A Sustainable Strategy for Developing Hamilton as a Gateway

McMASTER INSTITUTE FOR TRANSPORTATION & LOGISTICS

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McMaster Institute for Transportation and Logistics

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Executive Summary

Hamilton has a unique opportunity to develop itself as a Gateway city and to do so in an environmentally responsible manner that keeps harmful emissions to a minimum. From a goods movement perspective, there are few Canadian cities that can boast simultaneous and relatively uncongested access to all of the major modes of transport: road, marine, air and rail. All of this is in the context of a strategic, centralized geographic location providing ready access to large population centres within a day's travel by ground. From a quality of life perspective, Hamilton is an excellent place to live. This reality must be effectively communicated to attract and maintain the talented labour force required to take Hamilton to the next level.

The central thesis of this report is that economic development and job creation need not conflict with environmental sustainability. Development of employment lands coupled with a strong urban intensification strategy and investment in public transit infrastructure is ideal for promoting economic interaction and gateway development while minimizing congestion and transport related emissions

Should Hamilton be successful in its quest to develop as a gateway, there are several important benefits to expect and some are already coming to fruition. These are as follows:

- A population of skilled and talented people lead productive and prosperous lives in a well-planned, compact and uncongested city with a vital central core.
- World-class teaching and research institutions play a key role in developing the population and related innovative firms see Hamilton as an ideal place to conduct business.
- Hamilton is seen as a strategic place to locate a firm, especially so for those that have a logistics element or require good access to a leading 24-hour cargo and passenger airport. The industrial parks are full and generate significant, job-creating multiplier effects.
- Development around the airport is seen as exemplary in that new residential sprawl is avoided, firms with low carbon footprint are attracted and a high proportion of the workforce accesses the development via public transit.
- Hamilton is seen as an integral component of efficient multi-modal goods movement within Southern Ontario and beyond. Different modes of transport interact seamlessly and generate synergies with one another.
- The Port of Hamilton becomes more diversified in terms of goods movement and more is shipped from the Port than is currently the case.
- The Port grows through greatly expanded short-sea shipping and excellent container-handling capability which combine to minimize emissions and to transport goods more efficiently.

- Hamilton is seen as a leading city with respect to intensified land use. Outcomes include increased economic activity, efficient use of brownfields, partially in response to growth at the Port, and a bustling downtown viewed as an attractive place to live.

- Hamilton defines a prototype for the transition from heavy industry to environmentally sustainable, diversified local economy with strong links to outside regions. Hamilton is seen as an excellent access point to the United States via Niagara or Windsor or to Toronto.

Many of the key components to realize such a vision for Hamilton are already in place. To assist in filling the gaps, an investigation of gateway cities from around the world reveals several proven principles that Hamilton should take into account. The best gateways in the world:

- Place a lot of emphasis on being uncongested; which is good for the flow of goods and for the reduction of emissions

- Have developed effective transport-focused organizations

- Are effective at building consensus, partnerships and alliances involving the public and private sectors and other jurisdictions when required

- Are very good at self-promotion and creating a compelling value proposition to attract business

- Do not rest on their laurels even if they have excellent locational advantages

- Have fully embraced containerization

- Do all of the “little” things well even as they maintain compelling visions.

The McMaster Institute of Transportation and Logistics will continue to focus on successes of other gateways and to communicate this insight to the public and stakeholders. The objective is to keep Hamilton gateway development current with worldwide best practices as they evolve.

An important contribution of this report is to quantify the impacts of gateway development under certain scenarios. To this end, analytical work examines gateway development in Hamilton from a regional and local perspective. In the regional analysis, a Multi-Regional Input-Output (MRIO) model uses the best available Canadian trade data and detailed localized sectoral employment distributions to simulate economic linkages of the Hamilton-Niagara Economic region with other regions in Canada. The key findings of this analysis are that:

- At nearly $70 billion in GDP, the Hamilton-Niagara Economic Region, by itself, is a larger economic region than no fewer than <u>six</u> Canadian provinces. In other words, local gateway decisions are very important ones with strong local, regional and national implications.

- Assuming the direct creation of 35,000 Gateway jobs in Hamilton, the regional economic model forecasts an incremental boost in GDP of $4.8 Billion for the Hamilton-Niagara Economic Region by 2031

- Results emphasize the interconnectedness of regional economies since areas outside of Hamilton will also benefit profoundly from local gateway development. For example, under this same scenario, the rest of Ontario and Toronto would benefit by approximately $3.3 Billion with other provinces gaining to a lesser extent.

- The table immediately below demonstrates the 35,000 job scenario as well as more conservative 15,000 and 25,000 job scenarios in terms of expected incremental economic output. All amounts in the table are in billions of 2001 dollars.

Region	Base GDP (2031)	15K Jobs	25K Jobs	35K Jobs
Hamilton	72.48	2.06	3.44	4.82
Toronto	372.60	0.72	1.19	1.67
Rest of Ontario	340.50	0.70	1.16	1.62

- In an examination of trade movements in and out of the Hamilton-Niagara Economic Region, the 35,000 job scenario is estimated to produce a 9.5% increase in harmful emissions relative to the base scenario. These emissions would mostly be spread along transit corridors leading to the region. Simulations show that a modest increase in short-sea shipping from approximately 1% to 5% market share of goods movement into the region would largely offset the inter-regional goods movement emission impacts of local gateway development.

This report also features results from IMULATE, a state-of-the-art Integrated Urban Model customized for the Hamilton CMA. Targeted local employment scenarios were developed to measure local traffic and environmental impacts of gateway development. Among these was a compact residential development scenario implemented with and without improved public transit. In the case of public transit, Light Rail Transit (LRT) is introduced. Findings were as follows:

- Auto commuting levels are reduced by approximately 11 percent (for vehicle kilometres travelled) and 34 percent (for vehicle minutes travelled) when a Compact-LRT approach scenario is implemented rather than an Urban Sprawl scenario.

- In comparing an LRT scenario to a sprawl scenario for 2031, emission levels are decreased by 35, 23, 16 and 12 percents for HC, CO, NO_x and particulate matter under the LRT scenario.

- Transit ridership could increase from the current 3% to 17% for work trips and from 35% to 40% for school trips in the morning peak period if the LRT is adopted.

Key recommendations arising from this investigation are as follows:

- As a gateway city, Hamilton should be planned as compactly as possible. Residential development should be focused on the urban core. Minimization of congestion is a related theme which is important for goods movement and reducing emissions.

- To facilitate residential development of the core and minimization of emissions, an LRT development focused on King and James Streets is highly recommended.

- The formation of a transport-focused gateway organization is recommended based on positive experiences elsewhere. Such an organization would be invaluable for getting stakeholders on the same page and for promoting collaboration between them. In addition, such an organization can be crucial in promoting and developing Hamilton as a transportation and logistics centre.

- Greenfield industrial development near the airport should proceed in phases while residential development in the vicinity should be avoided. LRT access to the airport would assist in this regard. Fast transit and highway access to nearby Ancaster and Glanbrook business parks is a very important consideration. The Airport Employment Growth District should be zoned and planned as soon as possible.

- A sense of urgency is required. Given the recessionary economic environment, varying levels of government are eager to invest in infrastructure. The federal *Building Canada* initiative is an example of available funding for local infrastructure. Also, other potential gateway cities are not standing still.

- Enhanced containerization capability at the Port of Hamilton should be a priority and substitution of trucking by short-sea shipping, where possible, is encouraged.

- Hamilton needs to nurture and grow its human capital and attract it from elsewhere. Excellent teaching and research institutions such as McMaster University and Mohawk College are helpful in this regard. To directly support key gateway functions, a strong labour force in the Transportation and Warehousing sector is very important.

- Urban intensification and connectivity are important themes that must be pursued as they help to facilitate economic activity and minimize emissions.

Hamilton currently has gaps between where it is and where it can be as a gateway. Pursuing steps outlined above will help to close those gaps. Developments that are contrary to these themes, such as suburban residential sprawl, will only increase the gaps. Hamilton should probably not spend much thought on whether or not it *wants* to be a gateway. By virtue of its considerable assets, this city is already a gateway. The question is: relative to its potential, will Hamilton be a strong gateway or an underachieving one?

1

Introduction

1.1 Background

The flow of commercial goods is an increasingly important component of economies at the local, regional, and national scale. In part, this is the result of widespread local level reliance on globalized production and distribution systems. While the globalized system of production brings with it considerable supply side cost savings it also creates complex logistics problems. In particular, goods must be moved across a variety of modes, and often over vast distances and territorial boundaries, both during the production process, and afterwards for final consumption.

The advent of containerization in the 1950s brought a high level of efficiency to goods movement, as well as facilitating inter-modalism (the use of two or more vehicle types to move goods on a single journey). Increased efficiency however, dramatically increased the volume of goods being moved. Elevated levels of global shipping have created numerous challenges, especially as businesses and consumers have come to rely on fast and consistent goods deliveries. Particular issues which can hinder supply chains include: congestion at ports and other nodes; congestion on highways and other links; slow transfer of goods between modes; slowdowns due to security checks, international turmoil; and weather related slowdowns.

There have been a number of innovations adopted in order to minimize supply chain slowdowns. Among these is the emergence of goods movement gateways, sometimes referred to as gateway villages or gateway cities. The Southern Ontario Gateway Council (SOGC) defines a gateway as a total transportation system serving the movement of cargo and passengers. They observe that a key concept behind a gateway is the **co-operation** and **co-dependence** of **all modes**. Gateways are particularly effective at reducing congestion, and facilitating intermodal transfers. Generally speaking, a gateway is a centralized collection of transportation and logistics operations, which allow for incoming goods to be processed (customs and security being an example), re-routed, assigned to a different mode, stored, or have value added.

Often, a gateway will be located at the outskirts of a large market, serving as a central point for incoming goods to be processed and distributed to the market. This formulation has several advantages. First, maintaining the main logistics operations on the outskirts of the market reduces congestion within the market. Second, shipping to the market becomes simpler, and minimizes unnecessary confusion. Third, firms that rely on goods-movement can cluster near the gateway, gaining considerable efficiency. Finally, on the outskirts of a large market, land is typically more plentiful, and less expensive, which makes large-scale transportation and logistics operations more feasible.

Ideally, a gateway will be a convergence point for rail lines, truck routes, sea or lake shipping facilities, and air transport facilities. In this case, fast and efficient movement of goods between modes becomes one of the main advantages of a gateway. The scale of gateways can vary widely. In some cases, a gateway might consist of only a small business park with rail and truck connections, and some warehousing and goods movement operations. In other cases, a gateway might refer to an entire city, with intermodal transportation, logistics, and value added operations dispersed throughout the area. Regardless, gateways exist to fulfill the same basic need, which is to maximize the efficiency of supply chains and ideally, to do it in a way that minimizes the environmental impact.

Gateways and cities are strongly inter-connected. Cities are critical socio-economic structures that enable progress and innovation. By definition, cities are much more concentrated than their surrounding hinterlands and this is the essence of their advantage. It is no coincidence that the great cities and gateways of the world are associated with an unmatched level of intensity and connectivity. Cities at their best are environmentally and economically efficient at the same time. Consider also that many of the best urban places are intertwined with exceptional public transit systems. These urban areas are associated with high real estate values, vertical development, vibrancy and business getting done. Urban sprawl does not fit into this equation in either economic or environmental terms.

In this report, the city of Hamilton, Ontario is examined in terms of its potential as a goods movement gateway serving the Southern Ontario region. In many ways, Hamilton already possesses the necessary ingredients. The Port of Hamilton is one of the busiest on the great lakes, and has connections to Montreal, as well as international ports, via the St. Lawrence Seaway. The Hamilton International Airport is the largest cargo airport in the region by volume. Both CN and CP rail lines pass through Hamilton, which is also well served by highways. There are many key nodes of activity in Hamilton such as McMaster University and Mohawk College among others. Overall, Hamilton is strategically located for gateway purposes and the city can and should be positioned as a key gateway for goods movement in the Southern Ontario region.

What are the benefits of Hamilton becoming a goods-movement gateway? In the best case scenario, Hamilton will develop towards being a sustainable, environmentally sound, and economically successful city, while further integrating itself with the surrounding region, and other national and international trading partners. Efficiencies gained from the Hamilton Gateway can translate into significant reductions in transport related emissions and energy use. As well, gateway development can be a tremendous benefit to Hamilton's economy, both in and of itself, and as a catalyst for further growth. Federal monies for infrastructure projects may flow to Hamilton as a result of prospective gateway development and this also would benefit the region as a whole.

1.2 Purpose and Contributions of this Report

It is useful initially to outline the main purpose and objectives associated with this report. Following this brief sub-section there will be a discussion of the context in which gateway decisions must be made and then a final sub-section that details the contributions and the outline of this report. Briefly, here are the main objectives of this research:

- To enhance our understanding of the underlying factors and conditions needed to establish Hamilton as a gateway
- To analyze the patterns of transportation, and associated emissions, as well as economic and job creation impacts that are likely to emerge in the region under the different scenarios
- To promote sustainable transportation while maintaining economic growth and prosperity and assessing environmental impacts
- To outline a coherent vision and many of the associated steps in developing Hamilton into a successful gateway.

Already, there are a number of published planning visions that pertain to Hamilton, from different levels of government, citizens groups, and other stakeholders and organizations. Although the focus of each is different, there is certainly a need to take these into consideration in planning Hamilton gateway development. The following are important reports pertaining to planning in Hamilton and the greater region: Vision 2020; GRIDS; The Hamilton Goods Movement Survey; SOGC final report; Metrolinx final report. The current report differs in at least two significant ways:

- **To our knowledge, this is the first report which systematically employs the tools of integrated urban models, economic linkage analysis via input-output modelling and vehicle emissions analysis to provide a broader, more holistic, understanding of the implications of the gateway concept for Hamilton. This report rests on a sound scientific foundation.**
- **This report provides a more detailed investigation of how other gateways in the world compare to Hamilton than any study that has preceded it.**

In taking a broader view of gateway development, the transportation, housing, and employment distributions of Hamilton's population are considered. Indeed, the movement of people within and through the city, in an uncongested manner, is a key component of the gateway concept. Here, for instance, the role of regional public transport, and the passenger operations of the Hamilton International Airport are relevant gateway issues. Further, the distribution and transport of individuals within the city affects its sustainability and local level environmental conditions. In summary, while there are specific objectives related gateway developments; these must be holistically incorporated into the broader planning framework for Hamilton, both for the good of Hamiltonians, and the gateway. These issues are addressed in the gateway vision, as well as in the modelling and analysis sections of this report.

What remains to be done for Hamilton to realize its potential as a gateway? This report addresses the question and puts it into context. To this end, here are the major sections to follow:

- In Chapter 2, the gateway concept and other gateway examples from around the world are explored with a view to implications for Hamilton.
- Chapter 3 analyzes the current state of Hamilton today from all relevant perspectives.
- In Chapter 4, some of the best quantitative tools available in social science are applied to achieve a broader understanding of Hamilton Gateway development under different scenarios. Environmental and economic effects, in particular, are considered.
- Chapter 5 is a more qualitative counterpart to Chapter 4. In it, a possible vision for the Hamilton Gateway is outlined in detail, given our improved understanding of some of its effects.
- Finally, in Chapter 6, a set of concrete recommendations are offered which seek to capitalize on Hamilton's potential and realize the gateway vision of this report.

Characteristics of Successful Gateways

In considering the concept of a gateway as it relates to Hamilton, it is worth examining a series of gateway cases from around the world. Initially though, some context on important gateway concepts and on the origin and evolution of gateways is provided. Later, some seaport examples are contrasted with inland port examples and a brief review of selected airport communities is added. Note that an airport development can be an integral part of an inland port, for example, so the two are not mutually exclusive. After the airport review, there will be a more detailed case study of Kansas City and its trendsetting SmartPort organization.

Obviously, Hamilton will have more in common with some of the examples than with others. The intent is to extract the key lessons from each case and then adapt, if possible, to the Hamilton case. This is not to suggest that Hamilton can become a "Rotterdam" for example but perhaps that things can be learned from Rotterdam. A final summary at the end of this major section of the report provides a synthesis of findings and their relevance to Hamilton.

2.1 Key Gateway Concepts

2.1.1 The First Gateways

The term 'gateway city' is a common one in geographical literature. The term has been employed in the English language since the 1880's, where it was a metaphor borrowed from Nebraska novelist Carl Jonas. In the geographical context, R.D. McKenzie discussed the gateway concept for the first time in 1933, in "The Metropolitan Community". The term has varied meanings to different audiences. For many decades Paris and Milan have been widely recognized as fashion gateways, London as a financial gateway, Boston as an educational gateway and New York City as a gateway for creativity and artistic expression. Historically, Chicago and Winnipeg, for example, played the role of prominent gateway cities in the North American context as the railroads opened up the vast western hinterlands for development. Omaha, Nebraska is widely considered to be one of the world's first gateway cities. In the late 19th century, it occupied an urban setting with a river valley, a railroad network and a warehouse district. These components were integral because they established the commercial connection between the urban core and its periphery, and between one gateway city and another throughout the North American midsection.

Burghardt (1971) observes that originally gateways were not Central Places. They did not conform to the expectations of the Central Place Theory of geography that a metropolis should sit at the centre of a symmetrical network of medium and low-ranked cities, towns, and farms. Instead, the gateway served as the entrance and exit linking some large region with the rest of the world. Burghardt describes a gateway city as a positional concept that characterizes the city as a combined entry and exit point for a given area or region. The concept was originally developed to explain the US frontier cities in the nineteenth century. Such cities were centres of economic power within a broad area and also maintained strong transportation connections to distant cities (Drennan 1992).

In 1957, Ullmann noted that gateway cities host the headquarters of the most important national services, such as: railroad and navigation lines (Burghardt 1971). Soon after, American air carriers weighed in with their definition of the term, where they linked the frontier concept to the gateway city, defining it as the first/last American city of an international flight (Drennan 1992). Regardless of their prescribed functions, the common denominator in all gateway cities is that they are 'located on a site of considerable transportational significance' as emphasized by Burghardt (1971).

2.1.2 The Gateway City in the Globalized Economy of Today

In the modern era of globalization, the gateway city has evolved to attain new meaning. Nowadays, the gateway city plays the role of transportation hub and freight forwarder, where multimodality and synergies in modes and network topologies are the defining competitive advantage. Burghardt emphasizes how gateway processes are inherently variable: there is a "temporal as well as locational aspect to the development of gateway cities". As transport/communication hubs, the fortunes of gateway cities often change with technological advances. This is a vital consideration, particularly in the context of economic globalization and the "end of geography" thesis (O'Brien, 1992).

This most recent phase of the world economy is characterized by the ascendance of knowledge technologies, increases in mobility and liquidity of capital, and the associated regulatory and liberalization reforms of large economic sectors that have dynamic international markets. Sectors most affected include finance, advanced business services, transportation and information industries. In this economy, technical advances and institutional innovations in transport and communications are shrinking distance, eroding time and borders, and creating a knowledge-rich global production system. Global markets with extensive outsourcing and 'just-in-time' deliveries are requiring ever increasing on-time shipments of manufactured and semi-manufactured products, components, spare parts, and final goods between production and assembly centres scattered all over the globe.

The 'half life' of many new products in this knowledge economy is becoming shorter and shorter, and the spatial distribution of supply and demand points is changing rapidly. It then follows that the nature of what is transported, how it is transported, and associated origins and destinations are also rapidly changing. This emerging global knowledge economy is a distributed system with a vast array of geographically dispersed economic operations. Powerful trends of decentralization are afoot. All the value-adding components of a global corporation's activities, from R&D, strategic control to production, post-sale services, etc. can be and are globally located (Porter, 1990). Gateway cities in this new economic order can serve both neighboring hinterlands and broader international markets. Ideas, goods and services, and people from "elsewhere" are today more present in most locales than they have been anytime in the past.

2.1.3 The Move toward Seamless Logistics

More recently, the term "Gateway" has taken on a variety of associations, not all of them representing cities per se. Other names for gateways have included: inland ports, hubs, logistics centres or freight villages. The common element in each case is the creation of transportation and warehousing environments to facilitate seamless logistics processes. This focus on secondary activities not directly relating to production results in the minimization of many supply-chain link inefficiencies. Associated transportation capabilities in the form of highway connections, intermodal rail facilities, or air cargo operations form the building blocks for businesses looking for a competitive advantage. The provision of numerous modes enables businesses to choose the best alternative for their needs (Morash, 1999).

Many trading blocs including the European Union are convinced that an accelerated modal shift from road towards inland navigation is one of the key requirements for reducing congestion and environmental externalities. The belief is that inland ports/freight villages can play a crucial role in achieving such a modal shift (Dooms & Macharis, 2003).

Consider a definition of the more European-oriented term "freight village". Such an entity is defined as "a cluster of quality industrial-intermodal distribution-logistics companies within a secure perimeter, located on the periphery of a metropolitan area close to intermodal yards, seaports, or airports. Tenants either own or lease their buildings, but management of the operations and support services rests with one organization or entity" (Weisbrod et al, 2002). The first freight villages sprang up in France in the 1960's, in the wider Paris region (Ballis 2005). By the 1970's, these hubs had also appeared in both Italy and Germany, with their focus on extended inland rail/road intermodal terminals. By the 1980s and 1990s, the number of freight villages multiplied in France, Germany, Italy, Netherlands, Belgium and the United Kingdom (Kapros et al. 2005). In North America, the term 'Inland Port' is often synonymous with the freight village concept. Many examples of inland ports exist in the US, including the cities of Nashville, Atlanta, Orlando, and Louisville.

