

Population and Job Growth Planning

Socioeconomic Issues with *Places to Grow*

Research Report
November 2015



CANADIAN CENTRE FOR
ECONOMIC ANALYSIS

About the Canadian Centre for Economic Analysis

The Canadian Centre for Economic Analysis (CANCEA) provides objective, independent and evidence-based analysis dedicated to a comprehensive, collaborative and quantitative understanding of the short- and long-term risks and returns behind policy decisions and economic outcomes.

CANCEA serves municipalities, regions, provinces and industries that seek a best-of-breed understanding of the issues facing them using expertise combined with a realistic, multi-variable, computational socioeconomic policy evaluation platform.

About This Report

This research was conducted by Paul Smetanin and David Stiff with report writing assistance from Ioana Moca of CANCEA.

Statistics Canada data and relevant literature were used to inform the computer simulation models used to produce the results of this report. All quantitative methods used are documented herewith.

Forecasts and research often involve numerous assumptions and data sources, and are subject to inherent risks and uncertainties. This information is not intended as specific investment, accounting, legal or tax advice.

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EXECUTIVE SUMMARY

BACKGROUND

Regional municipal planning is a crucial aspect of strategic economic development. Decisions made today create ripple-like impacts throughout the region—impacting each aspect from government finances, industry production, and individual income, to macro-level economic and population growth, environmental conservation, and the capacity of infrastructure to sustain all of that activity. Further complicating the problem of municipal planning is the diversity among regions, each of which must be uniquely appreciated in terms of its potential and its limitations in conjunction with the relationships it has with the regions around it.

The strategies behind growth naturally must anticipate future needs, allocate resources accordingly, manage risk associated with uncertainty, and correspond to a vision for how and where development should occur. In Ontario in 2005, such a vision for development was legislated through the Places to Grow Act (Ministry of Municipal Affairs and Housing 2013). In order to combat the accelerated urbanization of green space and agricultural land, while simultaneously supporting expected increases in population and encouraging economic growth, the Places to Grow Act calls for a harmonized approach across different regions. To support the mandates of the Places to Grow Act for regions within the Greater Golden Horseshoe, long-term projections for “land use, infrastructure, and financial planning” (Hemson Consulting Ltd., 2012) were generated for the diverse constituent regions and municipalities of the Greater Golden Horseshoe.

REGION OF PEEL CASE STUDY ¹

When growth occurs as expected, the economy of that region can thrive. For instance, in a growth study performed by CANCEA for the Region of Peel, it was shown that if Places to Grow (P2G) population projections are realized in the future, then the Region of Peel would enjoy a projected population growth of 41% between 2014 and 2041. If this population growth is accommodated with appropriate investments in infrastructure today, Peel can expect to reap significant rewards by 2041, such as an increase of 35% in the number of its employed residents, and a 47% increase in size of its real regional GDP. The province and the federal government will benefit with respective real, annual tax revenue increases of over 60%.

PEEL 2041 GROWTH HIGHLIGHTS:

- Regional population expected to grow by 41%
- Number of employed residents of Peel expected to grow by 35%
- Jobs in Peel at risk of growing only 23% from current levels
- Places to Growth suggests a job growth rate of over 50%

¹The growth represented in the Peel case study was evaluated between 2014 and 2041, inclusive. Therefore, all figures reflecting growth and percentage increases correspond to this timeframe.

The wrinkle in the Peel's growth outlook is however, the discrepancy between *Prosperity at Risk (PaR)* agent-based modelling of Peel's job growth and that supplied by P2G that govern Region of Peel's planning mandates. The growth study found that Peel jobs (actual jobs located in Peel) was at risk of only growing by 23% from current levels to 2041, as opposed to the P2G job growth projection of over 50% from current levels.

RISKS OF PLANNING TO PLACES TO GROW

Despite a concerted effort to create a unified plan towards rational growth management, the implementation of the plan has not occurred exactly as prescribed, particularly with respect to some of its provisions. These include intensification targets and the protection of agricultural land, neither of which have been pursued according to original standards (Allen & Campsie, 2013). Specifically, the Outer Ring of the Greater Golden Horseshoe is not aiming for the density targets outlined in the Places to Grow Act (Allen & Campsie, 2013), while Durham, Simcoe County, York Region, and others have allegedly implemented development plans that do not adequately protect agricultural land and environmentally sensitive areas (Ontario Greenbelt Alliance). Beyond potential issues associated with the way that the Places to Grow Act has been operationalized, matters have been complicated further by the fact that the projections to which regions are required to plan land use, infrastructure investment, and fiscal finances are not being realized. In most cases across the GTHA, planning and servicing lands to the employment projections provided through the Places to Grow Act may leave regional and municipal governments in debt. The reason for this is that infrastructure investment outlays must be made in advance of when population and employment growth is expected. Once growth begins to occur, municipalities and regions receive development charge revenues, which are then used to relieve growth-related capital debt.

However, if regions are planning for and servicing more employment lands than would be necessary for the actual number of jobs realized, then the GTHA is liable to face increasing debt across its government balance sheets. In order for governments to continue to deliver services to residents, and pay down debt, alternate fiscal measures would need to be leveraged in order to raise adequate levels of revenue to cover excessive overcapitalization² of the region. Alternatively, development charges may be increased as a response. This will, in turn, decrease regional affordability, hamper new private capital attraction and potentially threaten the credit ratings of municipal and regional governments.

GTHA OVERVIEW

Across the GTHA it is increasingly evident that P2G projections—particularly for employment—are not being realized. Using an internally-consistent model, the economy and society are simulated as one complete system that is characterised by abundant interdependencies. Any decision must be made in the context of its impacts on the entire system. Without a holistic appraisal of the complete profile of risks and benefits associated with planning decisions, most traditional economic analysis, no matter how accurate, will only capture a silhouette of the consequences. A failure to appreciate the complex

² Overcapitalization is defined as the excess of capital that is required to support a productive or growth process. Overcapitalization risk arises for a region when public investments have been made but remain underutilized failing to generate the fiscal revenue to pay for the investments within a reasonable timeframe.

interdependencies between economic agents and their environments will generate results that may be inaccurate over the long term, and fail to capture the true value of these connections.

CANCEA's agent-based micro-simulation platform called "Prosperity at Risk", or PaR for short, allows for multiple types of historical datasets to be combined into a vast and diverse set of heuristics for individual economic agents. The agents' interaction and behaviour over geography and through time allows for the tracking of intricate, micro-level actions whose impacts diffuse throughout the virtual system according to real-world expectations. Owing to its internal consistency, the PaR modeling platform has been able to recover the implicit and explicit assumptions of population projections of the Ontario Ministry of Finance, P2G projections and economic projections prepared by other independent organizations.

