share increase potential for transit in 2041 .....	29
<b>6</b>	<b>Carpool Mode Share Targets.....</b>	<b>33</b>
6.1	Trends analysis.....	33
6.2	Potential factors for future carpooling trips .....	37
6.3	Mode share increase potential for carpooling in 2041 .....	37
<b>7</b>	<b>Telework Targets .....</b>	<b>41</b>
<b>8</b>	<b>Summary of STS mode share targets for 2041 .....</b>	<b>46</b>
	<b>Appendix A – Maps of zone factors .....</b>	<b>51</b>

# 1 Introduction

## 1.1 Purpose

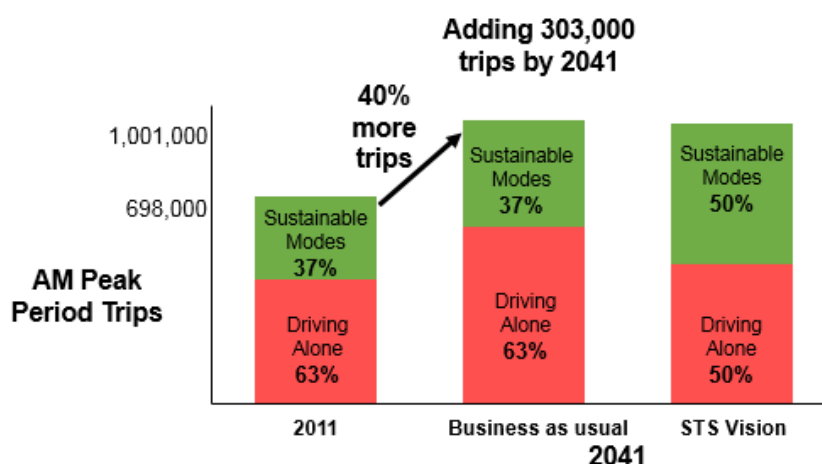
This report details the results and methods used to develop the sustainable transportation mode share targets for the Region of Peel for the years 2021, 2031 and 2041. Sustainable transportation modes considered in the Sustainable Transportation Strategy (STS) include walk, cycle, transit and carpooling, as well as the trips avoided by telework.

The mode share targets support the Sustainable Transportation Strategy's (STS) vision and will inform the development of program and policies in the next stages of the STS. The targets will also inform the mode shares used in the Region of Peel's Long Range Transportation Plan travel demand forecasts.

The STS has set a 50%-50% mode share target by 2041 for sustainable transportation and single auto occupancy trips – see Exhibit 1.1. Sustainable transportation modes are essentially defined as modes other than single occupant vehicles – namely walking, cycling transit and carpooling. The significant increase in sustainable transportation is aligned with the STS vision that aims for the creation of an effective, efficient, clean and balanced transportation system that will provide practical, attractive, equitable and integrated transportation choices for residents and visitors to the Region of Peel in the year 2041.

The ambitious mode share targets aim to significantly slow the increase in congestion in the Region by reducing the mode share of auto trips. The target reflects the reality that, in the absence of travel behaviour changes, Peel Region could not realistically expand road capacity to meet future auto demands.

**Exhibit 1.1: Mode share targets for Region of Peel in 2011 and 2041**

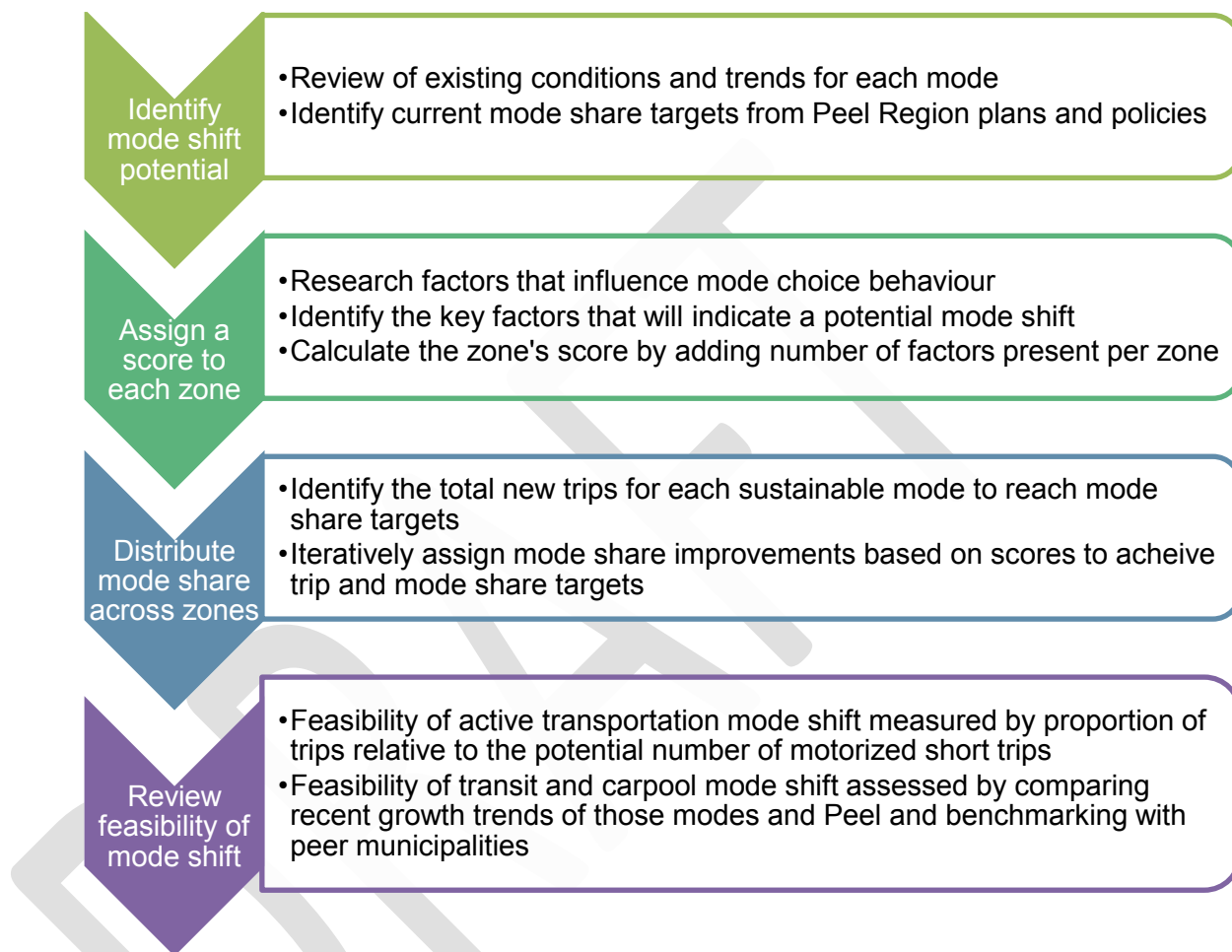


## 1.2 Approach

The mode share targets of 50% for sustainable transportation reflect the STS's ambitious vision to significantly increase the choice of travel in the Region of Peel. The distribution of the increase in mode share will not be uniform across the region – various investments in infrastructure and changes in land-use will vary the potential for an increase in sustainable mode

within the Region. Similarly, through other STS tasks, it may be determined that certain areas have a higher potential for mode shifts in response to policies or programs.

This analysis utilized a structured approach to assess and develop mode share targets across the region based on the following four steps:



The development of targets for each mode started with a review of the mode targets set by current policies and plans, see Exhibit 1.2. These overall modal targets were then adjusted based on input from STS Working Group meetings, a detailed analysis of current behaviour trends, and comparison to other GTHA areas (in the case of transit mode shares).

Once a regional targets were, the distribution of growth in sustainable modes across Peel communities was calculated by developing a scoring that ranks the potential for an increase of each mode based on a set of factors. These factors have been demonstrated to support higher levels of mode share, such as certain population and employment density to support higher transit usage. Each zone receives a score based on the number of factors present in that zone.

Once the score of each zone is identified, an iterative process was used to increase the future mode share of each zone to meet the regional mode share targets. For example, to meet the walking mode share of 9% by 2041 in Peel, 45,000 walking trips are required in the region. The zones with the highest score are assigned the highest mode share

increases as they have the most potential for that mode. The feasibility of the increase in trips is then assessed to ensure that the increase in trips are attainable in each zone. For example, each zone must have more walkable motorized trips under 2km (potential walk trips) than the projected increase in walk trips in 2041. For walking and cycling the feasibility of the mode share targets is assessed based on the available short trips per zone. For transit and carpooling, the feasibility is assessed by comparing the growth rate of each mode to recent trends in the Region.

**Exhibit 1.2 Policy based mode targets from Region of Peel and Municipal plans**

MODE	LOCATION	MODE SHARE TARGET AND TIME HORIZON	DOCUMENT
Walk & Cycle	Region of Peel	10% long term goal	Region of Peel's Active Transportation Plan (2012)
	City of Mississauga	10% long term goal	Moving Mississauga From Vision to Action (2011)
	City of Brampton	6% long term goal	City of Brampton Transportation Master Plan Update (2015)
Transit	City of Mississauga	18% AM Peak Period by 2031	Moving Mississauga From Vision to Action (2011)
	City of Brampton	16% PM Peak Period by 2041	City of Brampton Transportation Master Plan Update (2015)
Carpooling	City of Brampton	28% PM Peak Period by 2041	City of Brampton Transportation Master Plan Update (2015)

## 1.3 Context

### 1.3.1 Existing trends and conditions

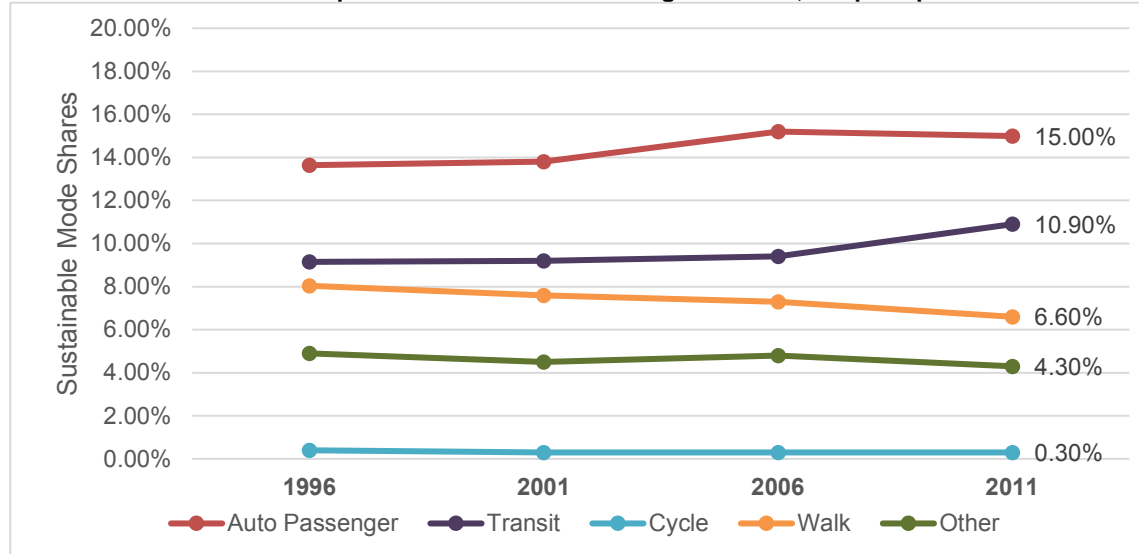
The historical trends of sustainable modes in the Region of Peel are evaluated using the Transportation Tomorrow Survey (TTS) data, which contains a detailed source of information about travel behaviour for each mode.

The sustainable transportation mode share in the Region of Peel was 37% in 2011, and has been slowly growing since 1996, primarily due to increased auto passenger and transit use. The region's population and employment have grown, increasing the travel demand by 60% in the AM peak period from 417,500 trips in 1996, to 669,000 trips in 2011.

In the AM Peak Period, the purpose of trips is 45% for work, 24% for school, 14% to drop off a passenger and 17% for other purposes. In the AM Peak Period, over 55% of active transportation trips are made by students travelling to school, and 48% of auto passengers are travelling to school. 75% of commuters drive to work, and the rest prefer to use carpooling and transit as alternatives to driving. Those commuting within Peel Region are more likely to use carpooling and local transit, whereas those commuting to Toronto are more likely to use GO transit.

A detailed analysis of travel behaviour trends for each mode is presented in sections 3-7.

**Exhibit 1.3 Sustainable transportation mode shares in Region of Peel, AM peak period**



### 1.3.2 Future land-use and travel demand

Over the next 25 years (to 2041), the Region of Peel is expected to grow in population and employment by 40%<sup>1</sup>. This represents a 46% increase in population and 49% increase in employment compared to 2011, the base year for the Peel Region model. This growth will change the character and density of certain neighbourhoods, and it will also continue to increase in travel demand, putting more pressure on an already strained transportation system. This challenge creates an opportunity to shift travel behaviour to use more sustainable modes of travel.

**Exhibit 1.4 Population and employment forecasts, 2021, 2031 & 2041**

	2011	2021	2031	2041	% change from 2011
<b>Population</b>	1,350,959	1,770,060	1,770,060	1,970,020	+46%
<b>Employment</b>	647,809	763,700	859,850	969,830	+49%

Forecasts of trips in the Region in the future years of 2021, 2031 and 2041 are generated using the Region of Peel's travel demand model— see total trips by interim year in Exhibit 1.5. To ensure that the distribution of trips uses consistent assumptions from base year to future years, the analysis presented in this report uses the total travel demand from the Peel Model for each zone in 2011 instead of the total trips recorded by the TTS, and only the mode shares for each mode is taken from the TTS.

**Exhibit 1.5 AM peak period person trips in 2011, 2021, 2031, 2041 based on Peel Mode**

	2011	2021	2031	2041	% change 2011- 2041
<b>Total Trips in Region of Peel</b>	697,697	893,690	920,330	1,005,381	+ 44%

### 1.3.3 Forecasting mode share targets in 2041

The overall target mode share for sustainable trips in Peel Region is 50% by 2041. This is a working target for the purpose of developing and validating specific targets by individual mode

<sup>1</sup> <http://letsmovepeel.ca>

and geographic area as developed in the remainder of this report. To reach a regional mode share of 50% sustainable modes by 2041, the share of sustainable mode will need to grow by 0.42% per year. Working back from this target, the sustainable mode shares would need to reach 40.9% by 2021 and 46.3% by 2031 as shown in Exhibit 1.6. The mode shares for the interim years are linearly interpolated from the 2041 results. Exhibit 1.7 show the mode shares of all sustainable modes by superzone. A detailed summary of the 2041 mode share targets is provided in Section 8.

The transit mode share will need to see the highest increase in mode share and in total trips, growing from 10.8% to 17%, and an additional 95,000 transit trips by 2041. This ambitious target is in line with the local transit agencies in Brampton and Mississauga's mode share target, and will be supported by significant investment in rapid transit projects, such as the Mississauga transitway, GO Regional Express Rail (RER), high frequency bus routes such as ZUM and the Hurontario LRT.

Carpooling (as defined by auto passenger trips) will also increase significantly from 15.2% to 18% by 2041, with an increase of 75,000 trips. The increase in carpooling trips is much lower than that of the Brampton TMP, but the 18% mode share target is still ambitious and will require significant support from the Region to change travel behaviour. The STS will identify policies and programs to support an increase in carpooling.

Walking and cycling modes will also increase significantly and are expected to reverse the trend of decreasing active transportation mode share from 1996-2011. The STS will identify policies and programs to support an increase in walking and cycling, such as a regional cycling network and programming to support cycling and walking.

The other modes included in the sustainable modes target include school bus, taxi and motorcycle. Telework trips are part of the STS policies and have a separate target, as telework trips are avoided trips, rather than a trip mode. Telework trips are discussed in Section 7.

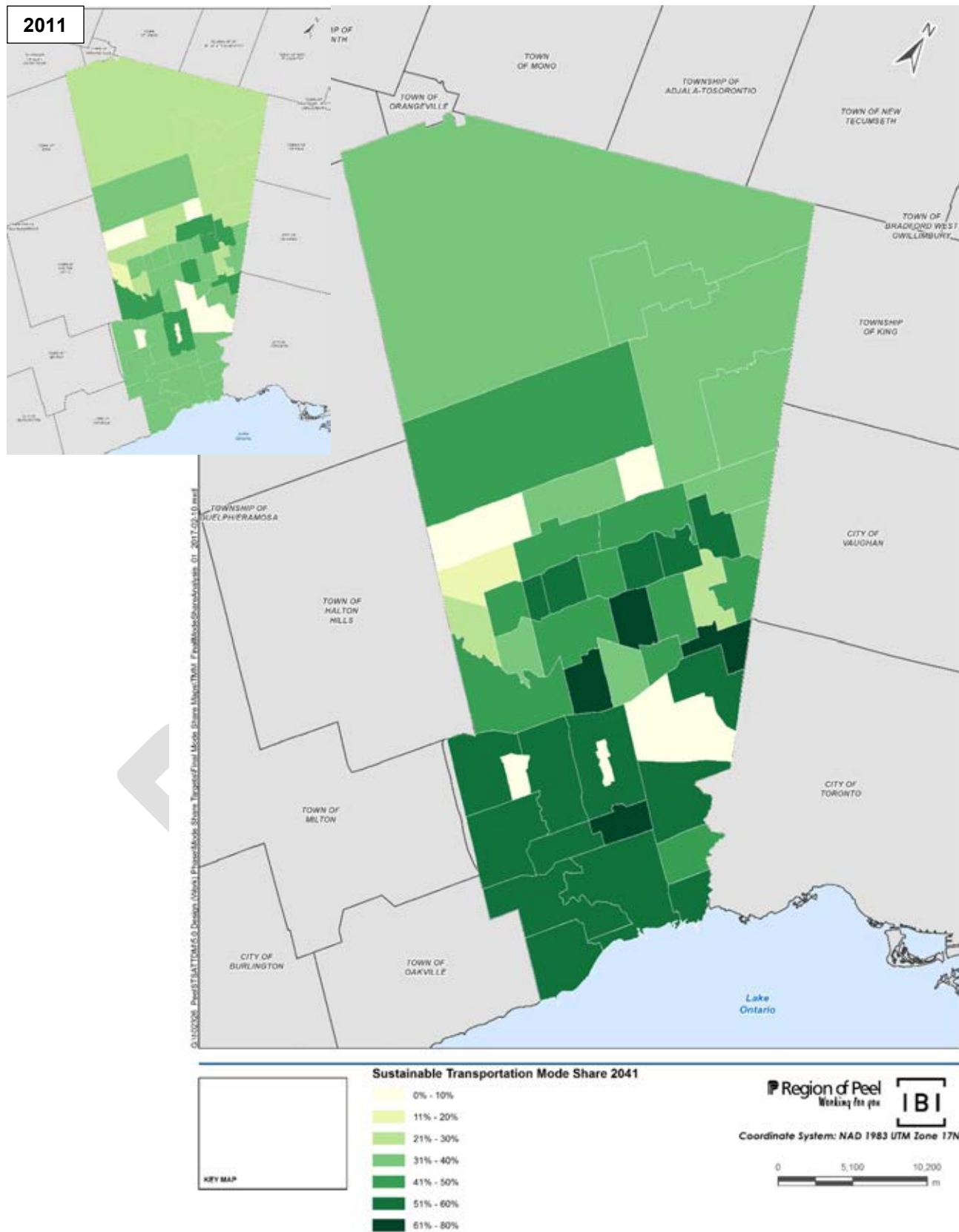
**Exhibit 1.6 Summary of trips and mode share targets for Region of Peel (AM peak period)**