The freight village concept is still evolving in Europe and continues to emerge in the United States (Weisbrod et al 2002). Many European cities employ freight villages in specific locations where all activities relating to transport, logistics and goods distribution are carried out by various operators (Ballis 2005). These freight villages are based on synergies and alliances between the entities responsible for transport, storage and distribution, as well as associated entities such as customs agencies and insurance companies. Zografos and Regan (2004) observe that a freight village located in the vicinity of a large city may provide an efficient solution to urban freight transport problems including traffic congestion, regional competitiveness, and quality of life.

There has been an inexorable drive towards what Leinbach and Bowen (2005) refer to as a "seamless" transport market. The seams here represent points of friction where smooth flows can become constrained or interrupted. These can refer to infrastructural seams (e.g. differences in rail gauges and changes in modes), operational seams (e.g. signaling systems, speed constraints), functional seams (processing points where goods change form and value as well as distribution points where repackaging and finishing occurs before onward movement) and of course institutional seams (e.g. tariffs, taxes, pricing, data sharing, customs). The theory promotes an efficient chain where national and modal boundaries do not delay movements or hinder the choice of the most efficient route and/or modal combination for the movement required (Willoughby, 2000).

So what are the forces that have been driving seamless logistics? Capineri and Leinbach (2006) identify five distinct drivers. First, they observe that competitive pressures require goods and services-producing firms to manage (almost simultaneously) multiple inter-organizational information and material flows. This is often difficult to attain given the global environment in which companies operate. Attaining efficiencies in this area allows firms to source, manufacture, and deliver their goods and services better, faster and cheaper. The authors note that this development has forced a radical rethink in the architecture of production, the importance of traditional supply chain relationships and the role of logistics.

The second driver relates to the externalization of production and associated activities to the point where corporations are now reliant on external, often international, resources. Operational activities such as product design and development, services and facilities management, logistics and even manufacturing have been taken over by suppliers, where they were once handled internally. These activities have come to be represented by the term "supply chain management" as a way of analyzing and detailing the flows of products and materials in complex organizational structures (Hall and Braithwaite 2001). The implications for transport are that longer and more customized linkages must be achieved through alliances across modes and nations (Capineri and Leinbach 2006).

The third factor driving seamless logistics is intermodality which relates to the ways separate modal systems can be brought together into intermodal structures (Slack, 2001). A key factor in intermodality is containerization. Capineri and Leinbach (2006) note that the container has entered virtually every ocean shipping market over a wide range of freight types and has revolutionized shipping. While slower to enter other modal systems, containerization using units of varying dimensions is also being applied in the road transport, rail and airline industries.

The fourth driver is the increasing role of time in global operations. An ever growing number of firms employ just-in-time production and distribution management processes in an attempt to maintain minimal inventories. The seamless logistics response to this demand must include a greater sensitivity to the timing of connections, arrivals, departures and the capacities of vehicles and storage units.

The final driver is identified by Capineri and Leinbach as the rise of E-commerce and E-business through the Internet. Recent US data indicate that E-commerce shipments are most dominant in manufacturing where 18.3 percent ($270 billion) of total sales are attributed to such transactions (Capineri and Leinbach 2006). E-commerce has direct implications for stocks of goods and, in particular, produces the need for transport of smaller batches and the need for attention to reverse logistics.

2.2 Sea Ports

Many distinctions can be drawn between seaports and inland ports. The hinterland of many seaports stretches beyond national borders (the Hamburg – Le Havre range spans four countries) whereas inland ports generally have a local or a very regional hinterland, due to the fact that they are in most cases the end-points of the logistic chain. Whereas seaports have realized important extensions and have withdrawn most of their port activities from the centre of the urban region (e.g. developments in Antwerp and Rotterdam), inland port activities are in many cases still located in urban centres as they play an important role in metropolitan logistics and urban goods distribution. This latter observation would appear to apply to Hamilton where most of the key transportation facilities are quite intertwined with the built-up urban area.

Another key observation of Dooms and Macharis (2003) is the existence of differences in the degree of awareness of port activities between inland ports and seaports. The scale of seaport activities means that local community groups and public bodies are entirely aware of the existence of a port, both in visual and economic terms. However, inland ports possess less economic scale, and their activities are not omnipresent in visual or in economic terms, although it is noted that in some cities they account for a relatively large share of regional employment and regional value-added processes. This lack of awareness of a successful port authority can have a negative influence on the perceived legitimacy of port activities.

2.2.1 Rotterdam

Rotterdam is Europe's largest and busiest port. In the 14th century, Rotterdam was a small fishing village situated on the river Rotte. Several centuries later, it has become a world-class port and the most important one for the continent of Europe. This development from fishing village to the main port of Europe progressed rapidly over the last century, the main stimulus being the excavation of an open link with the North Sea: the Nieuwe Waterweg. Rotterdam should be viewed not as a single port, but as a collection of specialized ports. A characteristic feature of Rotterdam is the way several large goods flows are bundled together with each sector maintaining its own spot in the port. The main goods classes that move through Rotterdam include liquid bulk, dry bulk, containers, roll-on-roll-off (RoRo) and food products.

The port covers some 40,000ha of land, with a total quay length of 74km. The port has some 1500km of pipelines for handling liquid bulk, one of its key cargoes. It has tank storage capacity in excess of 27,700,000m³. The port has 92 container cranes, 159 multi-purpose cranes, 58 bulk cranes and 25 floating cranes. There are 63 terminals and a vast array of accompanying services including 47 tug boats and 6 pilot boats, 6 dry docks and 7 floating dry docks.

Crude oil, oil products and liquid chemicals together account for almost half of Rotterdam's total goods throughput. To store this liquid bulk and supply it on demand, Rotterdam has specialized tank terminals with a storage capacity in excess of 30 million m³. One third of all incoming trade travels straight to the European hinterland via an extensive pipeline system. The incoming crude oil, much of which is transported in mammoth tankers, also forms the basis for the petrochemical industry, which has a very strong presence in Rotterdam. In the port and industrial area, there are five different refineries and more than twenty multinationals from the chemical sector. The companies are linked with each other via an extensive pipeline system, stretching 1500 kilometres in total.

Rotterdam has several large terminals for handling iron ore and coal. One of these is owned by the German steel industry itself. Iron ore arrives here in massive bulk carriers, mainly from Brazil. Inland vessels then carry it to plants in the hinterland via the Rhine. Large quantities of coal are also handled in Rotterdam. About 50 percent of this incoming trade is destined for the Dutch market; the other half goes to England and Germany. In addition, the port handles considerable quantities of agribulk (e.g. grains and feed) and other dry bulk.

Rotterdam is also Europe's leading container port. The majority of containers are handled on the Maasvlakte, directly on the North Sea, or further inland in the Waalhaven/Eemhaven. The Maasvlakte can accommodate the very biggest container ships at any time of day or night. Many of the scheduled container services, which operate worldwide, call at a limited number of European ports. Rotterdam is one of these, often the first and/or last port of call in Europe. From the port, so-called 'feeders' distribute the containers by sea to smaller ports. Rotterdam is also an important centre for short-sea traffic: container transport by sea as part of intra-European transport networks. Near the container terminals there are three Distriparks, with large distribution centres for logistic service providers and shippers. Here, companies can store, treat and re-pack the incoming containerized goods. They are then distributed throughout the European market, on demand. In the port, there are several terminals which specialize in handling roll-on-roll-off (RoRo) traffic. The crossing to and from Great Britain, for example, is brief. Ferries depart several times a day. All RoRo terminals have direct links with the European motorway network.

The companies operating in the port handle approximately 30 million tonnes a year of foodstuffs and the raw materials for food. About 60 percent of this is destined for the European market. Important product groups are agricultural raw materials, drink, meat, fish, canned goods and grain products. For the handling of vegetables, fruit and fruit juices, a separate area has been created on the northern banks of the port: Rotterdam Fruitport. The port also offers an extensive range of services for handling such products as cars, steel, timber products and project cargo. Often, innovative concepts are applied here, such as covered storage and multi-storey car parks.

Rotterdam offers an unrivalled number of connections with the European market. Depending on the required speed, price and quantity, companies can opt for rail, inland shipping, feeder/short-sea, road or pipeline. In and around the port, many hundreds of carriers have set up business, each with its own specialty. For large consignments of bulk cargo, inland shipping is ideal. Goods can be transported deep into Europe via the Rhine in an efficient and environmentally-friendly way. Also, increasing numbers of containers are being transported on the river. Currently, over a third of all containers in Rotterdam travel to their final destination by inland shipping.

Rotterdam is also the departure and arrival point for hundreds of trains a week. The opening of the Betuwe Line on 1 January 2007 is further boosting train use. The Betuwe Line is a new, 160-kilometre long goods line that will link Rotterdam directly with Germany. Feeder and short-sea ships connect Rotterdam by sea with more than 200 European ports; often with several departures a day. The short-sea/feeder ship is forming an increasingly important alternative to goods transport via Europe's busy roads. Underground too, Rotterdam has direct links with the major industrial centres elsewhere in Northwest Europe. Pipeline is an ideal mode of transport for bulk chemicals, crude oil and oil products.

Even with all of these other assets, the truck remains indispensable, particularly when it comes to short-distance transport. Trucking is the only mode of transport that can deliver door to door. Every year, about 35,000 sea-going ships and 130,000 inland vessels dock in the port of Rotterdam. In total, that amounts to around 400,000 ship movements (Port of Rotterdam, 2006). The Port of Rotterdam Authority is responsible for the safe and efficient handling of this shipping traffic. These movements are unrivalled in the European context

2.2.2 Dubai

Dubai is a city-state of 1.2 million inhabitants, located on the Arabian Gulf. It is one of the seven United Arab Emirates, a federation founded in 1971 when the British abandoned this outpost. If there is a recent example anywhere in the world of the impact of big-picture thinking and pursuing opportunity, Dubai is it. While Dubai was originally associated with the discovery of oil, it is quite significant to note that the non-oil sectors now contribute 90% of GDP. Dubai invested heavily to become the region's main commercial centre and transportation hub and is now reaping the rewards.

The Dubai Port area consists of three ports: Port Saeed, Port Rashid and Jebel Ali Port. The first, Port Saeed is located inside the city along the Creek and is primarily devoted to the handling of bulk cargo brought in by dhows (traditional Arab sailing vessels). Port Rashid is located in Dubai City at the entrance of the Creek and has container handling facilities, a cruise ship terminal and a dry dock facility. The third and largest port is at Jebel Ali some twenty-five kilometres south of Dubai City. The management of the two larger ports was consolidated in 1991 to form the Dubai Ports Authority (DPA).

Dubai Ports can be best understood as a *public service port*, since all the land, infra-and superstructure are in the hands of DPA. As the state-agency in charge of Dubai Ports, DPA decides on the harbour dues and the cargo handling costs at the terminals and furthermore employs all labour in the port. During the 1990s, Dubai Ports witnessed tremendous growth. Port Rashid and Jebel Ali Port together handled over six million TEUs in 2004 (compared with one million TEUs in 1991) and Dubai now ranks 11th in the world (UNCTAD, 2003), which is larger than the Port of New York/New Jersey. With a market share of over 70%, Dubai Ports are the United Arab Emirates main transportation hub.

It is important to understand Dubai Ports' strong competitive position and extraordinary growth over the last twenty years. To this end, its institutional structure of provision in terms of decision rules, fiscal rules, pattern of property rights and jurisdictional boundaries is analyzed. Historical factors and geopolitical and contingent developments provide additional explanations.

Dubai's entrepreneurial spirit has been critical in the city's development as a world class port. This can be explained using three examples. The decision by Sheikh Saeed to create a tax-free port definitely contributed to Dubai's initial growth. This provision lured many merchants and traders from neighboring areas into Dubai. Secondly, in 1952, the Sheikh ordered the dredging of the creek in combination with the redevelopment of the harbour-area. These investments in infrastructure secured Dubai maritime trade and improved its regional competitive position, since it now could receive more and larger vessels than its regional rivals such as Sharjah or Bahrain.

The third illustration is the development of modern port facilities at Port Rashid and Jebel Ali. The construction of Port Rashid, located in Dubai City, started in the 1960s and was accomplished in 1972. The port was unique in the region, since it was one of the first ports capable of handling containers. Not long after completion, Sheikh Rashid bin Saeed Al Maktoum launched another port development project at Jebel Ali, which remains today the world's largest man-made basin. The first phase of the project was finished in 1979 and the project was completed in 1983. Together with the creation of the Jebel Ali Free Zone in 1985, Dubai had put in place the most modern infra and superstructure in the region capable of handling the post-Panamax generation of large ocean carriers. In doing so, Dubai was able to pick the first fruits of the continuous growth of trade and consumption in the region as it successfully anticipated containerization.

One of Dubai's major institutional advantages is its strong and committed political leadership, who run the Emirate like a corporation. The establishment of the Jebel Ali Free Zone near the port's container terminal in 1985 is a clear example of Dubai's growth strategy. In 1991 over 300 companies were located in the Free Zone. It currently hosts approximately 6,000 businesses originating from over 100 countries (DPA, 2007). The advantages of being located in the Free Zone are simple: no taxes and full foreign ownership. Outside the Free Zone only 49% foreign ownership is allowed. There are furthermore no corporate taxes, a concession that is renewable after 50 years, no personal income taxes, 100% repatriation of capital and profits. There is no imposition of duties on imported or exported goods within the Free Zone, whereas outside the free zone custom duties are fixed at 5% within the entire Gulf Cooperation Council's customs union. Land, offices and industrial units within the Free Zone are only available to lease, with no freehold ownership allowed. The leasehold terms are valid for various periods, depending on the type of land use. The absence of freehold ownership apparently does not have any effect on the attraction of businesses. The Jebel Ali Free Zone Authority (JAFZA) manages the Free Zone.

The Free Zone and the Port clearly have a symbiotic relationship. The Free Zone's location near the port has ensured a focus on trans-shipment and the proximity of the Port has attracted numerous businesses into the Free Zone. Almost two-thirds of Dubai's trade volume is re-exported. Noted one industry commentator: "Clearly, the success of Jebel Ali as a port is based less on Dubai's domestic growth than on its ability to handle transshipment bound for India, Iraq, Iran and the wider region" (Gulf Business, 2003). The planned development of nearby Jebel Ali International Airport will provide opportunities for sea-air modal shifts and strengthen the port-industrial cluster even more. Further evidence of a symbiotic relationship is the fact that both JAFZA and DPA have been part of the Ports Customs & Free Zone Corporation since 2001.

2.2.3 Hong Kong

As the only modern, fully developed deep water harbour between Singapore and Shanghai, Hong Kong is the focal point of all maritime activities in southern China. It is one of the busiest and most efficient international container ports in the world. In 2006, the port area handled over 23.5 million TEUs of containers. It was the world's busiest container port from 1987 to 1989, from 1992 to 1997, and again from 1999 to 2004. The port, located by the South China Sea, is a deepwater seaport dominated by trade in containerized manufactured products, and to a lesser extent raw materials and passengers. A key factor in the economic development of Hong Kong is that the natural shelter and deep waters of Victoria Harbour provide ideal conditions for berthing and handling all types of vessels.

Hong Kong's most prized natural resource is its geographical location. Flanking the mouth of the Pearl River Delta (PRD), Hong Kong is perfectly situated for trade between Mainland China and the rest of the world. For more than 150 years, Hong Kong has served as the gateway to Mainland China. The city has the expertise, information and facilities needed to tap into the immense Mainland Chinese market. This has become ever more important since China joined the World Trade Organization (WTO). The marriage of Hong Kong's world class financial, marketing and technical expertise and sophisticated infrastructure, with the mainland's rapidly developing manufacturing and services base, has created a win-win situation. Mainland China is now Hong Kong's largest trading partner. Thousands of international companies involved in trade with China have chosen to establish their beachhead in Hong Kong.

Hong Kong benefits from relatively low levels of taxation. Its taxes are among the lowest in the world, with identical tax rates for foreign and local companies at 17.5 percent. There is no capital gains tax in Hong Kong, withholding tax on dividends and interest or collection of social security benefits. There is no sales tax or VAT in Hong Kong. The limited tax base, combined with exceptionally low tax rates, makes Hong Kong's tax incidence much lower than in virtually all other developed economies.

The port is served by some 80 international shipping lines providing some 500 container liner services per week connecting to over 500 destinations worldwide. There are currently nine container terminals situated at Kwai Chung Stonecutters Island and Tsing Yi (the last one completed in 2004). Substantial TEU throughput is handled by the River trade terminal at Tuen Mun and by various mid-stream sites. The terminals are operated by five different companies, namely Modern Terminals Ltd, Hong Kong International Terminals Ltd , COSCO-HIT, DP World and Asia Container Terminals Ltd. They occupy 275 hectares of land, providing 24 berths and 8,530 meters deep water frontage. The Kwai Chung-Tsing Yi basin is deep, at 15.5 meters. The total handling capacity of the container terminals is over 18 million TEUs per year.

The operation of mid-stream sites in Hong Kong mainly involves the loading and unloading of ocean and river cargoes from barges to trucks/lorries and vice versa. Currently, these sites are situated at 12 different locations occupying a total land area of 34.3 hectares and water frontage of 3,462 meters. They are either under long-term or short-term tenancies. The operation of the River Trade Terminal in Hong Kong involves the consolidation of containers, break bulk and bulk cargo shipped between the Hong Kong port and ports in the Pearl River Delta. The terminal is located near Pillar Point in Tuen Mun and is being operated by the River Trade Terminal Company Ltd. The terminal was fully completed in November 1999, operating with some 65 hectares of land and 3,000 meters of quay.

Port back-up activities are an integral part of the overall port operation in Hong Kong and include container depots, container yards, container vehicle parks and container vehicle repair workshops. Currently, there are about 380 hectares of land being used for port back-up purposes and these PBU facilities are mainly located in the New Territories (e.g. Yuen Long, Lok Ma Chau). The port industry in Hong Kong is supported by two types of ship repair facility: small repair yards (serving the local shipping fleet) and floating docks/ship repair yards which serve much larger ocean-going vessels. While local ship repair yards are spread across 11 different districts within Hong Kong, the three floating docks are located off the coast of north Lantau Island and west Tsing Yi Island.

Responsibility for administering the port is vested in the Director of Marine. The Port Operations Committee advises him on all matters affecting the efficient operations of the port, except those matters that are the responsibility of the Pilotage Advisory Committee and the Provisional Local Vessels Advisory Committee. The Hong Kong Port Development Council advises the Government on matters related to port planning and development and promoting Hong Kong as a regional hub port and the world’s leading container port. Meanwhile, the Hong Kong Maritime Industry Council advises the Government on measures to further develop Hong Kong’s maritime industry and to promote Hong Kong’s position as an international maritime centre. Both councils are chaired by the Secretary for Economic Development and Labour. The Marine Department is responsible for ensuring that conditions exist to enable ships to enter the port, work their cargoes and leave as quickly and as safely as possible. It is concerned with many aspects of safety standards for all classes and types of vessels, from the largest oil-carrying tankers to the smallest passenger-carrying sampans. It also maintains aids to navigation and mooring buoys for sea-going ships, manages two cross-boundary ferry terminals and administers eight public cargo-working areas.

Vessel turnarounds are among the fastest in the world and port charges are among the lowest world-wide. Container ships at terminal berths are routinely turned around in 10 hours or less, while conventional vessels working cargo at buoys are in port for only 1.8 days on average.

The state-of-the-art Hong Kong International Airport is just 23 minutes from the central business district by a high-speed rail link. Opened on 6th July 1998, the Hong Kong International Airport is already one of the world's busiest airports and can process about 36 million passengers and 3 million tonnes of air cargo annually.

Hong Kong continues to move ahead with vision. It plans to spend US$30 billion over the next five years on a significant expansion of the railway network, new land formation, roads, new town developments, government buildings, schools, community facilities and environmental protection.

2.3 Inland Ports

An *inland port* can be defined as "… a site located away from traditional land, air, and coastal borders containing a set of transportation assets (normally multimodal) and the ability to allow international trade to be processed and altered by value-added services as goods move through the supply chain" (Leitner and Harrison, 2001). It is worth bearing this definition in mind when considering the real life examples below.

2.3.1 Berlin-Brandenburg Intermodal Freight Traffic Centres (IFCs)

After the fall of the Berlin Wall in 1989, and the German reunification that followed, the city of Berlin-Brandernburg felt the necessity to develop a freight transport policy that could cope with the increased freight movements brought about by reunification and its indirect influences. The planning concept for the city addressed two distinct issues:

- traffic congestion and its associated problems
- health, environment, and urban development problems associated with motor vehicles, and heavy goods transport

To address these issues, the city submitted specific targets and deadlines for the development of an integrated facility to handle freight traffic and logistics. Furthermore, the city committed to improve local conditions for freight traffic, to ensure accessibility to the CBD and surrounding districts and to improve the environmental sustainability of freight traffic.

Interestingly, this ambitious project also sought to restrain suburban growth and the outward expansion of firms. These goals were achieved through a co-operative planning approach in conjunction with the Berlin Senate (City). Since freight transport is a direct outcome of corporate activity, the participation of business representatives as stakeholders was considered essential. The concept is therefore associated with a new understanding of the roles that market and state actors and their respective interests may play in the transport planning process (Banister 2002). Although this project began its life as a municipal project, its scope developed rapidly to incorporate surrounding states. Due to its unique characteristics and approach, this concept was awarded the status of an official demonstration project at the Expo 2000 World Exhibition in Hannover (Hesse 2004).

In the implementation of this project, three large intermodal freight traffic centres (IFCs) were constructed in the Berlin-Brandenburg Metropolitan Region, located at the eastern, southern and western urban fringe approximately 35–40 kilometres from the city centre. The role of the IFCs was three fold:

- to procure large, accessible sites for locating freight transport, freight forwarding and warehousing firms, and to offer proper operating conditions without affecting sensitive neighbourhoods
- to enable the transshipment of road haulage to rail freight and waterway operators, particularly for long distances, thus supplying multimodal infrastructure
- to ensure that final goods supply into the denser urban space is carried out in a more sustainable manner, with smaller delivery vans instead of heavy vehicles.

