Complete Mobility in the Greater Toronto and Hamilton Area

A research report sponsored by Siemens examining Complete Mobility solutions

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Globally, with their economic importance on the rise, cities have become the growth engines of the future. However, in addition to the impact of global megatrends such as demographic change, urbanization, climate change and globalization, this development is creating serious challenges for urban centres. Today more than ever, municipal infrastructures are being pushed closer and closer to their limits. In addition, cities are consuming vast amounts of natural resources; they account for 75 per cent of the world’s total energy consumption and generate 80 per cent of its greenhouse gases. Sustainable, energy-efficient infrastructures for buildings, transportation, power and water supply are urgently needed to preserve the quality of life, ensure competitiveness, conserve natural resources and protect the environment.

The impacts of these megatrends are the same in Canada, which is why Siemens recently conducted and released a research study of 12 leading Canadian cities titled: The Sustainable Cities Challenge in Canada. This study explored the topic of sustainability relating to five infrastructure areas: Transportation; Energy; Water and Waste Water; Healthcare and Safety and Security. The report clearly shows that transportation is essential to a city’s success. Nine out of 10 experts see a great need for investment in transportation infrastructure – far greater than other areas – and that transportation is the most important factor in attracting investment to their cities, ultimately acting as the primary enabler in realizing a city’s vision.

As a result of this insight, and with the goal to elaborate on this critical infrastructure area, we commissioned this follow-up study – Complete Mobility for Canadian Cities – which focused in detail on the topic of mobility in the Greater Toronto and Hamilton Area.
(GTHA). To this end and to further the dialogue, Siemens has developed a concept called “Complete Mobility” which defines a future mobility system that will both meet the urban challenges of the future and reinforce the use of mobility as a tool to support a wide range of urban objectives.

Complete Mobility has been derived from a detailed analysis of megatrends and their future impact on freight and passenger transport across all modes, including trains, light rail transit, subways, roads and bikes, and between major hubs like airports and harbours. To help decision-makers understand their current and potential mobility systems, a Complete Mobility Index was developed which ranks the performance of global cities against this concept of Complete Mobility.

The conversation must shift; shift away from planes, trains and automobiles to integration and convergence. Systems must be integrated to help ensure seamless movement of goods and people and concepts must be converged to not only help us to think about the future, but to drive change.

On behalf of Siemens in Canada, I am proud to share this report with you. I encourage you to partake in the subsequent dialogue, with the hope that we can engage stakeholders to embrace and possibly rethink what the future of mobility in the GTHA can look like.

Marco Jungbeker
Vice President, Mobility
Siemens Canada Limited
Complete Mobility in the GTHA

1.0 Executive Summary

1.1 Complete Mobility

The Complete Mobility concept aims to define a system that moves people and freight by developing sustainable, efficient and user-focused infrastructure that offers a high level of service and is safe, reliable and environmentally friendly for cities, metropolitan areas and major hubs.
1.2 Approach to the study

This research first explains the concept of Complete Mobility and its measurement within the Complete Mobility Index, before placing the six largest cities in Canada on the Index. It then analyzes the performance of the Greater Toronto and Hamilton Area (GTHA) with regards to Complete Mobility through a detailed review of its position within the Complete Mobility Index, and subsequently through an in-depth study of the GTHA.

The detailed study involved stakeholder workshops and interviews with public and private sector representatives from the cities of Hamilton and Toronto in addition to the other four regional municipalities. Participants addressed different transport modes – air, rail and road – and covered planning, policy, strategy and academic professions. In addition, an appraisal of the GTHA plans and programs against Complete Mobility was undertaken. This was used to develop three future scenarios for the GTHA up until 2030, including a Complete Mobility scenario. Delivery issues concerning this latter scenario were described and developed.
1.3 Complete Mobility in Canada: Canadian cities in the Complete Mobility Index

The Complete Mobility Index uses five qualitative and 10 quantitative mobility indicators that measure the “sustainability”, “efficiency” and “user focus” of a city’s mobility system. These are plotted against GDP per capita for each city. When it was first developed, it included 46 global cities from across all continents. From Canada, however, it only included the city of Toronto. The Index has now been updated to include the metropolitan GTHA, Ottawa, Montreal, Edmonton, Calgary and Vancouver, highlighting their relative performance towards Complete Mobility.

The expanded Index presented in this report shows two clusters of Canadian cities. Vancouver, Ottawa and Montreal are all within the “Best in Class” categories as defined in the Index.

Edmonton, Calgary and the GTHA form another cluster that is more closely aligned to the “At Risk” category. Interestingly Calgary and the GTHA both have very similar Mobility Scores and are very much on the border with the “Best in Class” category. The report reflects on their performance within the Index and contrasts their position to other global cities – it is on the global stage where major international cities and the GTHA compete.

The GTHA itself performs moderately on the Complete Mobility Index. It performs poorly on two scores of “efficiency”, reflecting relatively low investment in road and transit infrastructure (currently being addressed by Metrolinx) and the under-exploitation of sea and inland waterways, particularly for intermodal freight operations. It performs relatively strong on two “sustainability” measures, reflecting the low level of accidents and fatalities in the GTHA and the low levels of carbon monoxide emissions. Other scores are generally mid-range, leading to an overall score of 3.76 out of 6.

The GTHA must improve its score to maintain or increase its global competitiveness. In moving towards a “Best in Class” position, it faces a number of challenges that stakeholders have highlighted. Significant among these are:

Growth and sprawl
The GTHA benefits greatly from a growing population that adds to the vibrancy of the area and its economy. However, with this growth has come urban sprawl and low population densities, with resulting lifestyles built around the car, as well as growing congestion levels.

Integration
The levels of integration between modes in the GTHA must be improved for passengers and goods traffic. This integration will be achieved by integration of physical infrastructure and by payments and information technologies, so people and goods move seamlessly through the system.

Balancing demands
Conflicting requirements for fast and efficient freight movement on the one hand, and travelers’ needs for easy accessibility to work and leisure on the other, must be effectively balanced and managed in the GTHA. This will ensure that commercial business needs are met and the GTHA’s natural geographic advantage as a freight hub is effectively exploited.

Events, visitors and new arrivals
Many new permanent immigrants and temporary immigrants (e.g. students) arrive in the GTHA every year, as well as tourists and visitors to events. Meeting and influencing these groups’ mobility requirements will be important in achieving Complete Mobility in the GTHA.
Figure 1 – Canadian cities in the Complete Mobility Index
The following three future scenarios for the GTHA are built upon a review of the existing policies and plans, focusing upon The Big Move (the Regional Transport Strategy for the GTHA); a well-received and ground breaking plan presented by Metrolinx.

The Business as Usual scenario
This scenario envisions a 2030 in which only the infrastructure projects that have already received committed funds have been implemented. This primarily includes Metrolinx’s nine Priority Projects – i.e. “The Big Five plus Four” (York VIVA, Sheppard LRT, Eglinton LRT, Scarborough RT, Finch LRT, Spadina Subway Extension, Airport Rail Link, 403 Transitway and Union Station Revitalization). An analysis of this scenario on the GTHA’s Index performance shows the GTHA slipping firmly into the “At Risk” category with an overall reduction in its Index score. The challenges of growth, passenger and goods integration and a lifestyle built around the car, with no credible alternative for most trips, have not been met. It paints a scenario where the GTHA is exposed to significant risk from external factors such as increased oil prices and competition from other global cities for investment and jobs.

The Big Move scenario
The second scenario sees a GTHA in 2030 that has benefited from the full implementation of The Big Move policies and programs. A range of score improvements occurs, due to a fast and dedicated airport link integrated into other GTHA networks and a more integrated transit system. Score increases concerning goods movement are not as significant. In this scenario, the GTHA moves into the “Best in Class” category, closer to Canadian cities such as Ottawa, Vancouver and Montreal, and European cities such as Paris, Berlin and Barcelona. However, as stakeholders have noted, The Big Move Transport Strategy in many ways just starts to address years of underinvestment and a lack of mobility strategy within the GTHA.

The Complete Mobility scenario
The third scenario shows how a mobility system built around the concept of Complete Mobility will affect the GTHA’s position on the Index by 2030. Three Pathways to Complete Mobility are presented. These are infrastructure and technology pathways, user focus pathways and value added pathways. Each Pathway consists of packages of infrastructure and services that observe the principles of Complete Mobility and thus provide the extra impact necessary to achieve high scores within the Index. The Pathways, as illustrated by numerous best practice examples from around the world, are distinctly achievable and have in common a focus on the seamless, whole journey and total goods movement, including the all-important first and last kilometre. They create one system.

In this Complete Mobility Scenario, the GTHA achieves significantly better scores, taking the area well into the Best in Class category, alongside global cities such as Vienna, and in many ways performing better than London and Tokyo.

Quick wins for the GTHA are presented which show the three policies which must be implemented from within The Big Move scenario, four supporting initiatives essential in delivering Complete Mobility, and four distinct Complete Mobility Pilots which will clearly demonstrate the benefits of Complete Mobility.
1.5 Delivering Complete Mobility in the GTHA

The final section of this report provides an analysis and recommendations as to how Complete Mobility can be delivered in the GTHA. The four preliminary requirements for Complete Mobility are:

Adequate and sustainable funding
A number of funding sources are available to bridge the funding gap that The Big Move itself recognizes. Stakeholders are encouraging Metrolinx to be innovative and “think outside the box”. A number of additions to the Metrolinx investment principles are suggested, including the adoption of the “user pays” principle, the control and exploitation of the potential revenue streams from integrated ticketing, such as those realized in London and Hong Kong, and a clear funding agreement between all relevant partners including local municipalities.

Effective governance and delivery
Metrolinx is an innovative organization and has delivered a strong, consensual vision and strategy for the region. In moving its role towards delivery and performance management, it is proposed that clearly separated functions are established with a contractual relationship between strategy, delivery and operation. Performance management must have a focus on the user experience, and a new operational role for a “Mobility Manager” (contracted to Metrolinx) is proposed that will be responsible for meeting performance requirements.

Integrated transport and land use planning, with a focus on placemaking
While the GTHA policy background does appear to be in place to integrate land use and transport planning (Greenbelt Plan, Places to Grow, The Big Move), the report notes that Toronto’s city centre is not maximizing the benefits of the city to improve the economy and quality of life of the area. In many places there is a need to rebalance “movement space” with “exchange space”, which will then drive the economy and improve the experience of citizens, businesses and visitors alike.

Integration of modes and interoperability
The move to one system requires improved infrastructure and technology. Collecting data on the use and performance of the network from a user’s point of view, and having the ability (via pricing and capacity changes) to change network usage, allows proactive management of the network. Along with infrastructure and technology, new organizational requirements will be required to harness and channel this power to use transport proactively as a tool to manage the economy and environment of the GTHA and improve the quality of life of its citizens and visitors.

This research has provided new insights into how the concept of Complete Mobility can add value to the Greater Toronto and Hamilton Area’s current mobility system and its ongoing plans to ensure that it retains its position as a successful city in 2030.

We invite stakeholders and interested parties to contribute to the ongoing discussions needed to define the detail of the system, and we hope that this study will inspire and encourage people to actively participate to make the Complete Mobility vision become a reality.
2.0 Introduction
2.1 Background to the study

In 2010, Siemens completed a study called The Sustainable Cities Challenge in Canada. Based on a survey of 243 experts across 12 Canadian cities, it was a deep dive into urban infrastructure topics of transportation, energy, water and wastewater, healthcare and safety and security. The main conclusion: transportation is the most important infrastructural component necessary to attract investment to Canadian cities and will therefore require the greatest portion of infrastructure investment.

The results of the 2010 report closely mirror the findings from a 2006 Siemens study called Megacity Challenges. This research identified mobility as the biggest issue for megacities by a factor of three. The Megacity Challenges study showed that while all cities are unique, all are on the same development pathway and show similar trends, including suburbanization, urbanization, aging population and growing personalization of goods and services. The study also confirmed that all cities, as part of the global economy, compete with each other.