Mode Share in AM Peak Period	2011	2021	2031	2041
<b>Driving</b>	<b>62.5%</b>	<b>59.1%</b>	<b>53.7%</b>	<b>50.0%</b>
Walking	6.8%	7.3%	8.2%	9.0%
Cycling	0.3%	0.8%	1.5%	2.0%
Transit	10.8%	12.3%	14.8%	17.0%
Carpool	15.2%	15.9%	17.1%	18.0%
Other	4.3%	4.7%	4.7%	4.8%
<b>Sustainable Modes</b>	<b>37.4%</b>	<b>40.9%</b>	<b>46.3%</b>	<b>50.0%</b>

Trips in AM Peak Period	2011	2021	2031	2041
<b>Driving</b>	<b>436,351</b>	<b>527,983</b>	<b>494,584</b>	<b>494,137</b>
Walking	47,525	64,695	75,536	90,565
Cycling	2,218	7,192	13,285	20,270
Transit	75,561	109,664	136,199	170,771
Carpool	106,082	142,468	157,278	181,169
Other	29,961	41,688	43,448	48,469
<b>Sustainable Modes</b>	<b>261,347</b>	<b>365,707</b>	<b>425,746</b>	<b>511,244</b>
<b>Total</b>	<b>697,697</b>	<b>893,690</b>	<b>920,330</b>	<b>1,005,381</b>



**Exhibit 1.7 Sustainable transportation mode share in 2011 and 2041, 6:30-9:29 AM**

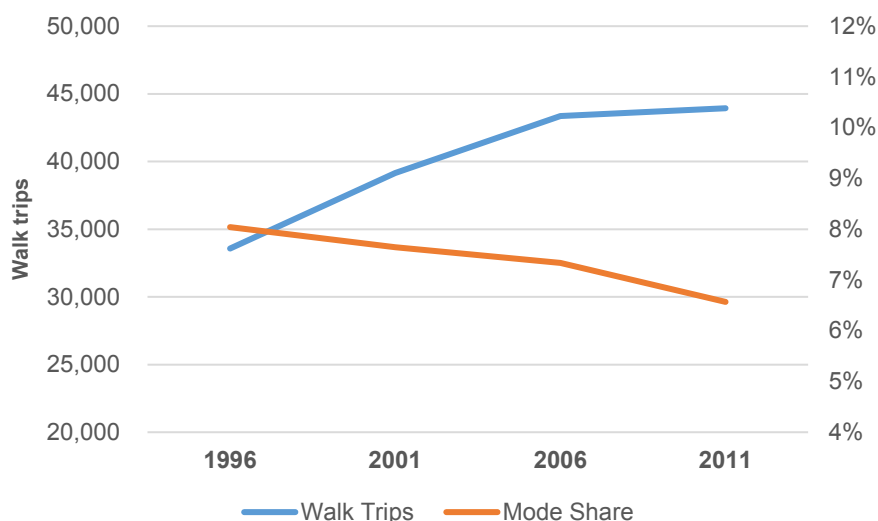


## 2 Walking Mode Share Targets

### 2.1 Trends analysis

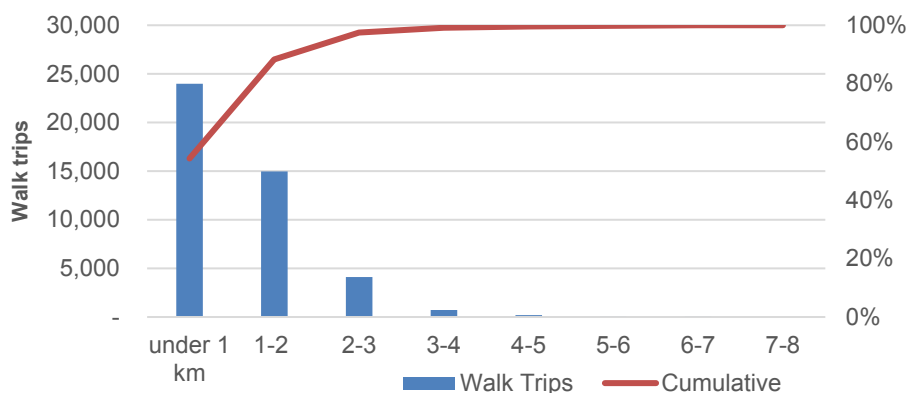
An analysis of the demographics and characteristics of walking trips in the Region can help better predict the potential growth of walking in the Region of Peel. The overall number of walking trips has been increasing steadily in 1996, but the share of walking trips relative to other modes is reducing see Exhibit 2.1. This trend will need to be significantly reversed to achieve the STS mode share target of 9% by 2041.

**Exhibit 2.1 Walking Trip and Mode Share in AM Peak Period, 1996 to 2011**



In 2011, four out of five walking of morning walking trips are from home to school, and the average age of those who walk in Region of Peel is 17 years. Of the 15% of pedestrian who are commuting to work, the most common profession is Retail Sales and Service, and most live in a households with at least one car. Almost all of those trips are under 2km in length –see Exhibit 2.2.

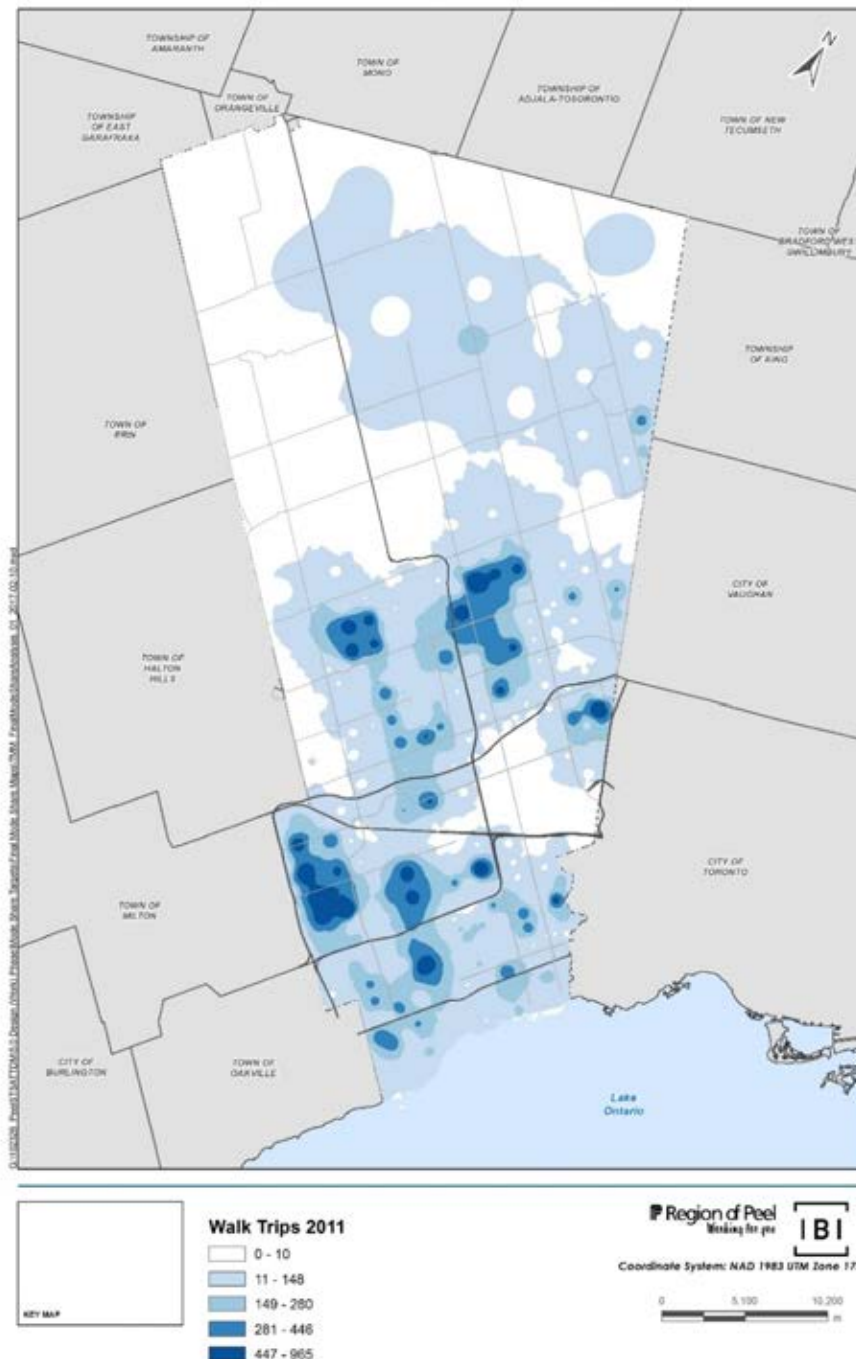
**Exhibit 2.2 Distribution of Walking Trips in the Region of Peel, 2011 TTS AM Peak Period**



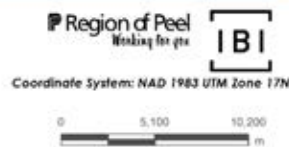
### Areas with high existing walking trips

Exhibit 2.3 illustrates that areas with higher walking trips are located in areas with higher urban density (population and jobs). While the number of trips is affected by size of zone, this map is also a good indication of walk mode shares. An overlay of walk trips and urban density are shown in Exhibit 2.4. It is interesting that some of the areas with high walk trips are in new neighbourhoods on the edges of north Brampton and west Mississauga, suggesting that neighbourhood design and/or demographics may have an influence on walk shares.

### Exhibit 2. Walk Trip Origins (2011 AM Peak Period)



### Exhibit 2.4 Urban density and walking trips in 2011



## 2.2 Potential factors for walking

This study utilizes four zone specific conditions to indicate the potential for an increase in walking mode share for a particular zone. If the threshold for each condition is met, a point is allocated to the zone rank. The justification for the threshold and applicability of each factor is as follows:

### 1. The zone's 2011 walking mode share is greater than 6%.

A walking mode share greater than 6% indicates that the zone is above the average walking mode split for all zones. A higher existing walking mode share indicates something about the geographic characteristics of the zone that encourage walking today and that can be leveraged to encourage more walking in the future. Since there are urban geographic conditions that contribute to walkability, and since these factors are challenging to accurately measure, this study assumes that if a zone currently has a high prevalence for walking, that these pre-existing conditions that indicate better walkability are present in the zone.

### 2. Over 500 daily walkable trips (trips less than 2km).

Trips less than 2 km are considered to be suitable for walking, as shown previously in Exhibit 2.2 the majority (88%) of existing walking trips in Peel are less than 2 km. Zones with a high number of short auto-based trips was used as an indicator potential to shift more trips to walking. Accordingly, zones with more than 500 auto based trips under 2km are given a point in ranking framework.

### 3. Population density greater than 50 persons/ha

While high density alone doesn't necessarily contribute to a higher walking mode share, low density, even with supportive urban form and infrastructure is less likely to achieve conditions for good walkability (e.g. lower speeds, perceived safety). Therefore, it is reasonable to assume a certain density threshold must be realized for walkability and infrastructure and urban design interventions to be viable<sup>2</sup>. A higher population density indicated the potential for walking since there are more potential pedestrians, and because a denser urban form is more likely have more amenities close-by than lower density and suburban neighbourhoods.

### 4. The zone has a mix of residential and employment land-uses

While urban density is important indicators of the viability of walking, a mix of commercial or employment land-uses in proximity of residential uses is more likely to encourage walking than high residential density on its own<sup>3</sup>. Having a mix of land uses presents more opportunities for travel within the zone and for the potential for someone to work and live within their zone to be higher. If a zone has a population density greater than 30 persons/ha and employment density greater than 20 persons/ha in 2041, the zone is allocated one point in the ranking framework. This split indicates a balanced mix of jobs and residents.

<sup>2</sup> Benfield, Kaid (March 4, 2013). "Not All Density Is Created Equal", The Atlantic. Retrieved March 2017, <http://www.citylab.com/housing/2013/03/why-we-need-stop-obsessing-over-density-all-costs/4862/>

<sup>3</sup> Brasuell, James (November 17, 2015). "Planning for Walkability? Concentrate on Commercial Density", Planetizen. Retrieved March 2017, <https://www.planetizen.com/node/82262/planning-walkability-concentrate-commercial-density>

## 2.3 Mode share increase potential for walking in 2041

Depending on the combination of conditions that are met for a specific zone, a score and an associated mode share target is assigned. The scoring system and adjustment to the zone mode share for 2041 is as follows:

- Additional 8% walk mode share to zones with all 4 factors;
- Additional 6% walk mode share to zones with 3 factors;
- Additional 3% walk mode share to zones with 2 factor;
- Additional 1% walk mode share to zones with 1 factor;
- Additional 0.5% walk mode share to zones with no factors.

The total score for each zone is shown in Exhibit 2.6. Once the mode share increases are applied to each zone the mode share are aggregated to the superzone level and show in Exhibit 2.7.

The annual projected increase of walk trips in the Region of Peel is an average of **1435 new trips per year** from 2011 to 2041. Exhibit 2.5 shows the growth in walk trips for each municipality.

While Mississauga and Brampton have similar growth rates of approximately 700 new walk trips per year, Caledon' target is more modest at an increase of 50 trips per year.

**Exhibit 2.5 Growth in trips in Peel municipalities to achieve walking target of 9% by 2041**

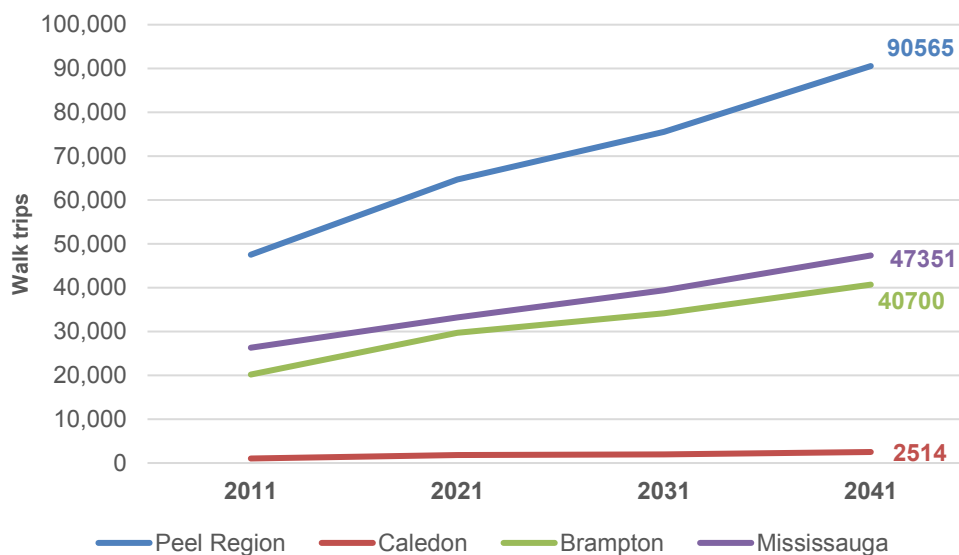
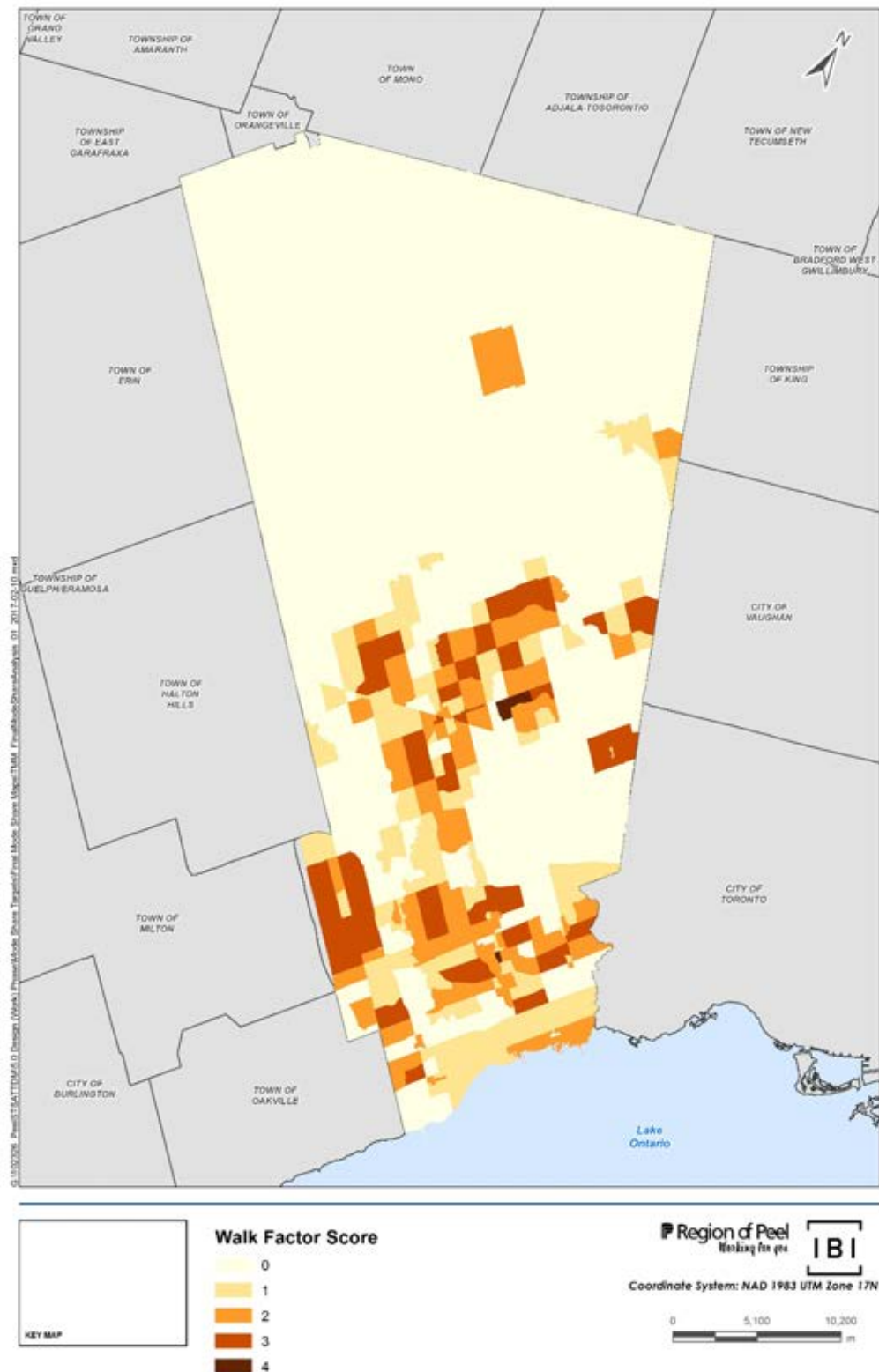
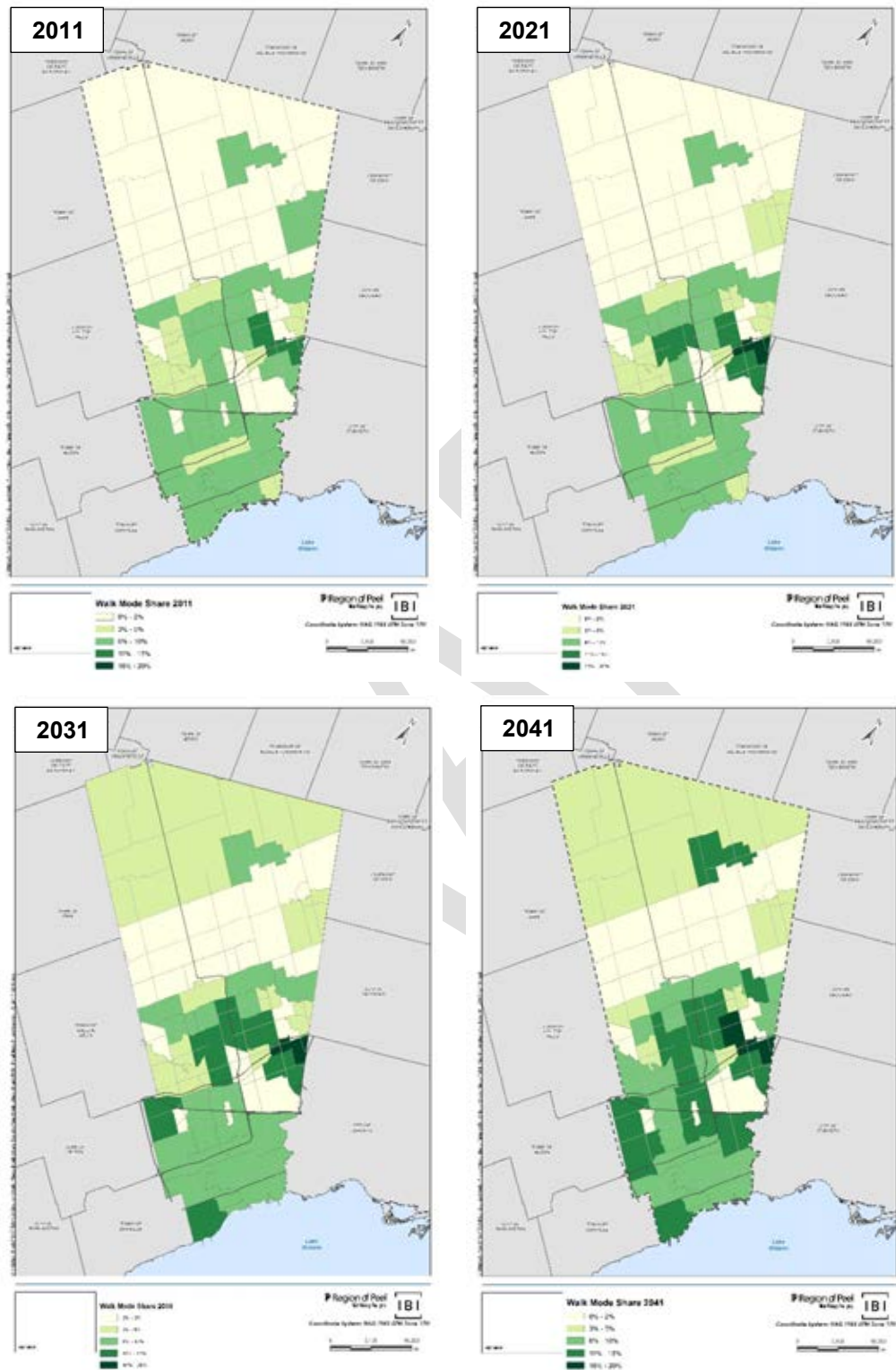