Within a simulation of the entire country covering 5,253 census subdivisions, including 574 Ontario census subdivisions, projections for the number of jobs located in a municipality as well as the number of employed residents of every municipality throughout the GTHA had been simulated out to the year 2041 using PaR while simultaneously accounting for movements of private capital, other economic activity and population movements. Working within historically justified behavioural policy and people decision traits, the P2G population projections for all municipalities within the GTHA except Durham Region had been recovered through PaR within a small margin of error. However, the differences between the employment projections of P2G and the PaR projections for jobs located in a municipality, and the number of employed residents in a municipality, respectively, suggest all regions across the GTHA except Toronto are at risk of developing excess employment lands. In addition, the internal consistency of the Places to Grow model is tenuous given the discrepancies between jobs and population forecasts.

The table below illustrates the percentage difference between PaR employed residents and jobs projections and Places to Grow employment projections, as well as the percent difference in population projections between the two models, by 2041.

Table 1 Model Percent Differences: Jobs, Employment and Population in 2041, by Region

	Durham	Halton	Hamilton	Peel	Toronto	York	GTHA
<i>PaR</i> jobs vs. P2G employment	33.4%	53.7%	28.5%	23.3%	-6.7%	39.4%	15.9%
<i>PaR</i> employed residents vs. P2G employment	-7.4%	19.2%	1.1%	8.4%	11.9%	10.8%	8.8%
Population	21.4%	0.5%	2.2%	-0.2%	-0.4%	-1.5%	1.9%

For example, in Peel, PaR estimates approximately 782,500 jobs in the region by 2041, whereas Places to Grow is projecting 965,000 jobs, representing a difference of 182,400 jobs by 2041 (23.3% higher than PaR). Another significant example is what appears to be occurring in the Region of York, with PaR estimating 643,400 jobs in that region by 2041, whereas P2G projects 897,000 jobs in York; of the difference, therefore, is approximately 253,600 jobs by 2041 (39.4% higher than PaR).

The significance of these municipal differences is captured by considering the GTHA. PaR estimates 4.16 million jobs in the region by 2041, whereas Places to Grow expects 4.82 million. Therefore, the two models' projections are separated by a gap of 661,000 jobs by 2041, of which Peel and York represent 56% of the difference. This is a material difference of a cumulative 1.64M extra job years by 2041, which would represent a cumulative activity of half of the current GTHA employment pool. In today's terms, that is about \$176B worth of GTHA economic activity.

Unless economic development across the GTHA takes on a historically uncharacteristic and exceptional turn for the better, such a risk can only mean one outcome: a heavily overcapitalized system which would remain unproductive for potentially a generation.

CONCLUSION

Ensuring that economic growth conforms to the guiding principles of sustainability, environmental conservation, and prosperity is a multi-faceted problem. This necessitates co-ordination and careful implementation of development targets, as well as equitable participation in the support of those principles and in guided growth among all of the municipalities and regions in the Greater Golden Horseshoe. This necessitates projections and forecasts so that municipalities can plan their land use, allocate resources, and manage the risk associated with the necessary debt financing for growth.

The growth plan designed for the Greater Golden Horseshoe, under the Places to Grow Act, features such projections for all constituent regions. If growth occurred as suggested by these projections, then the case study for the Region of Peel offers a glimpse into the numerous benefits that such growth can offer. Among these is a projected 47% increase in regional GDP between 2014 and 2041, a 35% increase in the number of employed residents of Peel, a 23% increase in the number of jobs within Peel, 87% more non-residential private capital investment, and others.

However, the case study for the Region of Peel has also illustrated a variety of risks that accompany the process of planning for and accommodating growth. For instance, Peel would have to invest over \$16 billion in growth-supporting capital between 2014 and 2041. With 35% of this total supported by development charge revenues, Peel is required to take on a risky investment into infrastructure under the premise that future growth would finance these present outlays. The investment becomes risky when the revenue streams are not assured. In fact, the discrepancy between PaR and Places to Grow job projections rises to over 182,400 by 2041. If those jobs are not realized within Peel Region, then Peel would have over-invested in employment lands and would be left with over \$2 billion in stranded debt on its balance sheet looking for a revenue source to pay it down.

GTHA GROWTH HIGHLIGHTS:

- PaR forecasts 15.9% less job growth by 2041 than Places to Grow
- Represents a difference of 1.64 million less job years for the GTHA by 2041
- Difference is equal to about \$176B worth of GTHA economic activity

Unfortunately, the Region of Peel is not the only region in the GTHA that is planning to ambitious employment figures prescribed by Places to Grow. In fact, every region in the GTHA aside from Toronto is at risk of over-developing employment lands, incurring outstanding debt by 2041, and threatening agricultural lands and environmentally sensitive areas³. In addition, co-ordinated investment is not only a municipal affair; adequate support from the provincial and federal government—as is demonstrated in the case study for the Region of Peel—is necessary in order to fully leverage and utilize assets, thereby facilitating growth.

As regions and municipalities invest and plan to the optimistic employment projections of Places to Grow, the risk is transferred to residents. Failing to set and meet intensification targets may mean that growth is more expensive. Similarly, generating outstanding municipal or regional debt as a result of high projections will likely require the increase of taxes, or the use of other financial instruments, in order to recover the debt that will remain on municipal balance sheets. Preventing all risks is implausible; however the strength of the dynamic baselines of a model such as PaR is that it can mitigate uncertainty associated with the projections that are used as a benchmark for our economic future.

³ This is a risk if intensification targets are not implemented. In many cases that the targets are implemented, it is difficult to track the adherence of the region or municipality to that set target (Allen & Campsie, 2013).

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1.0 PLACES TO GROW

The Places to Grow Act, legislated in 2005, was designed to assist in regional management and promote co-ordination in developing strategic growth plans that guide decision making. (Ministry of Municipal Affairs and Housing 2013). In particular, its aims are to ensure that:

- Existing resources are appropriately leveraged for current and future populations;
- The environment is given consideration and conserved;
- Communities' values are sustained, and communities are able to offer the necessary amenities to support a high quality of life as demand pressures change; and
- Growth is integrated across regions, and policies governing growth are co-ordinated (Places to Grow Act, 2005).

The Places to Grow Act is focused on guiding growth to areas that will promote the creation of jobs, the attraction of investment, and the preservation of the natural environment of the Greater Golden Horseshoe Area as well as Northern Ontario (Ministry of Municipal Affairs and Housing 2013). The Act legislates that each area that is designated to accommodate growth must have an associated growth plan, which is to be prepared by an executive municipal council position, such as a Minister of Infrastructure (Places to Grow Act, 2005) in conjunction with the provincial government. These growth plans include employment and population forecasts to which each region must plan. Once a growth plan is approved, the respective region is required to use it to guide its decision making and planning. The growth plans contain policies for allocating the supply of land across various usage types, managing resources, capital spending, planning areas for intensification, and other objectives for the corresponding area.