Thus mobility is seen to be a critical factor for any city’s economic success. As cities progress along the development pathway, they move from a mobility system that offers poor, fragmented services to a fully integrated system that is intrinsically part of a city management system and could be called “Complete Mobility”.
2.2 Aims of the study

The aim of this study is to provide fresh insight into the current mobility system of the metropolitan area of the GTHA, and show how it can meet the global challenges it will face in the next 20 years. The study initially presents a Complete Mobility Index that measures a city’s relationship to Complete Mobility, then places and compares the GTHA, Ottawa, Montreal, Vancouver, Edmonton and Calgary on this Index. The study then provides an assessment of the GTHA’s performance within the Index and an analysis of the current and future challenges it faces in achieving Complete Mobility by 2030. Three scenarios for the future development of mobility within the GTHA to 2030 are then presented, including a scenario based on the concept of Complete Mobility. The study concludes with an analysis of what is necessary to deliver Complete Mobility in the GTHA.
2.3 The Complete Mobility concept

Following on from the *Megacity Challenges* report, discussed above, further work was undertaken examining trends in other cities. This has included over 50 cities of varying size, from cities of 500,000 to megacities with populations in the tens of millions. The work covered a comprehensive range of trends (Table 1). As with the *Megacity Challenges* report, it is clear that the influencing trends are common to all cities and they follow the same development patterns, though not all are at the same point in their development.

These trends will interact to create a complex array of requirements for mobility. As an example, changing patterns of workforce participation may see more women or men in the workforce, leading to increased demand for public transport or urban planning changes.

### Table 1 – Megatrends

<table>
<thead>
<tr>
<th>Economic trends</th>
<th>Demographic trends</th>
<th>Lifestyle and social trends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased disposable income</td>
<td>Urbanization</td>
<td>Personal lifestyles (expectations, needs, behaviour)</td>
</tr>
<tr>
<td>Globalization</td>
<td>Suburbanization</td>
<td>Safety and security</td>
</tr>
<tr>
<td>Increased motorization</td>
<td>Smaller households</td>
<td>Environmental awareness</td>
</tr>
<tr>
<td>Scarcity of fossil fuels</td>
<td>Ageing population</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased workforce participation</td>
</tr>
</tbody>
</table>
elderly entering the workforce, in addition to more part-time work, use of flexible working hours, or teleworking. As a result, a city could experience an increased demand for personalized travel options, a spread of the peak hours of travel, an increased complexity of journeys, and an expectation from passengers for high levels of connectivity between transportation modes. In previous studies, the impacts of each of the economic, demographic and social trends have been examined both individually and in combination with each other. Ultimately the result of these trends leads to the conclusion that mobility systems in the future will have to be sustainable, efficient and user-focused, and be developed as one seamless system covering all transportation modes, both physical and virtual. This is all part of what Siemens calls “Complete Mobility”.

The concept of Complete Mobility is achievable in increments. It is conceivable that within the next 20 years some cities will be well along the pathway towards implementing a sustainable, efficient and user-focused system.

**Definition of Complete Mobility:**

The Complete Mobility concept aims to define a system that moves people and freight by developing sustainable, efficient and user-focused infrastructure that offers a high level of service and is safe, reliable and environmentally-friendly for cities, metropolitan areas and major hubs.
2.4 Complete Mobility Index

The Complete Mobility Index was developed to gain a better understanding of Complete Mobility and the relationship between mobility and economic competitiveness. The Complete Mobility Index is a combination of 15 qualitative and quantitative indicators, which are shown in Table 2. Each indicator is scored on a scale of 1 to 6 with 1 being the lowest and 6 the highest. The final Mobility Score is an unweighted average of all 15 indicators. The 15 indicators selected each represent key elements of the Complete Mobility concept – user focus, sustainability and efficiency.

### Table 2 – Indicators from the Complete Mobility Index

<table>
<thead>
<tr>
<th>Indicator Number</th>
<th>Name</th>
<th>Definition</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Public transport level of service</td>
<td>Level of organizational, regulatory and modal integration which enhances user experience, service efficiency and urban management</td>
<td>Qualitative</td>
</tr>
<tr>
<td>2</td>
<td>Transport management, control &amp; security</td>
<td>Uptake of urban traffic control and security systems and their application which provide infrastructure for proactive management of mobility</td>
<td>Qualitative</td>
</tr>
<tr>
<td>3</td>
<td>Transport information and payment systems</td>
<td>Implementation of customer facing tools for journey planning and payment to support both trip decision-making and city objectives</td>
<td>Qualitative</td>
</tr>
<tr>
<td>4</td>
<td>Air transport</td>
<td>Level of connectivity of national and international air travel and integration of airport facilities with urban infrastructure</td>
<td>Qualitative</td>
</tr>
<tr>
<td>5</td>
<td>Sea transport</td>
<td>Level of connectivity of national and international sea travel and integration of port facilities with urban infrastructure</td>
<td>Qualitative</td>
</tr>
<tr>
<td>6</td>
<td>Road infrastructure</td>
<td>Optimised provision of road space per 1,000 of the population</td>
<td>Road km-lane/1,000 of the population</td>
</tr>
<tr>
<td>7</td>
<td>Accidents</td>
<td>Rate of fatal accidents from transport</td>
<td>Fatalities/1,000 vehicle of the population</td>
</tr>
<tr>
<td>8</td>
<td>Pollution</td>
<td>Level of emissions arising as a consequence of transport</td>
<td>Emissions mg/m³ (CO, NO₂, SO₂, and PM10)</td>
</tr>
<tr>
<td>9</td>
<td>Energy use intensity</td>
<td>Level of energy use intensity from transport</td>
<td>kJ/$GDP</td>
</tr>
<tr>
<td>10</td>
<td>Cost of transport provision/ unit GDP</td>
<td>Cost of transport provision for the community</td>
<td>Cost/GDP (split for road and rail network)</td>
</tr>
<tr>
<td>11</td>
<td>Performance of road network</td>
<td>Average journey time on road network</td>
<td>% change (over 5 year period) of average journey time on core route into urban centre during peak hours</td>
</tr>
<tr>
<td>12</td>
<td>Affordability</td>
<td>Average cost of travel by public transport as a percentage of household income</td>
<td>Average household expenditure on public transport as a percentage income</td>
</tr>
<tr>
<td>13</td>
<td>Reliability of rail services</td>
<td>Reliability of rail journey time</td>
<td>Reliability of rail journey time – percentage of services ”on time”</td>
</tr>
<tr>
<td>14</td>
<td>Dedicated cycle lanes</td>
<td>Level of provision of dedicated cycle lanes</td>
<td>Dedicated cycle km-lane/1,000 of the population</td>
</tr>
<tr>
<td>15</td>
<td>Accessibility</td>
<td>Percentage of stations with disabled access</td>
<td>Percentage of stations with lift</td>
</tr>
</tbody>
</table>
2.5 Methodology followed

The different stages of the study require different inputs and methodologies. The Complete Mobility Index utilized quantitative data collected by an independent data collection agency, in addition to qualitative scoring that was completed by a panel. The Index analysis was supported through discussion with a group of stakeholders from the GTHA and gaining a detailed understanding of local plans, policies and trends.

2.6 Complete Mobility in Canada

The Complete Mobility Index is globally applicable. When it was first developed the only Canadian city it included was Toronto. The Index has now been updated to include the metropolitan GTHA, Ottawa, Montreal, Edmonton, Calgary and Vancouver.

Table 3 shows the GDP per capita and the Mobility Scores achieved by these six selected Canadian Cities. In Figure 1 these cities have been plotted on the Complete Mobility Index.

<table>
<thead>
<tr>
<th>Urban Area</th>
<th>GDP per Capita (USD)</th>
<th>Mobility Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toronto and Hamilton</td>
<td>44.54</td>
<td>3.76</td>
</tr>
<tr>
<td>Calgary</td>
<td>55.68</td>
<td>3.75</td>
</tr>
<tr>
<td>Edmonton</td>
<td>37.30</td>
<td>3.56</td>
</tr>
<tr>
<td>Montreal</td>
<td>33.01</td>
<td>3.81</td>
</tr>
<tr>
<td>Vancouver</td>
<td>38.05</td>
<td>4.11</td>
</tr>
<tr>
<td>Ottawa</td>
<td>35.84</td>
<td>4.11</td>
</tr>
</tbody>
</table>
3.0 The GTHA Complete Mobility appraisal

3.1 The Greater Toronto and Hamilton Area

This study covers the large geographic area of the metropolitan GTHA and surrounding areas as shown in Figure 2.
3.2 Relevance of Complete Mobility to the GTHA

A series of relevant global megatrends were explained in Section 2.1. These trends underpin the concept of Complete Mobility. Figure 3 presents data to show that the global trends and the Complete Mobility concept are pertinent to the GTHA, Ontario and Canada. Please note that two additional trends — “Immigration” and “Social Inequality” — have been added as these trends are significant within the GTHA.

These trends create a wide range of needs and requirements that a city’s transportation system must respond to if it is to be successful. Complete Mobility can provide the pathways that will allow the city to foresee the impact of the trends and proactively manage the system.

The three key components of Complete Mobility are sustainability, efficiency and user focus. The Big Move for the GTHA describes a transportation system which will enhance:

1. A high quality of life
2. A thriving, sustainable and protected environment
3. A strong, prosperous and competitive economy

The components of Complete Mobility are aligned with the GTHA’s ambitious goals of The Big Move.

▲ Economic trends

- **Rising incomes** – In Ontario, per capita personal disposable income rose steadily from $18,698 in 1992 to $28,502 in 2009, representing an increase of 52%.

- **Motorization** – Between 1986 and 2001, transit mode share in Toronto fell by 26% while auto trips increased by 46%, against a population increase of 36%.

- **Globalization** – In 1981, the value of Ontario exports to the rest of the country was about equal to international exports. By 1995, the situation has changed completely with international exports valued at close to three times those to the rest of Canada. An estimated 92% of Ontario’s international exports now go to the U.S., representing 43% of the provincial GDP.

▲ Demographic trends

- **Ageing** – The percentage of the population aged 65 years or older in Toronto has risen from 11% to 11.9% in the ten years to 2006. This is similar to the increase observed nationally for Canada from 12.2% in 1996 to 13.7% in 2006.

- **Household size** – In Toronto the percentage of one-person households has risen from 21.9% to 22.9% between 1996 and 2006.

- **Workforce participation** – Employment in Toronto grew 8.9% between 2001 and 2006 to 2,627,400. However, this was about half the pace of the 17.0% growth from 1996 to 2001.

- **Immigration** – Between 2001 and 2005, the metropolitan Toronto area attracted an average of 107,000 international immigrants each year; the City of Toronto welcomed two thirds (69,000). According to the Canadian government, Canada has the highest per capita immigration rate in the world, and 43% of new immigrants settle in the Greater Toronto Area.

- **Suburbanization** – The overwhelming majority of the employment and population growth in Toronto has occurred in the four GTA regions which surround the city of Toronto (Durham, York, Peel and Halton). These areas represented 75% of the employment growth and 77% of the population growth. The city of Toronto accounted for 23% of employment growth and 18% of population growth.

▲ Social trends

- **Inequality** – In the GTHA, many low-skilled job opportunities are located in the downtown core. However, adequate affordable housing is not available within the downtown centres, meaning that many working poor are forced to live some distance away from their place of work. These same people are less able to afford a car and are therefore reliant on public transit.
3.3 Complete Mobility performance of the GTHA

Performance on the Complete Mobility Index
The Greater Toronto and Hamilton Area receives a Mobility Score (i.e. the average across all 15 indicators) of 3.76, where a score of 6 is the maximum. Based on this score and the GTHA’s level of GDP per capita, Figure 4 shows that the GTHA falls on the border of the “At Risk” and “Best in Class” categories.