Exhibit 2.6 Walk factor Score



**Exhibit 2.7 Walking mode shares by super zone in 2011, 2021, 2031 and 2041**



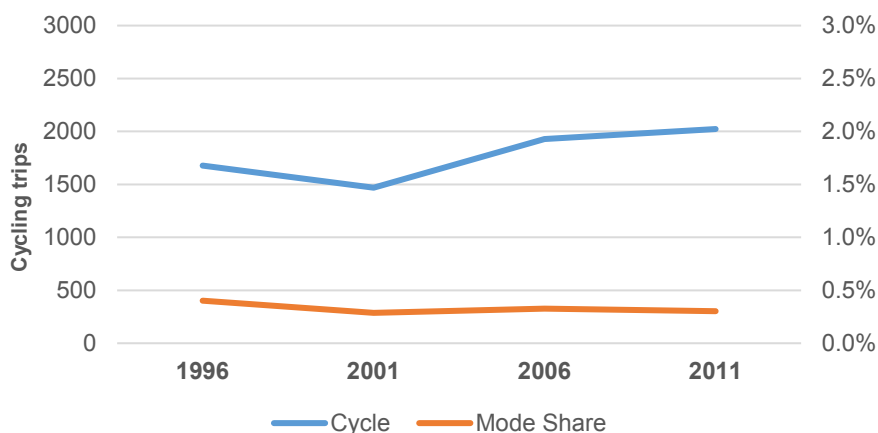


## 3 Cycling Mode Share Targets

### 3.1 Trends analysis

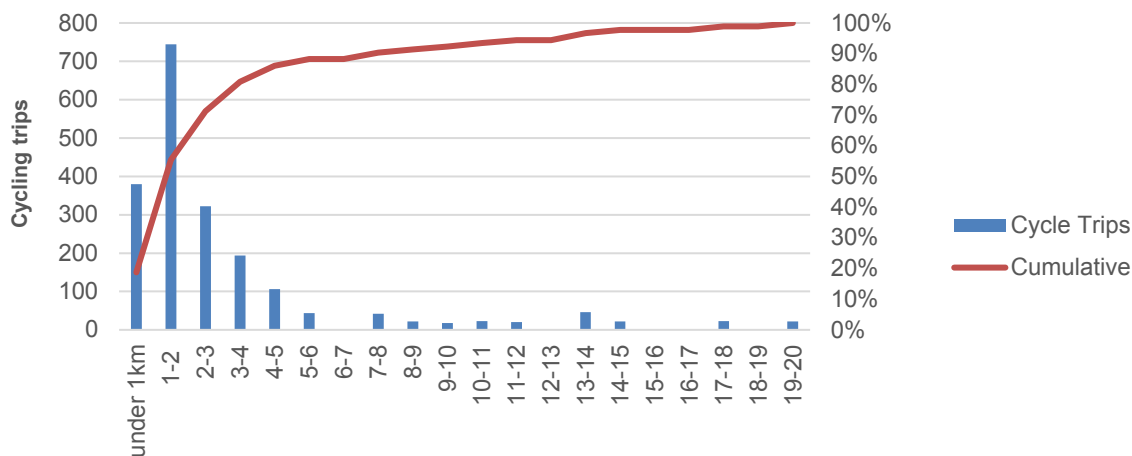
An analysis of the demographics and characteristics of cycling trips can help better predict the potential growth of cycling in the Region of Peel. The overall number of cycling trips has been slowly increasing since 1996, but the share of cycling trips relative to other modes is reducing see Exhibit 3.1. This trend will need to be significantly reversed to achieve the STS mode share target of 2% by 2041.

**Exhibit 3.1 Cycling Trip and Mode Share in AM Peak Period, 1996 to 2011**



In 2011, 35% morning cyclists are commuters and 55% are students. The average age of those who cycle in Region of Peel is 26 years, and 80% of cyclists are male. Of the 35% of morning cyclists who are commuting to work, the most common profession is Retail Sales and Service, and most live in a households with at least one car. Over half of cycling trips are under 2km, and 85% of those trips are under 5km in length – see Exhibit 3.2.

**Exhibit 3.2 Distribution of Cycling Trips in the Region of Peel, 2011 TTS AM Peak Period**

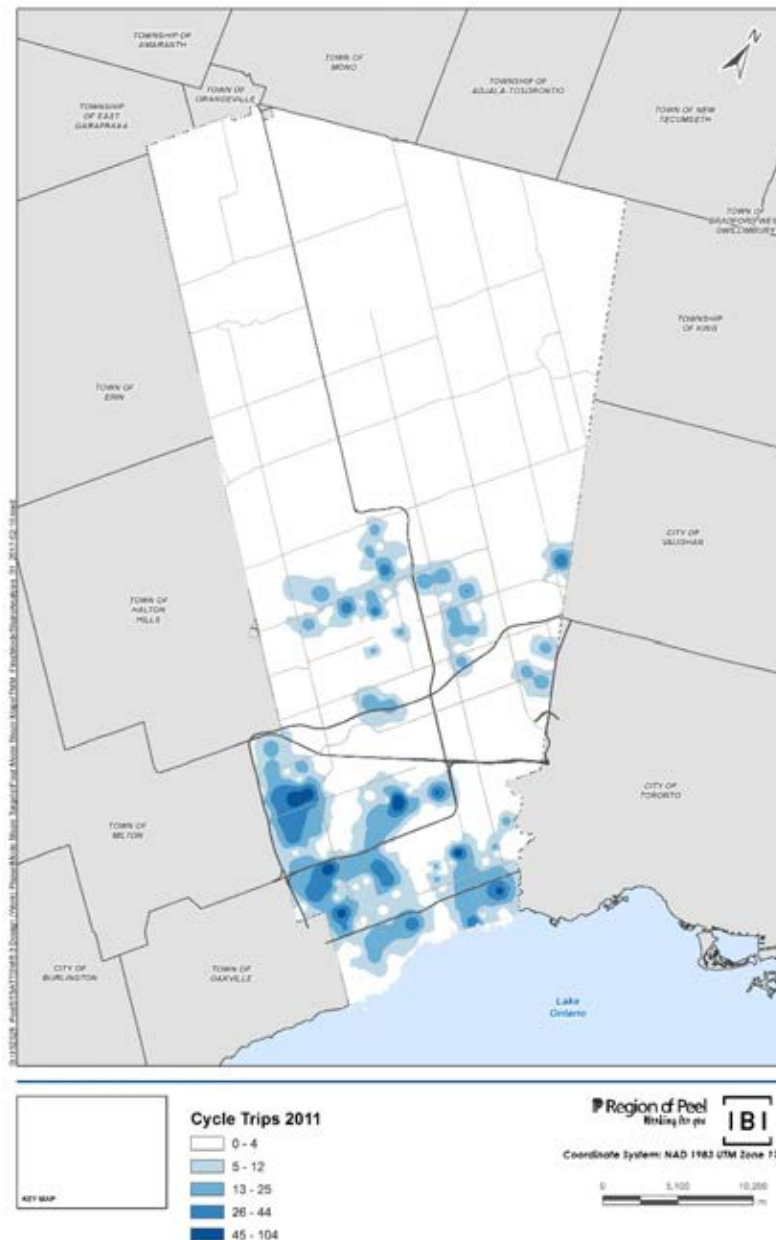


### Areas with high number of cycling trips

Exhibit 3.3 illustrates that areas with higher cycling mode shares are located in newer residential neighbourhoods that have a number of features that are supportive of cycling trips including:

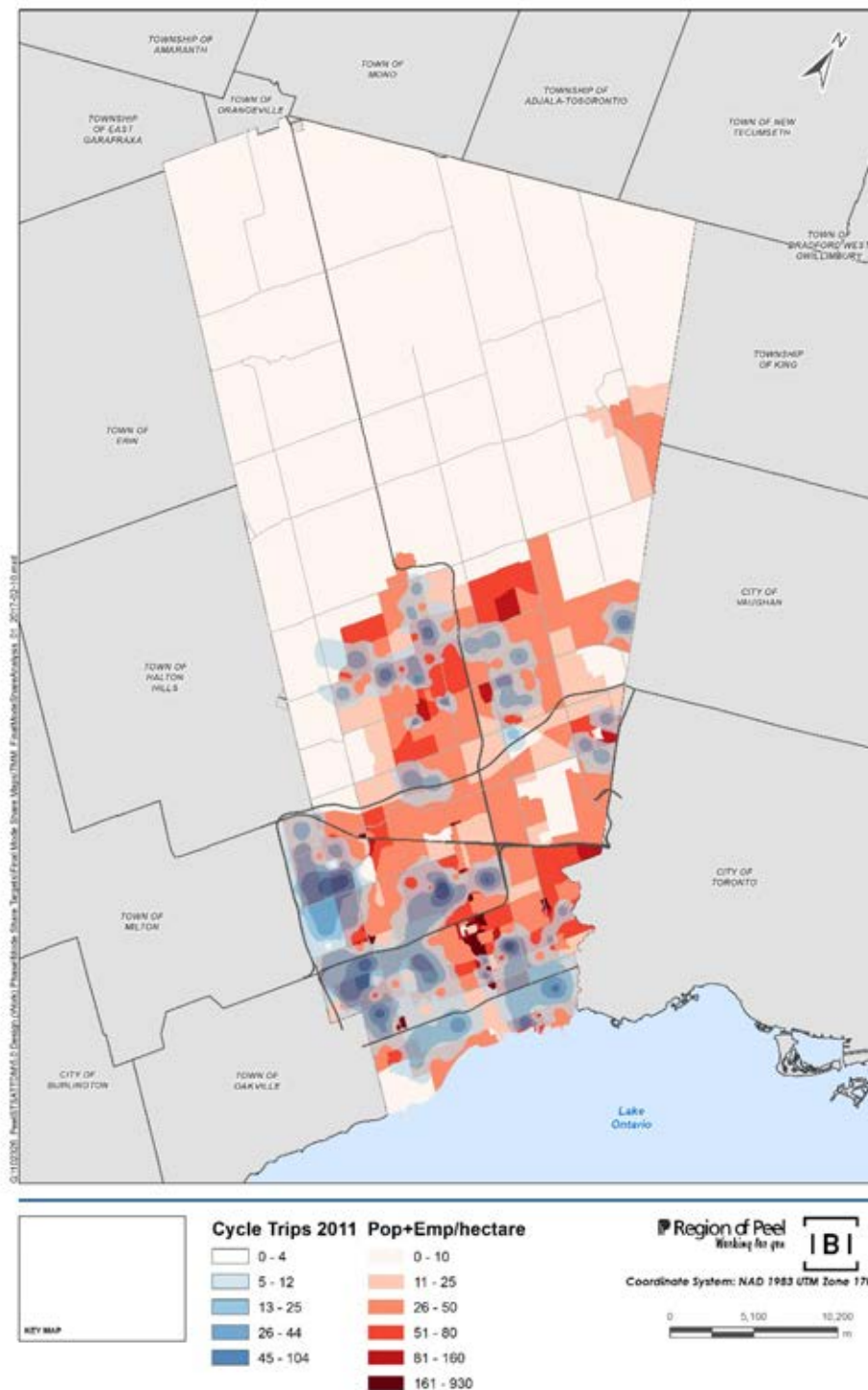
- Connected cycling infrastructure
- Lower traffic speeds
- Grid road network
- Pedestrian oriented urban design

**Exhibit 3.3 Cycling trips origins (2011 AM Peak Period)**



The overlap of urban density and cycling trips in Exhibit 3.4 shows that cycling generally follows increases in urban density. An interesting outlier is in the densest area of Mississauga, near Square One. There are few cycling trips in this area, which may be due to high vehicular traffic and other physical deterrents to cycling, indicating the need for better cycling infrastructure in this area that has a significant potential for cycling trips.

**Exhibit 3.4 Urban density and cycling trips in 2011**



## 3.2 Potential factors for future cycling trips

Similar to the zone specific conditions for walking, cycling has three similar indicators of potential. They are:

### 1. The 2011 cycling mode share is higher than average

A cycling mode share greater than 0.3% indicates that the zone is above the average cycling mode split for all zones. A higher existing cycling mode share indicates something about the geographic characteristics of the zone that encourage cycling today and that can be leveraged to encourage more cycling in the future. Since there are urban geographic conditions that contribute to bikeability, and since these factors are challenging to accurately measure, this study assumes that if a zone currently has a high prevalence for cycling, that these pre-existing conditions that indicate better bikeability are present in the zone.

### 2. The zone has 500 or more auto trips under 5 km

Trips less than 5 km are considered to be suitable for cycling. Over 60% of cycling trips in the Region of Peel are less than 2 km and 85% of cycling trips are under 5 km. Having a high portion of short trips made by auto driver or passengers indicates that the zone has a higher number of trips that are within the feasible distance for a cycling trip. This reflects the land-use characteristics of the zone.

### 3. Urban density is greater than 50 persons/ha in 2041

Population and employment density are important indicators of the viability of cycling, as they indicate areas with a larger number of potential cyclists and destinations in the areas. Similar to walking, high density alone doesn't necessarily contribute to a higher cycling mode share. However, low density, even with supportive urban form and infrastructure is less likely to achieve conditions for good cycling conditions. Therefore, it is reasonable to assume a certain density threshold must be realized for cycling to be attractive and for infrastructure and urban design interventions to be viable and effective.

## 3.3 Mode share increase potential for cycling in 2041

Depending on the combination of conditions that are met for a specific zone, a score and an associated mode share target is assigned. The scoring system and adjustment to the zone mode share for 2041 is as follows:

- Assigned 3% cycling mode share to zones with 3 factors
- Assigned 2.5% cycling mode share to zones with 2 factors
- Assigned 1% cycling mode share to zones with 1 factor
- Assigned 0.5% cycling mode share to zones without factors

The total score for each zone is shown in Exhibit 3.6. Once the mode share increases are applied to each zone the mode share are aggregated to the superzone level and shown in Exhibit 3.7.

The annual projected increase of cycling trips in the Region of Peel is an average of **602 new trips per year** from 2011 to 2041.

The regional target of 2% cycling mode share in 2041 requires that cycling trips increase in:

- Brampton to triple from 2011 to 2041 at a rate of *266 trips/year*
- Mississauga to double from 2011 to 2041 at a rate of *318 trips/year*
- Caledon to increase from 2011 to 2041 at a rate of *18 trips/year*.