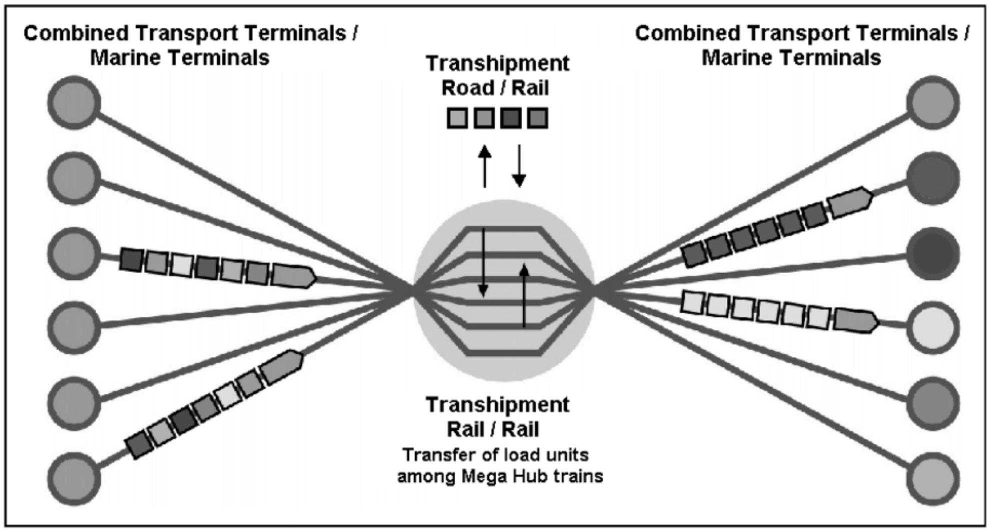
By April 2002, around 85 enterprises were located within the IFC, employing approximately 4,800 people. About two thirds of the lots were settled by 2004, with the remaining lots expected to be sold out by 2008. The vast majority of consignments transshipped through the IFC are in the road sector. With regard to intermodality, results are not what were anticipated in the development stage. In 1999, only 5,000 tons out of about 4.7 million tons were shipped via rail (Landtag Brandenburg 2000). The intermodal terminal in the IFC Berlin-West is currently not being used for container shipments. This is certainly a response to competition and low freight rates that improved the market position of road freight firms significantly (Hesse 2004). The intermodal terminal in the IFC in Berlin South has hardly been used at all. The benefits of IFCs with regard to VKT and emission reduction have not been realized as anticipated. Although heavy vehicle traffic is down, longer distance hauls are increasing, thus presenting a divided picture on the overall environmental benefits.

2.3.2 Hanover–Lehrte Mega-Hub

The EU and many of its national governments are encouraging intermodal transport (rail, barge and short sea) in order to achieve a modal shift and stimulate a more balanced use of different infrastructures. Road transport alone will be unable to accommodate the growth in transport volume. Germany, in particular, has been extremely proactive on this front, with the conceptual ‘mega-hub’ of Hannover-Lehrte in Germany’s north presenting a fine example of this approach. Hannover is located on the river Leine and is the capitol of Lower Saxony. Hannover’s advantageous location represents an important hub on the German autobahn network, and also an important rail hub, with connections to almost every rail line in Germany’s extensive network.

In the German context, the proportion of transport operators using single railway carriages has been decreasing steadily due to its poor associated time-quality ratio (Rotter 2003). Future transport services will focus on industrial zones and large cities that can offer the transport volumes required for direct train operation. This makes it difficult for regions with smaller loads to be incorporated into a combined transport network (Rotter 2003). To address this, new concepts have been introduced. The mega-hub is one such concept.

Exhibit 2.1: Mega-hub as Operationalized in Hannover-Lehrte



The basic idea of a mega-hub is to interchange load units between several block trains during a short stop at an intermodal terminal. Thus connecting trains can carry loads that are otherwise too small to be transported to final destinations by direct trains. Train to train transshipments are carried out during the day, concurrent with rail-road transfers (See Exhibit 2.1). The transport time is therefore extended by one day, which is not considered an issue when dealing with long-haul/international shipments. The operation of the Hannover-Lehrte mega hub involves six shuttle trains, arriving in intervals of eight minutes at the hub. For a brief time interval, all trains are “parked” in the terminal, facilitating the direct interchange of load units between trains / trucks. Finally, the trains will leave the terminal at short intervals, in order to reach their final destinations in the early morning (Rotter 2003). This operating timetable is dependent on rigid train arrival and departure schedules, which German operators are already familiar with thanks to their vast experience in passenger transit.

Rotter (2003) notes the following benefits of such a system:

- The service qualities of block trains are coupled with the flexibility of bundling groups of railway wagons
- There are improvements to the cost–quality ratio in comparison to current single wagon traffic
- It provides for a strategy to counter pressures for reducing flexibility (reduction of single wagon traffic)
- It supports established national block train networks by means of gateway solutions, based on a national overnight transport service.

- Increases in the efficiency of transport facilities (rail and road) and infrastructure coupled with increased transport frequencies lead to a reduction of lead time in the whole transport chain and therefore, improvements in competitiveness.

  To achieve these benefits and advantages, the mega hub concept requires four key factors:

- Accurate and reliable train operation
- Advance information about the physical transport including the composition of wagons on each train as well as origin and destination of load-units
- Advanced train capacity planning
- Robust back-up procedures in case of serious delays to trains, defective cranes or missing data.

2.3.3 Greater Columbus Inland Port, Ohio

The Columbus, Ohio inland port is comprised of multiple components including three intermodal ramps, an all-cargo airport, an international passenger airport, and various industrial parks. Thus one central location is not a prerequisite for inland port status, which is noteworthy for the Hamilton context. The Greater Columbus Inland Port Commission, formed in 1992, is a coalition of businesses, government agencies, and economic development organizations that work to advance the region's goals by advocating quality rail access and highway development as well as building international awareness.

Columbus has used its natural locational advantages to complement its strong transportation infrastructure. Located within a 1-day truck drive or a 90-minute flight is 58% of the United States population, 50% of Canada's population, and 61% of the manufacturing capabilities of the United States. Four interstates provide access to Columbus: Interstates 70, 71, 75, and 77. Fourteen major air carriers, 140 motor carriers and thirty-eight freight forwarders are located in the region. Additionally, 150 million square feet of manufacturing and distribution facilities are currently operating in Columbus. These assets help Columbus attract logistics-related business to support the goal of providing competitive port facilities and services to those who deal in international and domestic trade. Three intermodal yards are operated by Norfolk Southern and CSX railroads. Nationwide rail service is provided through these ramps that handle more than 200,000 container lifts annually. Port Columbus International Airport serves as Central Ohio's passenger airport. In addition to its passenger functions, it serves as a cargo handling facility. Total year 2000 passenger activity at Port Columbus International Airport (enplaned and deplaned) was 6,838,047 passengers; its total freight activity (enplaned and deplaned) in 2000 was 6,640 tons.

The most successful and widely recognized component of the Greater Columbus Inland Port is Rickenbacker Air Industrial Park. Rickenbacker is a 5,000-acre, dedicated cargo international airport and Foreign-Trade Zone. This site was the former Rickenbacker Air Force Base that entered into a joint-use agreement with the Rickenbacker Port Authority (RPA) in January 1982. In October 1990, the government transferred full control of the airport to RPA. Rickenbacker features two 12,000-foot parallel runways, open 24-hours per day, 365 days a year. The total freight activity at Rickenbacker in 2000 was 212,094,348 pounds. Rickenbacker handled more than fourteen times the cargo handled at Port Columbus in 2000. United States Customs is located on site allowing for clearance of international cargo. Approximately twenty cargo planes are scheduled to land daily as well as numerous general aviation and corporate planes. The RPA is the grantee and operator of Foreign-Trade Zone #183, which allows businesses to reduce or eliminate customs duties on imported products. The adjacent industrial park currently houses fifty-five tenants with 90% focused on warehousing and distribution. The remaining tenants deal in light manufacturing. The information in this section was taken from the web sites of the Port Columbus International Airport, the Greater Columbus Chamber Inland Port, and the RPA.

2.3.4 Port of Huntsville, Alabama

The story for the Port of Huntsville is an interesting one because Huntsville is not a very large place (about 200,000 people) and it is fairly distant from any large metropolitan area. According to Kirkland (2007) it is a story of dogged determination by the local authorities, in particular, the Huntsville and Madison County Airport Authority. In the 1960s Huntsville leaders created a vision for the Huntsville International Airport to become a premier multimodal gateway. At the outset, public agencies were investing without a clearly defined market need. For years there was little progress but gradually there were positive developments in the auto sector which led to spin off effects.

The Port of Huntsville is formed by the Huntsville International Airport, the International Intermodal Centre, and the Jetplex Industrial Park. The mission is to provide multimodal transportation services to a diverse regional customer base and to stimulate the economic growth and development of the Tennessee Valley Region. The airport along with the International Intermodal Centre, Jetplex Industrial Park, and Foreign-Trade Zone #83 has made Huntsville a principal transportation hub in the southeastern United States and a global inland port.

The Huntsville International Airport provides seventy daily passenger flights serviced by six major carriers. Many services are provided to business travelers including a business centre, lounge, and hotel in the terminal building. These amenities can be attractive to businesses that deal with international cargo. Adjacent to the airport is the International Intermodal Centre. This inland port is a central location for receiving, transferring, storing, and distributing by air, rail, and highway. The Centre is located on 80 acres of airport property with direct access to the runways, interstate highways, and the Norfolk Southern Railroad main line. The rail intermodal yard can accommodate forty-four 100-foot railcars on four parallel tracks. Over 22,800 lifts were performed in 1998. The International Intermodal Centre is designated as a United States Customs Port of Entry and the location of Foreign-Trade Zone #83. The final component of the Port of Huntsville is the 1,700-acre Jetplex Industrial Park. One of the main attractions of the Park is its Foreign-Trade Zone status and the amenities provided by the adjacent airport and intermodal facility. Twenty distribution and manufacturing companies now operate at the Jetport site.

2.3.5 Port of Battle Creek, Michigan

The United States Customs Port of Battle Creek has operated since 1976 providing western Michigan with a competitive link to international business. This "uncongested" inland port of entry allows goods that arrive in the morning to be cleared by Customs and ready for further handling in the afternoon. This provides a competitive advantage over crowded coastal and border ports. This inland port is overseen by the Inland Port Development Corporation chartered by the City of Battle Creek. The vision is to make Battle Creek a regional freight hub through the addition of new transportation modes and improvements to existing infrastructure.

The Battle Creek Customs Port of Entry is located at the 3,000-acre Fort Custer Industrial Park. This facility is considered to be the largest modern park in Michigan. Approximately 95 companies are located at the park dealing with products ranging from auto supplies, pharmaceuticals, textiles, and food processing. Interstate 94, the most important transportation corridor between Windsor, Detroit and Chicago, serves the port. Nearby is Interstate 69, a major north-south corridor. Adjacent to the port is W.K. Kellogg Airport, the fastest growing general aviation airport in the United States in 1999. The 10,003-foot runway is capable of landing any aircraft made today. The inland port in Battle Creek was built on the vision that the strategic location of the region and its proximity to Canadian and United States markets could be maximally leveraged if the transportation infrastructure was strongly developed.

2.3.6 Port Inland Distribution Network, Port of New York/New Jersey

The Port Inland Distribution Network (PIDN) is an innovative component of the port redevelopment plan for the Port of New York/New Jersey (PONYNJ). Given the potential to double the volume handled in ten years, a redevelopment plan has been created to address growth development issues related to land creation, modal split, environmental impacts, return on investment, and regional market share. The PIDN component of the plan looks to improve the landside distribution of the volumes of containers predicted by the port into the future. The PIDN will comprise a network of inland container terminals in locations like Albany, New York; Bridgeport, Connecticut; and Harrisburg, Pennsylvania. These inland sites would be linked to the port by dedicated rail, barge, or tandem trailer-truck shuttle.

For instance, in 1991 the port of New York / New Jersey inaugurated a direct ship-to-rail and rail-to-ship transshipment facility, a function which grew at a phenomenal rate (much faster than the port traffic growth) from 43,000 containers handled in 1992 to more than 338,000 in 2006. It is expected that by 2010, intermodal rail share would climb to 25-30% of transshipped containers, resulting in improved economic and environmental benefits for the locality. This initiative is not without challenges. For instance, the New York / Albany barge service was suspended, due to the lack of funding in February 2006, which corresponded to the end of subsidies provided to help jump start the service. Inland barge distribution remains a problematic endeavor for the Eastern Seaboard.

The goals of this network are to reduce inland distribution costs, reduce truck trips, improve air quality, increase throughput capacity, and increase market share. One important benefit recognized by the Port Authority is that value-added distribution opportunities are possible if this component of the redevelopment plan is implemented. Value-added services are a key component of the definition of inland ports and thus classify the New York/New Jersey configuration as an inland port system.

To determine the location of the various inland ports in the PIDN, dense trade clusters were first defined. A dense trade cluster occurs where location, area, and demand threshold criteria coincide and benefits in productivity derive from the transfer of containers to the inland port from the maritime port. The feasibility criteria of a dense trade cluster involve outlining the freight transportation networks serving the cluster (road, water, and rail) finding the cost savings from massing container transport between the port and the cluster centroid, and determining if a given site facilitates the accomplishment of the goals outlined above. Projections of terminal productivity in 2040 show that under the PIDN system, modal split will be balanced among more modes, container dwell time at the port will be reduced, and vehicle miles traveled (VMT) within close and far range will be significantly reduced.

2.3.7 Virginia Inland Port, Front Royal, Virginia

The Virginia Inland Port (VIP) began operation on March 1st, 1989, in an effort to create time and monetary savings for shippers and container lines using the Ports of Virginia. VIP is located in Front Royal, 220 miles inland from the Hampton Roads marine ports. This movement inland brings the marine terminals 220 miles closer to the target markets of the Northern Shenandoah Valley, West Virginia, and the Southern Ohio Valley. This inland port has positioned itself to intercept container traffic that is trucked to other competing East Coast ports. Originally, operations at the VIP were intended to provide shippers with one-stop service. This meant that a truck was dispatched from the inland port to the customer where the cargo was picked up and returned for shipment to the marine terminal. Currently, only 10% of the cargo at the VIP is handled this way. Since the majority of shippers are transporting their own cargo to the VIP there is an indication that shippers are more comfortable with the reliable services at VIP. Due to the success of operations, shipping lines are offering a bill of lading to the VIP at Front Royal.

Currently, 45 acres of 161 available acres are developed. The facility contains 17,820 feet of on-site rail operated by Norfolk Southern. Five-day-a-week rail service is provided between the VIP and the marine terminals in Hampton Roads. Most cargo arrives at the VIP from the target markets by truck. Therefore, the location within 1 mile of Interstate 66 and 5 miles of Interstate 81 provides ideal access for trucking. Foreign-Trade Zone #20 designation exists and a truck assembly company is looking to utilize this zone to reduce costs associated with entry into United States markets. The area surrounding VIP has seen an increase in the location of distribution and manufacturing companies who utilize the fast connection to the maritime ports provided by the VIP (Virginia Port Authority, 2008).

2.3.8 Winnipeg, Manitoba

A report on Gateways in the Canadian context would not be complete without reference to Winnipeg, which was the very prototype of a Gateway in the early part of the 20th Century. Burghardt (1971) provides an interesting historical discussion of the evolution of Winnipeg and other Gateway cities during that time period. Essentially, Winnipeg served as the “Gateway to the West” and was otherwise known as the “Chicago of the North.” Massive population growth resulted when the Canadian Pacific

Railway linked Winnipeg to the national link in 1881. There was also a rail link to Minnesota added in 1878. The Winnipeg population increased 350% from 1901 to 1911 and defined Winnipeg as the 3rd ranking city in Canada. The dominance of Winnipeg moderated somewhat as other prairie centres developed and upon the opening of the Panama Canal. This latter development raised the relative importance of shipping and assisted in the development of Vancouver which eventually usurped Winnipeg as the 3rd largest Canadian City.

A comparison of 1911 employment distributions between Hamilton and Winnipeg is interesting. Winnipeg had 13.7% of its labour force in the transportation sector whereas Hamilton had 6.5%. Meanwhile, Hamilton was 50.3% manufacturing whereas Winnipeg was 17.8%. Over time those differences have moderated somewhat but the perceptions linger that Hamilton is a manufacturing centre whereas Winnipeg is more of a transportation centre. Comparison of the two CMAs today is also interesting in that the two have an almost identical population of just over 690,000. The manufacturing labour force percentages from the 2006 census are 15.6% for Hamilton and 11.1% for Winnipeg. The percentage for Hamilton is somewhat moderated downward by the inclusion of cities such as Burlington in the CMA.

Much of the Gateway-related excitement in Winnipeg currently relates to CentrePort Canada which is a corporation legislated into existence by the Manitoba government to develop an inland port. This announcement seems to be inspired by the success of recent developments in Kansas City (see the case study below). This development is to be centred on thousands of acres of land northwest of James Armstrong Richardson International Airport. It received special mention for federal funding in the recent budget of January 2009. The economic downturn has fueled the desire to proceed with large infrastructure projects such as this one. CentrePort is intended to be strong from a governance perspective with a proposed board of directors of fifteen members.

The purpose of CentrePort is to fully capitalize on Winnipeg's strategic location. The city forms the northern hub of the mid-continental trade corridor which is centred on Kansas City. The railway remains a strong transport theme in Winnipeg with Canadian National, Canadian Pacific and Burlingon Northern Santa Fe operating main lines. CN recently completed a major new intermodal terminal on the east side of Winnipeg which is capable of 100,000 container lifts per year between truck and train. Winnipeg is well-connected for road transport with direct access to the Trans-Canada Highway and to the 2nd busiest U.S. border crossing in Western Canada to the south. There are 500 for-hire motor carriers in Winnipeg. There is also potential for Winnipeg in the marine context as the nearby Port of Churchill offers a plausible sea route to Europe and some northern Asian ports via Hudson Bay. However, a short shipping season hampers this mode of transport for Winnipeg.

The main emphasis for CentrePort though is to leverage the nearby airport which handled 156,000 tonnes of cargo in 2007; an increase of 60% from 2001. The airport also handles about 3.5 million passengers per year. Winnipeg anchors many of the shortest routes for over-the-pole flights originating from countries such as Russia and even China. An extensive multi-modal facility at the CentrePort site would streamline the flow of goods using air, road and train modes. Foreign trade zone development would be another prominent aspect. Already, the airport is partially surrounded with some fairly well developed business parks. In particular, Airport Business Park East, which is located between the airport and the downtown, is maturing.

Overall, Winnipeg appears to have many of the assets to further develop as a Gateway and in a manner consistent with its historic role. However, there is a consensus that the required infrastructure is not quite there yet. The main emphasis of CentrePort and related initiatives is to get the required infrastructure into place to allow Winnipeg to compete most effectively.

2.4 Airport Communities

Many of the various “ports” that have been covered thus far have a strong airport component helping to drive economic development. Winnipeg, Columbus and the Port of Huntsville are good examples. The purpose of this section though is to expand somewhat on the issues surrounding airports and economic development as this topic is of considerable importance for Hamilton.

A common practice in modern economies is the development of Airport business parks. These are often referred to as Airport Communities, Airport Employment Growth Districts, Aerotropoli and Airport Cities. Kassarda (2000) defines such an operation as a master planned community that develops around an airport, including industrial, commercial and residential development. There is often more space available around airports than in central business districts and this space can be more economically utilized. Basic industrial drivers for airport business park development are advanced telecommunications, new supply-chain management systems, time-based competition, production flexibility and mass customization and consumables. Such business clusters are freight forwarding, third party logistics and e-commerce fulfillment centres, just-in-time manufacturing, perishables and cold-chain centres, high technology industries, business services, amenities and regional headquarters. These developments contribute to maximizing the economic effect of the presence of the airport.

With speed and agility taking centre stage, modern logistics technologies and aviation-based infrastructures have become essential for many firms to compete in regional and global markets. Industrial advantage is being gained by firms that respond flexibly and rapidly to their domestic and global customers, delivering products quickly and efficiently. Development advantage is being gained by countries which fuse digital technology and air commerce through logistical infrastructure that optimizes their position in the global network of information and product flows. It is not just time-sensitive goods processing and distribution facilities are being drawn to airports. They are also becoming magnets for corporate headquarters, regional offices, and professional services that require employees to undertake frequent long-distance travel.

Kassarda considers the current (year 2000) generation of airport cities, aerotropoli and airport corridors as a first generation. If globalization and the importance of air travel keep growing, a local network of airport cities, central business districts and technology parks bound into the global networks by airline alliances may become a global space of concentration of management, production and innovation. Transportation is considered to be a main driver or indicator of the spatial pattern of globalization. If so, the cities with a central or hub position in the networks of the global alliances are likely to be places of concentration of economic activities within the western world, either because they already have a strong world city status, or have the air accessibility and the potential to become a world or gateway city. The hub-and spoke networks of the global alliances may create new relationships between metropolitan areas. “Airports become cities in themselves, offering excellent conditions for time critical processes of people and goods, with an emphasis on exchange. The challenge is to integrate these airport cities into society, make them the true intersection points between the local and the global by giving them meaning as urban places” (Schaafsma, 2003).