The GTHA Mobility Score is similar to the Canadian cities of Calgary (3.75) and Montreal (3.81) shown in Figure 4. Other global cities with comparable scores include New York, Melbourne, and Seoul. Some of these cities – Montreal and Seoul – would be regarded as better performing than the GTHA because they are managing to achieve a similar Mobility Score whilst having a lower level of GDP per capita. On the other hand, New York and Calgary are performing relatively worse than the GTHA. Their levels of GDP per capita are higher but this has not been translated into a higher Mobility Score.
Another analysis of performance on the Index can be measured via a horizontal cross-section of the Index as shown in Figure 5. Here the relative Complete Mobility performance of cities with a similar level of GDP per capita is shown. This suggests that the GTHA is out-performing cities such as Dubai, Phoenix, Rome and Sydney whose levels of GDP per capita are similar to, or higher than, the GTHA’s but whose Mobility Scores are lower. On the other hand, there is a group of cities (Vancouver, Ottawa, Berlin, the Ruhr and Zurich), where GDP per capita is lower than that of the GTHA but Mobility Scores are higher. This group is, therefore, performing better than the GTHA in moving towards Complete Mobility.

Figure 5 – GDP peer group
3.4 Performance across components of Complete Mobility

The three core components of Complete Mobility – sustainability, efficiency and user focus – have previously been highlighted. An assessment of the performance of the GTHA’s mobility systems against each of these three core components of Complete Mobility (sustainability, efficiency and user focus) has been completed. Both indicator scores and stakeholder insights have been utilized.

Figure 6 offers an overview of the scores received by the GTHA for each of the 15 indicators. Due to the methodology used, the qualitative scores, unlike the quantitative scores, are not necessarily whole numbers. Therefore, Table 4 has been included to show the exact scores for the 5 qualitative indicators.

The GTHA received mainly 3.0s and 4.0s. It received no 1.0s and, conversely, no 6.0s. The Region was given a score of 2.55 for Sea and Inland Water Transport which is seen as a largely under-utilized resource in the area. Cost of Transport Provision appears to be a further weakness. The GTHA’s best scores were for Accidents, Polluting Emissions and Affordability. Further details relating to indicators scores are offered below.

Table 4 – Qualitative Mobility Score details

<table>
<thead>
<tr>
<th>Qualitative Indicator</th>
<th>Mobility Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Public Transport Services</td>
<td>4.28</td>
</tr>
<tr>
<td>Transport Management and Control</td>
<td>4.42</td>
</tr>
<tr>
<td>Transport Information and Payment Systems</td>
<td>4.31</td>
</tr>
<tr>
<td>Air Transport</td>
<td>3.88</td>
</tr>
<tr>
<td>Sea and Inland Water Transport</td>
<td>2.55</td>
</tr>
</tbody>
</table>

Figure 6 – Overview of Complete Mobility performance
Sustainability

Four of the fifteen indicators in the Complete Mobility Index relate best to Sustainability and are shown in Figure 7. Toronto scores an average of 4.0 across these four indicators. Under this component, the GTHA scores a 5.0 for both Accidents and Polluting Emissions.

The GTHA has a fairly high level of Energy Use Intensity which results in its score of 3.0. High vehicle dependence; increased trip lengths due to suburbanization and land-use trends; and congestion on the road network impacting goods and passenger movements all contribute to this relatively poor score.

The GTHA receives a score of 5.0 for the Polluting Emissions indicator. That’s because their levels of carbon monoxide emissions are relatively low, despite the poor score for Energy Use Intensity.

For the Dedicated Cycle Lanes indicator, the GTHA scores 3.0 because there is only a small provision of cycle lane kilometres per 1,000 of the population. Within the GTHA’s regional transport plan, The Big Move, there is an emphasis on increasing the cycle lane network. In the Toronto Bike Plan, it is planned to increase bikeways from 425.1 to 1,004 kilometres.

Figure 7 – Performance for Sustainability Indicators
3.0 The GTHA Complete Mobility appraisal
3.4 Performance across components of Complete Mobility

Efficiency
The Efficiency group of indicators includes six factors as shown in Figure 8. The average score across these indicators in the GTHA is 3.3 – the lowest average across the three components of Complete Mobility.

The GTHA scores an average of 4.42 for Transport Management and Control. This respectable score reflects the fact that the GTHA has some good individual transport management systems. However, there are numerous different municipalities and agencies and creating a region-wide, integrated transport management system will be a challenge in the future.

The GTHA scores an average of 3.88 for the Air Transport indicator. There are good airports in both Toronto and Hamilton with high-quality facilities and numerous national and international connections. However, access to the airports is not currently well served by a range of modes, especially transit.

For Sea and Inland Water Transport the GTHA scores an average of 2.55; many of the stakeholders interviewed accepted that the seaways are a largely under-utilized resource in Ontario – especially when compared to the similar resources in Europe. It should be noted that the ports and seaways near the GTHA are not currently operational year round.

In the GTHA, there is an over-provision of road infrastructure compared to the ideal of Complete Mobility within which there is an emphasis on the need to balance space within a city. This has resulted in the Road Infrastructure indicator scoring a 4.0. Sprawl and low density development in the GTHA is often lacking transit-oriented aspects.

The Cost of Transport Provision receives a score of 2.0 due to the relatively low investment level into road and transit infrastructure and operation.

Toronto receives a score of 3.0 for the Performance of Road Network indicator; the data shows that there has been a considerable increase in journey times over the past five years. Increasing levels of congestion throughout the GTHA’s road network is certainly viewed by locals as a key problem for the region.

User focus
User focus is probably the most important aspect of Complete Mobility, because without a system centered on the needs of its current and potential users, it will be difficult to achieve sustainability and efficiency. Encouragingly, Toronto receives its highest average score across the “User focus” group of indicators (4.1). As shown in Figure 9, all five indicators in this group score a 3.0 or higher.
Toronto receives a score of 4.28 for Local Public Transport Services, based on the average score of the internal scoring panel. This is a good score that reflects a reasonable level of provision and choice. However, the size and complexity of the GTHA will make governance, and integration, within the transport system difficult.

For the Transport Information and Payment Systems qualitative indicator, the GTHA scored an average of 4.31. This is a reasonable score based on widespread information sources and a range of payment mechanisms across the GTHA. The most significant issue for both was how to integrate these systems over the entire municipal area.

Toronto scores a 5.0 on Affordability, measured by the percentage of household expenditures on public transport, as only a small percentage of household expenditures is applied to public transport. In the context of the GTHA it is difficult to tell whether this truly indicates that public transit is affordable.

The score for Reliability of Rail Services, as measured by the percentage of rail services arriving “on-time”, was a 3.0, which is poor. This score was, however, similar to the other five Canadian cities.

In terms of Accessibility there was a split between how well different operators within the GTHA have provided for the needs of their disabled users. GO Transit and Metrolinx have an accessibility plan which includes a strong Provincial commitment to improved universal accessibility.

There was consent among the stakeholders that there is a strong culture within the GTHA of high mobility expectations supportive of lifestyle choices. This expectation, coupled with ever-diversifying mobility choices, will be difficult to meet with the current transit systems in the GTHA. Families are highly dependent upon their cars.

The GTHA is aiming to be a globally competitive city region. One important aspect of this is the ability to host large-scale events. For example, in 2010, Toronto hosted the G20 summit and in 2015 the GTHA will be home to the 17th Pan American Games which is expected to attract 250,000 spectators and 10,000 athletes. The success of the GTHA is partially reliant upon its ability to provide efficient, user-focused mobility services to this specific user group of visitors. The stakeholders interviewed, however, suggested that this was a weakness of the current set-up in the GTHA.
3.0 The GTHA Complete Mobility appraisal

3.5 Summary

The GTHA performs moderately on the Complete Mobility Index. Its scores across the indicators are mixed – some scores are good, others can be improved. The mobility system in the GTHA is currently facing a number of overarching challenges which are all inter-related with the trends that were presented in Section 3.2. These trends and challenges are summarized next, although the relationships between trends and challenges are highly complex with cause and effect being highly interrelated.

Trend 1: Population and economic growth
The GTHA is one of Canada’s fastest-growing urban areas, and the majority of its employment and population growth is now in the suburbs. Economic growth is expected to continue the trend of rising incomes experienced over the last decade.

Resulting challenges
Growth and sprawl – It will be necessary to improve mobility in areas where population density is low and personal lifestyles are built around the car.
Events, visitors and new arrivals – The GTHA must be prepared to handle the mobility requirements of many temporary and permanent visitors.

Trend 2: Increasing use of cars
Car use and congestion are both increasing at a faster rate than the population. The Big Move estimates a projected reduction in GDP of $7.2 billion per annum by 2031 due to excess congestion if there is no improvement.

Resulting challenges
Integration and interoperability – It will be necessary to provide adequate road and transit networks and create the conditions for integration between all transportation-related modes to ensure seamless movement of people and goods within modes. Integration should also occur between transport and land-use planning.
Trend 3: Accessibility
Given continued immigration and suburbanization, social issues may arise as people move out from inner city areas to suburbs that are less accessible to work and other facilities.

Resulting challenges
Balancing demands – A key challenge is to create an acceptable balance between occasionally conflicting requirements, e.g., between business needs for fast freight movement and residents’ needs for easy accessibility to work or leisure.

Trend 4: Climate change
Continued increases in congestion will result in increased inefficiencies as well as poor local environmental conditions.

Resulting challenges
Balancing sustainability – The GTHA must try to provide solutions that reduce carbon emissions in line with municipal, provincial and federal strategies.

Trend 5: Governance
Governance, delivery and operation of transit and mobility, while significantly improved with the establishment of Metrolinx, may need further review.

Resulting challenges
Delivering change – In order to correct past underinvestment in mobility, as well as meet the needs of a rapidly growing population, the governance and delivery framework must be purpose fit within the GTHA and a long term funding model must be put in place.
4.0 Scenarios

4.1 Introduction

This chapter considers scenarios for the future of the GTHA. The first scenario, Business as Usual, addresses the impact on mobility if only currently committed projects take place. The second scenario, The Big Move considers the impact if all The Big Move strategies and projects were implemented. A third scenario, Complete Mobility describes how the GTHA might take further steps towards the vision of Complete Mobility.
4.2 Business as Usual scenario

Business as Usual is defined as the implementation of current committed projects only. Therefore it includes The Big Five plus Four infrastructure projects from The Big Move (as shown in Figure 10). This assessment is based on our established and proven scoring criteria for qualitative criteria.

Section 3.5 of this report presents the challenges facing the GTHA. In our view, the trends in the GTHA (being related to population and economic growth) are so strong that the current committed projects will probably not match likely increases in demand – therefore some scores may decline even further.
If no more action is taken beyond current committed projects, the impact is shown in Table 5.

Under this scenario, the GTHA would be likely to suffer increased car dependence, energy use and pollution with consequent impacts for environmental, economic and quality of life objectives. As such there is a real possibility that overall GTHA Mobility Scores will decline, taking it further into the ‘At Risk’ category, as shown in Figure 11.