**Exhibit 3.5 Growth in trips in Peel municipalities to achieve cycling targets**

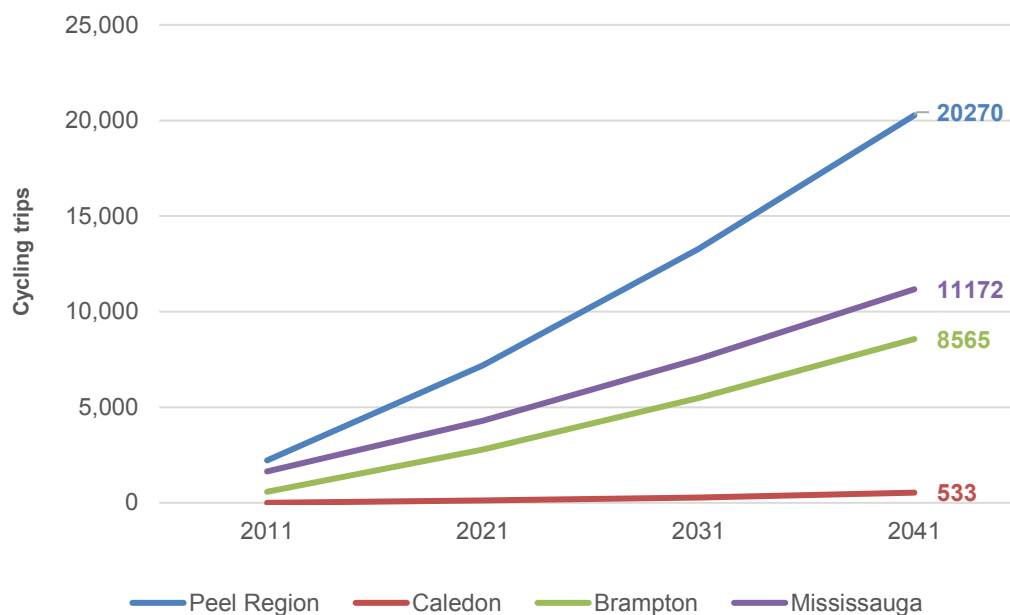


Exhibit 3.6 Cycle factor score

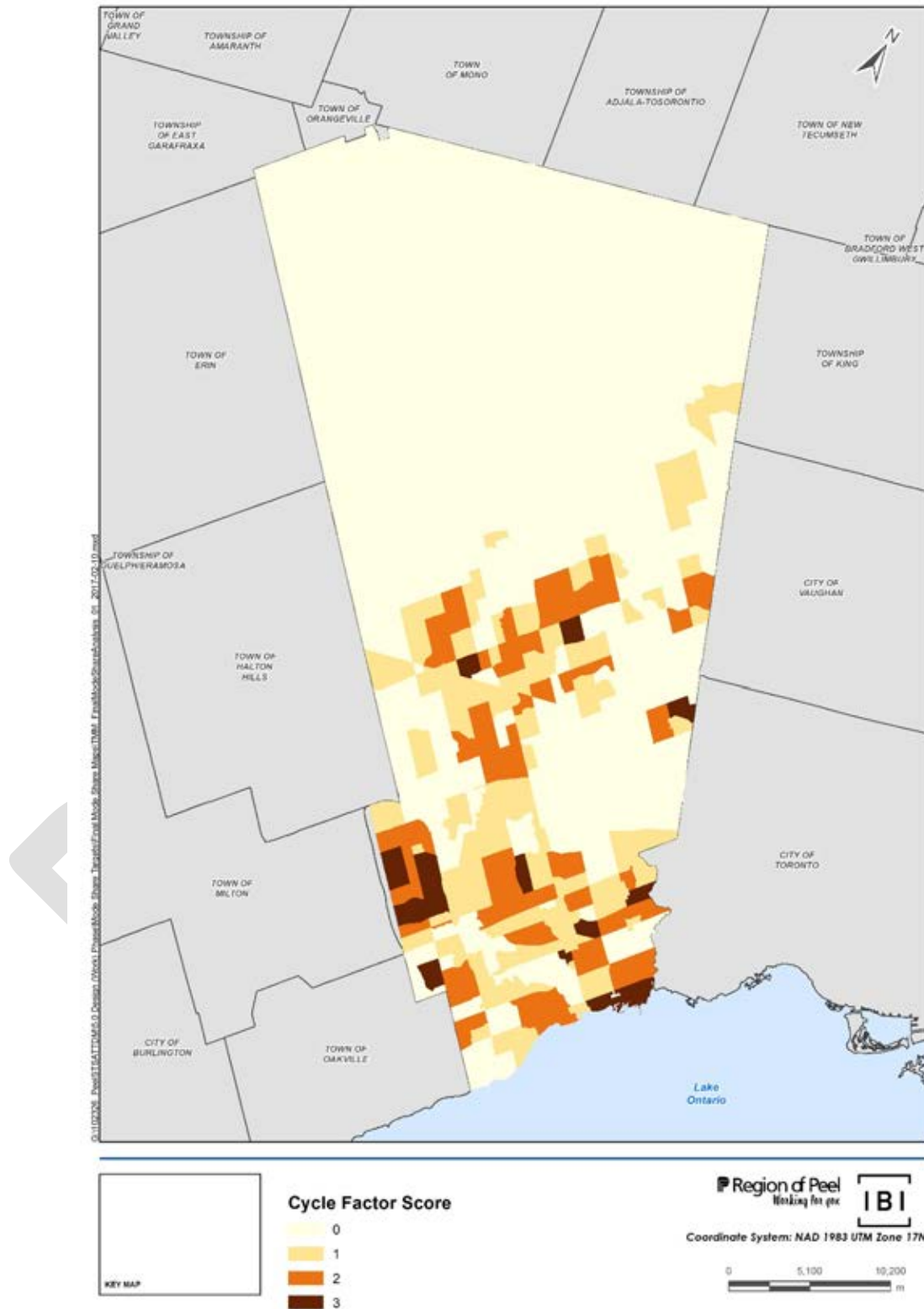
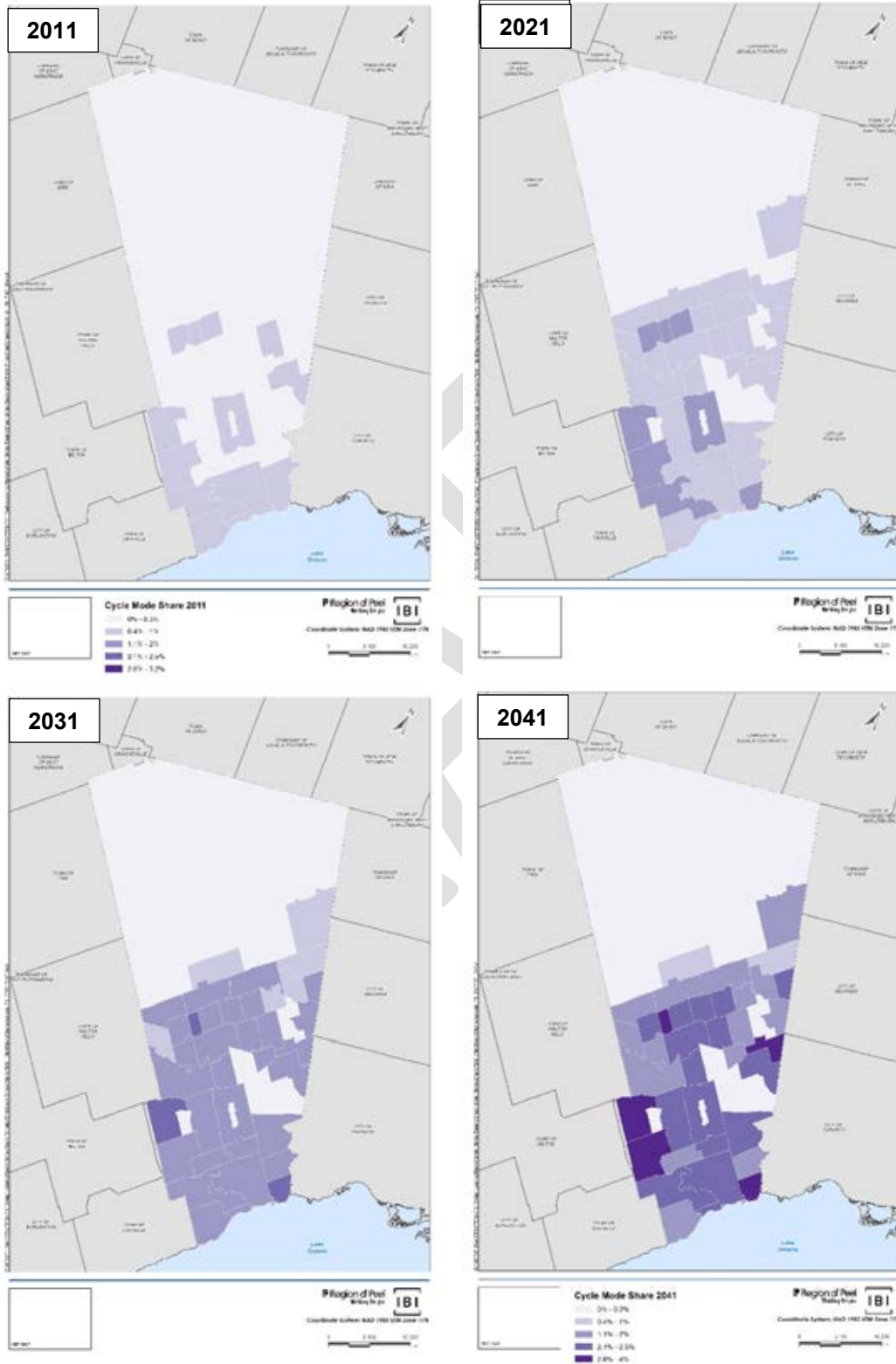


Exhibit 3.7 Cycling mode share by super zone in 2011, 2021, 2031 and 2041





## 4 Feasibility of Walk and Cycle Mode Share Targets

To assess the feasibility of the walk and cycle mode share targets, the proportion of short motorized trips required to shift to active transportation modes is calculate. The shift should not exceed 100%; the proportion of the shift will help gauge the level of effort that programs and policies will require to achieve the travel behavior changes required to meet the mode share targets.

The method to assess the shift in trips first calculates the number of new walking and cycling trips in addition to those already taken in 2011 to achieve the 9% and 2% walking and cycling mode share targets in 2041. The number of short motorized trips in 2041 are calculated by applying the percentage of short trips by zone in 2011 to the trips in 2041, with a slight increase to account for intensification which will most likely increase the number of short trips in the future. The proportion of the shift is simply a ratio of the new walk/cycle trips over the available short trips in each zone. Across the region of Peel the shift for active transportation trips are:

- **25%** shift of motorized trips under 2km to walk, ambitious but feasible
- **8.2%** shift of motorized trips 2-5 km to cycling, very achievable

The shift for walk trips is more significant that of cycling trips, but that is to be expected as the mode share target requires many more trips but the pool of short trips is smaller. Exhibits 4.1 and 4.2 show to ratio of walk/cycle trips to short trips for each traffic zone in the Region of Peel. Zones in red and orange may have too many walk trips to available short motorized trips, and zones in green indicate areas with potential for a higher mode shift.



Exhibit 4.1 Percent of short motorized trips required to shift to walk modes

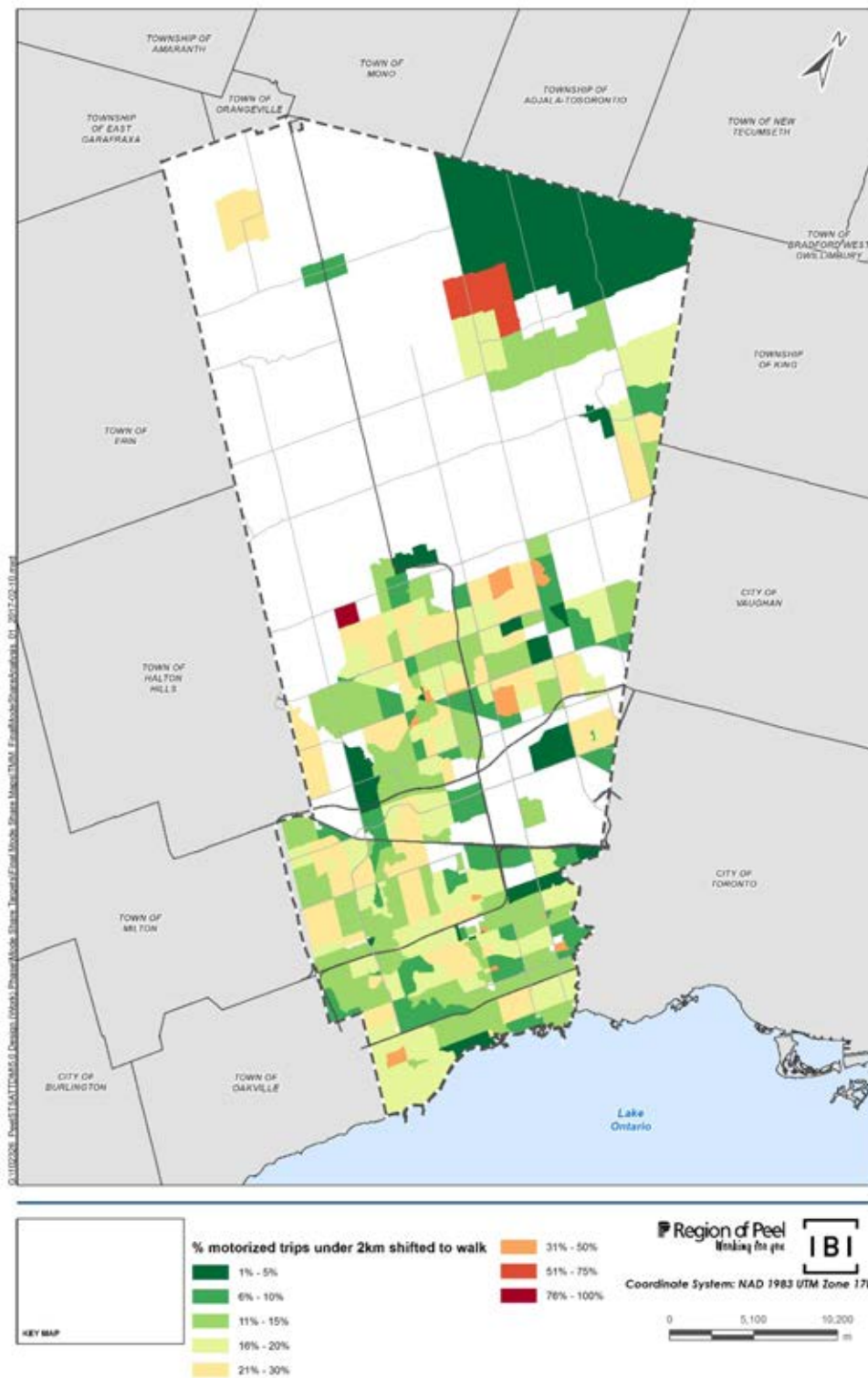
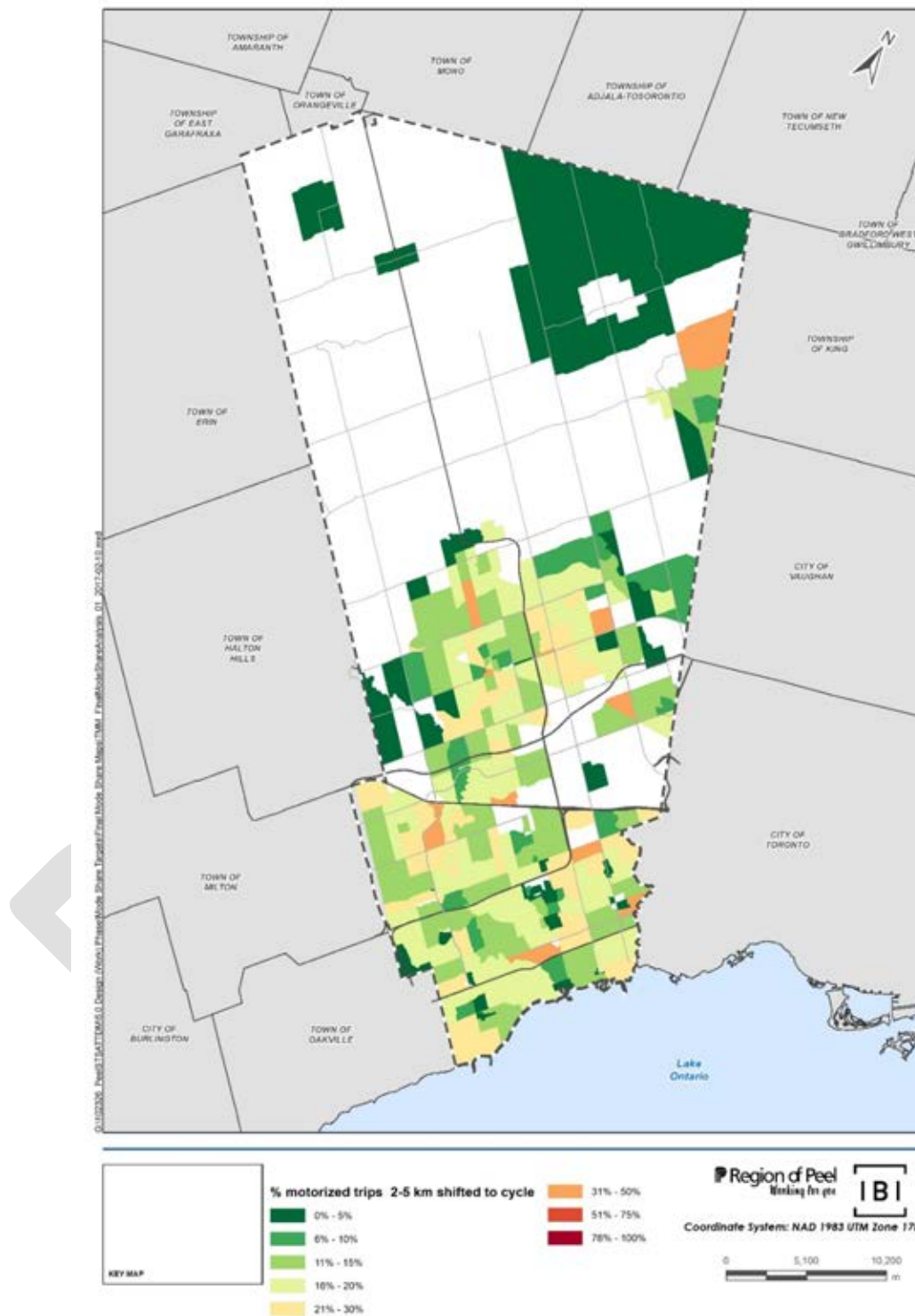


Exhibit 4.2 Percent of short motorized trips required to shift to cycle modes

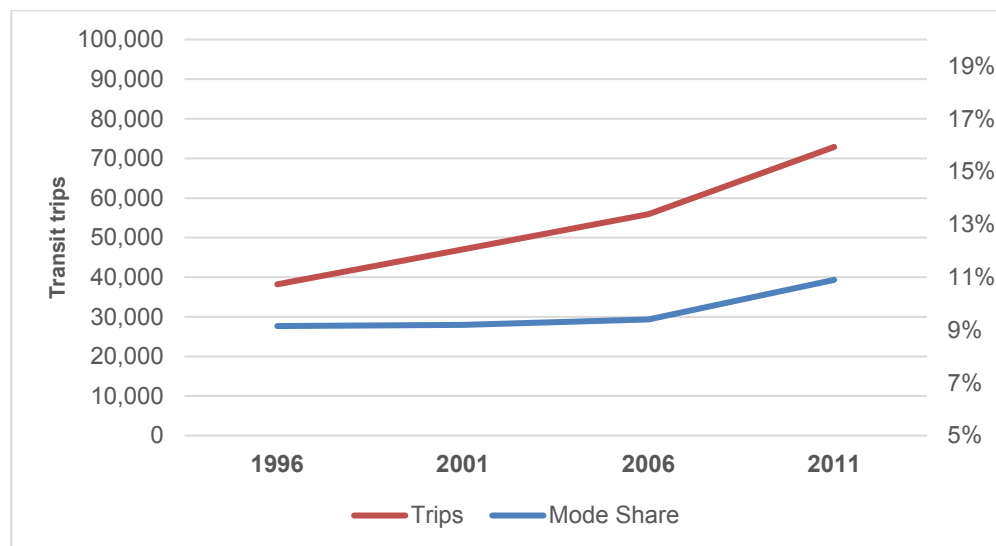


## 5 Transit Mode Share Targets

### 5.1 Trends analysis

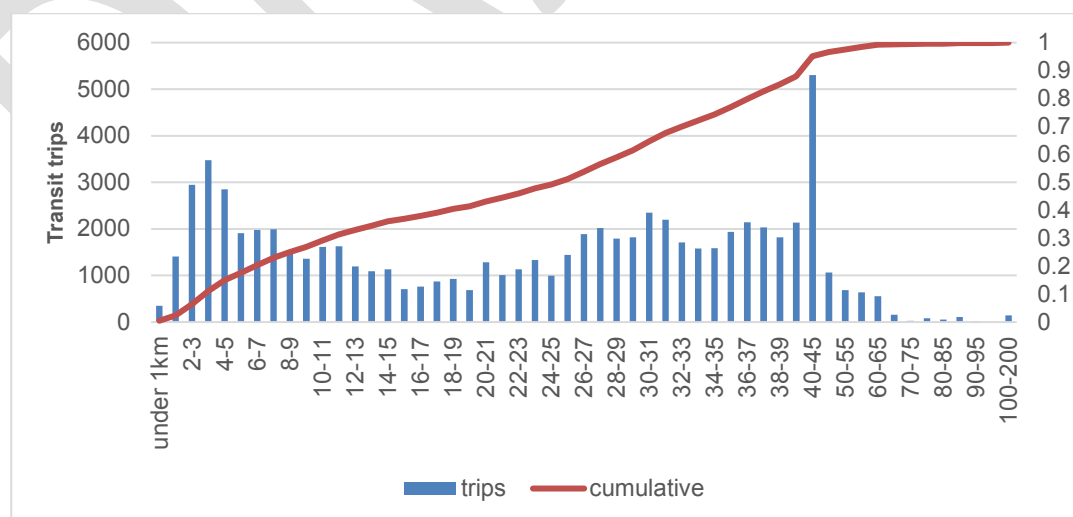
Since 1996, transit has been growing in popularity in the Region of Peel, and with increasing growth between 2006 and 2011 - see Exhibit 5.1 for growth in transit mode share and total trips in the AM peak period.