Button and Stough (1998) conducted a comprehensive study of the impact of hub airports on employment growth in high-tech fields. Their multiple-regression analysis covered all 321 U.S. metropolitan statistical areas and showed that the presence of a hub airport in a metropolitan area can increase the number of high-technology jobs in the area by over 12,000.

Brueckner (2003) and Green (2007) have also carried out statistical analysis relating airports to economic development. The general outcome is that airports have their most powerful effect when there are a large number of passengers passing through the gates. Passengers are found to be more important than cargo in terms of economic spin-off effects. Airports are shown to be an important catalyst for attracting businesses to the local area. Good proximity to an airport with good connections facilitates inter-city interaction between businesses. Interestingly, the positive impact relates mostly to service-oriented firms as opposed to manufacturing firms. Brueckner estimates a roughly 1% increase in the employment of service-oriented firms for every 10% increase in airport passenger traffic. Green notes that neither of the two main cargo centres: Memphis (FedEx headquarters) and Louisville (UPS headquarters) are high growth metropolitan areas. He notes anecdotal evidence of some warehouse development around these airports but minimal incremental economic activity.

Overall, there is no single blueprint for airport developments. They are as diverse as the cities in which they are located. In the US and in Hong Kong the focus is on leisure, entertainment and tourism. In Kuala Lumpur, the onus is on technology but in Amsterdam, the focus is on logistics and industry. As an example, consider AllianceTexas, a master planned business community comprising some 15,000 acres around Fort Worth Alliance Airport, Dallas–Fort Worth, Texas. The project was conceived by Ross Perot Jr., founder of Hillwood Development Corporation, the real estate development and investment firm responsible for AllianceTexas. The focus of this development is on private investment stimulating rapid growth and development. Interestingly, Kirkland (2007) notes that an important initial impetus for this development was the relocation of a Burlington Northern Santa Fe Railway facility from a more central location to one in the outlying Roanoke area of the metro area. Another important feature was a large amount of private investment.

The Piedmont Triad Area is another example. This metropolitan region is comprised of 12 counties between the Cities of Greensboro, Winston-Salem, and High Point, North Carolina. In the late 1970’s the various local municipalities and economic development agencies began to implement their vision for the area as a centre for technology and entrepreneurial development focused on an international airport. Piedmont Triad International Airport now occupies a 2,800-acre complex that is owned and operated by the Piedmont Triad Airport Authority. Marketing for the Region is undertaken by the Piedmont Triad Partnership, a consortium of private developers, businesses and public agencies. The airport is a centre for commercial and industrial activity that generates close to $1 billion in economic activity for the area and employs approximately 4,000 individuals, according to data provided by the Triad Partnership (PWC 2002).

2.5 CASE STUDY: Kansas City

Having gone over several inland port examples and some airport communities examples, this Chapter is concluded with a case study of Kansas City. The elements of this case study are drawn largely from the Kansas City SmartPort Website (www.kcsmartport.com) and various news articles from the Kansas City Business Journal. While the airport dimension is prominent in Kansas City, the big transport drivers are trucking and rail. The city has been a noted transport hub since 1868 when the Hannibal Bridge was built over the Missouri River, but there have been several recent developments of note. One of the most important of these was the creation of SmartPort a non-profit economic development organization oriented toward transportation and logistics. Apparently, it was this organization that first coined the term "inland port" and which may well have inspired Winnipeg to follow in its footsteps with their own CentrePort organization. Certainly, there has been direct interaction between the province of Manitoba and SmartPort given their mutual interest in the north-south NAFTA trade corridor. As well, the success of SmartPort in promoting some of the inherent transportation advantages of Kansas City may well provide some valuable lessons for Hamilton.

This case study for Kansas City is divided into two major sections. The first section describes Kansas City, its locational attributes and how it compares on a modal basis. The actions of SmartPort will have influenced some of the outcomes described in this first section. The second section will focus more on SmartPort itself and describe some of the aspects that have made it successful. SmartPort has had a positive impact; however, it is worth noting that Kansas City has some strong attributes in its own right and has also benefitted from some favourable macro-trends.

2.5.1 A Transportation Background on Kansas City

Kansas City is a significant transportation centre. It is the largest rail centre in the United States by tonnage and the third largest trucking centre in the United States. With such a significant presence in two critical modes, it is not surprising that massive investment has been taking place on large, new intermodal facilities. International trade, particularly with Asia via Los Angeles, has been a large driver of transport growth in Kansas City. According to the Intermodal Freight Strategies Study, approximately 80 million tons of freight moves to and from the Kansas City region annually, and about 50 percent of all eastbound intermodal freight originating in California passes through the Kansas City area. In terms of exports, agricultural products are the leading commodity originating in Kansas and Missouri. Over $2 billion of agricultural products are exported per state per year.

The core city of Kansas City has a population of about half a million while the entire metropolitan area is approximately two million. There has been a lot of highway development in Kansas City over the decades. Kansas City is one of only five cities in the United States with direct access to three different interstates (I-35, I-70, and I-29 and soon to be a 4th - I-49). At this point the region has more lane-miles of freeway per capita than any other American city. While this extensive highway infrastructure is attractive in the trucking context, since it helps to minimize congestion, it has not been conducive to designing a truly sustainable city. Kansas City has been noted to suffer from excessive urban sprawl along with some decline in the heart of the city.

Kansas City has some basic locational advantages. Although the general area is relatively lightly populated, its central location on the continent positions it well for north-south and east-west flows. It is possible to ship anywhere in the contiguous United States by ground in three days or less. Since real estate prices were not bid up in the city to the extent of other major centres, there are large quantities of reasonably cheap developable land available. This has been one factor in the development of multiple large inter-modal facilities and also the availability of several large distributional facilities ranging in size from 400,000 square feet to 1.5 million square feet.

Another factor of importance is that the regional population is receptive to large scale developments of this sort as it is seen to be good for the economy. In December 2006 the city of Gardner, which is on the outskirts of Kansas City, approved annexation of land for a 1300 acre intermodal park to be anchored by Burlington Northern Santa Fe Railway. The focus of the centre would be on moving Asian goods from Pacific ports and then distributing from Kansas City. While locals were concerned about the high volume of truck traffic that would result, they were sufficiently impressed with the commitment of city council to reduce negative externalities caused by the facility.

The air and marine themes are not so dominant in Kansas City. The city does have navigable waterways in the form of the Missouri/Mississippi River system; however, low water levels, drought and water shortages have hampered development of freight movement. On the other hand, the Kansas City International Airport moves more air cargo than any air centre in the immediate surrounding states. Currently, it is seeking to take advantage of lower landing fees and less congestion than centres such as Dallas and Chicago. As well, Smartport is helping to position the airport in a more positive light for cargo given the strength of Kansas City in the two other critical modes. In 2007, a total of 127,000 tonnes of cargo passed through the airport.

The economics of rail shipping have improved in recent years as fuel prices have increased. As a result, the rail companies have been making extensive investments and Kansas City has been a major beneficiary. Two rail companies have corporate headquarters in Kansas City, two others have regional headquarters and another has extensive local facilities. Kansas City Southern (KCS) railway is the anchor modal tenant of the CenterPoint-KCS Intermodal International Freight Gateway, a 1,400-acre development site located at a converted air force base. The facility is centrally located at Interstate 71 with good access to the other interstates. The Missouri Department of Transportation is investing tens of millions of dollars to improve and expand highway access to the International Freight Gateway. This intermodal development, among others that are taking place, strongly demonstrates the interplay between rail and trucking modes in Kansas City.

International trade has been a strong theme in Kansas City and based on the investments that are being made; these trends are expected to strengthen. The most important flows, as mentioned, have been between the west coast and Kansas City via the BNSF railway. There is also a focus on trade with and via Mexico. One vision involves bypassing the congested U.S. west coast ports altogether in processing freight from Asia. The plan would involve cargo being unloaded at the Mexican port of Lazaro Cardenas and then being shipped in bond directly to Kansas City for subsequent efficient distribution. The seamless process would allow Kansas City to behave almost as a "virtual Mexican port" taking advantage of cheaper labour costs in Mexico. While the entire vision has not come to fruition, Kansas City Southern is currently utilizing the Mexican port with a dedicated train service that is available each day at a certain time. For now the service is linked to Jackson, Mississippi but there are plans to extend it to Kansas City. The Kansas City Southern railway company is of course headquartered in Kansas City.

On the export side, there is a vision to bypass the congested Laredo border crossing to Mexico with the same sort of seamless setup. The key aspects on the export side are the creation of a Mexican Customs facility in Kansas City which is still in the works. While such a set up would truly be seamless, there is nevertheless still a lot of cargo passing through the Kansas City region en route to Mexico. It is estimated that approximately 1/6 of the $100 Billion in annual exports to Mexico passes through the Kansas City region. Over $2 billion worth of these exports originates in Kansas and Missouri.

Finally, on the trade theme, it is worth noting that Kansas City has more foreign trade zone space than any other U.S. city (over 10,000 acres). Companies are increasingly taking advantage of available foreign trade zone (FTZ) space. Imported goods admitted to FTZs pay no duties until they leave. If value-added work is performed, duties may be reduced or totally eliminated. Benefits of inland trade processing are potentially increased trade flows, reduced paperwork, streamlined shipping systems, and improved distribution centres. This is seen to directly benefit the many transportation, logistics, and export companies in the region.

2.5.2 Kansas City SmartPort

Kansas City SmartPort is a non-profit economic development organization formed to promote and enhance the Kansas City area's status as America's leading inland port solutions. Its mission is two-fold:

- to expand the transportation and logistics industries in greater Kansas City
- to make it cheaper, faster, more efficient, and secure to move goods in and out of the region. The ultimate objective is to make the flow of freight seamless.

A joint effort by the Greater Kansas City Area Chamber of Commerce, the Kansas City Area Development Council and the Mid-America Regional Council, Kansas City SmartPort was created as a non-profit organization in June 2001. This decision was based on the findings of The Chamber's 1993 Intermodal Task Force, the 1995 Intermodal Freight Strategies Study and 1999 Mid-Continent Trade Way Study. The studies concluded that the freight and transportation industry had significant impact on the economy of the Kansas City region to the tune of over 40,000 regional jobs and wages and salaries in excess of US$900m annually. These estimates, along with large current and projected increases in international trade, suggested that a new organization was needed to promote the transport interests of the region.

One of the keys to SmartPort is that different levels of government played a role in making it all happen and did not work at cross purposes. While Kansas City is essentially on the border between the states of Kansas and Missouri, the two state governments were both strongly behind the initiative. Upon establishment of SmartPort, the federal government backed the company with grants. One recent grant from the Department of Commerce has helped to develop security technology to assist in the seamless movement of goods from a Mexican customs facility in Kansas City followed by direct movement and entry into Mexico. The objective of course is to expand local exports to Mexico. Another federal grant, implemented via SmartPort, assisted local businesses in establishing direct trade relationships with Mexican entities.

It is worth noting that SmartPort is quite representative of many different stakeholders. Its board of directors is composed of over twenty different people. There are representatives from transport-oriented firms from the private sector and from various public entities. Overall, it appears to be a very strong organization from a governance perspective with the risk of conflicts of interest being minimal.

Another lesson of SmartPort is that certain key people are critical in getting an organization like this successfully off the ground. Ultimately, having the right people can be a strong competitive advantage. One important person for SmartPort was a lawyer by the name of Lorie Whitaker who is a Kansas City native. She had developed extensive international trade experience in Washington D.C. and applied this experience to excellent effect in the development of SmartPort. Another prominent person was Doug Luciani who envisioned turning the Richards-Gebaur Airport (formerly an air force base) into a freight hub. This of course has evolved into the large intermodal facility anchored by Kansas City Southern. Meanwhile, the current President of SmartPort, Chris Gutierrez, is a very active spokesman for his organization in the media and is busy proclaiming the virtues of moving goods to and from Kansas City. He appears to be very effective in "spreading the word." In the sections below, some of the operating principles of SmartPort are discussed in more detail.

Economic Development

One of the goals of SmartPort is to play an active role in the economic development process for Kansas City as it leverages its organizational focus on transportation and logistics. In cooperation with the area development council, SmartPort is brought into projects to provide transportation solutions to prospects looking at the Kansas City area. In particular, some of the economic development strategies employed by SmartPort include:

- identification of key sites using consulting firms
- attracting corporate targets with logistics operations to Kansas City
- providing resources and marketing information related to the logistics industry in Kansas City
- partnering with the area development council in all marketing and promotional events to tailor a consistent logistics message

- determination of the critical elements of a transportation system needed for new investments (e.g. technological innovation)
- development of relationships with other inland and ocean-based ports to promote coordination and cooperation
- focusing attention on the needs for maintenance, improvements, and growth in the Kansas City's physical infrastructure.

Intelligent Transportation Systems

Since one of the main goals of SmartPort is to make freight movement seamless, there has been an initiative to design and implement intelligent transportation systems (ITS) to improve the security and efficiency of the transportation infrastructure. SmartPort and the Mid-America Regional Council develop ITS funding requests to the Federal government to help fulfill this objective. The goal is to build a secure, efficient, integrated system that allows for increased freight traffic in and out of Kansas City utilizing a combination of rail, air and truck transportation modes. In addition, the integration architecture is being designed to link with systems in Canada and Mexico. Surveys have been carried out to establish those elements of the transportation infrastructure and ITS that are most attractive to manufacturers, distributors, and transportation companies relevant to the Kansas City region.

Business Services

More companies in the Kansas City region are becoming involved in international business, whether it be importing or exporting. There are services in the region to assist and support this growth but key components related to the movement of the goods are under development. Such services include customs, inspections, financing, documentation, packaging, and labeling. SmartPort has focused on building these services into the Kansas City region and on improving existing services.

Business service strategies that have been employed by SmartPort have included:

- securing the support of the Mexican Consul General in Kansas City,
- securing the support of the Canadian Consul General in Chicago
- getting letters of support from political leaders in Kansas and Missouri
- meeting with Mexican officials to present details of plans
- meeting with Canadian officials to present details of plans

New Firms Attracted to Kansas City due to SmartPort Initiatives

Exhibit 2.2 provides a snapshot of firms attracted to the Kansas City region that located there at least partially due to SmartPort initiatives. These firms include world leaders in their fields such as Kimberly-Clark, DHL, Lowes and FedEx. Over 1500 jobs have been created directly, however indirect job creation through spin-off effects is dramatically higher than this figure. In the modelling chapter for Hamilton (Ch. 4), scenarios are considered to trace the impacts of direct and indirect effects of job creation throughout the local economy.

Exhibit 2.2: New Jobs Created in Kansas City

Company	Type of Operation	Jobs Created
American Tire Distribution	Automotive supplier	30
Kimberly-Clark Corp	Global consumer products distribution centre	60
Liquid Container LP	Plastic container mfg.	35
MWI Veterinary Supply Inc.	Midwest distribution centre	30
Piston Automotive Group	Auto supplier mfg.	50
Ranpak Corporation	Paper packaging materials mfg.	21
Vari-Form Inc.	Automotive parts mfg.	40
Alcoa-SIE Cargo Conversions	Air cargo mfg. (Hdq.)	54
Case New Holland	Agriculture & construction equipment	120150
Conklin Co. Inc.	Direct marketing firm	100
Excelligence Learning Corporation	Educational products distribution	50
Musician's Friend	Musical instrument & equipment distribution	140
Pacific Sunwear	Retail distribution centre	250
DHL	Regional sort centre	130
FedEx Ground	Package distribution facility	286
Lowe's Company, Inc.	Lumber distribution centre	35
Wausau Supply Company	Building materials distribution	77

2.6 Possible Lessons for Hamilton

The purpose of this section is to briefly summarize the main findings from the gateway case studies presented in this chapter. While each gateway is unique, there are some generalizable similarities that are worth keeping in mind for the Hamilton context.

Creating a transport-focused gateway organization (e.g. Kansas City, Winnipeg)

The main reason that Kansas City is emphasized here is its SmartPort organization. This organization has appeared to assist Kansas City substantially and is attracting imitators like Winnipeg CentrePort. It seems to be a useful strategy in the context of good transportation assets that are less utilized than they should be. Note that in both cases this organization is non-governmental. Perhaps, this characteristic assists in creating differentiation from the more commonplace economic development department. Regardless, of whether the organization is public or private, the key aspect is very strong representation chosen from a wide range of stakeholders.

The importance of being uncongested (e.g. Kansas City, New Jersey/New York, Battle Creek)

One of the best ways for a smaller gateway to position itself is as an uncongested alternative to larger gateways. As a smaller gateway, it is thus critical for Hamilton not to suffer from congestion. Kansas City is noted for its less congested highways and in alliance with a Mexican seaport wants to position itself as an alternative to the congested Los Angeles port. In the short-sea shipping context, Hamilton could promote that mode as the uncongested and environmentally friendly alternative to trucks on the 401. Consider also that being uncongested aligns economic and environmental objectives perfectly since congestion (as will be shown later) is a major source of pollutants.

The importance of partnerships/alliances (e.g. Kansas City)

When a potential gateway is weak in one dimension, it is important to partner with another entity to help overcome that weakness. Kansas City, and more specifically the Kansas City Southern Railway, is attempting to gain virtual access to the ocean and Asian goods via the Mexican port. One way for Hamilton to minimize the seasonal port weakness, for example, might be to partner with the Port of Albany which offers a year round route through Lake Ontario. Apart from this specific example, most successful gateways are based on a combination of public and private investment. Capturing the private investment is quite dependent on clearly communicating a compelling value proposition.

Communicating a Compelling Value Proposition (many examples)

One of the main purposes of a transport-focused gateway organization is to clearly and frequently communicate a strong and compelling value proposition to attract private capital. The logistics advantages have to be made very clear as each city has to differentiate itself in order to play the role of successful gateway. The best gateways are very good at communicating their advantages at every opportunity.

The Importance of Containerization (e.g. every significant gateway)

Almost 75% of world trade is carried in containers. That percentage continues to grow, and may be associated with a doubling of volume by 2020. Reasons behind this growth include:

- changing trends in global trade environments and increasing development of global supply chains
- emergence of regional trading blocs as a result of free trade agreements
- harmonization of trade and regulatory policies and trade security standards and information flows.

The container is the transport unit of choice in the globalized world. To compete in such an environment, a gateway city must be able to handle containers and the transport modes that move them.

Free Trade Zones (e.g. many US examples, Dubai)

As described earlier, many of the gateway cases possess foreign trade zones. For this reason alone, it is worth investigating how Hamilton could benefit from this approach. While such a zone would appear, at first glance, to operate separately from the city-at-large, there can be local employment spin-off benefits. The example in Kansas City, where the authorities are trying to set Mexican customs facilities right in the heartland of the United States, is an interesting one.

Importance of Location (e.g. Hong Kong, Rotterdam, Dubai, Kansas City)

A clear lesson from the case studies is that there is no substitute for an outstanding location. A strategic location is a major driving force for each of the huge gateways. While Hamilton has a very good location, it is not an outstanding one and there are gateway substitutes for Hamilton in the vicinity. Toronto, for example, has stronger multi-modal railway operations. Hamilton must capitalize on the aspects where it is strongest. With regard to the airport, for example, it is the 24 hour operation which gives Hamilton an advantage. Related to the importance of location is that of climate. Each of the gateway case-studies are year-round operations. This is an additional obstacle for Hamilton to overcome.

Striking a balance between bold visions and incremental improvements (e.g. Berlin vs. Dubai)

This is a delicate matter and one where it is tricky to achieve a balance. The experience of Dubai suggests that bold and audacious visions can work out very well while the experience of the Berlin-Brandenburg IFC, originally designed to accommodate multimodal transfers, provides more of a cautionary tale. The vast majority of consignments transshipped through this Gateway are via the road sector although many of the capital investments were designed to accommodate high levels of rail volume. Perhaps the ideal mix is one of "pragmatic boldness." An under-sized vision can result in a development unsatisfactory to its tenants while overestimating the scale of operation may result in unused land and operational inefficiencies.

Multiple Node Gateways (Columbus, New Jersey/New York, Virginia)

A consideration in Hamilton is that some of the key gateway facilities are spatially separated. The Port of Hamilton is several miles from the airport, industrial parks are a few miles separated and the Aberdeen rail yard, for example is in its own distinct location. Examples have been shown though where disparate nodes work together well as a single gateway. In some cases that separation is much larger than is the case in Hamilton. It is important though that the multiple nodes be well-connected.

Taxation and regulation (Hong Kong, Dubai)

Despite all of their considerable advantages, Hong Kong and Dubai nevertheless position themselves as low-tax, business friendly alternatives for moving freight and setting up operations. Clearly, there is a message there for other gateways in the world if even the most advantaged gateways are taking great strides to be accommodating to business.

Diversification and Specialization (e.g. Rotterdam)

In creating a new gateway, it is critical to achieve the correct blend of modes and facilities. These must provide a ‘good fit’ on a number of levels. The economic drivers must be in place in the region to ensure success. Any facility must be accommodating to the specific needs of the commodities that move through it. Perishable goods, metals and liquid bulk for example, all have specific storage and transportation requirements which must be met. Intermodal facilities must generate savings for their occupants/users. Diversity of capabilities is a worthy objective but it is also worthwhile to be really strong in certain aspects.

Hamilton Today

In addressing the gap between where Hamilton is and where it wants to be in relation to an optimal gateway development, it is necessary to carefully consider the present context. That is the purpose of this chapter which considers all relevant dimensions including the economy, demographics, transportation infrastructure and other aspects. A sub-section worth highlighting in Chapter 3 features lessons from the Hamilton Goods Movement Study (IBI 2005). In many ways, that report also deals with evolving Hamilton into a successful gateway. The related sub-section below reviews some of those findings.