### Table 5 – Impact of current committed projects

<table>
<thead>
<tr>
<th>Qualitative Indicator</th>
<th>Current Mobility Score</th>
<th>“Trigger” for next level</th>
<th>Likely impact of committed projects on Mobility Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Public Transport Services</td>
<td>4.28</td>
<td>Public transit increasingly managed as a single entity. Focus increasingly on customer convenience/ease of use, linked to mobile/internet technology</td>
<td>Score will improve but not enough to trigger a move to level 5 despite considerable investment in transit infrastructure</td>
</tr>
<tr>
<td>Transport Management and Control</td>
<td>4.42</td>
<td>Some application of road user and parking charges as a mechanism for demand management</td>
<td>No change as no decisions made on future funding</td>
</tr>
<tr>
<td>Transport Information and Payment Systems</td>
<td>4.31</td>
<td>Use of internet, mobile and smart card ticketing comprehensively covering individual modes</td>
<td>No change as priority not given to resolving ticketing issues</td>
</tr>
<tr>
<td>Air Transport</td>
<td>3.88</td>
<td>Dedicated, rapid, congestion free public transit access to Central Business District</td>
<td>Increase to 4 with implementation of airport rail link</td>
</tr>
<tr>
<td>Sea and Inland Water Transport</td>
<td>2.55</td>
<td>Adequate rail and road access to ports and infrastructure though subject to some congestion/capacity constraints</td>
<td>No change</td>
</tr>
</tbody>
</table>
Figure 11 – Indicative impact of committed schemes
4.3 The Big Move scenario

This scenario is based on The Big Move Regional Transport Strategy. The Big Move is ordered around ten strategies, listed in Table 6, each with supporting policies:

<table>
<thead>
<tr>
<th>Strategies</th>
<th>The ten strategies of The Big Move</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy 1</td>
<td>Build a comprehensive regional rapid transit network</td>
</tr>
<tr>
<td>Strategy 2</td>
<td>Enhance and expand active transportation</td>
</tr>
<tr>
<td>Strategy 3</td>
<td>Improve the efficiency of the road and highway network</td>
</tr>
<tr>
<td>Strategy 4</td>
<td>Create an ambitious transportation demand management program</td>
</tr>
<tr>
<td>Strategy 5</td>
<td>Create a customer-first transportation system</td>
</tr>
<tr>
<td>Strategy 6</td>
<td>Implement and integrated transit fare system</td>
</tr>
<tr>
<td>Strategy 7</td>
<td>Build communities that are pedestrian, cycling and transit-supportive</td>
</tr>
<tr>
<td>Strategy 8</td>
<td>Plan for universal access</td>
</tr>
<tr>
<td>Strategy 9</td>
<td>Improve goods movement within the GTHA and with adjacent regions</td>
</tr>
<tr>
<td>Strategy 10</td>
<td>Commit to continuous improvement</td>
</tr>
</tbody>
</table>
These strategies are comprehensive in their reach, and cover most of the areas required to achieve Complete Mobility. Responses from our workshops and interviews suggest that Metrolinx is focusing strongly on the key strategy, Strategy 1 (Figure 12) and insufficiently on the other complementary strategies.

**BIG MOVE #1**

A fast, frequent and expanded regional rapid transit network.

1.1 Build the regional rapid transit network identified in Schedules 1 and 2, to bring fast, frequent, all-day, two-way express rail service and expanded regional rapid transit service to every region of the GTHA and to within two kilometres of 80 per cent of GTHA residents (see Section 5.0 for more detail).

Figure 12 – The Big Move: Strategy 1
Table 7 considers the impacts of The Big Move on the qualitative indicators for the GTHA. Although this is a partial assessment, it shows that the impacts would likely be significant. The Big Move includes strategies and plans for developing and implementing sustainable, efficient and user-focused transport proposals that will go some way toward a Complete Mobility solution.

Under this scenario, it appears that Mobility Scores could increase significantly if all the infrastructure and management initiatives in The Big Move are successfully implemented, as illustrated in Figure 13. This would probably take the GTHA into the ‘Best in Class’ category of the Complete Mobility Index, closer to the Canadian cities of Ottawa, Vancouver and Montreal, and the European cities of Paris, Berlin, Barcelona and Zurich.

However it should be noted that many of the ‘trigger points’ require successful implementation of Strategies 2-10 as well as transit infrastructure. Another factor to note is the still relatively low score for Sea and Inland Water Transport. This reflects issues raised at workshops and interviews about the possible neglect of the need to provide for business requirements including freight.

<table>
<thead>
<tr>
<th>Qualitative Indicator</th>
<th>Current Mobility Score</th>
<th>“Trigger” for next level</th>
<th>Likely impact of The Big Move on Mobility Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Public Transport Services</td>
<td>4.28</td>
<td>Public transit increasingly managed as a single entity. Focus increasingly on customer convenience/ease of use, linked to mobile/internet technology</td>
<td>Potential increase to 5 if these aspects are prioritized alongside infrastructure delivery</td>
</tr>
<tr>
<td>Transport Management and Control</td>
<td>4.42</td>
<td>Some application of road user and parking charges as a mechanism for demand management</td>
<td>Score will only be increased if difficult decisions related to future funding are tackled</td>
</tr>
<tr>
<td>Transport Information and Payment Systems</td>
<td>4.31</td>
<td>Use of internet, mobile and smart card ticketing comprehensively covering individual modes</td>
<td>Potential increase to 5 if current ticketing and management issues are resolved</td>
</tr>
<tr>
<td>Air Transport</td>
<td>3.88</td>
<td>Dedicated, rapid, congestion free public transit access to Central Business District</td>
<td>Potential increase to 5 if new airport links are well integrated into GTHA transit networks</td>
</tr>
<tr>
<td>Sea and Inland Water Transport</td>
<td>2.55</td>
<td>Adequate rail and road access to ports and infrastructure though subject to some congestion/capacity constraints</td>
<td>Potential increase to 3 with rail and road infrastructure and service improvements</td>
</tr>
</tbody>
</table>

Table 7 – Impact of The Big Move on qualitative Mobility Scores
Figure 13 – Indicative impact of The Big Move
Complete Mobility in the GTHA

Linking Complete Mobility with The Big Move

The Big Move is a visionary plan for a complete change in mobility in the Greater Toronto and Hamilton area, and its goal is to meet overall economic, environmental and quality of life objectives. The Big Move will substantially help deal with the high anticipated population and economic growth. It includes a large scale investment plan for new transit networks to identified priority locations, plus interchanges, new stations and ticketing improvements. There will be associated improvements to encourage active travel. The vision is encapsulated in the side bar.

The implementation of The Big Move infrastructure plan is being coordinated and monitored by Metrolinx but delivered in a variety of ways. However, implementation of the non-transit infrastructure parts of The Big Move is not as clear-cut.

While The Big Move implementation plan is strong on transit networks, at present it does not prioritize other necessary requirements for Complete Mobility that show up as potential weaknesses within the audit. These include:

- A requirement for improvements to ports and surface access to ports for freight
- Prioritization of airport links for freight and passengers
- Further ‘smart networks’ and operational controls to enable management of transport networks as one system
- Focused and prioritized road improvements in specific congestion ‘hot-spots’
- Integration of ticketing and fares within the GTHA’s transit
- Active parking management and pricing, particularly in the downtown area
- More emphasis on mobility management

25 years from now...

The distance that people drive every day will drop by one-third compared to today. We will accommodate 50 per cent more people in the region with less congestion than we have today. On average, one-third of trips to work will be taken by transit and one in five will be taken by walking or cycling. 60 per cent of children will walk or cycle to school. There will be six times more bike lanes and trails than today. All transit vehicles will be accessible. Customer satisfaction with the transportation system will exceed 90 per cent. A single fare card will be used for all transit trips throughout the GTHA, and all fares will be integrated. By transforming the GTHA’s transportation system, we will help meet the province’s Go Green Action Plan for Climate Change. Per person, our emissions from passenger transportation will be half of what they are today.
4.5 Complete Mobility pathways

Achieving a Complete Mobility vision requires a balanced approach to infrastructure and the proactive management of demand for transport. A balanced approach will serve a true solution by focusing attention on transport users, their needs and aspirations, and how transport ‘supply’ can be made more responsive. While Complete Mobility remains an ideal result, The GTHA can indeed make great progress towards that ideal with the right governance, delivery and performance mechanisms.

Complete Mobility implementation can be divided into pathways that are led by:

a. **Infrastructure and technology**
   (Section 4.5.1)

b. **User focus**
   (Section 4.5.2)

c. **Value added**
   (Section 4.5.3)

It is wise to follow several of these pathways concurrently – they are not mutually exclusive. The pathways follow the Complete Mobility principles of being sustainable, efficient and user-focused. There is a balance between modes, operations, supply and demand as well as consideration of spatial, governance and deliverability factors.
The infrastructure and technology pathway is the first step towards Complete Mobility. Infrastructure planning future pathways which, having considered needs and demands, propose infrastructure improvements to meet predicted levels. It is a necessary building block for the other pathways. However, to move further along the Complete Mobility pathway, the following additional features could be added:

- Integrated network management systems including real time information for mobile phones and workplaces as well as at stops and stations
- Smart card or mobile phone integrated ticketing with incentives and easy payment mechanisms
- Smart network capabilities to enable quick response to incidents, as well as planned (alternative) responses to congestion
- Social or other marketing along new routes, for example providing incentives to new residents along the new routes to use transit

The following are global references. They are grouped by public transit, roads and parking and intermodal solutions.

**Public Transit**

**Helsinki, Finland**

The new, automated (driverless) Metro system in Helsinki is able to run more often than a Metro system with a driver. Interval times are reduced from 4 to 2.5 minutes, more passengers are transported and overall convenience is enhanced.

**Paris, France**

Stations are being fitted with glass walls (with automatic doors) to separate platforms from tracks. This increases safety, reduces maintenance costs and cuts current intervals between trains by 20 seconds.

**New York, USA**

An automatic train control system has been installed for the line running between New Jersey and New York. The system operator can monitor the position of trains at all times, resulting in greater line usage without creating new infrastructure or incurring safety and reliability issues. The modernizations were expected to allow an increase of 50,000 daily passengers.

**Hannover, Germany**

Üstra, which is Hannover’s public transport company, has installed a sophisticated emergency and information system
(including a “train status” visual passenger information system and more), leading to increased safety, ease of use and network management.

Roads and Parking

Copenhagen, Denmark
A traffic-actuated control system has been introduced which allows for overall and individual intersection signal control. The result is enhanced efficiency of the traffic network, reduced congestion and travel time and better air quality.

Munich, Germany
Munich Airport has one of the world’s largest parking guidance systems. It monitors over 15,000 parking spaces and guides entering drivers to the nearest available parking space. This drastically reducing time spent by drivers looking for available spaces. As soon as a vehicle passes through the car park entrance the guidance system uses LED display panels to direct the driver reliably along the shortest route to the next available unoccupied parking space.

Intermodal

Berlin, Germany
Berlin has a state-of-the-art traffic management solution that (i) monitors and manages all traffic in the city and (ii) provides comprehensive, dynamic, real-time traffic information to the public. This solution improves efficiency of traffic movement throughout the region. In addition users can receive information about parking and congestion to enable them to adapt their journeys based on real-time conditions.

Ruhr, Germany
The Ruhr region encompasses 5.4 million people, 53 cities and 13 public transport companies. Its goal is to shift more traffic to rail while using the roadway capacity more efficiently. A region-wide traffic management system (Ruhrpilot) was installed to monitor traffic information on the regional and city levels. Online information is then shared with the public. The expected results include improved traffic flow and better air quality.

Bangkok, Thailand
An Airport Rail Link (ARL) connects Bangkok’s airport to the city centre. It incorporates a baggage-handling system that automatically transfers luggage from the central rail station to travelers’ flights and vice versa. All passengers can enjoy a more comfortable transit ride to the airport.