The growth plan for the Greater Golden Horseshoe Area stipulates population projections for multiple regions, including those comprising the Greater Toronto and Hamilton Area (GTHA). Population growth is to be accommodated in the following specific ways, according to the growth plan for the Greater Golden Horseshoe (Ministry of Public Infrastructure Renewal, 2006):

- Designated build-up areas will be intensified such that significant portions of residential and employment development will occur within these areas (particularly within urban growth centres, intensification corridors, and major transit station areas)
- Development will follow a principle of mixed land use, combining residential and employment lands in a way that transit services are supported, walking and pedestrian activity are encouraged, and access to major roadways is supported
- Urban growth centres are linked through transportation networks, acting as hubs for employment, service provision, transit, recreation and other focal community organizations
- Designated greenfield areas will accommodate new development featuring mixed land use, support for multi-modal (including non-vehicular) transport, and minimum density levels, with continued respect for the natural environment

In order to adequately plan for the growth anticipated by the projections, continue to serve the existing population, and promote community and environmental values, the GTHA must navigate its path from

servicing the needs of the current population to accommodating the needs of its population decades in the future. This necessitates a comprehensive understanding of the costs and benefits associated with growth in the GTHA and the current and projected social and economic conditions within the region.

1.1 GROWTH PLAN - THE GREATER GOLDEN HORSESHOE: FORECASTS FOR THE GTHA

In the 1980s and 1990s, growth in throughout North America was directed outwards, in favour low density and new developments (Allen & Campsie, 2013). However, this approach to growth resulted in a set of negative consequences for governments and residents including:

- Increased congestion and transportation times;
- Increased costs of municipal service delivery to low-density areas, as expanding outward is more expensive than intensifying;
- Increased energy consumption;
- Increased transportation costs for single-use, newly urbanized areas;
- A loss of agricultural land to urbanization; and
- Large necessary outlays for the expansion of infrastructure (Neptis Foundation, 2003).

In order to mitigate these impacts, the growth plan for the Greater Golden Horseshoe was created, which includes both employment and population forecasts for all constituent areas, and which is intended to support the mandates of the Places to Grow Act. The employment and population forecasts create the basis by which decisions are made regarding land use, particularly about residential lands, employment lands, and the infrastructure that must be in place in order to deliver services to future residents and businesses. In conjunction with density targets outlined through the growth plan, these forecasts form the basis for development planning and investment throughout the Greater Golden Horseshoe, including its most dense area, the GTHA. However, it is important to note that the growth plan is prescriptive in nature as the forecasts are intended to indicate where growth should occur, and are not intended to reflect historical growth patterns (Allen & Campsie, 2013). This combination of descriptive and prescriptive projection may generate discrepancies between the forecasts and actual growth.

The forecasts of the growth plan have been subject to revisions since the initial publication. An amendment made in 2012 featured extensions for employment and population projections up to 2041, and a second amendment was made in 2013 for a small number of regions, citing issues such as different environmental constraints to development (Allen & Campsie, 2013). Despite the dual nature of the projections—that is that they are both prescriptive and descriptive—significant discrepancies in projections begin to manifest for the year 2011. In other words, despite revisions occurring in 2012 and 2013, discrepancies persisted in historically known information about the year 2011. Additional discussion regarding the discrepancies can be found in sections 3.0 and 4.0 of this report. Within this report, the Places to Grow figures employed are those featured in the most recent amendment and conform to the reference scenario of growth, rather than the high or low growth scenarios (Hemson Consulting Ltd., 2013). Both amendments stated that they have taken into consideration the impacts of the 2008 recession, aligning projections with the economic forecasts by the Ontario Ministry of Finance published

in 2010, “Ontario’s Long-Term Report on the Economy”, and with the Ministry’s demographic forecasts, “Spring 2012 Ontario Population Projections Update” (Hemson Consulting Ltd., 2013).

Servicing growth typically involves the debt financing of infrastructure development in order to accommodate future growth. If growth occurs as expected, debt is then recovered in the future. This occurs because development charges are collected from residential and non-residential developers, who build in response to the demand of future, increased populations and industry (Smetanin, Stiff, Kobak, & Moca, 2015). However, infrastructure must be expanded in advance of growth in order to attract and accommodate it properly.

Although infrastructure development is a means by which to attract population growth to certain areas, it is insufficient to merely prescribe growth to a respective area, expend public capital on infrastructure development to service that prescribed growth, and expect it to occur. The reason for this is that systemic dependencies create a climate that necessitates co-ordination in investment across regions, public and private entities, tiers of government, and across the Greater Golden Horseshoe. Although the Places to Grow Act acknowledges this and aims to encourage unified approaches to growth, its provisions and exceptions have not only led to most regions pursuing the “minimum” intensification targets, but often have allowed them to set targets even lower than those minimums (Allen & Campsie, 2013).

For instance, although the growth plan calls for a minimum residential intensification rate of 40% in built-up areas of the Greater Golden Horseshoe (Ontario Ministry of Infrastructure, 2013), upper-tier municipalities are free to allocate different intensification targets to their different constituent areas as long as the average intensification target meets a prescribed minimum. This has allowed for vast differences between the population projections and actual populations of municipalities across the GTHA (Allen & Campsie, 2013). In addition, many regions have been exempt from the minimum intensification target of 40%. Therefore, the inter-regional and inter-municipal discrepancies that arise from fragmented and non-uniform targets have turned legislative provisions into loopholes. These have then translated into a systematic undermining of the ability of the Places to Grow Act to guide growth as a result of the following mechanisms:

- Unmet projections
- Non-uniformity in the application of requirements
- Insufficient ability of municipal revenue tools to incentivize growth as prescribed

2.0 PROSPERITY AT RISK

In order to conform with the co-ordinated planning approach to growth as stipulated in the Places to Grow Act, it is imperative to conduct a cohesive and holistic analysis and evaluation of regional performance and adherence to the principles within the Act. An internally-consistent and connected view of the development of regions is achievable only when they are all considered not just simultaneously, but as components of a wider system—the provincial economy—that act upon and influence one another. The outcome of an analysis of this nature allows for the rectification of the fragmented and non-uniform

application of growth principles, identifying risks that arise from within a focal region, those that arise from regional relationships, and other risks that arise by nature of the network of dependencies between the economy, individual firms, people, and government organizations. A co-ordinated approach to growth management therefore warrants a co-ordinated and invariant system of measurement, which accounts for these systemic dependencies, captures the potential for growth, identifies non-obvious stakeholders, isolates and measures risk.