3.1 Geography

Hamilton is situated equidistant between the US border at Niagara Falls and Toronto on the western shore of Lake Ontario. The city is located in the centre of the Southern Ontario/Golden Horseshoe region. More specifically, the region includes the cities and municipalities of Toronto, Hamilton, York, Peel, Halton, Durham, Niagara, and Waterloo, and the counties of Brant, Haldimand, Wellington, Dufferin, Simcoe, Haliburton, Kawartha Lakes, Peterborough, and Northumberland. This urban agglomeration is centred around the west end of Lake Ontario with outer boundaries stretching to Lake Erie to the south and Georgian Bay on the north. The built-up region extends from Niagara Falls at the eastern end of the Niagara Peninsula, wraps around Lake Ontario west to Hamilton, anchored by

Toronto on the northwest shore of Lake Ontario, continuing to the east of Oshawa. The wider region spreads inland in all directions away from the Lake Ontario shoreline, southwest to Brantford, west to the Kitchener-Waterloo area, north to Barrie and northeast to Peterborough. The region's area covers approximately 33,500 km^2, and out of this, 7,300 km^2 is covered by the Greenbelt. Although it is a geographically named sub-region of Southern Ontario, the Greater Golden Horseshoe is more frequently used today to describe the metropolitan region that stretch across the area in totality.

This region is one of the most prosperous economic areas in both Ontario and Canada, with a strategic location allowing for rapid access to numerous markets. Located within a 250 mile radius of the city are the Canadian cities of Toronto, Sudbury, Windsor, London and Kingston, as well as the US cities of Cleveland, Pittsburgh, Detroit, Buffalo, Rochester and Syracuse. Within a 500 mile radius are the cities of Ottawa, Montreal and Sault St. Marie in Canada. Within the same radius are the American cities of Milwaukee, Chicago, Indianapolis, Cincinnati, Columbus, Philadelphia, Washington D.C. and Baltimore as well as the tri-state area encompassing New York City.

3.2 Economy

In 2001, the Manufacturing sector was the largest employer in Hamilton, employing some 49,005 residents (Statistics Canada 2001). Agriculture is the second greatest contributor to Hamilton's economy, generating an estimated $813m a year in gross sales and some $8.9m in tax revenue for the city (Planscape et al 2003). This sector is closely related to Hamilton's food and beverage processing industry. Since there exists a market of 120 million people within a day's drive of Hamilton, the rapid production and processing of food and beverages presents an enticing logistics challenge for such time sensitive products. Port related industries form a third of Hamilton's traditional economic clusters. The Port of Hamilton is well served by road and rail, with proximal access to aviation facilities in the form of Hamilton International Airport. The Port of Hamilton is the second largest on the Great Lakes, and the largest on the Canadian side. Well served with shipping facilities, warehousing, cranes, and container handling, the port also provides the essential associated services of customs, dry-docking, tugboats and chandleries.

3.2.1 Traditional Economic Clusters

Hamilton's economic progress over the past century has been quite dependent on manufacturing. Over time Hamilton has become Canada's major manufacturer of steel and metal products. Throughout the 1950's and 60's, large manufacturing plants were constructed throughout the north central United States and in Southern Ontario to meet consumer demand for automobiles, tires, steel, building supplies and the myriad of goods required by the booming post-war economy. These centrally located plants were within days of virtually any North American market. In conjunction, transport infrastructure in the form of new roads, rail, air and sea ports were developed.

In the globalized world of the past quarter-century, there has been a shift within larger manufacturing entities. Firms commonly outsource manufacturing operations due to the cheaper costs of labour and taxation offered by many competing foreign nations. As a result, many mid-sized manufacturing entities have replaced the traditional larger industrial giants that were so fundamental in the development of Hamilton and similar North American urban centres. Relatively cheap power, in addition to a strategic geographic location, has encouraged the materialization of these mid-sized firms in Hamilton. Manufacturing remains the largest of Hamilton's economic clusters. Transportation and related industries are an important part of Hamilton's economy. Transportation industries account for some $6.8 billion of wages in Southern Ontario (see Exhibit 3.1).

Exhibit 3.1: Transportation Employment in the Southern Ontario Gateway

Mode	Employment (person years)	Wages ($ millions)
Airports	25,900	$1,080
Ports	2,500	$140
Rail and Transit	24,200	$1,450
Trucking	103,700	$4,190
Total	156,300	$6,860

Source; SOGC Strategic Plan, p3

3.2.2 Emerging Clusters

Hamilton's City Council decision in February 2001 to pursue an integrated growth strategy, with a particular focus on the development of economic clusters, was seen as a significant step. Cluster development will employ a strategic targeted approach to economic development (as opposed to past undirected efforts to secure any company interested in the locational advantages of the city), and will address the pressing issue of the limited supply of industrial land in the city (City of Hamilton 2005).

New economic clusters are emerging. The city's economic development strategy identifies three: Biotech/Biomedical, Airport Employment Growth District and Film/Cultural industries. The biotechnology/biomedical sector represents one of the world's fastest growing industries. Hamilton is poised for growth in the sector in no small part due to existing assets including McMaster University, hospitals and research centres employing experienced researchers. The Health & Biotechnology Sector's development and on-going research currently attracts investment and talented individuals to the community, as well as the myriad of associated industries. In addition to this investment, there are benefits which include high paying jobs for researchers and technical staff as well as a myriad of associated companies generating employment within the CMA and beyond.

Film and cultural industries is a new cluster for Hamilton. Sound and Smoke TV is a recently launched broadband television channel based in Hamilton. They are currently looking for short films by Ontario independent filmmakers and students to broadcast on their FILMSPACE channel. There is also a revenue possibility for filmmakers here. On a broader scale, with regard to the production of higher budget movies, much of this work often relies on a weaker Canadian dollar in order to attract US filmmakers.

The proposed Airport Employment Growth District in Hamilton is supported by the city's Economic Development Strategy, rooted in the theory of cluster development and employing Porter's cluster definition, “a geographic concentration of competing and co-operating companies, suppliers, service providers and associated institutions”. The strategic vision sees Hamilton International as becoming Canada’s gateway to the Southern Ontario region and the leading intermodal air freighter gateway in Canada. Section 3.4 will discuss the proposed Airport Employment Growth District in greater detail.

3.3 Demographics

The Southern Ontario region, with a population of 8.1 million people, makes up slightly over a quarter (25.6%) of the population of Canada and contains approximately 75% of Ontario's population, making it one of the larger population concentrations in North America. The City of Hamilton had a 2006 population of 504,559 which represented 2.91% growth from 2001, somewhat lower than Ontario's growth rate of 6.6%. Canada's national average growth rate in this period was 5.4%. Generally, all communities within the city limits contributed to the growth of the city with the exception of the community of Hamilton showing a slight decline in its overall population but remaining consistent at 329,820. The dwelling unit percentage change for the City of Hamilton averaged 5.55%, with Glanbrook leading in proportional dwelling unit change since 2001. In 2005, the Province released growth forecasts for the Greater Golden Horseshoe and one of these forecasts has been incorporated into the draft *Places to Grow* plan. Population, household and employment forecasts represent the cornerstones for the GRIDS planning process (see Exhibit 3.2 below).

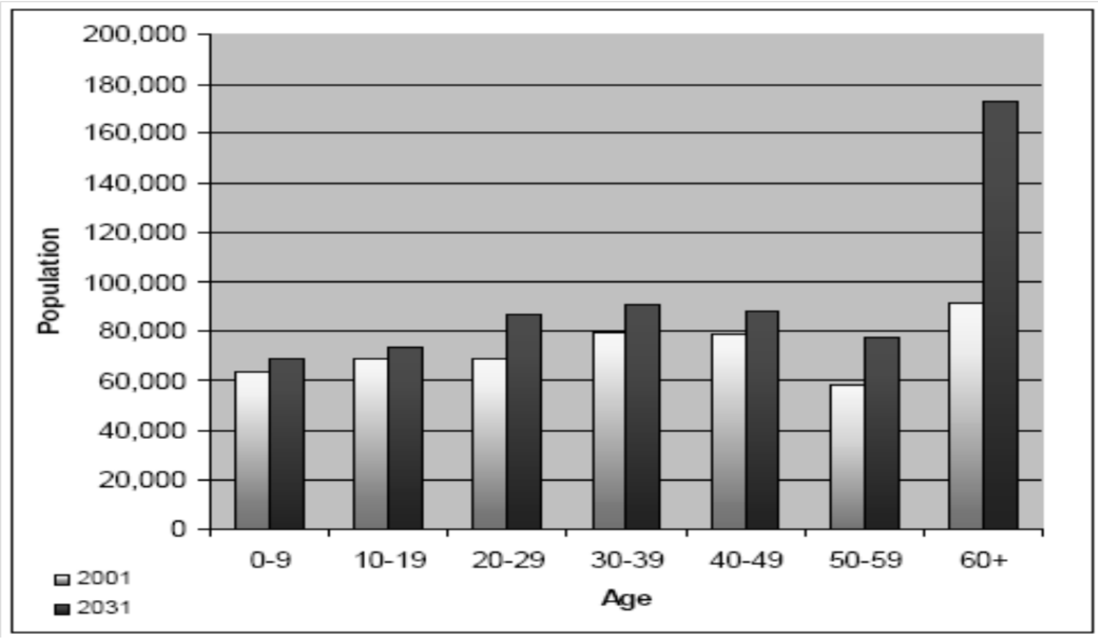
Exhibit 3.2: Demographic Forecasts for Hamilton

Year	Population	Households	Employment
2001	510,000	190,000	210,000
2011	540,000	210,000	230,000
2021	590,000	240,000	270,000
2031	660,000	270,000	300,000
Change 2001-31	150,000	80,000	90,000

Source: Places to Grow: Proposed Growth Plan for Greater Golden Horseshoe, 2006

The demographic composition of Hamilton is experiencing a period of change. In the period 2001-2031, the population of the city will be forecast to grow by 150,000 (Ministry of Public Infrastructure, 2005). These 150,000 new residents are anticipated to occupy an estimated 80,000 households and to add an additional 90,000 individuals to the workforce. Although these figures point to an overall population growth in the CMA, the population is aging and this presents challenges. The city will have a larger number of residents older than 50 and fewer residents younger than 40 (Exhibit 3.3).

Exhibit 3.3: Hamilton CMA Age Structure at 2001 and 2031



Source: City of Hamilton, 2006

3.3.1 General Labour Force

According to the 2001 Census, the Hamilton CMA recorded some 325,795 persons employed in the labour force, representing an employment rate of 61.80%. This workforce is greater than the surrounding cities of St. Catherines (180,470), Kitchener-Waterloo (220,080), Guelph (63,655) and Brantford (41,505), but considerably less than Toronto which has 2,413,100 individuals in the employed labour force. On a wider provincial level, Hamilton is comparable with London (215,695), Windsor (149,810) and Oshawa (150,690). Based on employed labour force, Hamilton is the third largest CMA in Ontario after Toronto and Ottawa.

3.3.2 Transportation and Warehousing Labour

With regard to employment in transportation and warehousing, the IBI report (2005) produced some interesting statistics, notably that from 1996 to 2001 the labour force in Hamilton grew 7%, while those numbers employed in Transportation and Warehousing (T&W) increased 50%. The corresponding provincial percentages are 9 and 41% while federally it is 7 and 29%. These results show that Transportation and Warehousing are relatively more important to Hamilton's economy, which is consistent with an evolving gateway.

3.4 Transportation Context

3.4.1 Highways

The city is serviced by five major expressways (Highway 403, the QEW, Highway 6 extension, the Lincoln Alexander Parkway and the Red Hill Valley Parkway). In addition, a vast network of associated links and arteries form some 5,352 lane-kilometers of paved roads (IBI Group 2005). On a wider scale, Southern

Ontario has an expansive highway system, dominated by Highway 401, the main east-west artery for road traffic across Southern Ontario. This route is in turn linked to a network of 400-series highways, which include the QEW linking Toronto to US border crossings in the Niagara Region. Key 400-series highways include highways 400, 404, 403, 407 ETR and 410. Most of these highways are equipped with ITS to maximize existing infrastructure capability. In 2003, an average of 160,000 trucks per day travelled on provincial highways (SOGC Strategic Plan, 2006).

Hamilton is not a large metropolitan area but it does suffer from congestion issues at peak times. Part of this relates to positioning relative to Toronto and part of it relates to local escarpment geography and other factors. Highway 403, for example, suffers from significant congestion at peak times partly due to frequent accidents along its winding route. It is common to see lengthy backups on the Lincoln Alexander Parkway as vehicles attempt to access the 403 towards Toronto. The merging of the Highway 6 and the 403 near the Burlington/Hamilton border is an awkward one. Meanwhile the pace on the QEW can be quite dependent on the conditions on the Burlington Skyway.

3.4.2 Rail

The City is served by an extensive rail network, with operating carriers including Canadian National (CN), Canadian Pacific (CP) and Southern Ontario Railway (SOR). Accompanying the decline in heavy industry in the Golden Horseshoe region, has been deterioration in the use of rail for local heavy goods movement. However, intermodal rail-truck transfer points exist for steel, forest products and bulk goods, located at Aberdeen and Stewart streets and operating near capacity. Across the greater Golden Horseshoe Area, 22 railway companies operate, with CN and CP being the dominant players. The network is supported by many shortline railways, freight railroads, and commuter operations. Of the 20,937 kilometres of rail track in the province, CN and CP own and operate 9,144 kilometres and 6,416 kilometres of the track, respectively. Ontario rail freight totaled 72.6 million tonnes in 2004. The majority of freight carried on Southern Ontario track is via traffic that does not originate or terminate in the region.

There are several major intermodal facilities located in the Toronto area. CN’s intermodal facility at Brampton (Brampton Intermodal Terminal) handles domestic, trans-border and overseas import-export intermodal shipments. CP’s terminal at Vaughan handles intermodal shipments between Eastern and Western Canada for both domestic and import-export. CP’s terminal at Obico handles trans-border intermodal shipments and shipments through the Port of Montreal and into the Eastern U.S. CP also has Expressway terminals at Agincourt and Milton, a drive-on drive-off form of rail transport that does not require any lifting of the standard highway trailers that are loaded onto it (SOGC Strategic Plan, 2006).

3.4.3 Marine

Hamilton is the busiest Canadian Great Lakes port, and the 8th busiest in Canada as a whole. The St. Lawrence Seaway connects the city of Hamilton with Lake Erie, and other great lakes, as well as international shipping lanes. The Seaway is especially cost-competitive for shipping steel, heavy lift and project cargoes to and from Europe. Great Lakes ports have lower port costs than competing ocean ports for the handling, wharfage, dockage and stevedoring of grain, iron ore, steel coils and machinery.

Currently, the port receives many of the required inputs necessary for the manufacture of steel products, which are in turn shipped out from these facilities. The Great Lakes system is at present experiencing lower water levels, which can result in the 'light-loading' of ships. However, this change is accompanied by an ever lengthening shipping season. Both 2006 and 2007 witnessed record early opening dates for the Welland Canal, with its first ever pre-spring opening on March 20th, 2007. A longer shipping season could enhance the opportunity for Hamilton to develop as a logistics hub in the region.

Currently, local consumer goods are shipped from Halifax to Montreal, then broken down and loaded onto trucks and shipped to Ontario. Montreal has a 12-month navigation season. Hamilton has 9.5 months on average (and lengthening). Container shippers, however, demand yearlong navigation. The present length of navigation season could still provide an opportunity for Hamilton in seasonal goods such as Christmas goods (which would come into the port in October/November) or Spring goods which arrive in early March.

The port has almost 12 kilometres of commercial shipping berths and offers a combination of facilities and services, ranging from transshipment facilities, to customs and dry-docking. The port's marine terminals offer dry and liquid bulk storage, warehousing for general cargo, heavy lift cargo capability and container handling. The port offers a full suite of facilities to shippers, including terminals for dry and liquid bulk cargos, warehouses, heavy lift cargo cranes, a RoRo berth, and container handling equipment. The port also offers a complete set of support services including customs, dry docking, barges, tugboats, and ship chandlers (SOGC Strategic Plan, 2006).

In May 2001 the Hamilton Harbour Commission became a Port Authority operating under the Canada Marine Act. Currently, Hamilton operates as a bulk port in particular serving the steel industry. Over 90% of total tonnage is inbound. Hamilton is a destination port with very little pass-through cargo. The port is the largest landowner in Hamilton and controls large tracts of unusable warehouses and abandoned industrial plants designated as brownfields. These sites present a future expansion and development opportunity for the Port of Hamilton. An abundant supply of port-side land area is already in existence, allowing for great flexibility with regard to containerization, multimodality and port development.

For obvious reasons, the Port of Hamilton is very dependent on the St. Lawrence Seaway. Recent developments on that front may be favourable for Hamilton. The St. Lawrence Seaway Management Corporation (SLSMC) has introduced a three-year toll freeze that, together with a revised tariff structure, may provide a significant boost to new business growth. With the goal of maximizing the volume of existing commodities, while at the same time attracting new cargoes to the Seaway/Great Lakes System, the new tolls structure underscores the commitment of the SLSMC and Transport Canada to increased use of the Seaway. A New Business Incentive Program targeted at carriers and shippers will allow for a 20% discount on cargo tolls over the course of three years for commodity/origin/destination combinations approved by the Corporation as "new business". Notably, all containerized cargo movements are eligible for the discount, from 2008 to 2012.

The Hamilton Port Authority has developed a 5 year Business plan that includes a comprehensive Land Use Study. This multi-faceted and aggressive plan is centred on immediate change and diversification, with key objectives including:

1. revamping land use policy to maximize revenues and to provide new modern facilities and services as well as shovel-ready land to attract new business
2. to seek out new tenants and new cargos to lessen the dependence on the steel industry
3. to develop an infrastructure that would promote and support flow through shipments and facilitate the transmission from a destination port to a distribution centre
4. a marketing strategy to develop new business throughout the Great Lakes

Another consideration in the context of port development exists in the form of local opposition to development in the port-lands area. Many local residents east of Eastport Drive branching out from Beach Blvd. are exposed to emissions from industries in the port area. As a result, these residents are particularly sensitive to nearby development in all its forms. In aggregate though, the environmental advantages of shipping are well documented and include reduced emissions and costs when compared to moving similar cargo volumes by either rail or road.

3.4.4 Airport Facilities

John C Munro Hamilton International Airport (*HIA*) operates with a vision to be the low-cost gateway to the Southern Ontario region and the number one intermodal air freighter gateway in Canada. Passenger numbers have been growing at *HIA* over the past number of years, with 662,855 passengers in 2007 (an increase of 25% over 2006) (John C Munro Hamilton International Airport, 2008). By way of comparison, Toronto Pearson International handled 31.5 million passengers in 2007. *HIA* again was Canada's number one multimodal cargo airport in 2007, moving some 101,400 tons of which 60%-70% are via couriers and 30%-40% cargo. *HIA* has many strengths including a large market in catchment area, unrestricted and uncongested 24/7 operations, a proven distinct passenger traffic market and a strategic location with strong integrator operations. The airport has strong community/stakeholder support, reflected in the airport economic development priority assigned by the City of Hamilton.

The airport is located in Mount Hope, on the Southern fringes of the city. The airport has been designed to handle large aircraft on overseas operations, and includes a 3050m x 60m centre lit paved runway, ideal for low visibility operation, as well as a smaller 1830m x 45m runway. The key competitive advantage of *HI* is its unique position as a cargo gateway to the North American market. The airport possesses numerous advantages including a strategic location along two NAFTA super-corridors, 24-hour landing, 24-hour Canada Customs operations, no peak-period charges, no air or ground congestion issues, multi-tenant cargo facilities and excellent surrounding infrastructure.

The City of Hamilton and the Province of Ontario recognize the importance of *HIA* as an economic driving force for the City of Hamilton, and the region as a whole. The Airport Employment Growth District (AEGD) aims to maximize the potential of *HI* and its surrounding lands to create a business cluster. In 2006, the preferred growth scenario developed for the Growth Related Integrated Development Strategy (GRIDS) identified the AEGD as one of the main areas to address the City's need for employment lands to the year 2031. Other airports in the region include 2 international airports at Toronto and Waterloo, seven general aviation airports (Buttonville, Toronto City Centre, Brampton, Burlington, Oshawa, Markham, Peterborough), and Toronto Downsview Airport, which is used privately by Bombardier Aerospace. There are 18,600 acres of rural land (owned by the Government of Canada) available in the municipalities of Pickering, Markham, and Uxbridge for the potential future development of a second international airport to serve the Greater Toronto Area (the Pickering Lands). Collectively, the region's airports handled approximately 30 million passengers in 2005 (SOGC Strategic Plan, 2006).

3.4.5 Traffic Congestion

Efficient urban transportation networks are pivotal to business investment and growth as well as environmental sustainability (Golden & Bender 2007). Transport Canada estimates that the total annual cost of congestion (in 2002 dollars) ranges from $2.3 billion to $3.7 billion for the major urban areas in Canada. More than 90 percent of this cost represents the value of the time lost to auto travelers (drivers and their passengers) in congestion. The remainder represents the value of fuel consumed (around 7 percent) and GHG's emitted under congestion conditions (around 3 percent). The study estimates a yearly increase of 1.2 to 1.4 megatons of GHG due to congestion (Transport Canada, 2006).

Recommendations have been made to alleviate congestion in Hamilton. The IBI group (2005) recommends resolving infrastructure bottlenecks and establishing clearly designated truck routes for goods movement connecting the port and the city, for both eastbound and westbound deliveries. They also note a possible improvement of the east-west link from Hamilton International Airport to Niagara.