Halle, Germany
Halle’s Park & Ride Information Security System (PaRIS) is a dynamic guidance system for the city’s park and ride sites. It informs drivers about real-time bus/tram schedules, parking space availability and roadway congestion. Use of Halle’s Park & Ride locations has increased 15 per cent, and more people are using the transit system. Furthermore reported benefits include: 110km of avoided congestion length within the city of Halle; 10km saved travel distance for each car per parking transaction; more than 32 tonnes yearly CO₂ emissions savings and 13,000 litres of fuel savings.
4.5.2 User focus pathways

The user focus pathway is a second step to Complete Mobility. It focuses on understanding the specific lifestyle needs of transport consumers, and then offers information, advice and small incentives to use the new transit system. To move further along the pathway, the following features could be added:

- More substantial incentives (e.g., discounted fares, discounted shopping with a transit ticket)
- An event management application (connecting travel incentives and products with the known needs of those attending the events)

The following are global references:

**Santander University Card**
Banco Santander currently issues almost 4 million university ID cards to more than 201 universities in 11 countries. Besides being an ID card, the Santander University Card offers a plethora of additional services — everything from checking academic records via ATM machines to acting as a library card. A recently-added service gives special discounts on public transport. This encourages student use of public transport.

**Nice, France**
In Nice, a “contactless mobile payment and validation system” is being pioneered on the whole transportation system (trains, buses, rental cars and bikes). It is part of an initiative involving government, businesses and organizations. It is expected that most customers will appreciate the system which offers efficient booking and payment services and provides information on leisure and shopping activities. A similar system was launched in 2007 involving about 1,000 testers and 500 retailers in two towns: Caen and Strasbourg. After one year of trial, surveys showed more than 90 per cent of all customers expressed satisfaction with this solution and 59 per cent stated that they would use this service once available. Furthermore, retailers reported satisfaction with this service (82 per cent) and appreciate the speed of contactless mobile telephone payment.

**Nottingham, UK**
In Nottingham, UK, a transit company is offering new residents in growth areas a complementary smart card ticket that is already charged with $40 for use on new transit routes. This is intended to get over the initial uneasiness felt by established car users when faced with different transport options.

**Packstation by DHL, across Germany**
Busy lifestyles mean that it’s not always possible for people to be at home to accept a package delivery. Packstation provides automated booths for 24/7 self-service collection of parcels and oversize letters. DHL already has over one million users of Packstation. Their goal is to ensure that no customer should need to travel more than 10 minutes to reach a Packstation.

Example from The Big Move: Social Marketing In Portland
Portland, Oregon was the site of the first large-scale individualized social marketing project in North America. The project, called TravelSmart, reached more than 14,000 people in 2004 after a new MAX light rail line was opened. Thousands of households in the TravelSmart area received information on transit, walking and cycling. Subsequent surveys showed that after the light rail line opened, the growth in transit trips was increased by 24 per cent in the area where there was no individualized marketing project, but 44 per cent — almost twice as much — in the TravelSmart area.
4.5.3 Value added pathways

The value added pathway is the third step towards Complete Mobility. Customers appreciate this pricing pathway and are willing to pay for related services. To move further along the pathway, the development of a smart card pass with multiple applications (e.g., access to university, catering and parking) as well as various discounts could be added.

The following are global references:

Perth, Australia
Most public parking in Perth is licensed. Fees are not charged when parking spaces can be shown to: help the city work, promote access, provide a community service or are incidental to prime business activity. The fees collected pay for a free Central Area Transit (CAT) bus system which is popular with retailers and the public.

The Hague, The Netherlands
Spitsmijden is defined as “peak traffic avoidance”. It aims to improve mobility by persuading people to adjust their traveling patterns. This concept has been tested in The Netherlands on both road and transit users. The users earned rewards and discounts.

Air Miles Incentives, Canada
A recent pilot project by the Toronto Transit Commission (TTC) and Air Miles for Social Change offered 150 Air Miles to travelers who committed to using the TTC’s one year monthly pass. Program signups increased by 57 per cent.

London, UK
The London congestion charge is a fee (roughly $12) for motorists driving within certain parts of London at certain times. Traffic within the chargeable zone is down by 14 per cent, with the revenue derived from this program, approximately $175 million, being used to improve the bus operations of Greater London.

Example from The Big Move: McMaster U-PASS
McMaster University’s U-PASS program provides all McMaster students with an eight-month transit pass for only $94.80 annually. An overwhelming 89 per cent of students voted in favor of the program in the last referendum.
4.6 Impacts of Complete Mobility

Complete Mobility provides additional focus on the impact of transportation. In the case of the GTHA, it can be used to further develop *The Big Move*, which in turn will lead towards achieving Complete Mobility.

In terms of the Complete Mobility Index, the GTHA could achieve significantly better scores, taking the city well into the “Best in Class” category by more strongly following the three balanced pathways described above. The potential impact of Complete Mobility for the GTHA is illustrated in Figure 14.

Under this scenario the GTHA mobility system would be used and managed as one system, by an organization here called the Mobility Manager. This is discussed further in Chapter 5. Please note that proactive management of the system would allow integrated policy to be developed and enacted while at the same time meeting the needs of the GTHA travellers, citizens, businesses and visitors.
Group 1 – “Struggling to Cope”

Group 2 – “At Risk”

Group 3 – “Best in Class”

Figure 14 – Indicative impact of the Complete Mobility scenario
5.0 Delivery concerns for the GTHA

5.1 Introduction

Following our analysis of the scenarios for the GTHA, this section considers the preliminary requirements for a sustainable, efficient and user-focused urban mobility system. These are:

- Adequate and sustainable funding
- Effective governance and delivery
- Integrated transport and land use planning with a focus on placemaking
- Integration of transport modes and interoperability – one system

These are discussed in the sections, including good practice from elsewhere and key principles for the GTHA. It is our view that these are essential prerequisites to the success of any urban mobility system.

5.2 Adequate and sustainable funding

Workshop participants confirmed that gaining adequate funding for mobility in the long run is a key issue for the GTHA. Only the first phase of The Big Move infrastructure plan is currently committed, and participants confirmed that there is no definitive funding plan for future phases. Considerable analysis of funding options has already taken place. For example, Metrolinx’s own 2008 Investment Strategy Workplan identifies five key options as sources of funding:

1. **Conditional government block funding**
   These funds can take the form of a capital fund, grant or trust.

2. **Broad beneficiary fees**
   These fees can include property taxes, a regional sales tax and payroll tax.

3. **User fees**
   A wide range is possible. Among them are a gas tax, drivers’ license fees, transit fares and tolls.

Financial empowerment options

Metrolinx’s 2008 Investment Strategy Workplan identifies five key options as sources of funding:

1. **Conditional government block funding**
   These funds can take the form of a capital fund, grant or trust.

2. **Broad beneficiary fees**
   These fees can include property taxes, a regional sales tax and payroll tax.

3. **User fees**
   A wide range is possible. Among them are a gas tax, drivers’ license fees, transit fares and tolls.
4. Debt instruments
Options include borrowing against owned assets, transportation infrastructure bonds, and tax increases.

5. True cost of transportation
These include impact fees or taxes to capture external costs of transportation. They would include fees for economic cost of congestion, community and quality of life degradation, air and water pollution, vehicle and parts manufacturing, disposal and recycling, and more.

The preliminary phase of the *The Big Move* investment plan is already under way, at a cost of $11.5 billion, with funding from the Province of Ontario. However, the investment strategy and program for further major phases are not due to be completed until 2013, after further investigation and assessment. One estimate of costs of *The Big Move* program is $50 billion over 25 years at 2008 costs.

There has been some concern that despite funds already committed, future funding for the implementation of *The Big Move* may not be forthcoming. For example, in the Toronto City Summit Alliance paper ‘The provincial Growth Plan and Metrolinx’s Big Move provide the necessary framework for integrated land use and transit/transportation improvements, and implementation has begun. But The Big Move remains more than 75 per cent unfunded and the key challenge is a chronic lack of long-term, reliable funding sufficient for transit/transportation capital and operating requirements, without which The Big Move’s implementation is seriously at risk’.
5.0 Delivery concerns for the GTHA

5.2 Adequate and sustainable funding

<table>
<thead>
<tr>
<th>Source</th>
<th>Net Additional Revenue to the GTHA</th>
<th>Basis of Estimate</th>
<th>Policy Advantages</th>
<th>Concerns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road Tolls on GTHA Highways</td>
<td>$1–2 B/year</td>
<td>10–20 ¢/km</td>
<td>Relieves congestion</td>
<td>&quot;Double taxation&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Revenue rises with demand</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Encourages more transit use</td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Increases traffic speed</td>
<td></td>
</tr>
<tr>
<td>Regional Fuel Tax</td>
<td>$1–2 B/year</td>
<td>10–20 ¢/litre</td>
<td>May lessen auto use</td>
<td>Sales &quot;leakage&quot; to surrounding areas</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Encourages energy-efficiency</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Easy to administer</td>
<td></td>
</tr>
<tr>
<td>Commercial Parking Levy</td>
<td>$1–2 B/year</td>
<td>$1.00–2.00/day per space</td>
<td>Reduces auto use in commercial areas</td>
<td>Employment &quot;leakage&quot; to areas surrounding the GTHA</td>
</tr>
<tr>
<td>Regional Sales Tax</td>
<td>$1–2 B/year</td>
<td>1–2% in addition to the HST</td>
<td>Administratively stable, reliable source of funds</td>
<td>No direct incentive for more sustainable transportation behaviour</td>
</tr>
<tr>
<td>HOV/Express Lanes on GTHA Freeways</td>
<td>$400–800 M/year for Express Lanes, Half that for HOT Lanes</td>
<td>10–20 ¢/km</td>
<td>Encourages car-pooling</td>
<td>Relatively small revenue versus infrastructure and enforcement costs</td>
</tr>
<tr>
<td>Tax Revenue from fuel sales</td>
<td>$400–600 M/year</td>
<td>$895 M additional gas tax revenue anticipated from 2010/11 HST</td>
<td>Encourages car-pooling</td>
<td>Relatively small revenue versus infrastructure and enforcement costs</td>
</tr>
<tr>
<td>Central Area Congestion Levy</td>
<td>$250–500 M/year</td>
<td>$5 – 10/vehicle entry-charge</td>
<td>Reduces Central Area congestion</td>
<td>Potential employment loss from Central Area</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Improves mobility in Central Area</td>
<td></td>
</tr>
<tr>
<td>Vehicle Registration Fee</td>
<td>$200–400 M/year</td>
<td>$100–200/year per vehicle</td>
<td>Stable, reliable source of funds</td>
<td>Does not moderate amount of vehicle use</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Encourages low-emission vehicles</td>
<td></td>
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<tr>
<td>Value Capture Levy</td>
<td>$50–100 M/year</td>
<td>N/A</td>
<td>Encourages compact development and increased transit use</td>
<td>Uncertainty in estimating increased value</td>
</tr>
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<td></td>
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<td></td>
<td>May reduce land speculation</td>
<td>Upward pressure on rents</td>
</tr>
<tr>
<td>Utility Bill Levy</td>
<td>$50–100 M/year</td>
<td>$20–40/year per household</td>
<td>Stable, reliable source of funds</td>
<td>No direct incentive for more sustainable driver behaviour</td>
</tr>
<tr>
<td>Employer Payroll Tax</td>
<td>$40–80 M/year</td>
<td>$100–200/year per full-time employee</td>
<td>Stable, reliable source of funds</td>
<td>Higher costs, potential loss of jobs in taxation zones</td>
</tr>
<tr>
<td>National Federal-Provincial Transit Strategy</td>
<td>$1–2 B/year</td>
<td>25–50% of transit capital costs; 25–50% of net transit operating costs</td>
<td>Administratively straightforward</td>
<td>Difficult in context of large federal/provincial deficits</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Stable, relatively reliable source of funds</td>
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Table 8 – Possible funding sources for the GTHA transportation infrastructure

Table 8 suggests that there are potentially large and varied funding sources that could be made available, but many of these require regulatory or legislative changes that might be difficult to achieve politically.

A report by the Toronto Board of Trade made the point that the GTHA public appears receptive to the idea of new funding mechanisms, especially where it is made clear that funds raised will go directly to improving mobility. In surveys around 75 per cent of GTHA residents supported levies or tolls if used specifically to improve transportation.