**Exhibit 5.1 Transit Trip and Mode Share in AM Peak Period, 1996 to 2011**



In 2011, the average transit trip distance is 23.8km— see Exhibit 5.2. The majority of transit trips (52%) in the AM peak period are for commuting to work, and 39% of transit trips are to commutes to school. The average age of transit passengers is 33 years, and the gender ratio is 56% female and 44% male.

**Exhibit 5.2 Distribution of transit trip lengths in AM Peak Period**



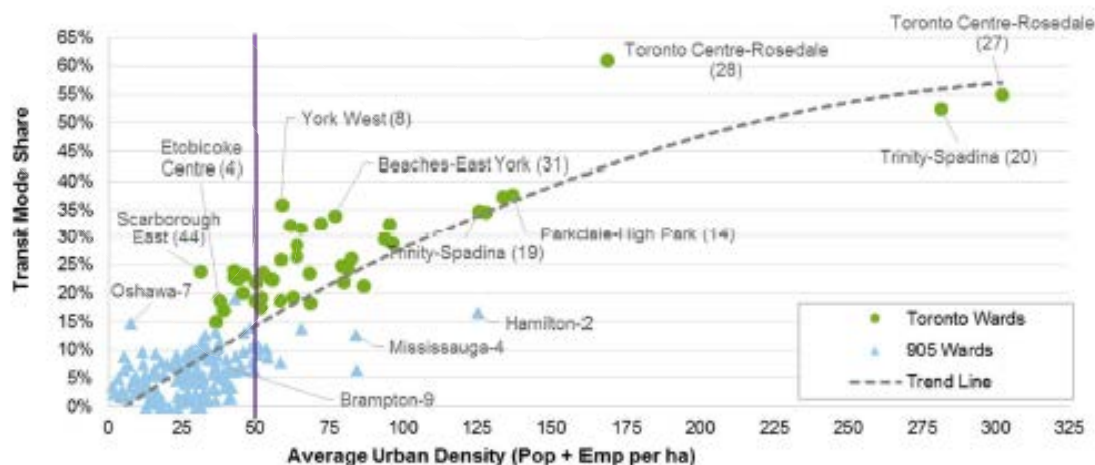
### Destinations of transit trips

About half of all transit trips are used to travel to the City of Toronto. Almost all of GO transit users travel to Toronto, whereas local transit is more often used to travel within the Region of Peel. Exhibit 5.4 demonstrate the relationship between urban density and transit<sup>4</sup>.

**Exhibit 5.3. Destinations of transit trips from Region of Peel in 2011 AM Peak Period**

All trip purposes	Local transit	GO transit	Total
Toronto	17,064	25,586	42,650
Peel	27,207	52	27,259
Halton	971	116	1,087
Hamilton	1,094	104	1,198
York	383	45	428
Guelph	418	29	447
Other	294	70	364
Commuters	Local transit	GO transit	Total
Toronto	7,860	21,173	29,033
Peel	9,429	23	9,452
Halton	260	86	346
Hamilton	102	20	122
York	280	45	325
Guelph	30	0	30
Other	70	70	140

**Exhibit 5.4 Morning peak period transit mode share in each GTHA ward vs average urban density**



<sup>4</sup> **Source:** IBI Group based on 2011 Transportation Tomorrow Survey, Statistics Canada 2011 Census and National Household Survey

**Notes:** Urban density is measured as the total population and employment divided by the area of the ward. The area considered excludes any lands within the Greenbelt and lands covered by water. Transit mode shares are based on all trips that either start or end in the respective ward.

**Exhibit 5.5 Transit trip origins (2011 AM Peak Period)**

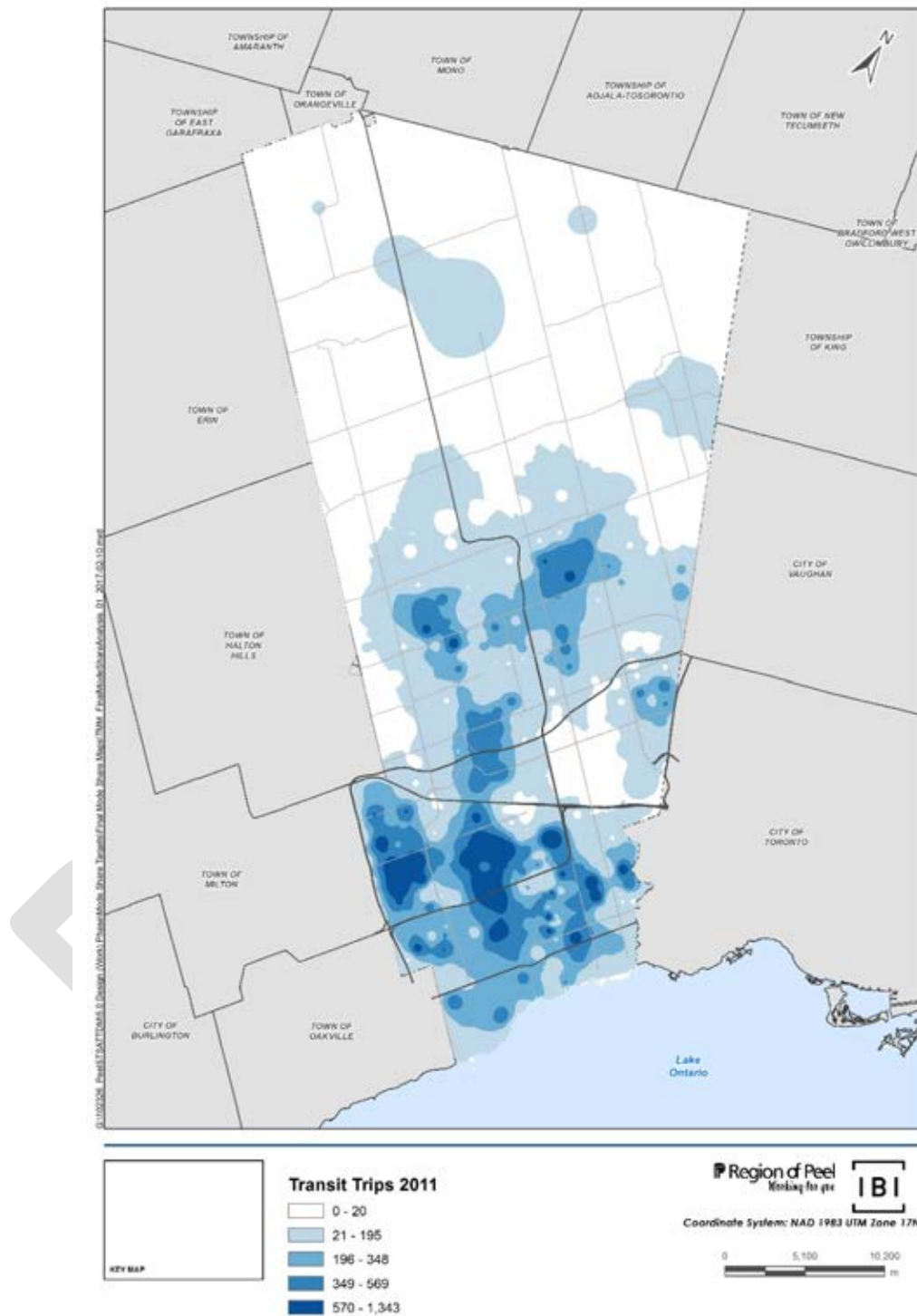
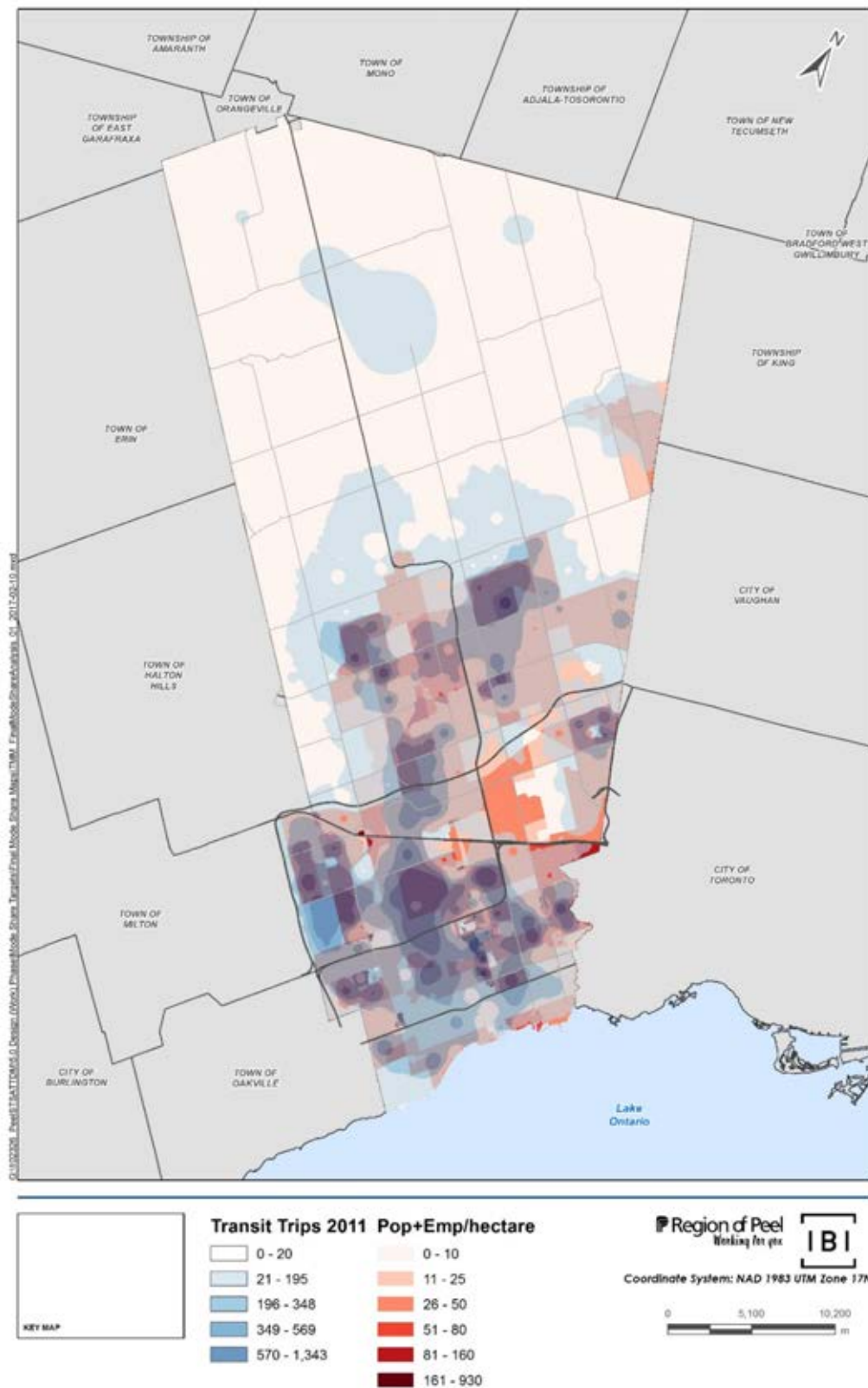


Exhibit 5.6 Urban density and transit trips in 2011





## 5.2 Potential factors for future transit trips

There has been an extensive amount of research conducted on indicators for transit viability. Some of these indicators are used to develop zone-specific conditions that influence the mode share targets of a given zone. Forecasts of transit mode shares and travel time competitiveness are estimated using Greater Golden Horseshoe (GGH) Model from the scenario based on full build-out of Big Move projects in 2031.

### 1. The 2041 population and employment density that is supportive of transit

Urban density (population and employment) is an important component of transit viability. Based on Ontario's transit supportive guidelines, an urban density of **80 persons** and jobs/ha is recommended to support what is termed as frequent transit service (10-15 minute service), and **50 persons** and jobs/ha is the suggested minimum density for basic transit service (20-30 minute service) to be efficient<sup>5</sup>.

### 2. The 2031 transit time to auto time competitiveness ratio is lower than 2.0.

In addition to cost, travel time is a significant indicator of mode choice decisions. The greater the increase in transit travel times relative to auto travel times for the same trip, the less likely it will be that people are willing to take transit. The average travel time competitiveness ratio (the ratio of transit trip times to auto trip times) is estimated to be 2.0 in the Region of Peel by the year 2031<sup>6</sup>. Zones with a better travel time competitiveness ratio than 2.0 will be allocated a point to account for the higher likelihood of transit usage in that area.

### 3. The 2011 transit mode share is above Regional average

The average transit mode share in the Region of Peel is 10.6%. Zones with transit mode shares of greater than 10% indicated zones with where transit is a more popular mode for travel. This indicator serves as a proxy for a number of factors that could influence transit mode share – such as reliable and frequent transit service, lower rates vehicle ownership, household income and driver's licensing.

### 4. Transit mode share will predicted to be over 10% in the year 2031, based on planned transit investments in the GTHA.

A study for Metrolinx<sup>7</sup> has modelled the transit mode shares in the GTHA based on current planned improvements to regional transit. Zones with higher transit mode share in 2031 are indicative of zone with more future transit trips as a result of improvements to transit infrastructure and the negative impacts of growing auto congestion. Areas with an estimated transit mode share in 2031 greater than the current average of 10% will be allocated another point in the zone ranking.

<sup>5</sup> <http://www.mto.gov.on.ca/english/transit/supportive-guideline/index.shtml>

<sup>6</sup> IBI Group (2016). Transit Needs and Opportunities: Background Paper for the Regional Transportation Plan Review. Prepared for Metrolinx.

<sup>7</sup> IBI Group (2016). Transit Needs and Opportunities: Background Paper for the Regional Transportation Plan Review. Prepared for Metrolinx.

### 5.3 Mode share increase potential for transit in 2041

Depending on the combination of conditions that are met for a specific zone, a score and an associated mode share target is assigned. The transit mode share adjustments for 2041 are based on the following on the score of each zone:

- Additional 15% transit mode share to zones with all 4 factors
- Additional 12% transit mode share to zones with 3 factors
- Additional 8% transit mode share to zones with 2 factors
- Additional 5% transit mode share to zones with 1 factor
- Additional 2% in transit mode share to zones with 0 factors.

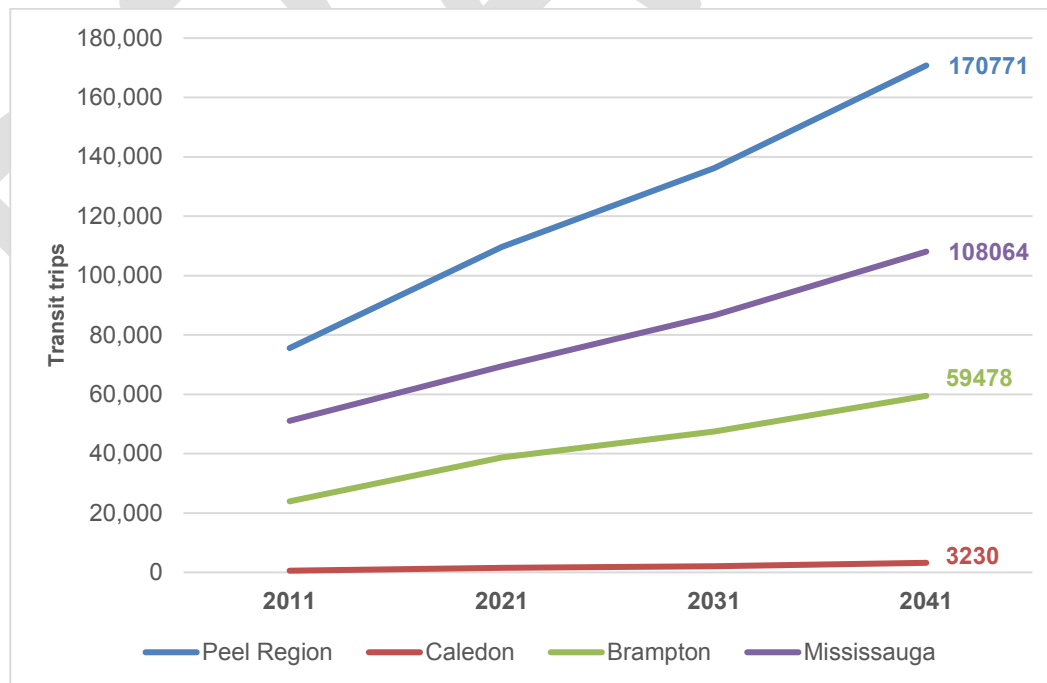
The total score for each zone is shown in Exhibit 5.9. Once the mode share increases are applied to each zone the mode share are aggregated to the superzone level and shown in Exhibit 5.10.

The annual projected increase of transit trips in the Region of Peel is an average of **3174 new trips per year** from 2011 to 2041. This is very close to the growth of 3385 transit trips from 2006 to 2011.

The growth in transit trips for each municipality to reach the regional target of 17% transit mode share is shown in Exhibit 5.7, and requires:

- Brampton to triple transit trips from 2011 to 2041, or *1200 trips/year*
- Mississauga to transit trips double from 2011 to 2041, or *1900 trips/year*
- Caledon to increase from 576 trips in 2011 to 3230 trips in 2041, or *88 trips/year*.

**Exhibit 5.7 Growth in trips in Peel municipalities to achieve transit targets**





To reach the 17% regional target by 2041, the transit mode share must increase by 0.2% a year, keeping pace with the annual growth in transit mode share of 0.3%/yr from 2006 to 2011.