Congestion can be examined using an integrated land use-transportation simulation model. Such models aim to capture the relationship between urban form and travel behaviour. Integrated urban models allow decision makers to isolate the potential impacts of a particular strategy by holding other characteristics of the city constant, something that is impossible to achieve otherwise. IMULATE is an operational Integrated Model for Urban Land Use, Transportation and Environmental analysis developed by McMaster University's Centre for Spatial Analysis to study urban issues in the CMA of Hamilton. It can be used to assess the impacts of land use change and generated travel demand on the environment. This model is described in detail in Anderson et al (1994) and Buliung et al (2005) and will be utilized in Chapter 4.

3.5 Public Transit

In May 2007 the city of Hamilton completed its Transportation Master Plan. The three major components of this plan are the compilation of a Travel Demand Forecasting Model to identify existing and future transportation issues and opportunities, the development of transportation policy papers and the development of a comprehensive transportation master plan. Objectives in the plan include increasing transit ridership from 5% in 2001 to 12% in 2012 and increasing annual transit trips per capita from 40 trips in 2001 to between 80 and 100 trips in 2012.

Key elements of the plan include the establishment of a Bus Rapid Transit (BRT) network consisting of three primary spines and other interconnecting routes: A Lower City east-west corridor between McMaster University and Eastgate Square; a Central North-South Corridor on James Street and Upper James via Mohawk College; and, a Mountain East-West Corridor on the LINC or parallel facility. The staged implementation of BRT could begin with updating and enhancing the existing BLine, located on the lower City east-west corridor. Other projects highlighted include establishing other priority transit routes between major nodes, construction of 120 km of new on-street bike lanes and over 140 km of new multi-use paths. There are also intentions to expand the commuter rail and regional bus system to integrate with land use intensification policy objectives and continued improvement of the road system to address existing capacity issues.

Metrolinx in their white paper *Preliminary Directions and Concepts* has noted the potential for two BRT/LRT routes in the city. The proposed lines would include a north/south line in the James Street corridor leading to Hamilton Airport and east-west line in the King Street corridor connecting to McMaster University. The prospect of an LRT system in Hamilton has garnered significant public support.

3.5.1 Bus

Currently, there are over 30 bus routes serving Hamilton, Stoney Creek, Dundas, Ancaster and Burlington. Buses run seven days a week on most routes, from around 5:30 a.m. to 1:00 a.m. The low density nature of recent suburban residential development has created challenges for passenger transit authorities in the Hamilton CMA. The City of Hamilton is also served by GO Transit via a bus service that offers frequent express service from downtown Hamilton to Union Station in Toronto. There is also a Hwy 407 service connecting Hamilton to Mississauga. Other GO bus services serve as feeders to GO trains leaving from stations in Burlington.

3.5.2 Rail

Since the late 1980s, GO transit has offered passenger train and bus service from its Hunter Street station. GO trains and buses serve a population of six million in an area of 8,000km^2. GO connects with every municipal transit system in the Greater Toronto and Hamilton areas, including the Toronto Transit Commission (TTC). The network extends out from downtown Toronto in a radius of about 100 kilometres to serve communities such as Hamilton and Guelph to the west, Barrie and Beaverton in the north, Stouffville and Port Perry to the northeast, and Oshawa and Newcastle to the east. The seven train lines extend to the following end points: Hamilton (Lakeshore West line), Milton, Georgetown, Bradford, Richmond Hill, Stouffville and Oshawa (Lakeshore East line). GO Transit trains utilize the rail track facilities of CN and CPR through contractual agreements with each party. The rail lines have a total distance of 361 route kilometres. The GO Transit fleet consists of 45 locomotives and 395 bi-level passenger rail cars.

There are 56 rail stations and associated parking facilities and feeder bus routes. Since many commuters drive to the GO trains, perhaps four of those 56 stations come into play for Hamilton residents travelling to Toronto: Hamilton GO Centre and three Burlington stations: Aldershot, Fairview and Appleby. In many contexts, particularly from the Hamilton suburbs, it is more convenient to drive to a Burlington GO station for a train as opposed to taking a train from Hamilton, although this situation is evolving. An additional morning train to Toronto from the Hamilton GO Centre has been added as of March 2, 2009.

VIA Rail provides long haul passenger transportation, the most proximal station being Aldershot, some 10km northeast of Hamilton. An increasing number of commuters are using VIA to get to Toronto from Aldershot since the trains are faster and the stops are fewer. In fact, there is a program where commuters can pay a supplement to use their GO Pass on VIA Rail. VIA does not actually have a stop in the city core of Hamilton.

3.6 Lessons from the Hamilton Goods Movement Study

On a given day in Ontario, some 150,000 truck movements transport $2.728 billion in goods across the province (SOGC, 2008). Highway 401 alone receives more than 43,000 truck trips daily, moving over $1.2 billion in goods. Determining the origins and destinations of these trips requires a comprehensive goods movement study. Studies by the IBI Group (2005) and McMaster University (2007) clarify the issues faced by shippers in the province and also the particular commodities transported.

A survey of 27 shippers and carriers in Hamilton was conducted as part of the Hamilton Goods Movement Study (IBI, 2005). All three major railways, the port and the airport participated in the survey as did five motor carriers of freight, freight forwarders or logistics service providers. Most respondents operate throughout 24-hour periods, and 35% of all respondents operate seven days a week on this basis. All carriers haul multiple commodities. Steel products, general freight and bulk liquids are the most common commodities hauled throughout the city. Almost 70% of respondents who identified themselves as carriers haul steel & steel products; 54% haul general freight and 46% haul bulk liquids.

Among the primary origins stated by carriers are: Hamilton, Windsor, GTA, Western Canada, United States, and intermodal terminals. Among the primary destinations stated by carriers are: Southern Ontario, GTA, Montreal, Canada and United States. There is a strong tendency among companies to focus on trade relationships in Hamilton or within a radius of 500 km. In terms of traffic generation, the transportation demand accounted for in the survey is slightly less than 10% of total inbound and outbound highway trips and marine voyages (rail figures unavailable).

Some key issues about goods movement in Hamilton have been identified. For trucking, the key challenges cited are traffic congestion, difficulties in getting to highways and in coordinating with the marine port. Other challenges include poor signage, lack of human resources and a lack of intermodalism. From the rail perspective, challenges are finding capital investment for equipment supply and finding sufficient real estate to accommodate major developments.

On-Time/Just-in-time Delivery is the most important service attribute noted by respondents, ranked first by 50% of respondents and among the top three by 63% of respondents. Cost is the only other attribute receiving frequent mention with 40% of respondents placing it among the top three factors. Clearly, levels of congestion and intermodality can affect these attributes. Stakeholders identified varying weak spots in the transportation network including:

- congestion in downtown corridors
- a need for more highways and/or better links to existing highways
- lack of road maintenance
- lack of commercial routes or dedicated truck routes
- congested terminals and refineries delaying truck shipping
- business risks due to Burlington Skyway bridge closings
- increasing harbour commission fees which are detrimental to bringing cargo to the city
- lack of a container port in Hamilton.
- Several suggestions were noted for how the City, Province and/or Federal Government could improve freight transportation in Hamilton. These were as follows:
- to join forces across levels of government to reduce congestion all across the city
- to create corridors allowing for straight flow of trucks, especially heavy trucks
- to design roads so that truck related activities such as loading and unloading could be performed more easily
- to introduce overweight permits to reduce number of trucks on the roads
- to create intermodal facilities where marine and rail have a stronger participation in freight transportation
- to introduce traffic light management in industrial areas with rail crossing to ensure safety
- to introduce tax refunds and reduce property tax for rail companies.

The study noted that a key component of future plans should include promoting investment in intermodal facilities in the port area involving marine, rail and truck; and the airport for air cargo and truck transportation. Land use policies are closely tied to this theme. Also recommended was the need for communication and coordination of plans and policies between industry and government, and for government between functions and jurisdictions. Jurisdictional differences, particularly involving policy differences with other levels of government, weaken the attractiveness of Hamilton. The GRIDS process and development of clusters were noted as positive steps, but there remains the requirement to get all of the policies, including environmental, social and economic aspects, aligned to encourage economic development in the logistical clusters. For example, expansion of employment lands can conflict with provincial greenbelt policies (IBI, 2005).

3.7 The Environment

The City of Hamilton's Transportation Master Plan (2005) provides an extensive array of policy objectives with regard to transportation and environmental sustainability. The report observes that at the community level, transportation influences urban form, structure, and health. At the neighbourhood level, transportation influences aesthetics, accessibility, mobility, safety, and quality of life.

The report provides numerous policy recommendations with regard to sustainable transportation including:

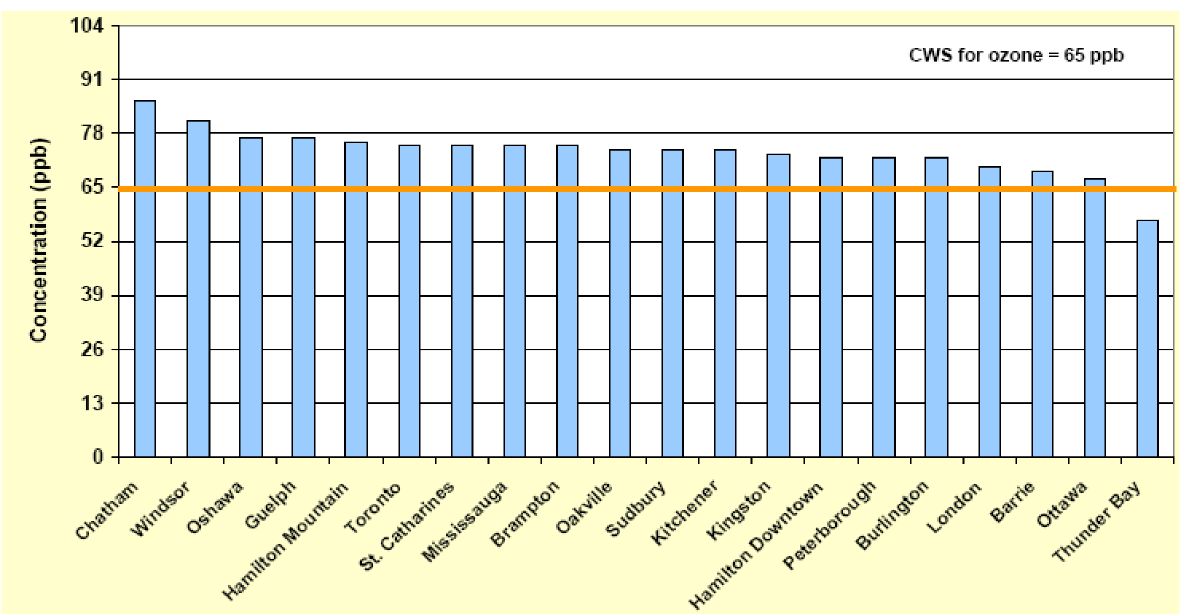
- Commit to targets for reducing auto use as outlined in the Transportation Targets Policy Paper
- Establish a GHG monitoring program to identify the amount and source of GHG emissions from transportation in Hamilton
- Maintain the commitment to reducing greenhouse gas emissions as set out in Vision 2020
- Increase public awareness of the relationship between individual travel decisions and the ability of the city and the country to reduce energy use
- Proactively work with the federal government, in cooperation with other municipalities, to find ways that Hamilton can most effectively reduce energy consumption from transportation
- Work with Clean Air Hamilton, Green Venture, the Southern Ontario Clean Airshed Network Initiative, Environment Hamilton, and other groups to develop and promote initiatives that reduce fossil fuel consumption
- Plan urban development so that travel by car is an option, not a necessity
- Incrementally expand the transit system with the intent of establishing a network of high capacity transit corridors connecting major activity nodes throughout the city
- Investigate ways to improve the efficiency of routed vehicles (transit, garbage, etc.)
- Train vehicle operators in low-emission driving techniques and institute a No-Idling rule for the municipal fleet
- Investigate opportunities to downsize municipal fleets
- Purchase new conventional-fuel vehicles and eliminate older, less efficient vehicles
- Explore the use of alternative fuels and hybrid vehicles in all municipal fleets

- Provide incentives for employees to commute to work via less polluting modes, such as walking, biking, transit, or carpooling
- Expand opportunities for people to walk or bicycle with paths, trails and bike lanes
- Encourage telecommuting.

3.7.1 Air Quality

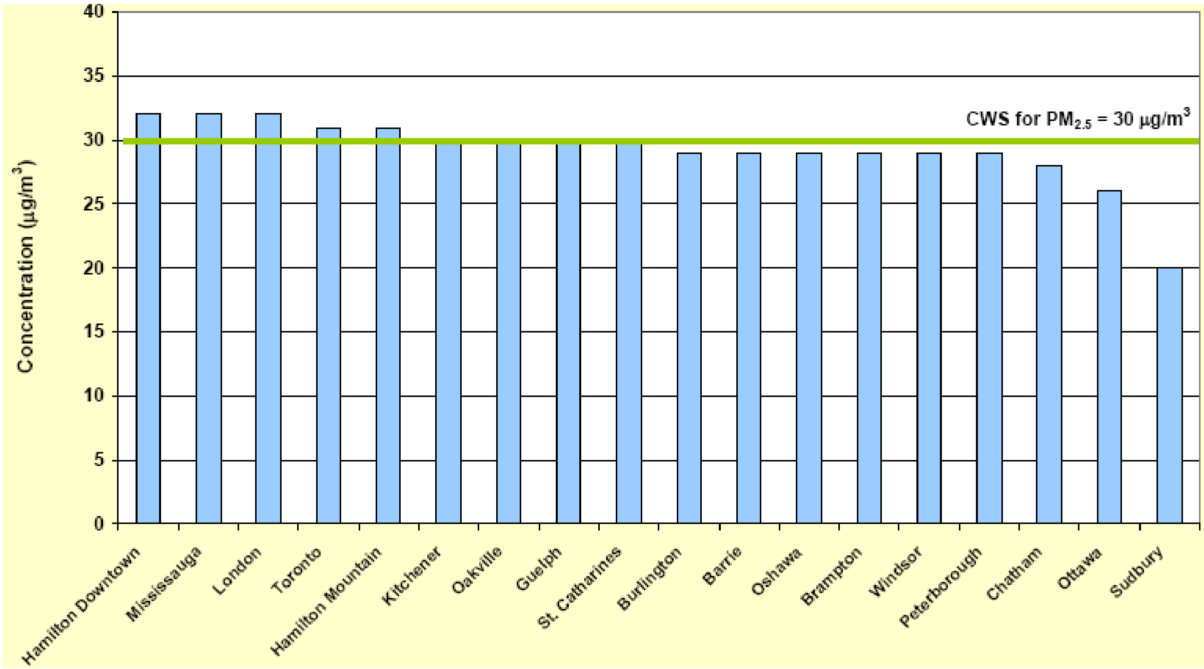
While air quality in Hamilton has improved substantially over the years, the levels of air pollution remain generally higher than other communities in southern Ontario. There have been significant reductions in the air levels of some pollutants such as benzene, total reduced sulphur, and benzo[a]pyrene. Other pollutants, such as PM_{10}, $PM_{2.5}$ and SO_2 have changed very little. Many of these reductions have resulted from actions taken to reduce emissions from the industrial sector and, to a lesser extent, the transportation sector (Clean Air Hamilton, 2007). For the purposes of atmospheric testing, Hamilton is divided into two areas, the "downtown" area and the "mountain". In comparing the 20 largest urban areas in the province with regard to ozone (O_3), Hamilton's downtown performs better than 13 of these cities, with the mountain outperforming four of them (Exhibit 3.4). For 2.5μg particulate matter ($PM_{2.5}$), there is a different trend where the downtown ranks poorest among all Ontario municipalities, with the mountain ranked 5th poorest (see Exhibit 3.5). For nitrogen dioxide (NO_2), all four regions of Toronto show the poorest performance, followed by Windsor, then Hamilton Downtown, with the mountain ranked 14th poorest (see Exhibit 3.6). For sulphur dioxide (SO_2), Sarnia and Windsor perform the poorest, followed by Hamilton downtown and the mountain (see Exhibit 3.7).

Exhibit 3.4: Ozone levels at Designated CWS Sites Across Ontario



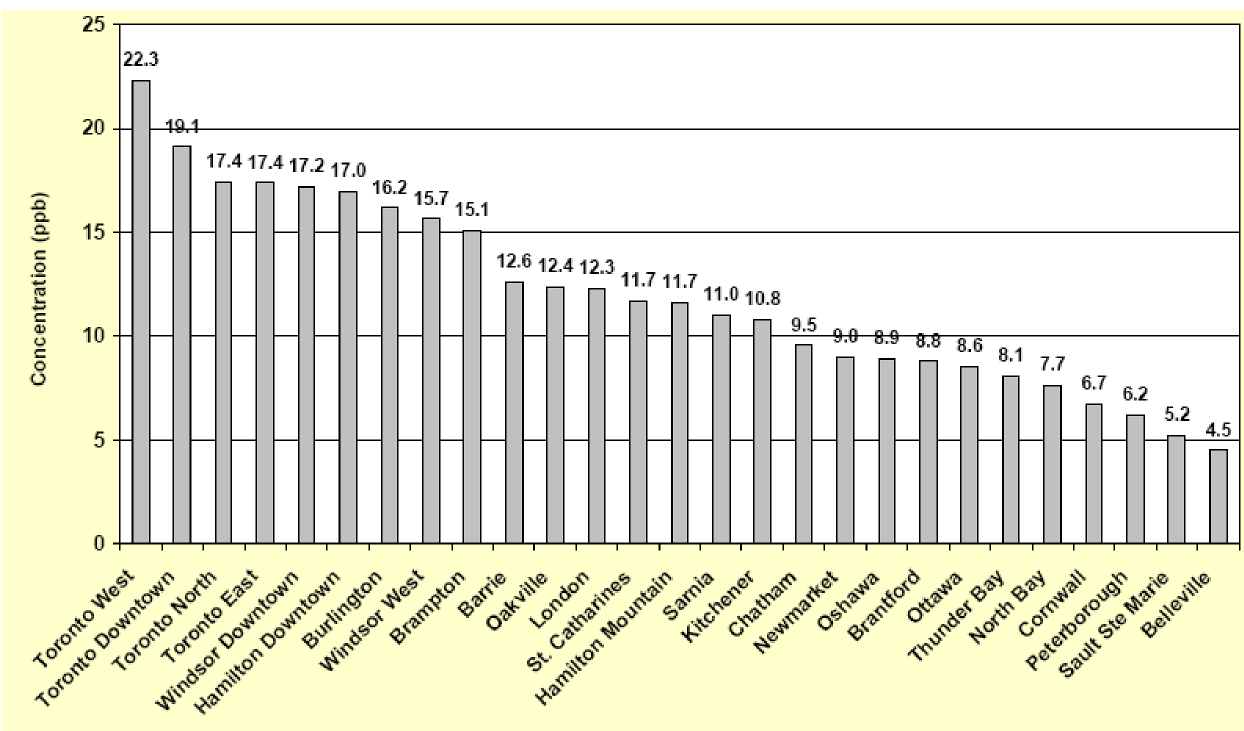
Based on the CWS for Ozone (2004 - 2006) Source Ontario Ministry of the Environment, 2007

Exhibit 3.5: PM2.5 Levels at Designated CWS Sites Across Ontario



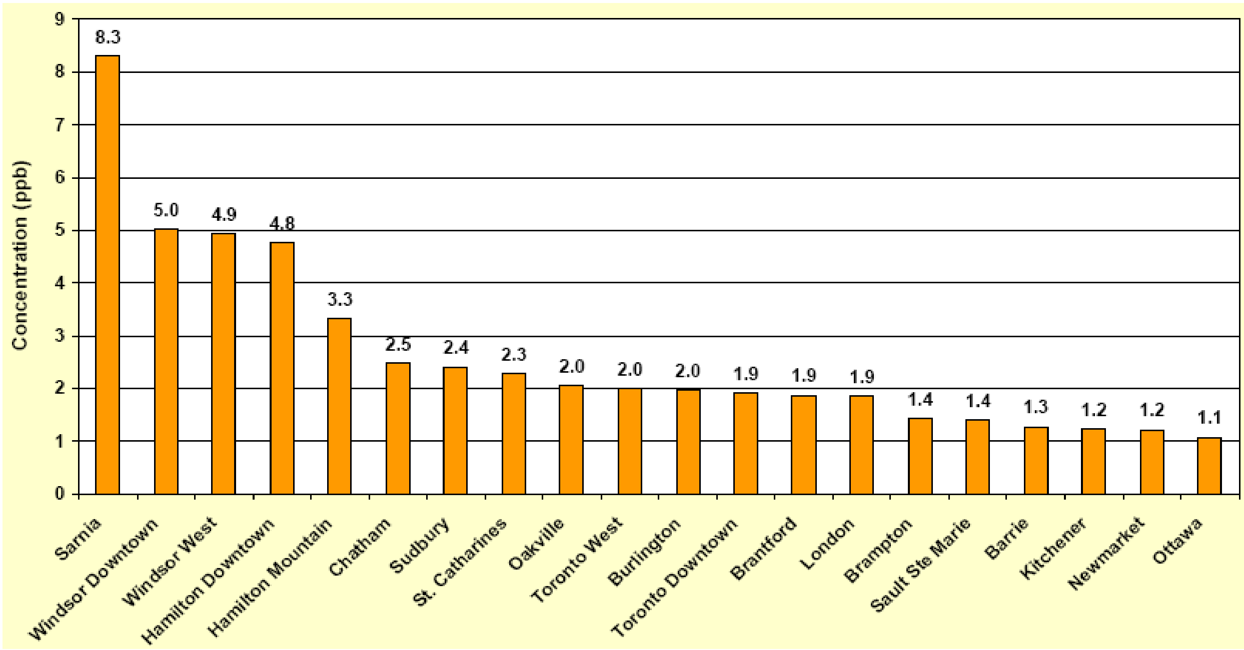
Based on the CWS for PM2.5 (2004 - 2006) Source Ontario Ministry of the Environment, 2007

Exhibit 3.6: Nitrogen Dioxide Annual Means Across Ontario (2006)



Source Ontario Ministry of the Environment, 2007

Exhibit 3.7: Sulphur Dioxide Annual Means Across Ontario (2006)



Source Ontario Ministry of the Environment, 2007

3.7.2 Water Quality

While the health of the Great Lakes has improved over recent decades, there are symptoms of stress. The growing population in the Great Lakes basin increases demand for water while urban development is radically altering natural habitats. Lake Ontario is not immune from these pressures. Invasive species such as the zebra mussel continue to arrive and cause changes to the ecosystem. Climate change is impacting water levels as well. The province is working to restore and protect the Great Lakes through the efforts of several ministries. These efforts relate to provincial policy and legislation, cooperation and agreements with the government of Canada and U.S. States, and close working relationships with groups and organizations throughout the Great Lakes Basin. Numerous bills have passed through parliament in the past decade to assist in the clean-up process including the Clean Water Act (2006), The Safeguarding and Sustaining Ontario's Water Act (2007), The Nutrient Management Act (2002) and the 2007 Canada-Ontario Agreement.