Analytical models are useful for isolating a single effect or variable, but are heavily (and intentionally) restricted by assumptions and generalizations in order to provide a particular answer to a single question. Designing or assessing a policy or strategy, especially one concerned with economic development, cannot be approached with such a narrow focus. If such an approach is taken, different problems will be solved in parallel rather than simultaneously. In the best cases, a different analytical model can be used to resolve each of the associated, multiple problems, but the decision maker is then left with a variety of fractured insights, none of which can be used to adequately understand or inform decisions and strategies.

Planning for growth begins with a framework by which upper- and lower-tier municipal governments can engage in informed decision-making, particularly when future needs and legislative directions must be considered. The crucial first step in charting a trajectory to economic prosperity, sustainability, effective risk management, environmental protection, and equitable sharing of risks and rewards is understanding the current state of economic development throughout the GTHA, and the future that is likely to arise from existing trends. In order to address the challenges facing the GTHA and plan effectively, an integrated approach must be undertaken to:

- Identify what type and quantity of capital and other investments must be made today in order to support future populations;
- Continue to provide adequate and appropriate services to residents;
- Quantify the costs and benefits associated with the projected growth;
- Capture unforeseen consequences of budgetary allocations and chosen development targets;
- Understand the risks faced by the regions, which may impact future costs and benefits to the region resulting from actions taken today; and
- Promote sustainability by understanding the dynamics of risk and reward sharing among stakeholders.

In order to address these objectives in a comprehensive fashion, one integrated approach can be employed. *Prosperity at Risk (PaR)*, is an agent-based model that allows for flexibility and captures effects that are not traditionally measured by disjoint economic models. Agent-based modeling, the conceptual framework underlying PaR, allows for the following features:

- Fewer *a priori* assumptions, with flexibility in the choice of the assumptions that guide the model;
- Historical evidence replaces theoretical approximations;
- Meaningful understanding of the diffusion of policy effects over the medium and long terms;
- Consideration of real-world

- Agents act based on historical behaviour as they compete for scarce resources, creating evidence-based, realistic constraints and boundaries on economic outcomes, which are not always achieved by traditional differential equations;
- Agent heuristics drive the ways in which agents respond to circumstances, allowing for the simulation of adaptability to a dynamic environment;
- Macro-level aggregates are derived from micro-level behaviours, which are informed by heuristics rather than imposed conditions;
- All flows of individuals, money, and goods are entirely accounted for within the model such that:
 - Consumption of goods corresponds to agent incomes
 - Inter-regional migration of individuals is endogenous to the model, whereby the movement of people is consistently accounted for
 - The supply and demand for labour, governed by a labour force model and microeconomic choices related to work
 - All financial transactions register on the balance sheets of all parties involved, so that no asset is created without a corresponding liability

PaR can track over 50 million individual agents for all of Canada, with over 29 billion attributes for them, spanning across more than 5,000 regions in Canada. Agents comprise all entities that are able to make decisions, engage in behaviours, and act, including individual people, non-profit organizations, government institutions, firms, and others. Behaviours in which agents can engage include borrowing, consumption, migration, importing and exporting, choosing to work and hire labour. Agents also each have complete financial statements, including balance sheets that reflect comprehensive financial states and impact their capacities to borrow, consume, and produce.

In the simulation process, PaR perceives not only the residents of the GTHA as agents but each order of government is an agent as well. Therefore, PaR also simulates financial accounts corresponding to the various governments across the GTHA, modeling the financial transactions that occur both internally and as the GTHA interacts with neighbouring regions, and the rest of the country. PaR appreciates the geographic attributes of the GTHA alongside its unique characteristics relative to other regions in Canada. Because agent-based modeling does not impose artificial constraints on the system, it allows the dynamics of individual interactions to show how the country adapts to a given scenario over time.

The combination of complete financial accounting for all transactions of money, movement of people, and flows of goods, along with demographic modeling and high-resolution mapping of the GTHA through one cohesive platform uniquely situates PaR as a powerful tool in generating interconnected, dynamic baseline projections. In this regard, it is able to go beyond the capacity for parameterization to the explicit assumptions of other models; PaR is also able to uncover implicit assumptions, including the ability to identify when projections across a geographic region are not internally consistent, or have been performed with disjoint models.

2.1 CALIBRATION

2.1.1 ONTARIO MINISTRY OF FINANCE

The Ontario Ministry of Finance generates demographic and economic projections up to twenty years in the future in order to assess Ontario's current and forecasted climates with respect to fiscal and financial health, as the province supports a growing population and responds to the dynamics of the global economy. The methodology employed to generate economic baseline projections that assume that current policy structures will not change, including taxation and spending patterns (Ontario Ministry of Finance, 2005).