**Exhibit 5.8 Peel Region Transit Mode Share Trends and Forecast**

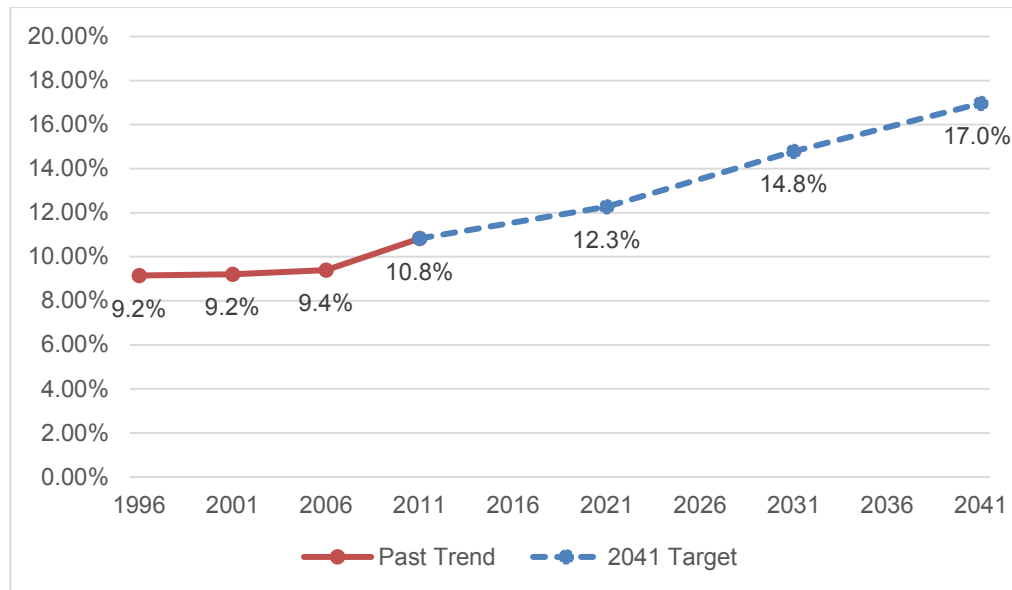


Exhibit 5.9 Transit Factor Score

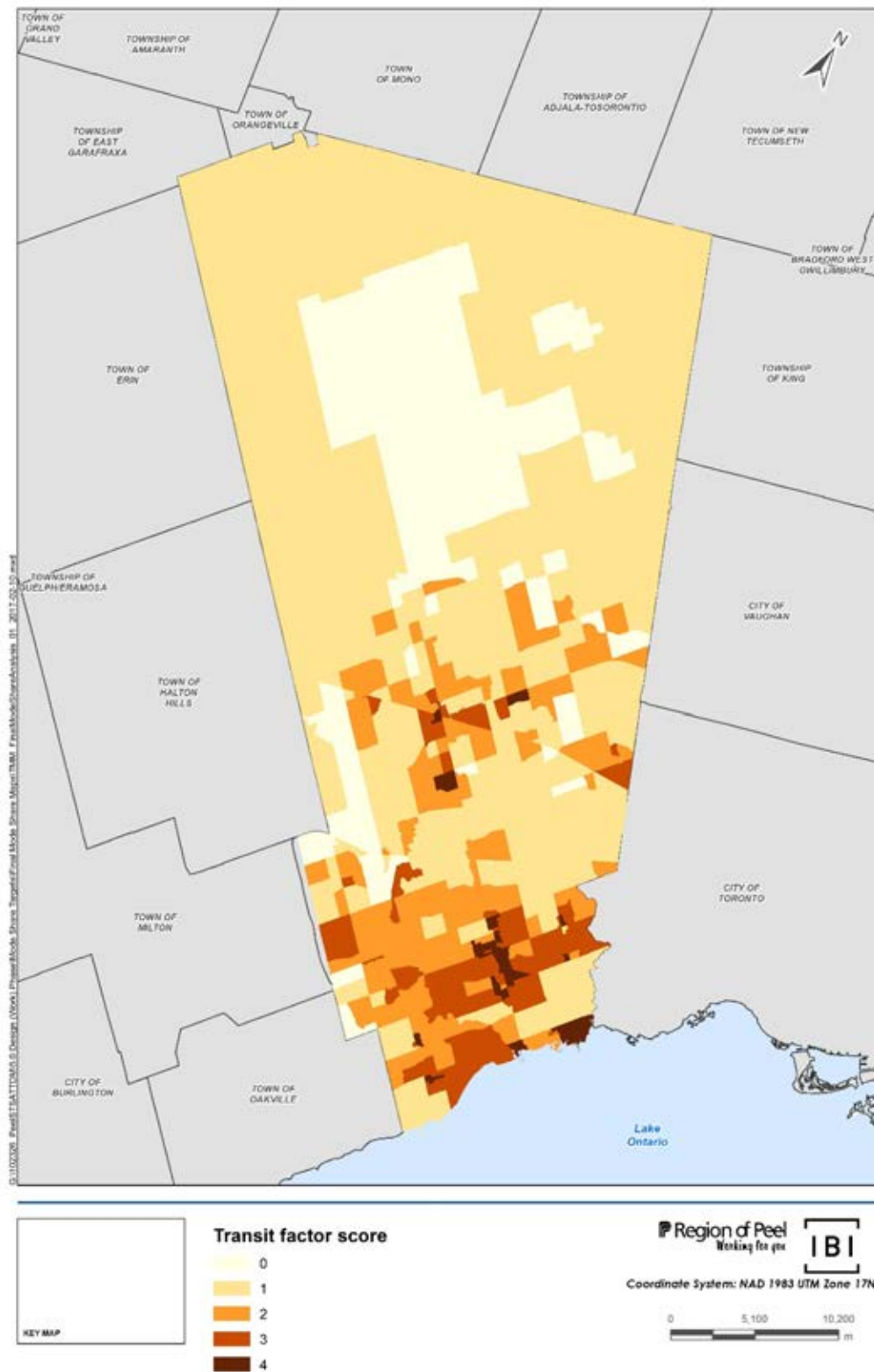


Exhibit 5.10 Transit mode share by super zone in 2011, 2021, 2031 and 2041



## 6 Carpool Mode Share Targets

### 6.1 Trends analysis

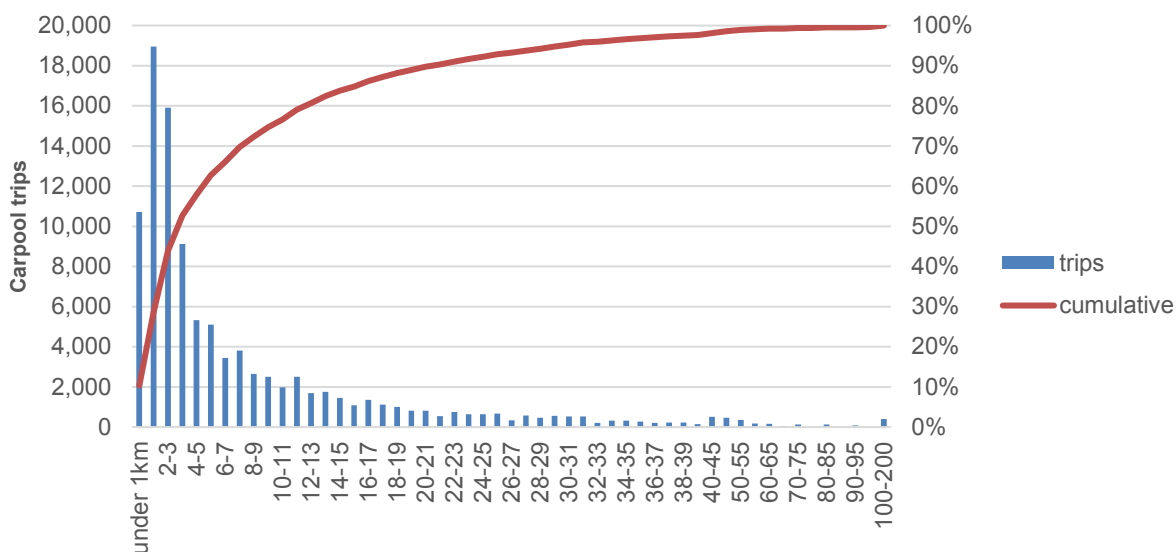
Since 1996, carpooling is growing in popularity in the Region of Peel - see Exhibit 6.1.

**Exhibit 6.1 Carpool Trips and Mode Share in the AM Peak Period, 1996 to 2011**



The average age of auto passengers is 26 years, and the gender ratio is 60% female and 40% male. Almost half of all auto passengers in the AM peak period are going to school, whereas 23% are for carpooling to work and 20% are carpooling for discretionary trips. The average carpooling trip distance is 8.5km, but the median falls between 1 to 2 km – see Exhibit 6.2. The average distance of those who carpool to work is almost double at 14km.

**Exhibit 6.2 Distribution of carpool trip lengths in AM Peak Period**



### Destinations of carpool commuters

Whereas transit trips are mostly destined to the City of Toronto, the majority of carpooling trips stay within the Region of Peel – see Exhibit 6.3 for the travel flow within and outside of the Region of Peel during the morning peak period.

**Exhibit 6.3 Destinations of carpool trips from the Region of Peel in 2011 AM Peak Period**

Destination	All trip purposes	Commuting to work
City of Toronto	9,748	4,759
Region of Peel	88,749	18,105
Halton Region	2,341	1,145
Hamilton	153	76
York	1,671	973
Other	1,219	214
<b>Total</b>	<b>103,881</b>	<b>25,272</b>

Exhibit 6.4 Carpool trip origins (2011 AM Peak Period)

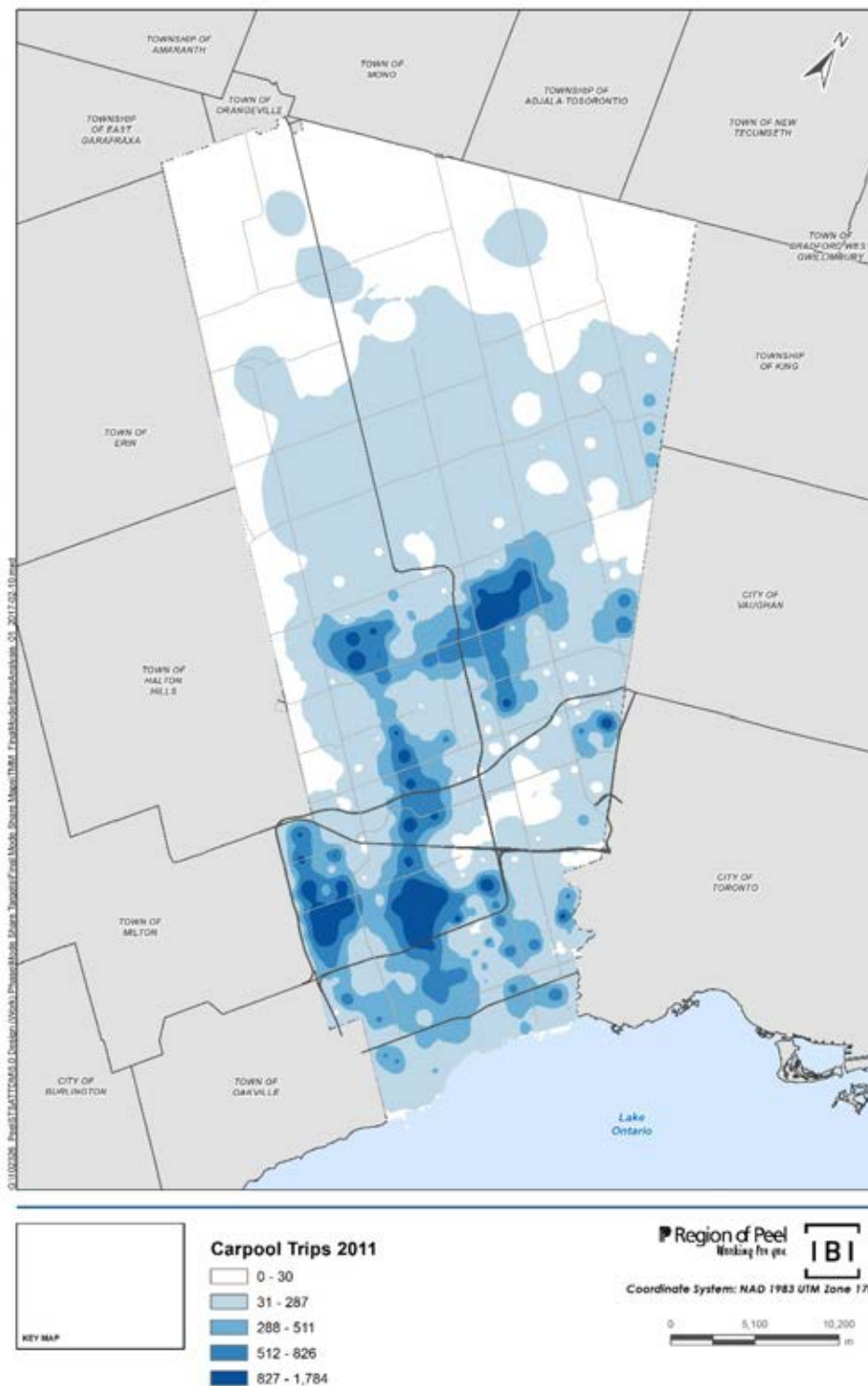
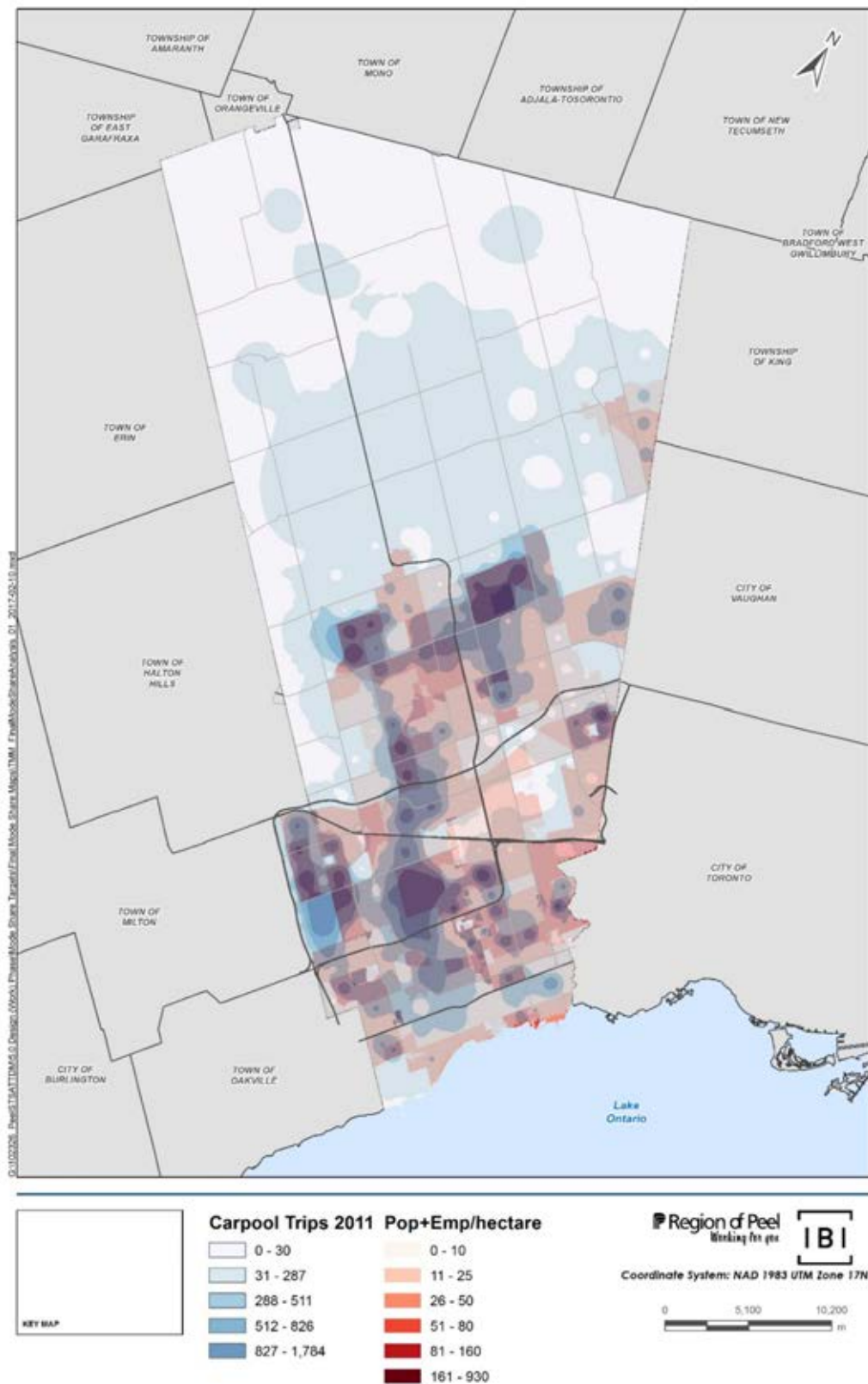


Exhibit 6.5 Urban density and carpool trips in 2011



## 6.2 Potential factors for future carpooling trips

Carpooling represents an opportunity to replace drive alone trips with auto passenger trips, thus reducing the total number of auto trips in the Region. Beyond a region-wide carpool and TDM strategy, there is opportunity to further engage specific areas of the Region that have certain characteristics that represent a higher potential for carpooling. These characteristics and zone specific conditions are described below.

### 1. The 2011 commute carpooling mode split is above 5%

The existing prevalence of carpooling activity in a given zone is a good indicator for greater carpooling potential in that zone in the future. A point is given to zones where the rate of commuter carpooling is over 5% of trips in the zone. The median commuter carpool rate for Peel traffic zones is 6%.

### 2. The 2031 transit time to auto time competitiveness ratio is higher than 2.5

Areas in the Region of Peel that are underserved by transit will have a higher ratio of transit travel time to auto travel time, and will be more likely to seek a carpool trip that to use transit. Zones that are below the Region's average of travel time competitiveness of 2.5 in 2031 will be given one point<sup>8</sup>.

### 3. Car ownership rate lower than Regional average of 1.7 cars/household.

The Region of Peel average car ownership is 1.7 cars per household<sup>9</sup>. If a zone has a household car rate below the regional average then this area has a higher potential for carpooling.

## 6.3 Mode share increase potential for carpooling in 2041

Depending on the combination of conditions that are met for a specific zone, a score and an associated mode share target is assigned. The carpool mode share adjustments for 2041 are based on the following on the score of each zone:

- 9% carpool mode share to zones with 3 factors
- 6% carpool mode share to zones with 2 factors
- 3% carpool mode share to zones with 1 factor
- 0% carpool mode share to zones with 0 factors

The total score for each zone is shown in Exhibit 6.8. Once the mode share increases are applied to each zone the mode share are aggregated to the superzone level and shown in Exhibit 6.9.

The annual projected increase of carpool trips in the Region of Peel is an average of **2503 new trips per year** from 2011 to 2041. The annual increase for each municipality, shown in Exhibit 6.6, is:

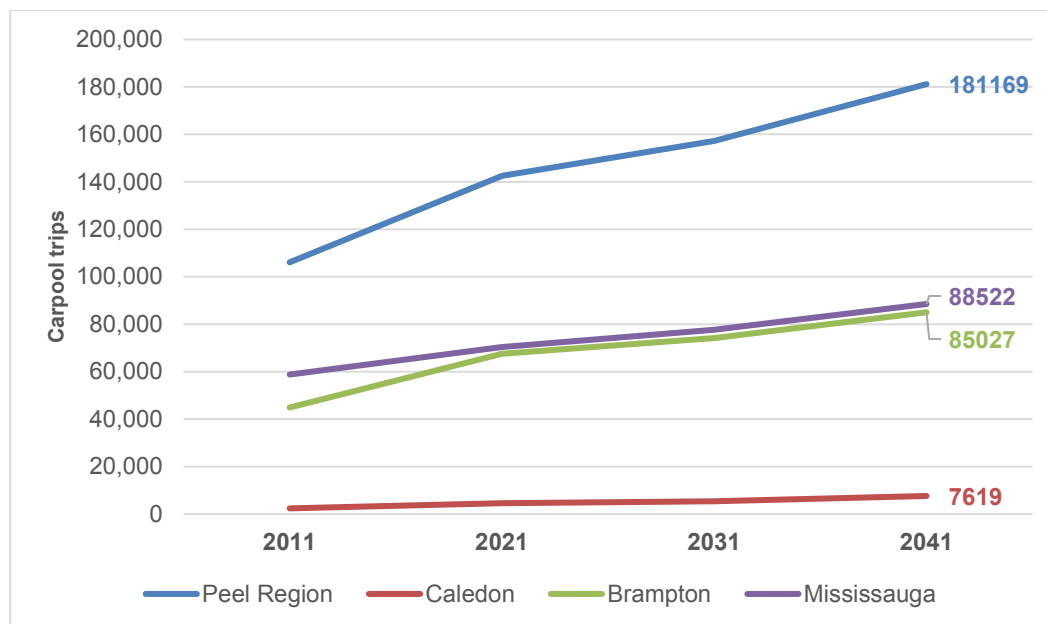
- 174 trips/year in Caledon
- 1338 trips/year in Brampton
- 991 trips/year in Mississauga

<sup>8</sup> IBI Group (2016). Transit Needs and Opportunities: Background Paper for the Regional Transportation Plan Review. Prepared for Metrolinx.