The City of Hamilton's Water and Wastewater Division has developed a strategic business plan (2008-2010). It includes strategy analysis, formulation, implementation and monitoring plans that the Water and Wastewater Management Team (WWWMT) have developed. These plans have developed through consultation with various staff and stakeholders to ensure that the mandate "to protect public health, property and the environment" (Hamilton Public Works, 2008) is fulfilled. Key challenges cited in the plan include the de-listing of Hamilton Harbour as an "Area of Concern", addressing the aging infrastructure and infrastructure deficit and establishing a Management System that addresses water quality, environmental impacts and health and safety issues.

3.7.3 Climate Change

Climate change is expected to have a negative effect on the efficiency of some freight operations due to reduced payloads. Shipping in the Great Lakes–St. Lawrence Seaway system presents specific vulnerabilities. Virtually all scenarios of future climate change project reduced Great Lakes water levels and connecting channel flows, mainly because of increased evaporation from higher temperatures (Mortsch et al, 2000, National Assessment Synthesis Team, 2001). Several studies on the implications of reduced water levels for shipping activities in the Great Lakes have reached a similar conclusion: that shipping costs are likely to increase as more trips are needed to transport the same amount of cargo (Millerd, 1996, Lindeberg and Albercook, 2000). Indeed, in recent years, lake vessels have frequently been forced into 'light loading' because of lower water levels. For example, in 2001, cargo volumes on the St. Lawrence Seaway were down markedly when compared to the previous five years, due in part to low water levels.

However, the effects of climate change on the waterway are not exclusively negative. In both 2006 and 2007 the Welland Canal, an important link between lakes Erie and Ontario, experienced record early opening dates. While the prospect of an extended ice-free navigation season is generally beneficial for Great Lakes shipping, it is unlikely to offset the losses associated with lower water levels (St Lawrence Seaway Management Corporation, 2001). Lower water levels in the Great Lakes system and the resultant 'light-loading' of cargo volumes have direct impacts on surface transportation. It is logical that those goods no longer transported by ship will be transported either by road or rail, and will generate increased volumes across these modes. Yet these modes are not immune from the impacts of climate change, and in the case of roads, contribute significantly to environmental pollutants.

Mills et al. (1999) remark how it is well recognized that individual storms can account for a large percentage of total seasonal costs that local and national economies incur. A succession of storms, in which the impacts are cumulative, can also result in substantial cumulative costs. The series of winter storms which affected Southern Ontario during January 1999 generated repeated snowfalls which exceeded the capacity of existing systems to maintain reliable air, road, rail and subway transportation services. Estimated economic losses, based on information from several government agencies and businesses, were in excess of $85m. Organizations that coped well during the event cited the benefits of previous experience in dealing with emergency situations and the ability to implement contingencies that reduced their reliance on transportation. Transportation authorities have generally responded to the event by redesigning their systems to withstand a higher threshold of winter hazard.

Changes in temperature are also likely to impact our surface transportation networks over time, and thus freight movements. There is strong evidence that not only maximum, but minimum temperatures have been warming in most of Canada over the past 50 years (Zhang et al., 2000), and these changes are expected to continue into the foreseeable future. Cracking of pavements due to low-temperature frost action and freeze-thaw cycles is a well-established problem in Southern Canada. The Royal Commission on National Passenger Transportation estimates that environmental conditions contribute up to 50 percent of pavement deterioration on high-volume roads and 80 percent on lower volume roads (Nix et al., 1992). An increase in the frequency and severity of hot days has implications with regard to Canada's pavement performance as well. Andrey, Mills et al. (1999) note that this could manifest itself in pavement softening, traffic-related rutting and migration of liquid asphalt to pavement surfaces from older or poorly constructed pavements. It is also conceived that due to climate change, Southern Canada will experience decreased frequencies of freeze-thaw cycles, while the converse is true for the North (Andrey et. al., 1999; Bellisario et al., 2001). Temperature has well documented effects on both road and rail performance, and greater variance in temperatures will have pronounced impacts on these modes in the future.

For Southern Canadian regions, the impetus on climate change is more pronounced in relation to precipitation. The impacts of climate change on future precipitation patterns are much less certain than those on temperature, due in part to the highly variable nature of precipitation and limited ability of current climate models to resolve certain atmospheric processes. The prevailing view is that annual precipitation is likely to increase over much of Canada, with an increase in the proportion of precipitation falling as rain rather than snow in southern regions. In the past, there have been many examples of damage to transportation infrastructure due to rainfall-induced landslides and floods (see Evans, 2002 and Andrey and Mills, 2003).

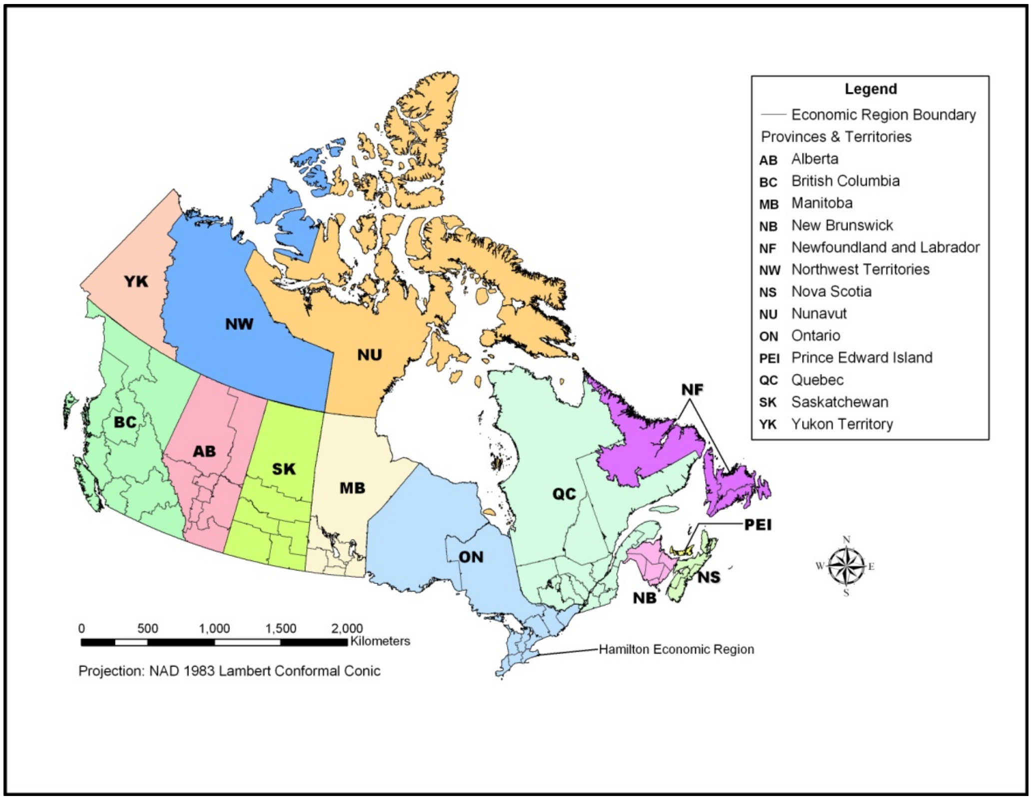
4

Modelling and Analysis

A crucial component of proper planning is the modelling and analysis of potential plans. This allows for the introduction of scientific rigour into the planning process, and can often bring to light previously unseen considerations. In this chapter, the results of several different modelling exercises are presented. The goal of this modelling is to explore different scenarios which might result from Hamilton gateway development, and to inform a vision of the gateway, which is presented in Chapter 5.

The modelling presented here can be broadly broken down into two parts: regional level modelling (Section 4.1), and local level modelling (Section 4.2). In both cases, a common set of scenarios reflecting various levels of gateway development are analyzed. For the regional level modelling, the macro-effects of these scenarios are explored, such as regional level GDP, and emissions resulting from inter-regional trade flows. Two distinct regional models are used to answer the regional modelling questions. For the local level modelling, patterns of land-use, traffic congestion, and the resulting emissions are explored, within the Hamilton Census Metropolitan Area (CMA), using IMULATE, an integrated urban model (see Anderson et al., 2004; Buliung et al. 2005; Behan et al. 2008; Kang et al. 2009).

Exhibit 4.1: Canadian Economic Regions



4.1 Definition of Modelling Regions

The first step in developing any sort of analysis involving multiple regions is to explicitly define what the regions are. To assist in this regard, three maps present the regional contexts used in this analysis. The first map, shown in Exhibit 4.1 above, demonstrates how Statistics Canada has broken Canada into 76 economic regions. Examples of actual economic regions from this set of 76 are the Hamilton-Niagara Economic Region (which we will shorten to Hamilton below) and the Toronto Economic Region. One of the regional models developed is based on an aggregation of the 76 economic regions to 15 regions. Essentially the 15 regions are made up of the provinces and the territories with the exception of Ontario (Exhibit 4.2), which is split into three regions: Hamilton Economic, Toronto Economic and the Rest of Ontario. The rest of Ontario contains several economic regions in its own right but for this analysis, we are treating it as one. The motivation for this aggregation to 15 is to facilitate easy reporting and to minimize extra detail that is not core to the research problem.

Exhibit 4.2: Simplified Ontario Economic Regions

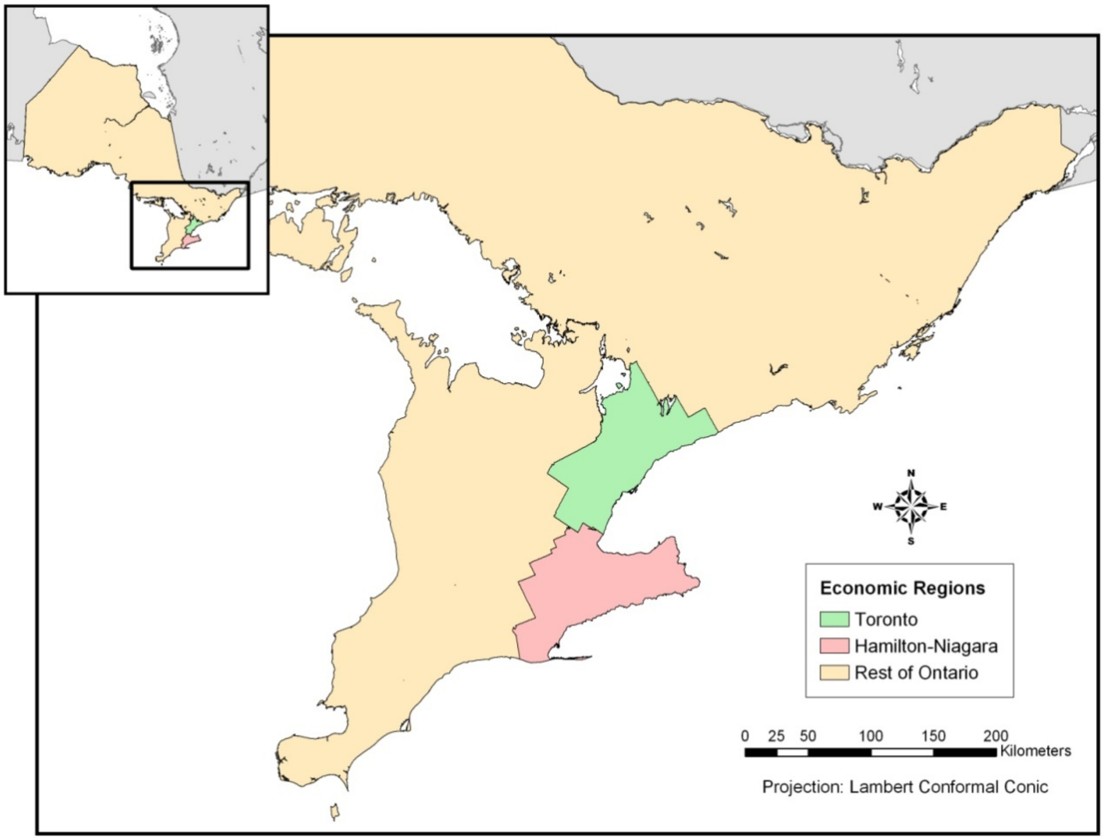
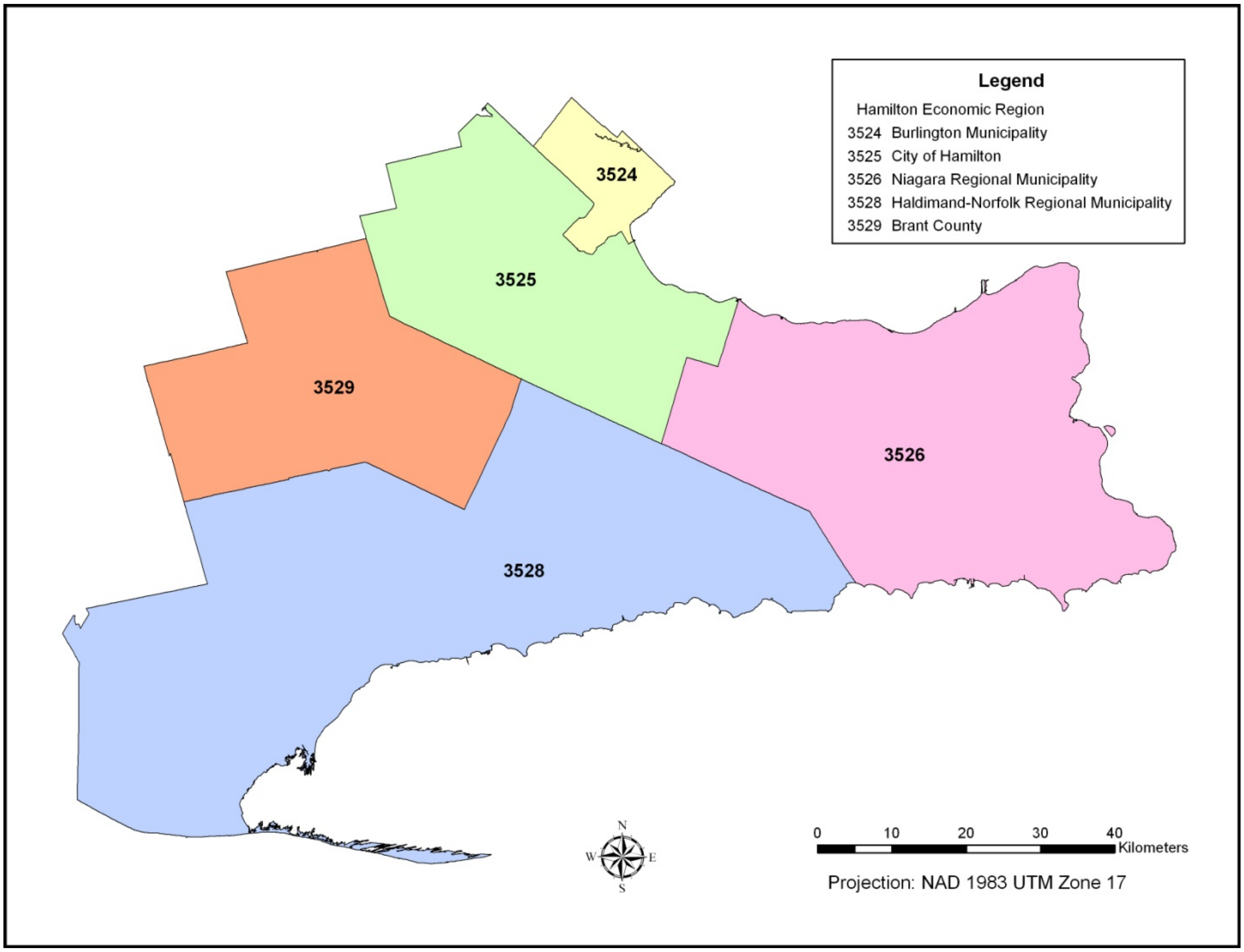


Exhibit 4.3: Components of the Hamilton Economic Region



Finally, the third map shown in Exhibit 4.3 shows the building blocks of the Hamilton Economic Region. These blocks consist of five major geographic jurisdictions that include the: Burlington Municipality, City of Hamilton, Niagara Regional Municipality, Haldimand-Norfolk regional municipality and Brant County. At the outset, it is very important to emphasize that the Hamilton Economic region, the city of Hamilton and the Hamilton CMA are used in differing contexts in the upcoming analysis. It is critical to keep these contexts in mind. They are as follows:

- The Hamilton Economic Region (HAM-ER) is the main local unit of analysis for the Regional Level Modelling. No spatial unit smaller than economic regions is used in the regional level analysis.
- The model used for the local level analysis, IMULATE, was developed at the level of the Hamilton CMA. The CMA includes Burlington, Hamilton and Grimsby and accounts for approximately ½ of the economic activity in the Hamilton Economic Region.
- In creating gateway scenarios, new additions to employment are restricted to the City of Hamilton. No direct gateway jobs are added in Burlington, for example.

To provide more clarity on local geographies used in this analysis, consider Exhibit 4.4 which shows the 2001 populations and distribution of firms for the relevant local geographies.

Exhibit 4.4: Size Measures of Key Local Geographies

Geography	Firms*	Population**
City of Hamilton	11,913 (33%)	490,105 (39%)
Hamilton CMA	17,338 (48%)	662,401 (53%)
Hamilton Economic Region	36,035 (100%)	1,241,050 (100%)

*Source: 2001 Canadian Business Pattern database (Statistics Canada, 2001)

**2001 Canadian Population Census (Statistics Canada, 2001)

4.2 Assumptions Underlying Scenarios

This modelling chapter of the report is based on a common set of scenarios. Three distinct models are used to analyze these scenarios: two relating to the regional analysis and one relating to the local analysis. There are subtle differences in the application of these scenarios depending on the model. These differences are clarified here.

In order to do the "before" versus "after" types of scenarios that are of interest in this research, it is necessary to define a "base case" which will serve as the "before" for each of the time periods. Initially, a base case scenario was created to reflect a "business as usual" situation for all of Canada's economic regions. Employment estimates relating to each region (including the Hamilton economic region) were created, for each industrial sector, for the years 2011, 2021, and 2031. Employment forecasts were based on the growth observed (for the given sector and region) between the years 2001 and 2006. However, the growth applied is not constant across the different economic regions since, for example, this was a period of faster growth in Alberta than in the Hamilton Economic Region. This trend, among others, is reflected in the projected bases cases.

A fairly slow employment growth forecast is assumed for Canadian industry sectors, up until the year 2031. The growth rate from 2011-2021 reflects economic recovery in that period and is thus the fasted growing time segment until 2031. This pattern, with local adjustment, is applied to Hamilton CMA employment (Exhibit 4.5: Assumed Rates of Employment Growth in Hamilton CMA (Base Case). Starting at a total of 280,000 jobs in 2006, the CMA will experience an overall growth of approximately 40,000 new jobs by 2031. This increase reflects natural growth that is independent of gateway development. Based on recent local evidence, these jobs will be associated with a population increase of 80,000 and a dwelling increase of 42,000.

Exhibit 4.5: Assumed Rates of Employment Growth in Hamilton CMA (Base Case)

2006-2011	2011-2016	2016-2021	2021-2026	2026-2031
2.61%	3.33%	3.33%	2.16%	2.16%

In the analysis, six gateway scenarios are created to reflect increasing levels of employment in Hamilton beyond the increases described above. Certain levels of sectoral employment directly attributable to the gateway are assumed. This direct growth is accompanied by 70% additional growth (Southern Ontario Gateway Council, 2006) across a wide variety of industrial sectors, representing indirect and induced employment driven by the gateway employment. Exhibit 4.6 provides a breakdown of the direct, as well as indirect/induced employment growth by scenario. Note that this growth is distributed such that 44% is added to the employment pool by 2021, and the remaining 56% is added by 2031.

Exhibit 4.6: Employment Growth in the Gateway Scenario

Scenario Name	Direct Gateway Employment	Indirect/Induced Employment
10K	10,000	7,000
15K	15,000	10,500
20K	20,000	14,000
25K	25,000	17,500
30K	30,000	21,000
35K	35,000	24,500

The scenario distribution of new employment in the gateway scenarios, amongst the industry sectors, is formulated to mimic the growth that would likely occur. What differentiates the gateway scenarios from one another is the total number of new jobs. Meanwhile, their distribution among industry sectors remains constant. Exhibit 4.7 shows the proportion of new jobs received by each sector, under the gateway scenarios.