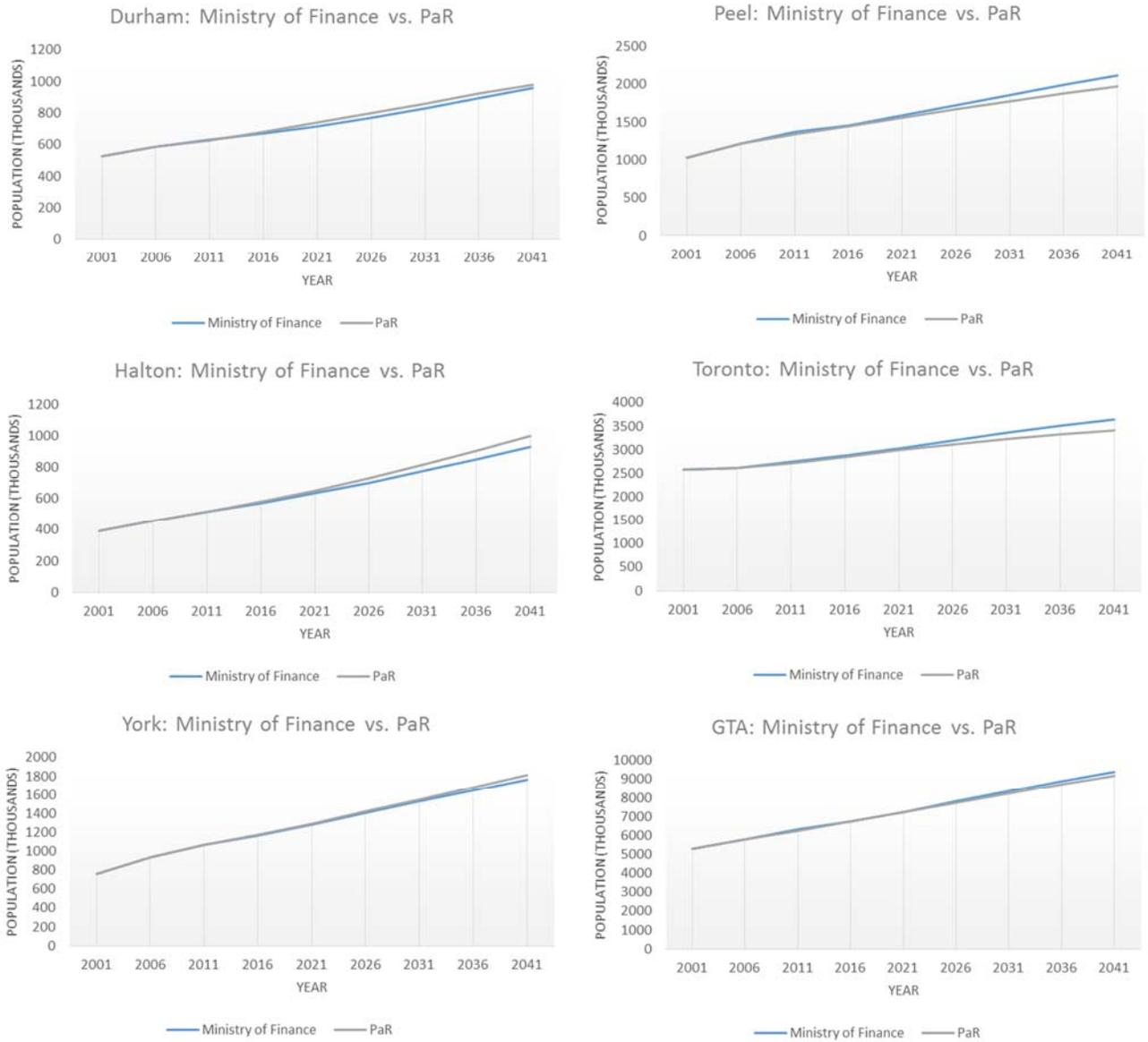
The economic projections are based upon demographic projections, which use the cohort-component method to model changes in the population. The cohort-component method involves a base population, which in the case of the Fall 2014 projections by the Ministry of Finance, is the population measured by the 2011 census (Ontario Ministry of Finance, 2014). Fertility and mortality rates are applied to this population according to existing trends, in conjunction with net migration trends and immigration targets.

PaR employs a similar framework that links demographic projections and economics, thereby generating forecasts that are cognizant of the feedback loop between demographic, economic, financial, and other data. PaR's projections are closely aligned with the populations of the Ontario Ministry of Finance across regions. Table 2 and Figure 1 below illustrate the alignment between the Ontario Ministry of Finance's projections for population between 2013 and 2041, and the projections generated in PaR.

Table 2 Percent Differences: Ministry of Finance and PaR Population Projections

Year	Durham	Halton	Hamilton	Peel	Toronto	York
2001	0%	0%	0%	0%	0%	-9%
2006	0%	0%	0%	0%	0%	-8%
2011	1%	0%	2%	1%	0%	-7%
2016	-2%	-2%	1%	1%	0%	-8%
2021	-3%	-3%	2%	1%	-1%	-7%
2026	-4%	-4%	3%	3%	-1%	-7%
2031	-4%	-5%	5%	4%	-1%	-6%
2036	-3%	-6%	6%	5%	-2%	-6%
2041	-2%	-7%	7%	7%	-3%	-5%

Figure 1 GTHA growth projection comparison: PaR and the Ministry of Finance



3.0 POPULATION: GTHA OVERVIEW

Parameterizing PaR to the assumptions of Places to Grow has allowed CANCEA to recover the population projections of most regions within the GTHA up to 2041, within a reasonable margin of error, with the notable exception of Durham. The table below summarizes the percentage differences in the regional population projections between Places to Grow and PaR by year.

Table 3 Percent Differences: Places to Grow and PaR Population Projections⁴

	Durham	Halton	Hamilton	Peel	Toronto	York	GTHA
2001	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2006	0.0%	0.1%	0.1%	0.0%	0.1%	0.0%	0.0%
2011	0.7%	0.5%	0.8%	0.7%	0.8%	0.6%	0.7%
2016	1.5%	-1.1%	-0.2%	0.6%	0.5%	2.1%	0.7%
2021	4.3%	-1.1%	-0.8%	0.2%	-0.6%	2.8%	0.5%
2026	7.7%	-0.4%	-0.7%	-0.4%	-1.2%	2.7%	0.6%
2031	12.7%	0.3%	0.0%	-0.5%	-1.1%	2.2%	1.1%
2036	17.3%	0.8%	1.5%	-0.3%	-0.9%	1.0%	1.7%
2041	21.4%	0.5%	2.2%	-0.2%	-0.4%	-1.5%	1.9%

According to Places to Grow, Durham's population is expected to grow from 631,000 in 2011 to 1,119,000 in 2041 (Hemson Consulting Ltd., 2013), representing a population growth of approximately 89%. This favourable growth, however, is not recovered by PaR. In order for Durham to meet its population targets, its historical immigration rates would have to increase approximately 20-fold; this increase is beyond what can be expected in normal immigration variance. However, it is possible that Durham has enacted policies that have augmented the rates at which economic agents will be attracted to the region⁵. If that is the case, the model is capturing agent behaviour in absence of these new attraction rates⁶. However, it is important to note that the population projections for Durham through PaR align closely to those of the Ministry of Finance, as is illustrated in section 2.1.1.

The Places to Grow population projections of other GTHA regions do not differ as significantly from PaR projections as Durham's does. However, the differences that do exist suggest that some of the growth that is expected by Places to Grow in Durham region will manifest in Peel, Toronto, and York. The following figures demonstrate the regions for which Places to Grow population projections exceed PaR population projections, and the regions for which Places to Grow population projections are lower than that of PaR in 2041.

Although the overall population of the GTHA overall is expected to be greater by approximately 186,000 individuals according to Places to Grow, the inter-regional distribution of the population over- and

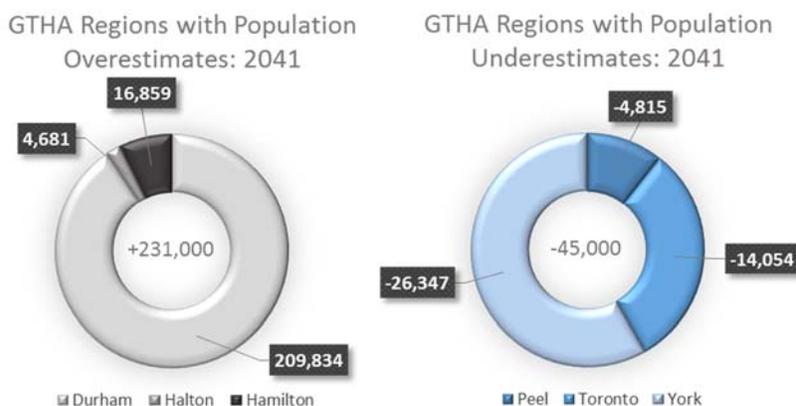
⁴ Highlighted columns represent regions and years in which PaR projections exceed Places to Grow projections. All percentages are relative to the PaR population projection for that region and year.