<sup>9</sup> 2011 Transportation Tomorrow Survey. Data Management Group, University of Toronto.



**Exhibit 6.6 Trip growth in Peel municipalities to achieve 18% mode share target in 2041**



To reach the 18% regional target by 2041, the carpool mode share must increase by 0.1% a year, keeping pace with the annual growth in carpool mode share of 0.1%/yr from 1996 to 2011. Trends in carpool mode share and the forecast increase to reach the STS target are shown in Exhibit 6.7.

**Exhibit 6.7 Peel Region Carpool Mode Share Trends and Forecast**

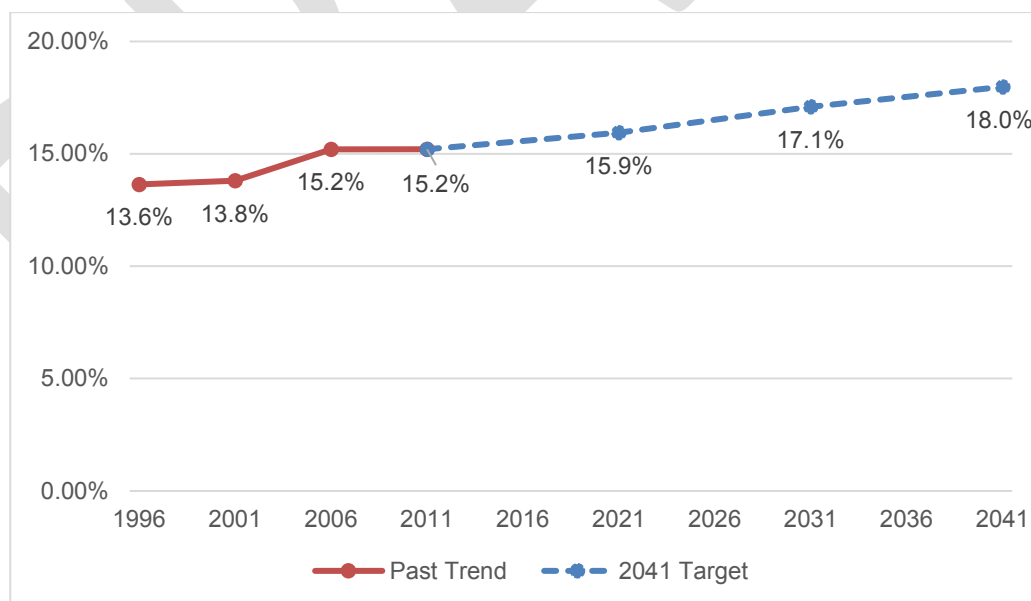


Exhibit 6.8 Carpool Zone Score

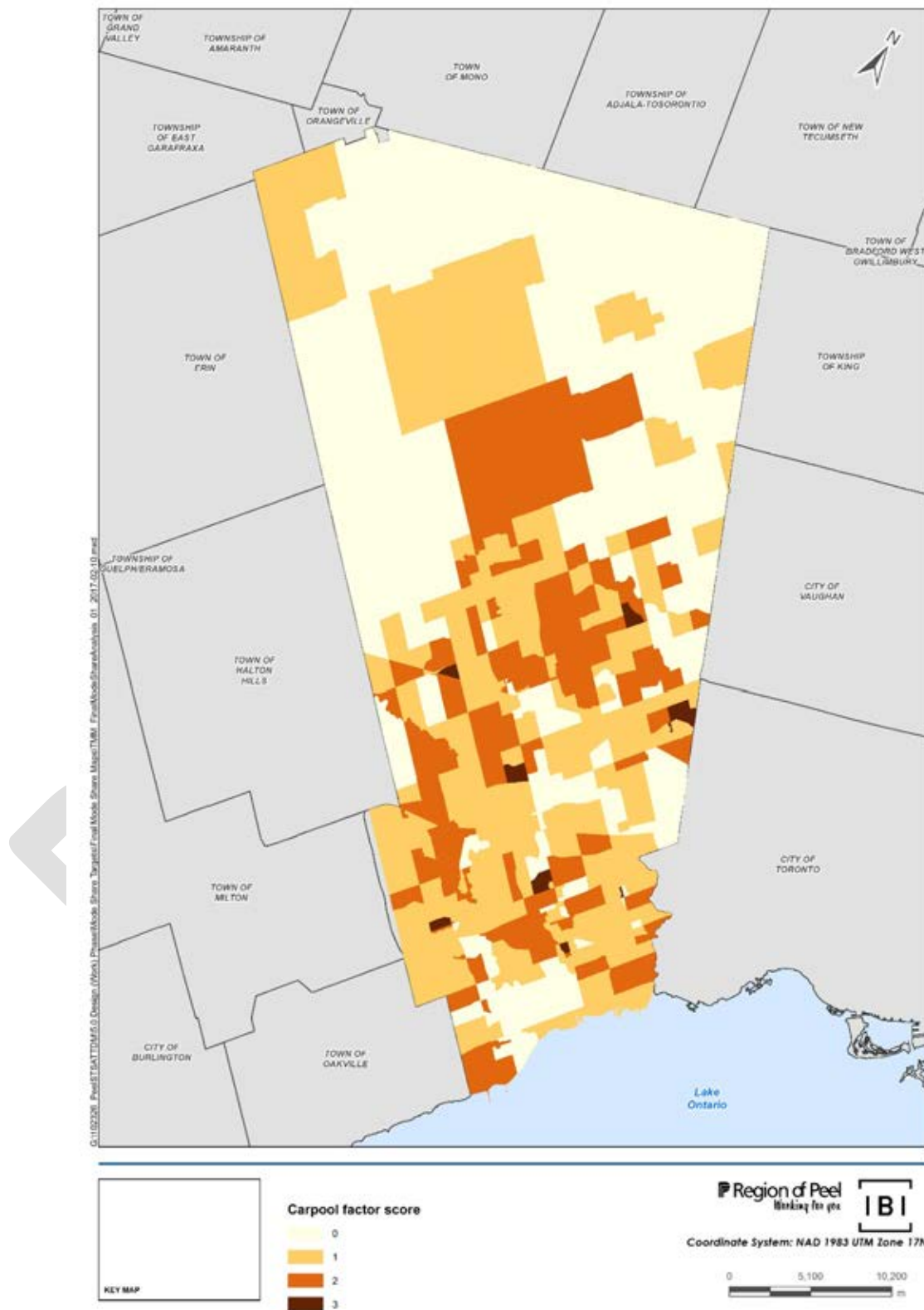
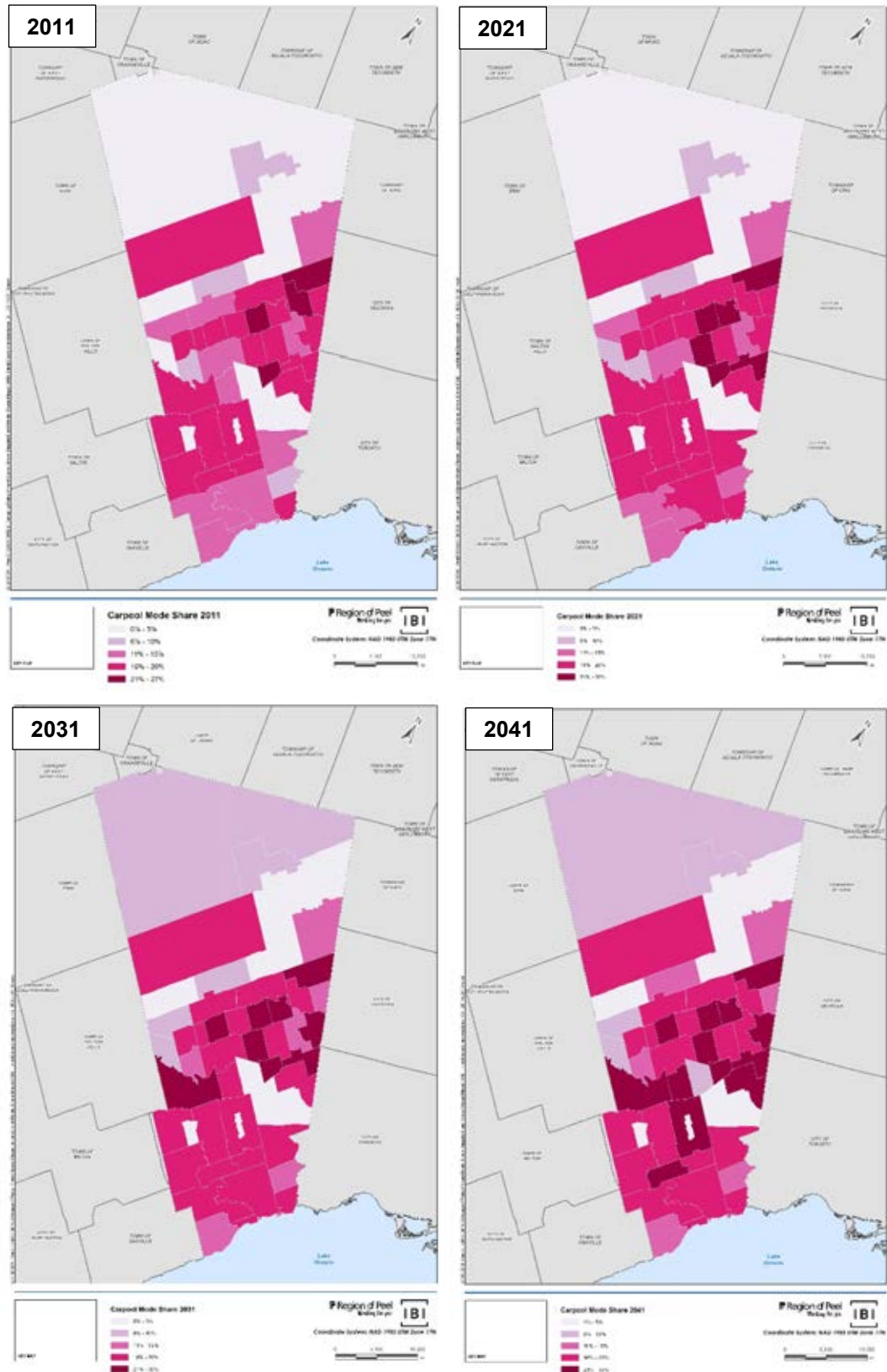


Exhibit 6.9 Carpool mode share by super zone in 2011, 2021, 2031 and 2041



## 7 Telework Targets

Telework, or telecommute trips, are defined as a work trips avoided when a person works from home or a nearby workstation, instead of commuting to their usual workplace. These trips are in fact avoided trips, and do not count as part of the mode share, but rather as a reduction in travel demand.

There are two sources of information about teleworking in Peel. The Canadian Census National Household Survey (NHS) also collects information about the usual location of the workplace. The census will record people who typically work from home, such as farmers or those who have home businesses, but it does not capture those who occasionally work from home, but have a regular work place outside of the home.

The Transportation Tomorrow Survey (TTS) collects information about the location of the usual place of work as well as whether a full-time employed person did not make a work trip, and instead worked from home. This second metric was used to measure the rate of telework in Peel Region. The TTS recorded 5616 work from home trips in 2011, only 0.6% of trips.

Using the TTS as a baseline of telework patterns in the Region of Peel, zonal characteristics that indicate conditions that may support higher rate of teleworking are identified and used to forecast the location of potential increases in telework. These conditions are described below.

### 1. Average commute distance of zone is higher than the Region's average

Similar to the factors that influence the propensity to carpool, people with longer commutes are more likely to telework than those with shorter commutes<sup>10</sup>. As such, zones in the region that have higher than average commute distances should be considered as having a higher potential teleworking. The average commuting distance in the Region of Peel is 18.8 km, so zone with a commute of 20km or more is counted as a zone with a higher than average commute distance.

### 2. High number of office/professional occupations

Compared to retail or manufacturing jobs, office workers have a higher potential for working remotely since their work is typically focused around a computer work station. With the aid of teleconferencing and remote access technologies, these tasks are more easily performed remotely from a home office, a co-working space, or another work space of their choosing that is closer to their home than their office. This is supported by several studies on the topic of variables that influence propensity for teleworking.<sup>11</sup> A zone is considered to have a high number of office and professional occupations if over 50% of employed persons are in the office or professional occupations.

Over the next 25 years, the rates of telework may increase as technology improves, and as more workplaces adopt policies that support and encourage flexible locations for employees. In 2011, there were 5,616 telework persons who telework in the AM peak period (0.6% of all trips). Using above factors to predict the increase in telework rates by 2041, there may be up to 15,001 (1.5% of all trips) telework trips in the Region of Peel.

#### Telework trip targets 2041:

- 2% of total trips are work from home in zones with 2 factors
- 1% of total trips are work from home in zones with 1 factor
- 0.5% of total trips are work from home in zones with no factors.

<sup>10</sup> <http://www.st-andrews.ac.uk/~wwwecon/papers/dp0408.pdf>

<sup>11</sup> <http://trrjournalonline.trb.org/doi/abs/10.3141/2010-13>

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Exhibit 7.1 Telework factor score