Moving toward a Complete Mobility vision could also open up other possible funding streams. Value added Complete Mobility Information Communication Technology (ICT) and Intelligent Transport Systems (ITS) will be used increasingly to deliver transport systems throughout the world.

Business models for transport and transport assets are also beginning to be developed in some countries. This approach attempts to treat roads and infrastructure as assets that can be better exploited by using alternative commercial and financial models. This often uses the concept of P3 (Public Private Partnerships). Infrastructure Ontario already operates an Alternative Financing and Procurement system, which is intended to be used for at least some of The Big Move infrastructure projects.

More controversial ways of involving the private sector are now being discussed in various countries. One recommendation is to further consider the option of selling off the strategic road network as an asset. This is an attempt to create an economic market model for road use.

Decisions on funding are inevitably politically sensitive and require considerable thought and analysis. However, funding options made possible by working towards Complete Mobility are based on providing value added services and these are more likely to be politically acceptable than some of the other potential options.

Some overarching funding principles could be added to the five investment principles already set out by Metrolinx in its Draft investment strategy:

**Metrolinx investment principles**
- Principle 1: Regional or ‘Metropolitan’ focus
- Principle 2: Invest Where It Matters Most
- Principle 3: Prudent Financial Management
- Principle 4: A System That Works and Is Accountable
- Principle 5: Risk Management and Project Management Discipline

**Suggested additions**
- Memorandum of Understanding – an overarching funding agreement amongst all the relevant partners (potentially including local municipalities) is required, like the TransLink area of British Columbia.
- Adopt the ‘user pays’ principle – but the amount the user pays can be subject to considerable discussion.
- Packages by type – in the GTHA situation where there are many potential forms of funding, it will be necessary to identify funding packages.
- Packages by funding source – in the GTHA situation where there are many democratic agencies, operators and other stakeholders, it will also be necessary to identify a funding package by source of funding.
- Complete Mobility – it may be possible to add other forms of value added funding, represented particularly by individuals choosing to pay for additional services provided either by the Mobility Manager or by business partners.

A further two principles are suggested by the Toronto City Summit Alliance:
- New funding instruments must be fair, effective, efficient, transparent and accountable, and seen to be so.
- New funding instruments need to do more than simply provide the bulk of funding required for The Big Move; they also need to help moderate increasing congestion.
INNOVATIVE FUNDING
How to raise the money

South America has been applying innovative forms of financing for many years.

In Porto Alegre, an important southern Brazilian city, the inability to fund infrastructure via traditional mechanisms resulted in the city exploring funding through the private sector. When planning an upgrade and expansion of their busway system, the city had trunk and feeder interchanges designed in order to accommodate commerce and services. This would then generate revenue to pay for the construction of new terminals and the majority of upgrades of existing busways to BRT standards. The construction and rights to the commercial uses was then tendered to a private group to deliver the upgrades and expansion.

Betterment contributions have been used as a tax on property owners who benefit through increased land values from the result of some type of public intervention. An example is the introduction of a new BRT line through a neighbourhood. The betterment tax system has existed in Brazil since the 1930s. Relatively new urban legislation has enabled value capture mechanisms to be used to fund projects such as BRT. Improved accessibility through new footpaths, roads and public transport systems or the development of new urban centres, are financed through increases in property values. A specific mechanism known as CEPAC (certificate of potential additional building rights) is used to sell, purchase and trade development rights. CEPACs allow funds to be raised in advance of undertaking projects which increase the value of surrounding land.

Many of Colombia’s infrastructure and services have been funded through a model of land value capture. Since the 1920s, municipalities have been allowed to levy contributions on any property that gains any value or benefits as a result of public works. The amount charged is 130 per cent of the value of the project which is then divided amongst the affected properties in proportion to the benefit attributed to each individual property.
5.3 Effective governance and delivery

Obtaining the right governance arrangement is the key to successful delivery. The GTHA has already been subject to governance reorganization to improve integrated transport strategy and delivery. Metrolinx is an innovative organization in itself, being set up specifically to develop the integrated regional transport strategy and then to implement it. Key features of the Metrolinx model are:

• A focus on strategic and integrated transport
• Led by the Province of Ontario rather than the municipal governments
• An initial focus on developing and getting agreement to a major transport strategy
• Flexible governance arrangements that can be changed
• Recent responsibility for the GO brand and transit operations
• A Board of Directors who were initially Mayors and politicians but are now private sector appointees

Despite some major successes there have been some challenging issues identified by stakeholders in our workshops and interviews, which include the following:

• Maintaining democratic accountability as well as a strong delivery focus
• Ensuring appropriate relationships with a variety of other organizations including municipalities, businesses and the Chamber of Commerce, transit operators, airport operators, large traffic generators, community and user groups
• Having potentially conflicting objectives and work priorities when being responsible for strategy, implementation of infrastructure, organization of integrated ticketing and some but not all operations
• Not having a separate regulator, commissioner or standards authority to resolve issues with other authorities, operators and individuals

Other Canadian cities have also developed integrated transport delivery and operational organizations. For example, TransLink (the South Coast British Columbia Transportation Authority), is an integrated transport authority and operator of varied transit systems, as well as running a parking tax and demand management measures such as travel plans and Smart Commute. It is beginning to create the ‘Mobility Manager’ function seen as a vital element of Complete Mobility. TransLink differs from Metrolinx in that it is accountable to the Mayors’ Council of all the mayors in the TransLink area which also appoints a Commissioner to regulate TransLink activities.
A Governance Model:

**TransLink, British Columbia**

TransLink is responsible for the regional transportation network (public transport and major roads and bridges) of Metro Vancouver. It’s governed by three interlocking bodies: the TransLink Board of Directors, The Mayor’s Council, and the Translink Commissioner. Each has well-defined duties and responsibilities. It would be useful to review them here, and consider them as a basis on which to build a unique governance model for Complete Mobility that fits the needs of the GTHA.

**TransLink Board of Directors**
- Appoints the Chair of the Board of Directors
- Appoints the CEO
- Establishes subsidiaries and appoints board members and Chairs
- Prepares and implements long-term transportation strategies (30-year) and 10-year transportation and financial strategic plans
- Proposes to the commissioner a customer complaint process and conducts surveys annually
- Proposes to the Commissioner a customer complaint process and implements it
- Publishes an annual report
- Holds a public annual general meeting
- Approves project and program public consultation plans

**Mayor’s Council**
- Composed of all mayors in Metro Vancouver
- Appoints the Chair of the Mayor’s Council
- Appoints TransLink Board of Directors
- Appoints the Commissioner and Deputy Commissioner(s)
- Receives and approves transportation and financial plans as laid out in the legislation

**Commissioner**
- Advises whether parameters and assumptions (including financial estimates) in the 10-year transportation and financial plans are reasonable
- Approves short-term fares
- Approves customer satisfaction survey processes
- Approves customer complaint processes
- Oversees the sale of major assets
- Publishes an annual report and submits it to the Mayor’s Council

A new model for Complete Mobility governance and delivery could take the best aspects from both TransLink and Metrolinx. It could have the following features:

**Vision/Strategy**
A democratically accountable vision and strategy, updated as necessary.
- Appropriate arrangements for ensuring accountability to local and provincial authorities

**Organization**
An organization dedicated to delivery and performance of the integrated transport system (Metrolinx)
- “Metrolinx’s mission is to create a state-of-the-art transportation system that moves people and goods efficiently, economically and in an environmentally sustainable manner.
- We are working to create an integrated transportation system for the GTHA that enhances the economy, the environment and our quality of life.”
(Metrolinx Strategic Plan)
In this model, Metrolinx would contract transit and other mobility operations to one or more separate Mobility Managers, subject to them achieving performance outcomes.

**Operations/Mobility Manager**

New operational arrangements (one or more Mobility Managers)

- The Mobility Manager (MM) would be a new or revamped organization that has the highest possible integration of its operations, its transportation systems (road, rail, transit, etc.) and its functions. This would occur over as much of the GTHA as possible.
- The MM office can work with private sector partners, innovate and be responsive.
- The MM office would be contracted by Metrolinx to meet specified performance goals.
- The MM office would be responsible for transit operations and perhaps also parking, road charges or tolling, management of networks, and marketing initiatives including incentives and payment mechanisms.

**Standards Authority/Commissioner**

The establishment of a separate Standards Authority or Commissioner should be considered.

- The Standards Authority would act as an independent regulator that would set and enforce standards for performance and financial transactions, as well as oversee financial probity and complaints procedures.
- It would also oversee proper allocation of costs, risks and benefits to its partners.

Figure 15 shows a diagrammatic representation of this suggested organizational structure for Complete Mobility within the GTHA.
The following summarizes the advantages and disadvantages of the three models discussed here.

**The Metrolinx Model**

**Advantages:**
- Set up for the specific purpose of planning and delivering an integrated transport strategy; therefore demonstrates a clear strategic view
- Accountability to, and able to access funding, from the province
- Successful delivery of first phases of transit infrastructure plan
- Now focused on planning and delivering next phases

**Disadvantages:**
- Accountability and relationships with municipalities could be improved
- No separate regulator or standards authority
- Danger of strategic view and/or delivery capability being diluted by operational responsibilities
- Not as successful in achieving integrated ticketing across the GTHA

**The TransLink Model**

**Advantages:**
- Set up for the specific purpose of planning and delivering an integrated strategy as well as transit operation and other mobility functions. Provides a comprehensive service with integrated ticketing.
- Clear links to livability
- Clear accountability to Mayor’s Council
- Is regulated by a Commissioner

**Disadvantages:**
- Strategic view and/or delivery capability may be diluted by operational responsibilities
- Accountability and relationship to Province is unclear

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**Figure 15 – Organizational diagram for Complete Mobility in the GTHA**
The Complete Mobility Model

Advantages
- Clearly separated functions with a contractual relationship between strategy, delivery and operator
- Excellent private-public partnership, contractual and performance arrangements
- Can release potential new funding
- Focused on customer requirements and managing demand

Disadvantages
- Same accountability issues as Metrolinx
- Some risk in an innovative model
- Requires integrated ticketing and good operator partnership arrangements that might be difficult to achieve in the GTHA
- May require separate standards authority or Commissioner

Presented below is firstly a description of what Complete Mobility could mean for Metrolinx and secondly, an illustration of how a Mobility Manager might operate under Complete Mobility.

Complete Mobility Management System
Metrolinx procures a new franchise for the Mobility Management System (MMS) for the GTHA. This has a number of advantages for Metrolinx.
- First, the franchise is placed within a policy framework which sets the objectives and targets to be achieved by the Mobility Manager. This means that the MMS is commissioned to support the economic, environmental and social objectives of the GTHA through specific actions and interventions to achieve key outcomes.
- As an illustration, one of the objectives is to increase access to employment for the unemployed. The MMS will be expected to achieve this by, for example, providing discounted travel to all unemployed people through their MMS smart card.
- The franchise also specifies a percentage return to Metrolinx on all income streams. These income streams include, income from fares, stored value on smart cards, advertising and on every transaction when the user uses the smart system to buy goods and services offered by the MMS, including both transport and retail services. This brings in significant new funding.

The Mobility Manager (MM)
While the MM franchise comes with some obligations (e.g., targets and objectives), it can successfully manage this since it also brings a freedom to develop the large market that has now been opened up. In the case of the Metrolinx franchise, it is a market of over six million people.
- This allows the MM to offer valued services for mobility but also for other services as defined within the franchise.
- The MM is developing a range of such services that are being well-received by users.
- The income from those services generates a good return for shareholders and also enables projects to achieve certain targets that Metrolinx has specified. These could include, for example, discounts for the unemployed on all transit services, and free school travel for junior primary school children in the GTHA.
5.0 Delivery concerns for the GTHA

5.4 Integrated transport and land use with a focus on placemaking

Our review of the key regional policy documents (*The Big Move, Greenbelt Plan, and Places to Grow*), as well as our analysis of the land use and transportation plans provided by the municipalities (Figure 16), have revealed many examples of good policies for integrating land use and transport, particularly with regard to the need to adequately serve and manage growth. While these could no doubt be improved, the policy background does appear to be in place.