⁵ Or significant housing price increases across the rest of the GTHA may attract population movement to Durham at some point.

⁶ Which cannot be found in any Places to Grow documentation.

underestimates illustrates that 25% of the total excess population growth expected in Durham, Halton, and Hamilton combined will actually be captured by Toronto, Peel, and York. Refer to figure 2 for details.

Figure 2 Population over- and underestimates within the GTHA by 2041



4.0 EMPLOYMENT AND JOBS: GTHA OVERVIEW

Places to Grow projections include figures for employment by region throughout the GTHA. Employment projections are crucial in planning the development of employment lands for municipal governments. Jobs within a region identify the demand for employment by local firms, government, and other enterprises that can hire labour, therefore demonstrating the positive economic impact of growth upon the region and impact the region’s capacity to cover previously incurred costs of growth.

However, Places to Grow does not make several important distinctions regarding regional jobs. First, the projections do not distinguish between the number of jobs located within the region (which may or may not be filled by that region’s residents) and the number of employed residents within the region (which may or may not commute to other regions to work). Second, Places to Grow does not distinguish among the type of jobs that are created. Specifically, jobs can take the following characteristics:

- A usual place of work, such as an office or other physical location to which workers commute. These will be reflected additional employment lands development or intensification, and will generate development charge revenues for the municipalities;
- Jobs that are performed from the worker’s home, which may not result in development charge revenues, or may manifest as residential development charge revenues for municipalities;
- Jobs with no fixed location, for which it is difficult to determine whether municipalities will receive development charge revenues at all;
- Part-time work; or
- Full-time work.

Unlike Places to Grow, PaR creates a distinction between employed residents living within a region and the jobs that are hosted within the region. Additionally, unlike PaR, Places to Grow does not distinguish between full-time and part-time work, as well as between jobs that have a fixed location, jobs that are performed from the workers' homes, and jobs that have no fixed location.

As a result of this distinction, the projections for the number of jobs and the number of employed residents in region that are generated by PaR are individually compared to Places to Grow employment projections. PaR results expect the number of jobs within the GTHA to increase by 26% between 2011 and 2041. However, the number of employed residents projected by PaR is expected to increase by 37%. This implies that by 2041, over 329,000 employed residents of the GTHA will commute elsewhere to work, in net terms. If regions and municipalities plan to accommodate those employed residents' jobs locally, municipalities will be faced with rising debt and residents will likely shoulder the subsequent financing burden.

High employment levels may be indicative of significant purchasing power among the residents. However, if regional governments and municipalities expect that all of those employed residents will work within their respective regional or municipal bounds, they will invest in infrastructure and employment lands development far in excess of the number of jobs that will actually be hosted in those regions. Therefore, the potential confusion between employed residents and the number of jobs within a region poses an additional planning risk. The figure below illustrates the employment projections for Durham as outlined by Places to Grow relative to the projections of employed residents of the GTHA and jobs within the GTHA respectively, according to PaR. Comparisons between PaR and Places to Grow projections, however, also elucidate the risk of overcapitalization on employment lands throughout the GTHA. The table below demonstrates the percentage differences by which Places to Grow employment projections exceed PaR projections for jobs and employed residents, respectively by year, for the GTHA.

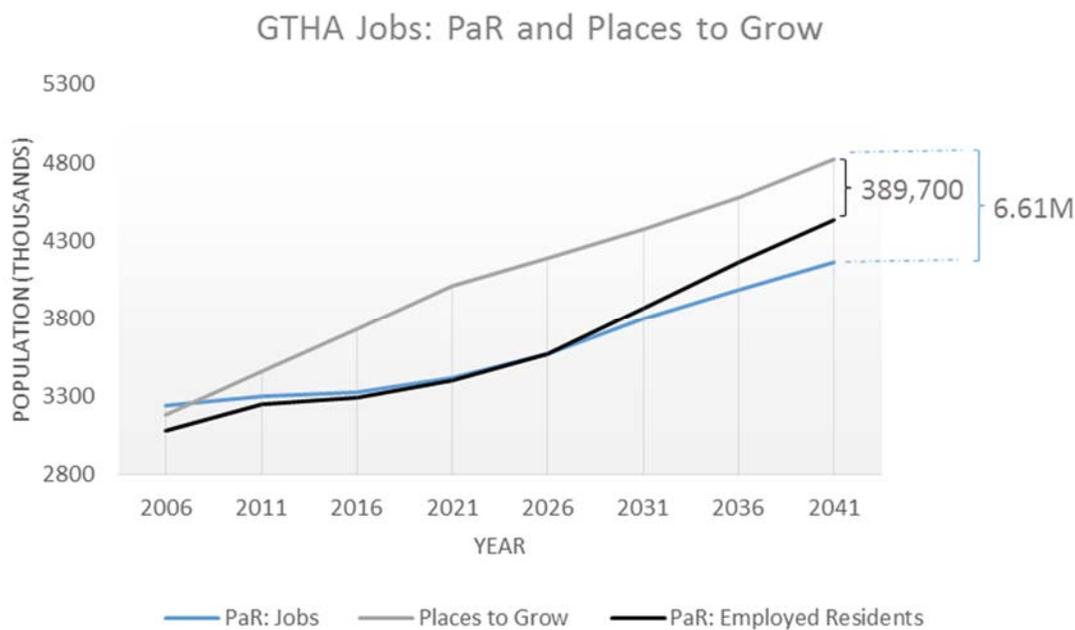
Table 4 Percent Differences: PaR and Places to Grow Jobs and Employment by Year

Year	PaR Jobs relative to Places to Grow Employment: Percentage Differences	PaR Employed Residents relative to Places to Grow Employment: Percentage Differences
2011	4.9%	6.7%
2016	12.4%	13.4%
2021	17.2%	17.8%
2026	17.3%	17.2%
2031	15.1%	13.2%
2036	14.8%	10.0%
2041	15.9%	8.8%

The discrepancy between Places to Grow and PaR projections is already visible in 2011. Although at the time of the final amendment to Places to Grow projections in 2013, data for 2011 was known, Places to Grow still overestimates the number of jobs in the GTHA relative to PaR. Specifically, Places to Grow employment projections are 4.9% greater than the PaR estimate for the number of jobs, and 6.7% greater than the PaR estimate for employed residents in 2011. Although this appears to be a small margin of error, these differences correspond to approximately 161,400 jobs and 219,000 employed residents, respectively. By 2041, the gap between Places to Grow projections and PaR projections widen to 15.9%

(6.61 million jobs) when comparing Places to Grow employment projections to PaR jobs projections, and 8.8% (389,700 employed residents) when comparing Places to Grow employment projections to PaR projections for employed residents. This is illustrated in the figure below.