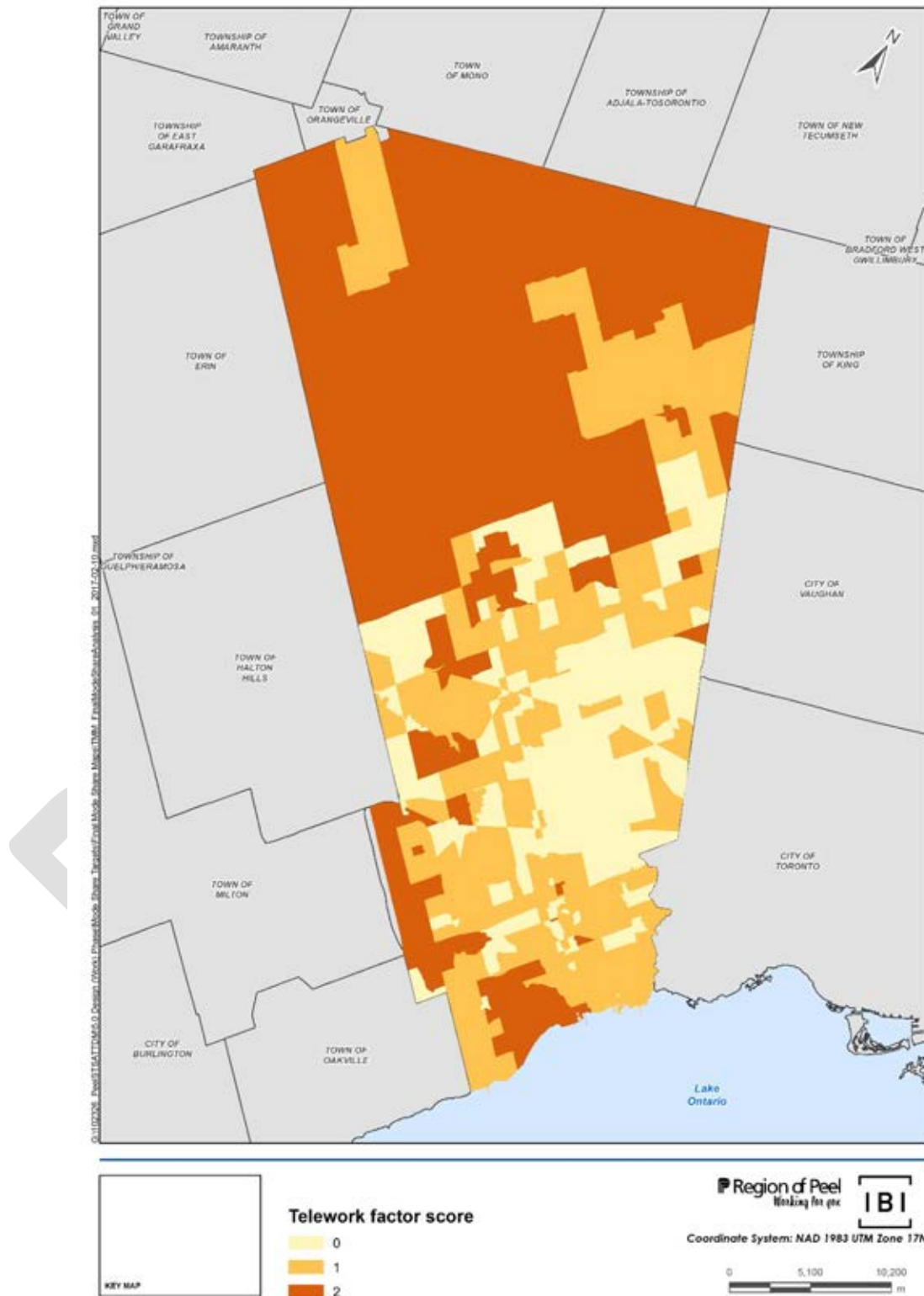


Exhibit 7.2 Telework trips by super zone in 2011

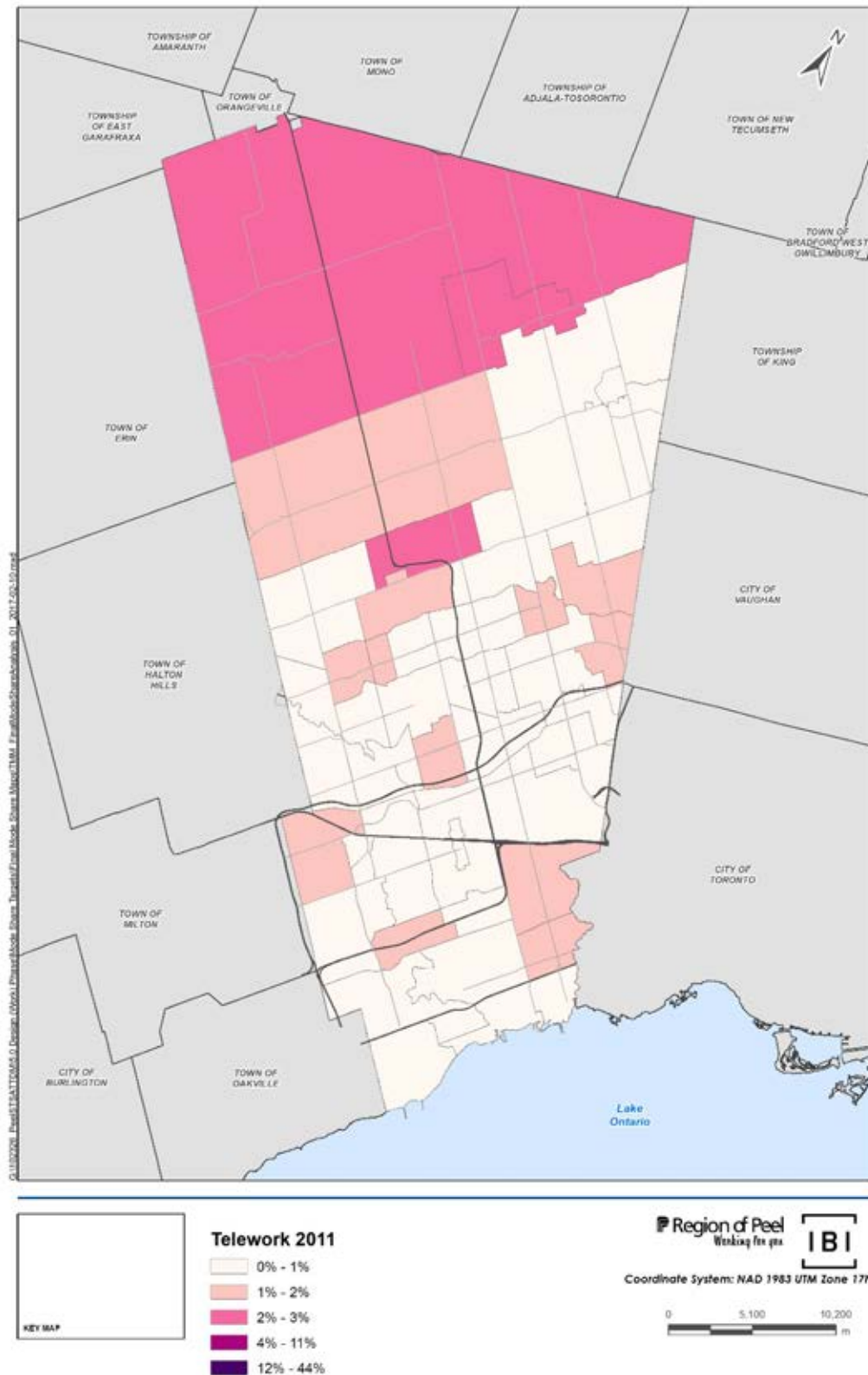
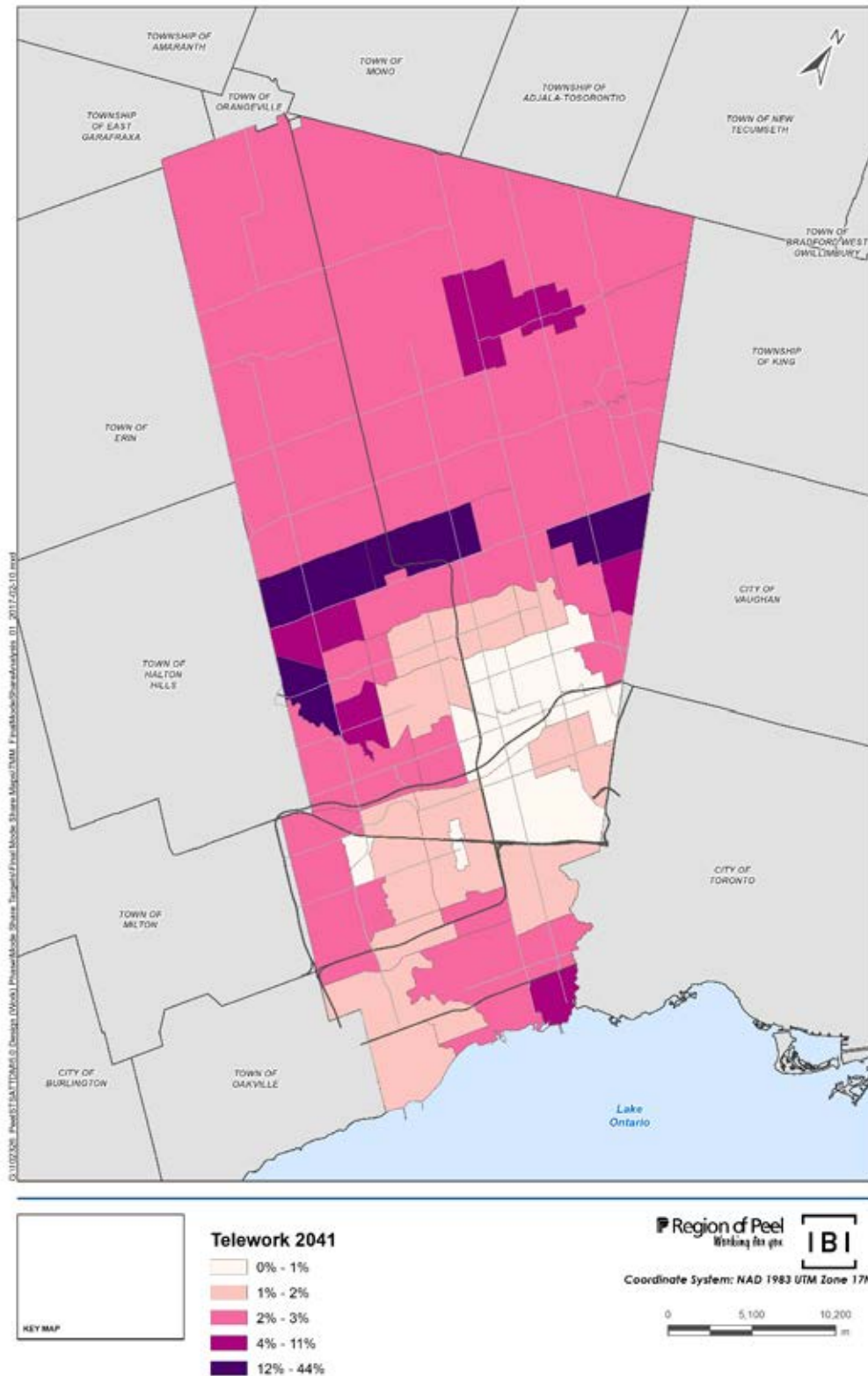




Exhibit 7.3 Telework trips by super zone in 2041



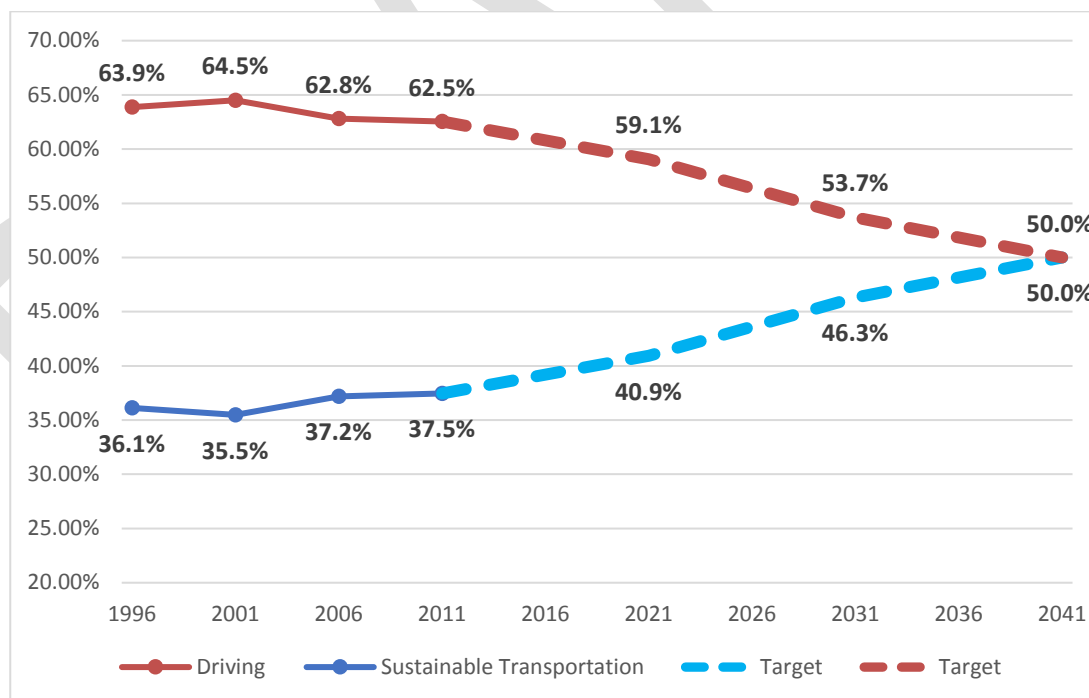
## 8 Summary of STS mode share targets for 2041

The objective of this analysis was to develop long-term mode share targets for the Region of Peel for the year 2041 along with interim targets for intermediate years. A working target of 50% overall sustainable mode share (walk, cycle, transit and carpooling trips) was established. This target was then evaluated and validated using a “bottom’s up” approach using a ranking of the potential for increase in the respective modes by individual traffic zone and aggregated to super zones.

The growth rate in sustainable modes from mode shares in 2011 to the year 2041 will require a faster rate of increase in sustainable mode share that has been observed in the period between 1996 and 2011 – see Exhibit 8.1. While increased congestion and significant investments in rapid transit will provide some impetus to change travel behaviour, the 50% target will require increased investment in active transportation infrastructure and programs, transit services and Travel Demand Management (TDM) initiatives.

The 50% regional target will vary by municipality, with Mississauga seeing the highest opportunity for increases in sustainable mode shares at 56%. Mode shares by municipality and interim are presented in Exhibit 8.2.

**Exhibit 8.1 Peel Region Mode Share Trends and Forecast**



**Exhibit 8.2 Peel Region Mode Share Targets by Municipality**

<b>Peel Region</b>	<b>2011</b>	<b>2021</b>	<b>2031</b>	<b>2041</b>
Driving	62.5%	59.1%	53.7%	50.0%
Walking	6.8%	7.3%	8.2%	9.0%
Cycling	0.3%	0.8%	1.5%	2.0%
Transit	10.8%	12.3%	14.8%	17.0%
Carpool	15.2%	15.9%	17.1%	18.0%
Other	4.3%	4.7%	4.7%	4.8%
<b>Sustainable Transportation</b>	<b>37.5%</b>	<b>40.9%</b>	<b>46.3%</b>	<b>50.0%</b>

<b>Caledon</b>	<b>2011</b>	<b>2021</b>	<b>2031</b>	<b>2041</b>
Driving	71.0%	70.7%	67.6%	64.7%
Walking	3.5%	3.3%	3.2%	3.2%
Cycling	0.0%	0.2%	0.4%	0.7%
Transit	2.0%	2.8%	3.8%	4.8%
Carpool	8.2%	8.3%	9.0%	9.8%
Other	15.3%	14.7%	15.9%	16.8%
<b>Sustainable Transportation</b>	<b>29.0%</b>	<b>29.3%</b>	<b>32.4%</b>	<b>35.3%</b>

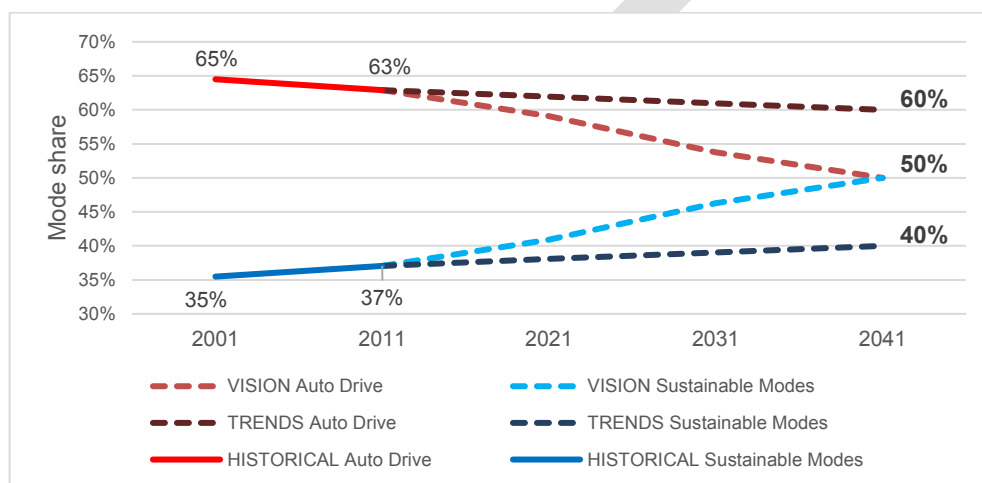
<b>Brampton</b>	<b>2011</b>	<b>2021</b>	<b>2031</b>	<b>2041</b>
Driving	62.7%	60.4%	56.1%	52.5%
Walking	7.4%	7.5%	8.4%	9.1%
Cycling	0.2%	0.7%	1.3%	1.9%
Transit	8.8%	9.8%	11.7%	13.4%
Carpool	16.5%	16.9%	17.9%	18.7%
Other	4.4%	4.7%	4.6%	4.5%
<b>Sustainable Transportation</b>	<b>37.3%</b>	<b>39.6%</b>	<b>43.9%</b>	<b>47.5%</b>

<b>Mississauga</b>	<b>2011</b>	<b>2021</b>	<b>2031</b>	<b>2041</b>
Driving	61.8%	56.4%	49.8%	44.0%
Walking	6.6%	7.5%	8.7%	9.8%
Cycling	0.4%	1.0%	1.7%	2.4%
Transit	12.9%	15.6%	18.9%	21.9%
Carpool	14.8%	16.0%	17.3%	18.5%
Other	3.4%	3.4%	3.5%	3.5%
<b>Sustainable Transportation</b>	<b>38.2%</b>	<b>43.6%</b>	<b>50.2%</b>	<b>56.0%</b>

## 9 Mode Share Target Sensitivity Analysis: “Trends” Scenario

In order to test the sensitivity of the 2041 mode share targets to levels of investment and programs and policies that are supportive of sustainable transportation modes, IBI Group has developed an alternative mode share target scenario to the STS Vision scenarios, shown in Exhibit 9.1, that reflects current modal trends and assumes a lower level of investment in sustainable transportation infrastructure and operations. The following section outlines the assumptions made to develop the trends scenario for 2041.

**Exhibit 9.1 - Mode Share ‘Vision’ and ‘Trends’ Target for the year 2041 (AM Peak Period)**

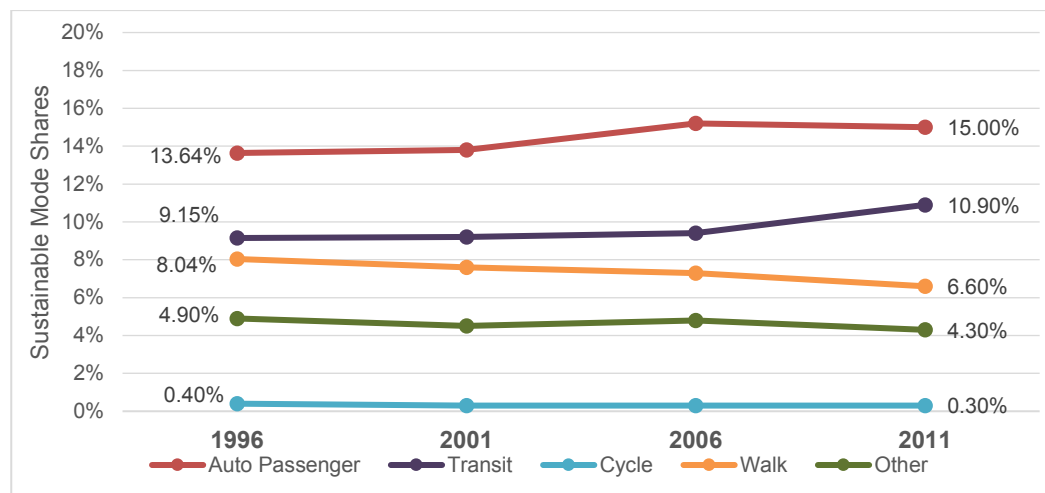


Mode Share in AM Peak Period	Baseline 2011	2041 'Vision'	2041 'Trends'
Driving	62.6%	49.7%	60.1%
Walking	6.8%	9.1%	6.0%
Cycling	0.3%	2.0%	0.2%
Transit	10.8%	17.0%	13.9%
Carpool	15.2%	17.9%	15.0%
Other	4.3%	4.3%	4.8%
<b>Sustainable Modes</b>	<b>37.4%</b>	<b>50.3%</b>	<b>39.9%</b>

### 9.1 Walking and Cycling Targets

- Mode share trends from 1996-2011 presented in Exhibit 9.2 show a slowly declining mode share despite an increase in the total number of trips.
- The trends scenario assumes that if only minor improvements to infrastructure are made and active transportation program funding is not increased, current trends will continue and **walking and cycling mode shares will slowly decline from 6.8% to 6% for walking and 0.3% to 0.2% for cycling.**

Exhibit 9.2 - Sustainable Mode Trends in the Region of Peel 1996-2011 (AM Peak Period)



## 9.2 Transit Targets

- Transit ridership and trips are correlated to factors such as increased population density, level of service and travel time competitiveness with auto. Investment in transit service hours as well as transit supportive policies and land-use will influence these transit factors and may lead to increases in transit ridership and mode share.
- The Region of Peel has seen an increase in transit mode share from 9.2% to 10.9% between 1996 and 2011 – see Exhibit 9.2. The Region has seen an increase in transit service hours and an increase in population density in redevelopment areas.
- Mississauga Miway has set a target of doubling transit mode share from 11% in 2011 to 22% by the year 2049.
- Mississauga's transit ridership growth in relation to the investment in annual service hours has declined since 1980<sup>12</sup>. Miway's 5-year service plan has estimated that a compound annual growth of 3% in service hours as well as transit supportive policies are required to achieve the 73,000,000 ridership target in the year 2049. Trends of declining productivity in ridership to service hours will continue without significant transit-supportive policies and investments in new transit infrastructure.
- Brampton Transit is planning to triple ridership from 6% in 2011 to 16% in 2041, and estimates that significant capital and operations investments are required to reach those targets.
- Brampton Transit's 5-year business plan estimates that to achieve its targets, a capital investment of \$25M annually is required starting in 2014, increasing to approximately \$150M by 2022 and sustained until 2041. Operating costs will need to grow at 3% per year to achieve the annual service hours increase from 846,000 in 2011 to 3,986,000 by 2041.

<sup>12</sup> Miway Transit Service Plan 2016-2020

- Using Mississauga and Brampton's estimates of transit investment and long-term ridership targets, we are assuming that the status quo growth of **transit mode share for the Region would be 14% instead of 17%.**

### 9.3 Carpooling Targets

- Auto passenger mode shares have increased in recent years, from 13.6% in 1996 to 15% in 2011.
- However, growth has stalled since 2006, and to increase the auto passenger mode share, it is assumed that a significant increase in investment in Smart Commute and community-based TDM programs is required to increase rates of carpooling.
- If current trends continue and investment in TDM is not realized, **carpooling mode shares are estimated to remain at 15%.**

### 9.4 Trends Scenario Forecast

The distribution of trips and mode shares by area municipality are shown in Exhibit 9.3.

Exhibit 9.3: Mode Share Targets per Area Municipality and Mode (AM Peak Period) – Trends Scenario 2041

Trips	Bike	Walk	Drive	Carpool	Transit	Other	Total
<b>Brampton</b>	738	26940	282548	70637	51871	18031	<b>450765</b>
<b>Caledon</b>	0	1525	55545	5693	1414	2674	<b>66852</b>
<b>Mississauga</b>	1539	31492	274841	74087	86295	19511	<b>487764</b>
<b>Peel Region</b>	<b>2277</b>	<b>59958</b>	<b>612934</b>	<b>150417</b>	<b>139581</b>	<b>40215</b>	<b>1005381</b>
Mode Share	Bike	Walk	Drive	Carpool	Transit	Other	Total
<b>Brampton</b>	0.2%	6.0%	62.2%	15.7%	11.5%	4.5%	<b>100%</b>
<b>Caledon</b>	0.0%	2.3%	70.3%	8.5%	2.1%	16.8%	<b>100%</b>
<b>Mississauga</b>	0.3%	6.5%	56.9%	15.2%	17.7%	3.5%	<b>100%</b>
<b>Peel Region</b>	<b>0.2%</b>	<b>6.0%</b>	<b>60.1%</b>	<b>15.0%</b>	<b>13.9%</b>	<b>4.8%</b>	<b>100%</b>

## Appendix A – Maps of zone factors

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