There are some particularly good examples of integrated transport and land use planning policies, for example:

**Summary highlight:**

**York Regional Official Plan**
Concentrate intensification in strategic locations in the built-up area – in Regional Centres and along Regional Corridors – to maximize efficiencies in the delivery and provision of infrastructure, services, and public transportation. Areas of intensification are to accommodate a significant portion of future residential and employment growth.

**Summary highlight:**

**Toronto Official Plan**
Concentrate growth on Centres, Avenues, Employment Districts, and the Downtown that are connected by an integrated regional transportation system providing frequent, direct, and transfer-free services. Concentrate jobs and people in areas well served by surface transit and rapid transit stations.

Assessing whether these policies are working is very difficult in a situation where historic land use changes affect current measures. The view from workshops and interviews was mixed. Improving this situation is a slow process of talking to developers, working closely with municipalities and creating awareness amongst individuals to encourage them to critically look at residential locations and thereby influence the market.

The city centre plays a very important role in growth management as well. It is the focus of activity, and often represents the whole city for particular groups – for example, tourists, business visitors, and even local citizens. It needs to be a user-friendly place, with impressive public spaces as well as buildings.

These public spaces are usually comprised of exchange space – used by people for meeting, sitting, eating in restaurants, and generally participating in the life of the city – as well as movement space – used for transport purposes of all types. These uses of public space should be balanced to achieve a city center that meets all the expectations of visitors and local inhabitants. In transport terms, it is the showpiece place for transit as well.
Complete Mobility solutions

The theory of “Smart Growth” (which promotes compact, transit-oriented, walkable, bicycle-friendly land use, including neighbourhood schools, complete streets and mixed-use developments with a range of housing choices) is particularly pertinent to a Complete Mobility system.

Case Study: Stockholm, Sweden

Polycentricity has long been one of the main developmental concepts within Stockholm. When developing in the late 1950’s each suburb was designed as a ‘neighbourhood unit’ with a social and commercial core. Virgin land was saved by increasing the density of already developed land and re-using former neglected sites. By making the public transportation efficient, private use of the car was discouraged and consequently pollution and commute time was minimized.

Case Study: Portland, Oregon, USA

Portland took several actions, including increasing urban densities through the use of urban-growth boundaries, restricting development on rural lands bordering the city, emphasizing mass-transit, changing street design to encourage traffic calming. They use urban planning to ensure that neighbourhoods and businesses are oriented around transit and are pedestrian-friendly, instituting a regional government to ensure that local governments follow these policies.

Case Study: Los Angeles, USA

Los Angeles is well known for implementing the Smart Growth development policy. Lower infrastructure spending, better land use reforms/land acquisition and, growth management are evidence that the Smart Growth agenda is being used.

Growth agendas are now revolving around changing the state’s ‘rules of development’ in order to slow decentralization, promote urban reinvestment and promote a new form of development that is mixed-use, transit-oriented and pedestrian-friendly.

Other policy tools

Environmental: The re-use of land to ensure the preservation of open space and critical habitats.

Ethical: Ensuring transparent, fair and cost-effective rules for development.

Cultural/historical: Ensuring historical sites are preserved.
Complete Mobility in the GTHA

5.5 Integration of transport modes and interoperability – one system

This report has shown that one of the implications for mobility systems in the future is that they will have to be fully integrated, seamless, and operating as one system. This has major implications for the way we plan, design and operate our mobility systems in the future.

This one system includes all modes of transport, serving the needs of people and freight. It links with other potential city management systems, such as those used for energy and water. It concentrates on the needs and aspirations of users rather than current established practices and challenges the traditional approach based on modal, operational planning and provision.

One system not only requires improved infrastructure and technology, but also new organizations, such as a Mobility Manager responsible for all modes of transport, as well as changes in behaviour and performance requirements to reflect the focus on integration and interoperability.

The majority of developed cities have started the shift towards one system and the GTHA is no exception. However, a considerable amount of discussion and work remains to be done to establish one system.

Heathrow Express, London

The Heathrow Express is a fast and frequent service that runs from Heathrow Airport to the City of London. The service is high-quality: every passenger has a comfortable, spacious seat with plenty of space for luggage, the opportunity to watch Express TV, and access to on-board facilities including free Wi-Fi. A single adult ticket costs approximately $26 or $41 for first-class. This cost is considerably higher than the alternative of taking the underground (approximately $6), and also considerably quicker. However, many passengers, especially business travelers, value the speed and higher level of comfort of the Heathrow Express and are willing to pay for the added value service.
There are various options for sustainable funding but most are very sensitive politically. The GTHA needs a stronger partnership working arrangements, possibly with a long term sustainable funding agreement, where all partners are committed to using their best efforts to fund an agreed program. Projects, initiatives and policies may need another stage of prioritization to ensure that the most effective ones are put first.

Metrolinx is an innovative and exceptional organization that provides a good basis for developing this funding plan but there are some issues to be tackled. These include building better relationships with partners.

There is room for improvement in transit operations, creating a more entrepreneurial situation where operators have the potential to become wider Mobility Managers, probably taking on additional functions on an incremental basis.

The Complete Mobility model offers potential in increasing funding opportunities as well as offering governance and delivery options. It also challenges the focus on delivering infrastructure rather than management improvements that can also meet required objectives – for example, prioritizing integrated ticketing.

Discussions are necessary to look at examples of good practice in city centre land use planning and transport integration, to discuss options with all stakeholders, and to generate a joint view of the specific requirements for the GTHA.
5.7 Quick wins and mobility pilots for Complete Mobility in the GTHA

Taking account of these delivery concerns, and the need for the longer term recommendations, it is still possible to identify some ‘quick wins’ that could be implemented in the short term. Figure 17 summarizes these quick wins in the three sections: The Big Move, Delivery Concerns, and Mobility Pilots.

<table>
<thead>
<tr>
<th>GTHA Complete Mobility quick wins</th>
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<tr>
<td><strong>The Big Move</strong> Transit City network including airport link</td>
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<tr>
<td><strong>The Big Move</strong> integrated smart ticketing</td>
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<tr>
<td><strong>The Big Move</strong> integrated transport and land use planning</td>
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<tr>
<td><strong>Social Challenges</strong> Complete Mobility Pilot</td>
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<tr>
<td><strong>Business Freight</strong> Complete Mobility Pilot</td>
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<tr>
<td><strong>Airport Expansion and Access</strong> Complete Mobility Pilot</td>
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Figure 17 – Complete Mobility quick wins and pilots
What is the challenge?
Poverty and social inequality are increasingly pressing issues in Toronto and the wider GTHA. What’s more, housing affordability is a particularly significant problem for low-income residents, such as new immigrant populations, who cannot afford housing in downtown locations and are therefore forced to live in the outer suburbs where housing costs are lower. This imposes the burden of higher travel costs (average household expenditure on transportation rises about 10 cents a day for each kilometre away from a defined business district on people seeking out the low-skilled job opportunities that are often found in the downtown areas).

However, life in the suburban neighbourhoods usually comes with substantial travel costs that are hard to avoid. This is because the low-skilled job opportunities are often focussed in the downtown areas, meaning that low-income workers must travel long distances from home to work. These longer commuting distances result in longer journey times (thus a lower quality of life) and higher transport costs.

Complete Mobility solutions
Low-income residents living in the outer suburbs struggle to access private transport and have low car-ownership levels. Complete Mobility suggests that these suburban neighbourhoods should be served by frequent, low-cost public transit. Furthermore, a smart ticketing solution, as promoted by Complete Mobility, could allow for transit services to be discounted for low-income earners. For example, travel to work could be subsidized for specific workers earning below a certain wage. The ability for low-income families to live in an affordable home near good public transportation translates into improved access to healthcare, education and employment opportunities, as well as reduced commuting costs.

Retaining some areas of affordable housing close to the downtown area is beneficial. One example is Thorncliffe Park, a multicultural, mixed-use neighbourhood to the North-East of downtown Toronto.
5.0 Delivery Concerns for the GTHA

5.7 Quick wins and mobility pilots for Complete Mobility in the GTHA

BUSINESS FREIGHT

Complete Mobility pilot

What is the challenge?
Highway congestion is an increasing problem in the GTHA, due to rising freight demands, associated with population and economic change, as well as growth in international trade and just-in-time delivery requirements. In fact, 89 per cent of all freight movements in the GTHA are by truck. The costs of congestion to the Greater Toronto Area are $6 billion annually and could grow to $15 billion a year.

What is the GTHA doing already?
- Increased knowledge and understanding: better mapping of goods movement to identify freight bottlenecks in the system
- Targeted Network Improvements: these include extensions to existing highways, including additional lanes, as well as the development of new corridors and highways
- Border investments and initiatives: efficiency programs such as Free and Secure Trade (FAST), which speeds up processing of commercial vehicles at the border
- Ontario Freight Forum: it serves to facilitate interaction among various stakeholders in solving mutual problems and to promote the competitiveness of central Ontario

Complete Mobility solutions

Infrastructure and technology
- Modal shift from road to rail and water
- Pipeline urban logistics and distribution: freight transportation using capsules running through pipes, conduits or tunnels, underground or on the surface
- Traffic Incident Management (TIM): this serves to reduce congestion and speed up vehicle clearance and incident resolution
- Variable speed limits: keep traffic moving by computerized control of the vehicle flow when the route is congested
- Truck platooning: this refers to trucks designed to drive automatically in convoy to minimize space between vehicles and maximize use of existing highway capacity

User focus
- Better freight governance structures and engagement with stakeholders
- Better integration of freight considerations in planning decisions
- The location of industry must also be guided to make best use of infrastructure

Value added
- Off-peak incentives
- Tolled highway network: a more effective system of tolling across the highway network could be implemented to incentive truck use of priority freight routes and discourage use of commuter highways
What is the challenge?
The Pan American and Parapan American Games are expected to attract 250,000 tourists and 10,000 athletes and officials, generating some 15,000 jobs. The main challenge is fast, efficient movement of people between the Games' widespread venues. The Games will be spread throughout the GTHA and include Hamilton/St.Catharines; Toronto; and Whitby/Oshawa. Public transportation will rely heavily on all public transit operators through the GTHA including GO Transit, Hamilton Street Railway, York Region Transit and Durham Region Transit.

Toronto 2015 Bid Report – transportation highlights
• Governance: there are plans to establish the Pan American Transport (PAT) as “a single coordinating agency responsible for delivering integrated transportation services, like road, rail and bus connections”
• Air Travel: acknowledges plans for a “fixed-rail link from the airport to downtown Toronto”
• Transportation in and around Toronto: the report outlines current PT infrastructure and its capacities recognizing Union Station as the central inter-city transportation hub in downtown Toronto
• Rapid Public Transit: a brief outline of Toronto’s largest transit operators and their capacities (TTC and GO Transit)
• Roads and Highways: outlines Ontario’s extensive highway network
• Active Transportation: “all sport venues will feature generous bicycle rack areas to encourage spectators to pedal to the Games”
• Water Transportation: a possibility, if desired

Complete Mobility solutions
Infrastructure and technology
The Pan Am Games do not appear to be investing in any significant public transport infrastructure. They instead appear to be benefiting from infrastructure projects already in the pipeline as a result of already identified needs.

The Pan Am Games could be utilized as a launch platform to upgrade a majority of the regions technological infrastructure. Efforts should also be made to utilize low carbon technologies whenever possible, particularly for the Pan Am Game vehicle fleets. These low emission vehicles could then serve the region afterwards in a public transit capacity.