Figure 3 GTHA Jobs: PaR and Places to Grow



In fact, given the approximate number of jobs in the GTHA to be just over 3.3 million in 2011, as estimated by PaR, this figure would have to grow by almost 46% for Places to Grow projections for the number of jobs in 2041 to be realized. Similarly, PaR estimates that the number of employed residents of the GTHA was 3.25 million in 2011. To attain the Places to Grow employment projection for 2041 of 4.82 million jobs, this figure would also have to grow by 49%. However, PaR estimates that the number of jobs will increase by 26% between 2011 and 2041, and the number of employed residents will increase by 37%. The following table summarizes the projected growth by variable and model for the GTHA, as well as the implied necessary growth to attain 2041 Places to Grow projections.

Table 5 Expected Growth in Employment and Jobs Summary: GTHA

Source Model	Variable	Expected Increase: 2011-2041
PaR	Jobs	+856,300 (Increase of 26% from 2011 levels)
PaR	Employed Residents	+1.185 million (Increase of 37% from 2011 levels)
Places to Grow	Employment	+1.356 million (Increase of 39% from 2011 levels)
PaR; Places to Grow	Implied Growth: Jobs ⁷	+1.517 million (Increase of 46% from 2011 levels)

⁷ From PaR-estimated jobs in 2011 to Places to Grow levels of employment in 2041

5.0 REGION OF PEEL: IN-DEPTH CASE STUDY

CANCEA has performed a recent study analyzing the costs, benefits, and risks of growth for the Region of Peel (Smetanin, Stiff, Kobak, & Moca, Costs, Benefits and Risks of Peel Growth, 2015). In order for Peel to plan for its population to grow according to the projections legislated through the Places to Grow Act, which expects that Peel will have a population of over 1.97 million people by 2041, it must incrementally invest in infrastructure as it continues to support its current population. Peel plans for this through its capital and operational budgets, which features investment schedules that are aligned to Places to Grow population projections. Therefore, in order to accrue the benefits of growth, Peel must incur the associated costs as well. Furthermore, the dependencies that Peel faces both within its own economy and in its relationships to the economies of surrounding areas and the province pose systematic risks to the ability of Peel to achieve the benefits of growth. Managing these risks in relation to the costs and benefits begins with identifying and quantifying them. In order to quantify the costs, benefits, and risks of growth, the economy of Peel and its surrounding regions must be modeled as an interconnected system.

In order to determine and analyze the benefits, costs, and risks associated with growth, the PaR simulation platform was used. Because the Region of Peel must simultaneously manage and balance its development across multiple, interconnected avenues, including the continued provision of diverse resident services alongside the support of its economic growth, a holistic approach to planning must be undertaken. For this reason, agent-based modeling was employed. Agent-based modeling animates individual agents—comprising businesses, governments, people, and others—using empirically informed behavioural heuristics, historical data, and complete financial accounting against geographic locations in one country-wide consistent model.

The Region of Peel is planning and investing to sustain a projected population growth of 41% by 2041. If this population growth is accommodated with appropriate investments in infrastructure today, Peel can expect to reap significant rewards by 2041, such as an increase of 35% in the number of its employed residents, and a 47% increase in its real, annual regional GDP. The province and the federal government will benefit with respective real, annual tax revenue increases of over 60%.

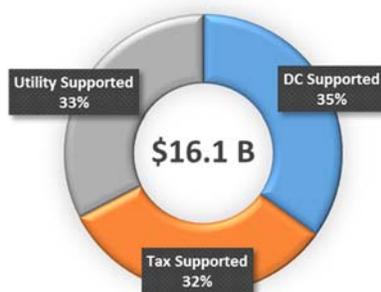
Specifically, if Peel invests according to its current expectations and growth occurs, it can expect:

- A 47% increase in its real GDP from \$67.1B in 2014 to \$98.5B in 2041
- A 35% increase in the number of its employed residents from 656,800 in 2014 to 889,900 in 2041
- A 23% increase in the number of jobs in Peel from 634,600 in 2014 to 782,500 in 2041
- An 87% increase in non-residential private capital investment from \$7.8B in 2014 to \$14.7B in 2041
- A 40% increase in residential private capital investment from \$4.3B in 2014 to \$6B in 2041
- A 68% increase in the federal tax revenue generated from Peel, from \$8.3B in 2014 to \$13.9B in 2041
- A 62% increase in the provincial tax revenue generated from within Peel, from \$8.3B in 2014 to \$13.9B in 2041

However, Peel’s strategic planning must take into consideration the costs associated with sustaining such strong growth, and must acknowledge the risks posed to the process by dependencies in relation to internal and external policies, the national and international macroeconomic climate, and even the planning process itself, particularly the projections to which Peel must plan, which may leave Peel with an inability to pay for its growth. In order to generate the benefits described above, approximately \$16.1B must be invested in growth-supporting capital by the Region of Peel between 2014 and 2041, inclusive, in real, 2014 dollars. Of this sum, approximately one third is supported by development charge revenues.

Figure 4 Cumulative Capital Budget: Region of Peel, real 2014 dollars

Capital Budget: Real Sum from 2014 to 2041



PaR simulations of the GTHA had found that evidenced-based job growth expectations across several municipalities could not support Places to Grow reported planning projections. By 2011, echoing the discrepancy for the GTHA, Places to Grow employment projections for Peel already exceed PaR job projections by 64,900 jobs, or by 10.5%. By 2041, the discrepancy in projections widens. For Peel, the PaR and Places to Grow divergence grows to over 182,000 fewer jobs by 2041. In other words, Places to Grow projections for jobs in Peel exceed those of PaR by over 23% by 2041. Further, PaR suggests a job growth of 27% between 2011 and 2041 for Peel—an increase of 165,400 jobs. According to Places to Grow, jobs will increase by 41% over the same time period, translating into over 283,000 jobs. Therefore, between 2014 and 2041, Places to Grow expects that the job growth in Peel will be almost twice that expected by PaR.