User focus
A majority of the bid document focuses on the needs of only the athletes and the other accredited individuals. A legacy for the Pan Am Games should vastly improve the user experience. A number of tools can and should be employed to achieve this, including smart ticketing and payment systems reliable and accessible real time passenger information and seamless interchanges between transport modes.

It is important for the region to recognize that the Pan American Games can and rightly should function as a catalyst for community and economic development. Major sporting events such as this provide an opportunity for city regions to leverage public investments from provincial and federal levels, that directly link with locally initiated ‘City Building’ initiatives as well as leveraging other public policy benefits.

Value added
A smart integrated ticketing architecture should be installed to help cater to the anticipated number of visitors. Prices should offer incentives for public transport users by discouraging car dependency.
What is the challenge?
The number of passengers is predicted to grow at Toronto Pearson International Airport by an average of 3 per cent per annum from 31 million in 2006 to 66 million in 2030. Air cargo volumes are also forecasted to increase at a similar rate. Hamilton International Airport is following this trend.

Toronto Pearson International Airport is generally well-served by highway access, although many of the approach routes suffer from congestion, particularly at peak times of the day. In addition, sustainable public transport links are very limited for an airport of this size and importance. There are no sustainable public transport options to/from Hamilton International Airport. The lack of access from the Kitchener-Waterloo area continues to be the most significant weakness.

What is the GTHA doing already?
Planned airport expansion
With over 50 million passengers and 637,000 aircraft movements predicted by 2020, Toronto Pearson’s airside, terminal and supporting infrastructure will need sufficient capacity to cope with the future aviation demands of the region.

Proposed link to Toronto Pearson International Airport
A new direct rapid passenger rail service between Toronto Pearson International Airport and Union Station in downtown Toronto is proposed. It is estimated the service would eliminate more than 1.5 million car trips in the first full year of operation. However, it would do little to address sustainable access to the airport from the wider GTHA, particularly the south and west.

Proposed Niagara to GTHA corridor improvements
This involves Active Traffic Management on the existing highway network and strategic highway widening at specific bottleneck locations.

Complete Mobility solutions
Infrastructure and technology
• Terminal development: the New Terminal 3 at Delhi’s Indira Gandhi International Airport, which opened in July 2010, is the 6th largest airport terminal in the world. Spread over 5.5 million square feet, the glass and steel terminal can handle 34 million passengers a year. It incorporates a range of state-of-the-art technologies including passenger check-in processing solutions, a baggage messaging server, handheld scanners for automated baggage reconciliation and boarding pass validation security systems.
• Integrated multi-modal access: the Cologne-Bonn airport link is an integral part of the Cologne-Rhein main high-speed line. This line is a model of intermodal transport connections.

User focus
• Airport baggage system: intelligent conveyor baggage handling system in Madrid-Barajas eliminates the need to collect and re-check baggage in different terminals and offers the potential for early check-in if desired.
• Remote baggage check-in: a baggage handling system which allows passengers to reduce hassle by allowing them to check-in their luggage at a central rail station. Their luggage can be transferred directly from the city centre railway station to their flight (and vice versa for arriving flights).

Value added
• Range of sustainable access options varied by price, and offers a choice in the quality/luxury level of service.
GREEN INITIATIVES
Complete Mobility pilot

What is the challenge?
Despite the GTHA scoring well for our single measure of pollution (carbon monoxide) in the Complete Mobility Index, further research indicates that the GTHA currently suffers from high levels of Nitrous Oxide (NOx), particularly within the City of Toronto. Transportation is the major cause of this harmful GHG and is responsible for 73 per cent of the NOx emissions within Toronto itself.

What is the GTHA doing already?
In 2008, Metrolinx adopted the Regional Transportation Plan (RTP) known as The Big Move: Transforming Transportation in the Greater Toronto and Hamilton Area (GTHA). A key goal within The Big Move was to achieve “a smaller carbon footprint and lower greenhouse gas emissions”. Three objectives in particular were linked to this goal: 1) Decreased use of non-renewable resources, 2) Contribution to the achievement of the transportation related GHG reduction targets of Ontario’s plan called Go Green, and 3) Improved air quality, and reduced impacts on human health.

Complete Mobility solutions
Infrastructure and technology
In the transportation sector, there is a strong movement towards embracing alternative fuels and related infrastructures.
• Plug-in electric vehicles: the Electric Drive Transportation Association (EDTA) is implementing a Plug-in Electric Vehicle Acceleration Initiative throughout North America, providing education and outreach programs to extend demand of electric vehicles beyond first adopters.
• Hydrogen vehicles: Daimler AG and leading energy companies such as Shell and Total in 2009 are working with the government in Germany to expand the setup of a hydrogen infrastructure.

User focus
• Virtual Workplace: remote accessing and teleconferencing are becoming more important than ever as mobility solutions to allow companies to facilitate, manage, monitor and secure an increasingly dispersed workforce. Most importantly such systems allow for a significant reduction in the environmental externalities resulting from business travel.
• Intermodal Transportation: this is an increasingly important tool for promoting behaviour change. In Ontario, the Bike Train program has been a tremendous success.
• Smarter payment systems: as well as providing an effective method of managing demand, smart payment systems can also help encourage behavioural change for public transit users through incentives.

Value added
• Pricing incentives (e.g., toll roads, emission fines) are able to change behaviours for both public and freight sectors allowing authorities to spread movement across the network and maximize carrying capacity while encouraging sustainable, active, intermodal behaviour changes.
This research compares six major Canadian cities within the Complete Mobility Index and presents a detailed study of the GTHA pertaining to its performance with regard to the concept of Complete Mobility.

On the Complete Mobility Index graph, the GTHA falls within a Canadian Cluster, alongside Calgary and Edmonton, in the ‘At Risk’ category. This category includes cities that do not appear to be balancing mobility and the economy. This imbalance could constrain growth and/or quality of life in the future, for example by making the city less attractive because of high levels of congestion, long commute times, high car dependence and low levels of choice in transport options.

The GTHA performs relatively well on indicators related to basic provision and maintenance of roads and transit, including road safety. It performs relatively poor on indicators related to more sophisticated management of transport networks and integration. The impression is that the GTHA currently provides a reasonable if patchy basic mobility service but this may not be enough to compete with more proactive cities in the longer term.

The GTHA’s position as an ‘At Risk’ city region has been confirmed in this study. However the complete implementation of The Big Move strategy will improve the lower scoring indicators and move the GTHA away from the ‘At Risk’ category towards the ‘Best in Class’ category.

But there are challenges. Firstly there is a lack of confidence that governance, delivery and funding arrangements are good enough to ensure successful implementation. Secondly, even if The Big Move was completely funded and implemented it would not address all the identified mobility deficiencies, partly because of the continuing growth and continued global trends such as increasing expectations of city life and increasing competitiveness between cities.

The environmental challenge presented by the demands of transport and mobility should also be noted. We have therefore included environmental sustainability as a key consideration in our analysis and proposals.

The analysis has taken particular note of the GTHA’s dynamism as a center of economic and population growth. In many ways this makes the need to move away from the ‘At Risk’ position all the more urgent.

The study uses best practice examples from Canada and other cities throughout the world to illustrate solutions, ideas and potential options for the GTHA in moving towards the achievable Complete Mobility standard. In some cases we have made specific recommendations, such as proposing a formal funding agreement between Metrolinx and the municipalities on the model of the TransLink Memorandum of Understanding.
GTHA Complete Mobility quick wins

- **The Big Move** Transit City network including airport link
- **The Big Move** integrated smart ticketing
- **The Big Move** integrated transport and land use planning
- City Centre Placemaking Strategy
- Ensuring all transport networks are smart and integrated
- Mobility Manager
- Sustainable governance and funding including charging options
- Social Challenges Complete Mobility Pilot
- Business Freight Complete Mobility Pilot
- Events and Visitors Complete Mobility Pilot
- Airport Expansion and Access Complete Mobility Pilot
- Green Initiatives Complete Mobility Pilot

Figure 18 – Complete Mobility quick wins and pilots
In other cases we have highlighted issues that demonstrate the tensions of the economy/mobility imbalance, for example the concerns of business about provision for freight and unaffordable long commutes especially for new immigrants and lower paid workers.

The Complete Mobility scenario for the GTHA suggests three balanced pathways that build on The Big Move and provide an improved response to the dynamic economy/mobility imbalance. Complete Mobility and the pathways become additional tools for the GTHA to improve mobility options and thereby contribute to wider objectives.

Complete Mobility helps to create a framework to:
- Complement and build on The Big Move, making the achievement of targets more likely;
- Describe a possible future for the GTHA that enables and encourages choice-based solutions that potentially provide revenue for reinvestment;
- Make citizens and stakeholders aware of the potential of improved mobility;
- Secure funding, governance and delivery mechanisms, as well as to release new funding streams;
- Define different pathways to achieve Complete Mobility;
- Provide comparisons and examples of best practices from around the world;
- Link with major event management.

We have also identified priority individual projects and solutions that, in addition to key investments from The Big Move, would form key elements of a short term Complete Mobility plan for the GTHA – these are shown again in Figure 18.
It is 7:00 am and Nancy is getting ready for another busy workday. She needs the city's mobility system to help her day run smoothly, so the first thing she does is check to see if her Mobility Manager (MM) has sent any messages regarding transportation delays. How? She angles her wrist and projects her messages onto the wall via her watch. One message informs her that all transportation systems are working well. Among her other messages are offers to redeem the carbon credits she accumulated by using public transport and cycle clubs. She decides to look at these later.

After breakfast she heads off to the rail station to catch the 8:00am train. On her way she checks the travel schedule on her watch and confirms that the train is on time. When she gets to the station, the ticket machine gets a signal from her watch, notes her presence, and registers her on the public transit system. Once again she receives an option to use her carbon credits to pay for the upcoming trip or to receive a discount at one of the many shops in the station building.

As she boards the train her watch informs the transit system. On the train her MM notifies her of an upcoming delay because of a line problem before her destination station, then advises her to get off at the station before. Nancy uses the MM on her watch to check the interchange options to ensure she gets to work on time. The MM provides her with lots of information, including when the next bus arrives, as well as the option to call a taxi, book a shared car or reserve a bicycle. She calls a cab since the MM says it’s the fastest option.

As Nancy leaves the train, the transit system charges her for the train fare and adds carbon credits to her account. Since she’s given the retail system permission to view her profile, via her MM, she is sent offers that she might find attractive. Because she’s running late, she ignores the offers for now and gets in the taxi. She arrives at work on time and the taxi fare is paid automatically through her MM.

At lunchtime Nancy looks at the offers her MM sent her that morning. One of them tells her that, if she uses public transit three more times this week, she’ll qualify for a 50 per cent discount on a hotel in Niagara Falls and free international rail travel for her and a friend. She makes a mental note of that.

After lunch she needs to use one of the company’s car share vehicles. She books this through her MM. When she gets to the car later on, a connection is made between her MM and the car’s GPS, and her destination information is uploaded. While driving she receives an audio message saying the parking lot she normally uses is getting full. She reserves an available spot in the lot for a fee of $1.00 in addition to the parking fee. When she enters the parking lot, the parking system registers her for payment purposes. She also receives an offer for a discount on her parking fee if she leaves the parking lot off peak hours (before 4:00pm).

At the end of the working day she returns the car and goes to the health club for a work out and to relax. Because she is a member of the MM system, she’s provided with free health insurance and a discounted membership fee at the club.

Tomorrow is Saturday and Nancy is going out on her new bicycle for the first time. She used her carbon credits to buy it and received a discount because she is a Gold Member of the MM club. Nancy thinks to herself: “How did I ever survive in the past without Complete Mobility systems and my personal Mobility Manager?”

Note: The 2030 Mobility Manager is capable of managing all transportation needs in a multi-modal environment. The functionality consists of payment methods, traffic information, authorization, authentication, profile management, etc. and will be presented to the end-user via devices like watches, sunglasses, wall projections, etc.
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