Table 6 Percent Differences: PaR and Places to Grow Jobs and Employment by Year in Peel

Year	PaR Jobs relative to Places to Grow Employment: Percentage Differences	PaR Employed Residents relative to Places to Grow Employment: Percentage Differences
2011	10.5%	5.7%
2016	16.1%	11.4%
2021	22.3%	15.7%
2026	23.0%	14.8%
2031	21.3%	10.7%
2036	21.4%	7.8%
2041	23.3%	8.4%

In fact, given the approximate number of jobs in Peel to be just over 617,100 in 2011, as estimated by PaR, this figure would have to grow by over 56% for Places to Grow projections for the number of jobs in 2041 to be realized. Similarly, PaR estimates that the number of employed residents of Peel was 645,000 in 2011. To attain the Places to Grow employment projection for 2041 of 965,000 jobs, this figure would also have to grow by 50%.

Figure 5 Peel Job Growth: PaR and Places to Grow

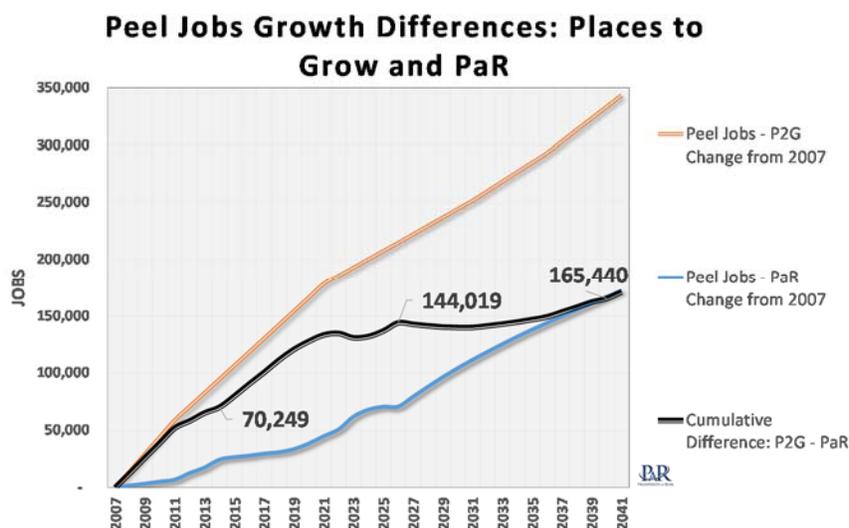


Table 7 Expected Growth in Employment and Jobs Summary: Peel

Source Model	Variable	Expected Increase: 2011-2041
PaR	Jobs	+165,400 (Increase of 27% from 2011 levels)
PaR	Employed Residents	+244,900 (Increase of 38% from 2011 levels)
Places to Grow	Employment	+283,000 (Increase of 41% from 2011 levels)
PaR; Places to Grow	Implied Growth: Jobs ⁸	+347,900 (Increase of 56% from 2011 levels)

If Peel planned and serviced to Places to Grow numbers and such a measured overestimate of job growth were to materialize, Peel would be at risk of carrying over \$2 billion in stranded debt by 2041. Such a risk would eventually be passed onto Peel residents and businesses, unnecessarily reducing Peel’s socio-economic affordability. Additionally, the Region of Peel does not face significant risk associated with its planned investment in residential lands, as it is projected to accrue sufficient revenue from associated development charges to cover the cost of the investment. However, there are significant implications on land use planning and revenue streams associated with non-residential development charges. As Peel must borrow in order to finance the development of employment lands to conform to Places to Grow projections, it inherits all of the risk associated with this potential overestimate. Peel can expect growing reliance on residential tax revenue as a result, which means that the risk is transferred to residents of Peel in the form of larger tax levies.

⁸ From PaR-estimated jobs in 2011 to Places to Grow levels of employment in 2041

The findings associated with the Region of Peel case study are particular to the region; however the trend across the GTHA illustrates the symptoms of the same risks. That is, Places to Grow potentially over-projecting employment might lead amounts of debt accumulating within GTHA regions. Further studies are necessary to identify precisely how much is at risk, and to analyze the dependencies associated with each individual region across the GTHA.

6.0 CONCLUSION

The Greater Golden Horseshoe faces significant challenges regarding its unified approach to growth management. In order to guide and support economic development towards a course of sustainability, intensified use of existing infrastructure, and the protection of green spaces, the Places to Grow Act was passed in 2005. It outlines targets for density and intensification, and calls for co-ordination in the planning and execution of growth management. This approach to municipal and regional growth planning is particularly powerful because it appreciates the systemic relationships amongst the regions, while also allowing for provisions that acknowledge the variations in the development potential between regions that are more heavily urbanized and those that are more rural in character.

However, some of these provisions have allowed regions to eschew the pursuit of intensification in built-up areas and the adherence to density targets in greenfield areas. Because the land to be developed for the expected population increase by 2031 has already been set aside and upper tier municipalities are free to dictate the distribution of intensification amongst their constitutive lower-tier municipalities (Allen & Campsie, 2013), there has not been a definitive and unified push to pursue the intensification and density targets. In addition, multiple upper tier municipalities have amended their growth plans to loosen the restrictions on the growth directive, often contradicting stipulations of the Places to Grow act (Ontario Greenbelt Alliance). In this capacity, the implementation of the Places to Grow Act through the Growth Plan for the Greater Golden Horseshoe has not been uniform. The simultaneously prescriptive and predictive functions of the population and employment projections in the Growth Plan for the Greater Golden Horseshoe, therefore, have not been completely successful with respect to their prescriptive facets.

The predictive function of the projections have also come under scrutiny. By applying the co-ordinated framework of the Places to Grow philosophy to the projection of growth within the GTHA, PaR was able to recover population projections for all regions within the GTHA aside from Durham. However, it was not able to resolve Places to Grow projections for employment. This effect may be a symptom of disparate models being used in parallel to solve separate analytical questions. PaR is able to align its projections to multiple sources, including the Ministry of Finance and the Conference Board of Canada while maintaining its holistic framework. Baseline projections will require revision upon any introduction of a major, unforeseen shock. However, having the flexibility to create dynamic baselines during the planning process improves the efficiency of the revision process. In addition, ensuring that baseline projections are reflective of real-world factors and are interconnected allows for consistency and concurrence among various metrics. Identifying the costs of growth allows regions to plan their finances and necessary investments, while interconnected baseline projections mitigate the risk of uncertainty and discontinuity in the forecasts to which regions plan.

Although the case study for the Region of Peel quantified the benefits of growth if it occurred as projected through Places to Grow, the realization of this growth appears unlikely, particularly with regard to employment and jobs. If this is the case, multiple regions across the GTHA will over-invest in infrastructure and employment lands if they plan to Places to Grow projections, generating a dispersion of costs that will be borne by residents in order to repay the municipal debt incurred.

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