Exhibit 4.7: Distribution of Gateway Employment to Industry Sectors

Industry Sector	Direct Gateway Employment	Indirect/Induced Employment
Manufacturing	16.40%	15%
Construction	1.25%	15%
Wholesale	13.95%	10%
Retail	4.70%	20%
Services	21.80%	40%
Transportation	39.90%	0%
Government	1.50%	0%
Education	0.50%	0%
Communications	0%	0%

4.3 Regional Level Modelling

4.3.1 Overview

The regional level modelling presented here is concerned with assessing the economic conditions and trade relations between Hamilton and the rest of Canada as the gateway develops. This development is expected to create new job opportunities, increase trade between Hamilton and the rest of Canada, and increase economic and transportation activities in and around Hamilton. Using the best publicly available data on trade and sectoral employment, this regional level analysis aims to provide insights into several important questions: how much business will the gateway project produce for Hamilton, the

Province of Ontario and the rest of Canada over the next 20 years?; what kind of environmental impacts are expected, and are there any benefits achieved by shipping more goods by water?

To address these regional research questions, two regional input-output (I/O) models (MRIO15R) and (C-MRIO) are employed. I/O modelling is an elegant demand driven macro-economic approach that accounts for economic linkages as well as trade relationships. I/O models are widely used to understand economies and the impacts associated with changes such as the development of a gateway. The model is a robust economic analysis tool which can be used to identify the total Gross Domestic Product (GDP) of regions under various trading and final demand regimes. Data for both I/O models is based on the 2001 input-output national economic accounts, produced and maintained by Statistics Canada. Both I/O models are commodity-based and account for the trading and final demand of 43 commodities, as shown in Exhibit 8.1 (Appendix).

It is useful to understand the rationale for using two different I/O models. Essentially, MRIO15R is being used purely to assess economic impacts while C-MRIO is being used to address environmental impacts of changes in the Hamilton gateway. While both are multi-regional I/O models, C-MRIO has some specific components that permit a very wide range of scenarios. Through C-MRIO, it is possible to evaluate modal substitution, for example, and to see the impacts. MRIO15R, on the other hand, is more of a "vanilla" MRIO model. Being the simpler of the two, the view is that MRIO15R is better suited to provide the basic economic results required while C-MRIO can address the more complex environmental impacts.

4.3.2 Estimating Increased Final Demand

Direct and Indirect/induced employment growth results in increased final demand for certain commodities. This additional demand generates increased economic activity in the region. As such, a method was devised to link changes in final demand to changes in employment by sector and scenario. In brief, final demand in an input-output framework is a composite of four components:

- Demand by households for personal consumption;
- Demand by business for local investment;
- Demand by government for goods and services;
- Demand resulting from net exports.

The base case final demand was broken into the above basic components, and each of these was updated in accordance with gateway changes in employment for each given sector. Exhibit 4.8 shows the total final demand per scenario. This table reflects the totals after aggregation across all the commodities. So for example, a 35,000 increase in direct gateway employment, along with indirect/induced growth is linked to a final demand increase of about $4.4 billion in the Hamilton Economic Region in 2031 relative to the base final demand for that year.

Exhibit 4.8: Estimated Total Final Demand in the Hamilton Economic Region (2031)

Scenario	2031
BASE	32,178.966
10K	33,441.765
Change from base	1,262.799
Percent change	3.92
15K	34,073.165
Change from base	1,894.199
Percent change	5.89
20K	34,704.565
Change from base	2,525.599
Percent change	7.85
25K	35,335.965
Change from base	3,156.999
Percent change	9.81
30K	35,967.364
Change from base	3,788.398
Percent change	11.77
35K	36,598.764
Change from base	4,419.798
Percent change	13.74

Given this estimated final demand increase for the Hamilton Economic Region, the necessary ingredients are in place to actually utilize the I/O model to trace economic impacts. Exhibit 8.2 (in Appendix) shows the breakdown of 2031 final demand into its constituent commodities.

4.3.3 Economic Impacts of the Gateway

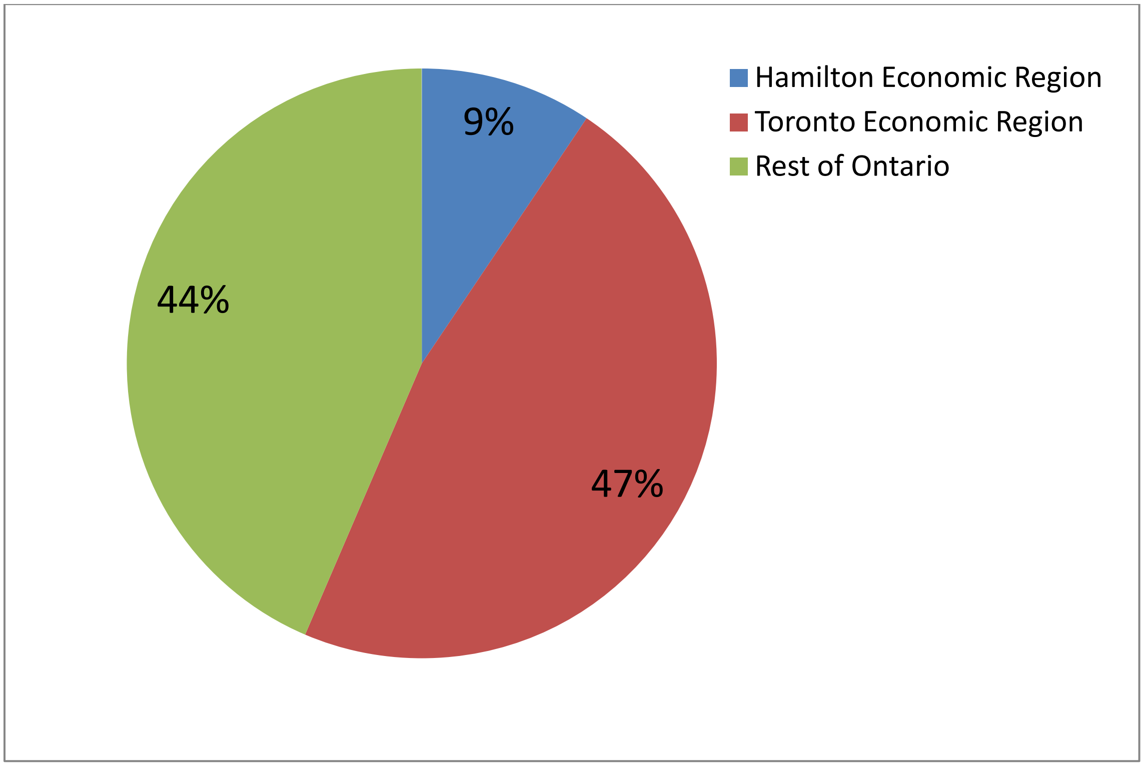
The MRIO15R model (see Miller and Blair (1985, page. 74 - 75)) is run for both the base case and gateway scenarios using the derived final demand figures discussed above for Hamilton as well as base figures for the other 14 regions. For the base case, Exhibit 4.9 lists the estimated GDP for the 15 regions for the years 2011, 2021 and 2031. Note that the Hamilton Economic Region accounts for 4% of total Canadian GDP and 9% of Ontario GDP (Exhibit 4.10). When compared to the GDP of other provinces, the estimates indicate that the Hamilton Economic Region is an important one, ranking as the sixth largest in terms of GDP and larger than several provinces.

Exhibit 4.9: Estimated GDP (in millions of dollars), BASE CASE SCENARIO

	2011		2021		2031	
	GDP	Percent	GDP	Percent	GDP	Percent
Newfoundland and Labrador	5,541.006	0	5,156.216	0	4,801.929	0
Prince Edward Island	3,463.922	0	3,493.211	0	3,487.594	0
Nova Scotia	33,075.728	2	34,058.886	2	34,606.094	2
New Brunswick	29,714.549	2	30,957.001	2	31,673.400	2
Quebec	358,347.290	20	372,589.240	20	380,739.810	20
Hamilton Economic Region	70,039.831	4	71,762.888	4	72,478.248	4
Toronto Economic Region	350,503.680	20	364,311.120	20	372,570.850	19
Rest of Ontario	324,117.700	19	334,819.600	18	340,568.470	18
Manitoba	50,262.538	3	52,103.450	3	53,240.084	3
Saskatchewan	39,924.119	2	41,365.638	2	42,053.790	2
Alberta	282,620.210	16	328,033.880	18	361,266.900	19
British Columbia	197,498.110	11	212,404.190	11	223,090.100	12
Nunavut	719.799	0	754.383	0	769.471	0
Northwest Territories	3,488.204	0	3,840.075	0	4,094.516	0
Yukon Territory	1,382.892	0	1,555.322	0	1,673.283	0
Total GDP	**1,750,699.578**	100	**1,857,205.099**	100	**1,927,114.539**	100

For the sake of brevity, results from the 15K, 25K and 35K Gateway scenarios will be presented and compared against the BASE case scenario for the years 2021 and 2031. Exhibit 4.11 and Exhibit 4.12 list the growth in the GDP (relative to the base scenario) under the Gateway scenarios for 2021 and 2031. The increased levels of employment in Hamilton as a result of gateway development would translate to a total growth (Canada-wide) of 1.95, 3.25 and 4.56 billion dollars for the 15K, 25K and 35K scenarios in 2021, respectively. These figures are destined to grow to 4.39, 7.32 and 10.24 billion dollars in 2031, respectively. Locally, the growth in the 2021 GDP for Hamilton is estimated to be approximately 0.91, 1.52 and 2.13 billion dollars under the three Gateway Scenarios. With time, GDP growth is estimated to be 2.06, 3.44 and 4.82 billion dollars in the year 2031, for the three scenarios respectively.

Exhibit 4.10: Breakdown of GDP Among the Ontario Regions



Hamilton's share of the total growth is estimated to be 47% of the total GDP growth resulting from the gateway scenarios in 2021 and 2031 (see Exhibit 4.13). This share is constant across the different simulated scenarios since, other things being equal, the assumed increase between scenarios in sectoral employment and final demand is linear. The Toronto Economic Region and rest of Ontario also benefit from gateway development, with shares reaching as high as 16.36% and 15.86% of the total GDP growth, respectively. Ontario is the leading province in terms of GDP growth (80% of total GDP growth) under the gateway scenarios. Quebec follows with a share of 10.29%, leaving just less than 10% of the estimated growth for the remaining provinces and territories.

In Exhibit 8.3, in the Appendix, a sectoral breakdown of the results for 2031. These results show, by sector, the percentage of the output gains that are retained by the Hamilton Economic Region. As can be seen, service-oriented sectors in particular retain most of the increases economic output locally.

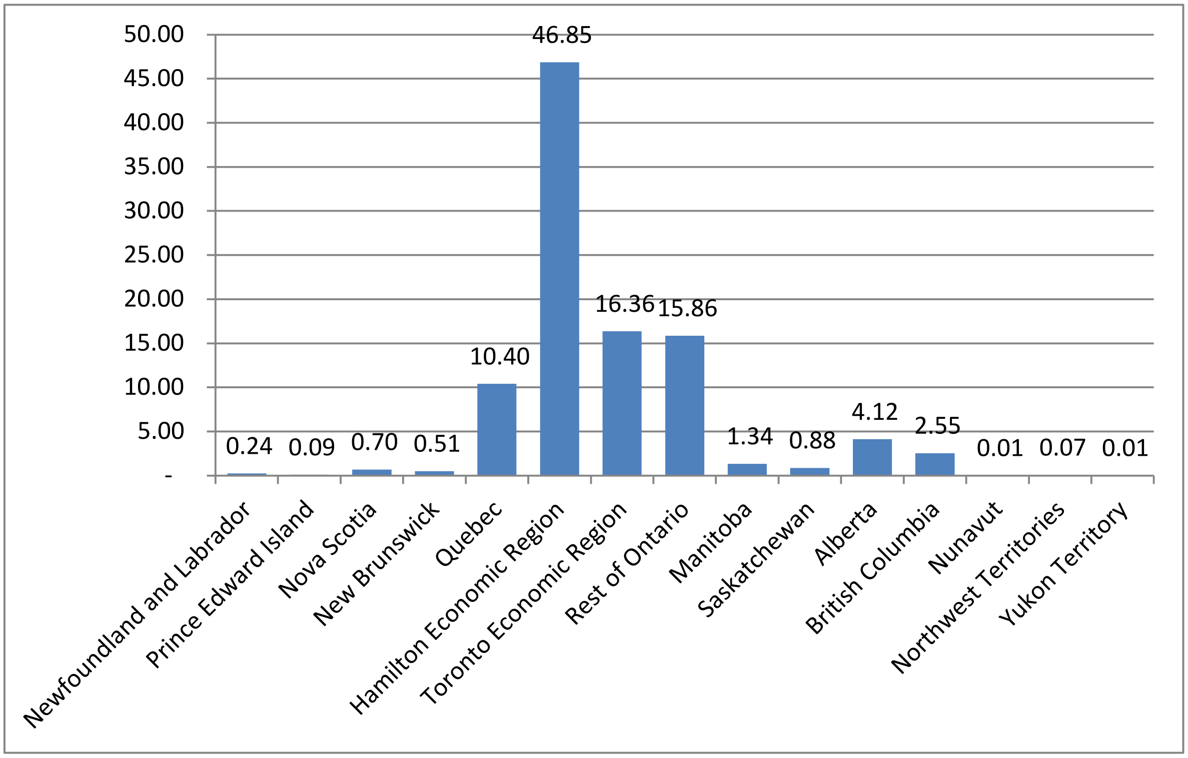
Exhibit 4.11: Estimated GDP Under Gateway Scenarios (2021)

Scenario Region	BASE GDP (2021)	15K Growth from BASE	25K Growth from BASE	35K Growth from BASE
Newfoundland and Labrador	5,156.216	4.763	7.938	11.113
Prince Edward Island	3,493.211	1.808	3.014	4.219
Nova Scotia	34,058.886	13.619	22.699	31.778
New Brunswick	30,957.001	9.902	16.503	23.104
Quebec	372,589.240	202.590	337.640	472.700
Hamilton Economic Region	71,762.888	913.130	1,521.872	2,130.614
Toronto Economic Region	364,311.120	318.910	531.510	744.110
Rest of Ontario	334,819.600	309.170	515.270	721.370
Manitoba	52,103.450	26.169	43.615	61.061
Saskatchewan	41,365.638	17.172	28.620	40.067
Alberta	328,033.880	80.240	133.730	187.220
British Columbia	212,404.190	49.630	82.720	115.810
Nunavut	754.383	0.222	0.370	0.518
Northwest Territories	3,840.075	1.317	2.195	3.073
Yukon Territory	1,555.322	0.240	0.401	0.561
Total GDP	**1,857,205.099**	**1,948.882**	**3,248.096**	**4,547.318**

Exhibit 4.12: Estimated GDP Under Gateway Scenarios (2031)

Scenarios Region	BASE GDP (2031)	15K Growth from BASE	25K Growth from BASE	35K Growth from BASE
Newfoundland and Labrador	4,801.929	10.698	17.829	24.961
Prince Edward Island	3,487.594	4.095	6.826	9.556
Nova Scotia	34,606.094	30.525	50.874	71.224
New Brunswick	31,673.400	22.136	36.894	51.651
Quebec	380,739.810	451.630	752.710	1,053.800
Hamilton Economic Region	72,478.248	2,064.226	3,440.377	4,816.527
Toronto Economic Region	372,570.850	716.680	1,194.470	1,672.260
Rest of Ontario	340,568.470	695.880	1,159.810	1,623.730
Manitoba	53,240.084	58.802	98.003	137.204
Saskatchewan	42,053.790	38.680	64.466	90.252
Alberta	361,266.900	180.650	301.070	421.500
British Columbia	223,090.100	111.840	186.390	260.950
Nunavut	769.471	0.502	0.837	1.172
Northwest Territories	4,094.516	2.967	4.945	6.923
Yukon Territory	1,673.283	0.545	0.908	1.272
Total GDP	**1,927,114.539**	**4,389.856**	**7,316.409**	**10,242.981**

Exhibit 4.13: Percentage Share of Gateway-Induced GDP Growth (2021)



4.3.4 Targeted Sectoral Regional Analysis

In the I/O modelling, the Hamilton Economic Region is treated as a whole. It is not possible to designate employment to sub-areas of the region such as the Hamilton CMA. One alternative though, is to assume that different types of gateway growth would have different types of sectoral implications. Alternative growth scenarios could focus on high growth at the seaport and low growth at the airport (scenario *35K_Seaport*) or vice versa (scenario *35K_Airport).* Different sectoral employment growth rates are assumed per industry as shown in Exhibit 4.14. These growth rates reflect gateway development under a balanced growth scenario (i.e. 35K), a seaport growth scenario (35K_Seaport) and an airport growth scenario (35K_Airport). The balanced growth scenario is the one from prior sections.

For instance, manufacturing employment growth might be higher under the seaport scenario when compared to the airport scenario since the development of the seaport is likely to attract a higher percentage of manufacturing employment to Hamilton. On the other hand, the growth rate in services might be higher under the airport scenario since the development of the airport will attract a higher percentage of high-tech, service based industries to the region. This logic is implemented in Exhibit 4.14. Notice that the growth rates for the balanced scenario (35K) are always situated between the corresponding seaport and airport rates. All three scenarios are associated with the same number of incremental jobs.

Exhibit 4.14: Hamilton- Potential Sectoral Employment Growth Rates

		Employment* 2031	Percent growth from BASE		
	Scenario	***BASE***	***35K***	***35K_Seaport***	***35K_Airport***
	Manufacturing	61.210	15	19	11
S	Construction	43.228	8	6	11
E	Wholesale trade	35.217	21	35	5
C	Retail trade	68.679	8	8	10
T	Services	356.239	5	2	8
O	Transportation	55.874	28	34	22
R	Government sector	27.500	2	2	1
	Educational services	51.811	0.39	0.14	1

* Note: Employment figures are in thousands

The results listed in Exhibit 4.15 indicate that the assumed employment growth rates are generating different levels of final demand. Compared to the 35K scenario, the results indicate that final demand under the seaport growth scenario will increase by a total of 205 million dollars, whereas it will decrease by 254 million dollars under the airport scenario. Exhibit 4.16 lists the commodities that are primarily affected by the assumed employment growth under the two scenarios.

The seaport scenario generates the highest overall GDP for both Canada and Hamilton, whereas the airport scenario generates the least. Keep in mind that these results are very dependent on the original sectoral employment assumptions. Hamilton's share of total GDP is 46.58% under the seaport scenario, 47.63% under the airport scenario, and 47.02% under the balanced (35K) scenario. Overall, the province of Ontario is retaining the lion's share of generated GDP under all three scenarios, indicating that the gateway project will benefit the Hamilton, Ontario and Canadian economies, with an overall GDP growth ranging from 9.66 to 10.71 billion dollars in the year 2031.

Exhibit 4.15: Estimated Final Demand and GDP($M) for Targeted Growth Analysis

Scenarios	*BASE*	*35K*		*35K_Seaport*		*35K_Airport*	
Region	**GDP(2031)**	**Growth from Base**	**%**	**Growth from Base**	**%**	**Growth from Base**	**%**
Newfoundland and Labrador	4,801.93	24.96	0.24	26.05	0.24	23.61	0.24
Prince Edward Island	3,487.59	9.56	0.09	9.91	0.09	9.12	0.09
Nova Scotia	34,606.09	71.22	0.70	74.63	0.70	67.00	0.69
New Brunswick	31,673.40	51.65	0.50	54.23	0.51	48.45	0.50
Quebec	380,739.81	1,053.80	10.29	1,117.01	10.43	975.35	10.10
Hamilton Economic Region	72,478.25	4,816.53	47.02	4,990.20	46.58	4,601.68	47.63
Toronto Economic Region	372,570.85	1,672.26	16.33	1,768.38	16.51	1,553.24	16.08
Rest of Ontario	340,568.47	1,623.73	15.85	1,701.83	15.89	1,526.84	15.80
Manitoba	53,240.08	137.20	1.34	145.54	1.36	126.85	1.31
Saskatchewan	42,053.79	90.25	0.88	95.02	0.89	84.33	0.87
Alberta	361,266.90	421.50	4.12	444.15	4.15	393.39	4.07
British Columbia	223,090.10	260.95	2.55	275.57	2.57	242.80	2.51
Nunavut	769.471	1.17	0.01	1.22	0.01	1.11	0.01
Northwest Territories	4,094.52	6.92	0.07	7.26	0.07	6.50	0.07
Yukon Territory	1,673.28	1.27	0.01	1.32	0.01	1.21	0.01
Total GDP	**1,927,114.54**	**10,242.98**	**100.00**	**10,712.33**	**100.00**	**9,661.48**	**100.00**
Estimated final demand (Hamilton)		**36,598.764**		**36,804.334**		**36,344.134**	

Exhibit 4.16: Differences in Final Demand ($million) from 35K Scenario

Commodity	***35K_Seaport***	***35K_Airport***
Furniture and fixtures	10	-12
Other metal products	10	-13
Machinery and equipment	20	-25
Motor vehicles, other transport equipment and parts	45	-56
Electrical, electronic and communications products	4	-5
Chemicals, pharmaceuticals and chemical products	-1	1
Other manufactured products	1	-2
Wholesaling margins	108	-134
Retailing margins	46	-58
Other finance, insurance and real estate services	-17	22
Business and computer services	-30	39
Transportation margins	9	-12
Total	205	-254

4.3.5 Environmental Impacts of Inter-Regional Goods Movement Serving the Gateway

Transportation is an important sector that contributes to economic prosperity, but can have negative effects on the environment if improperly planned. In order to introduce transportation and the environment into the regional analysis, a transportation-based trade flow model (C-MRIO) is utilized. This model determines the volume of trade taking place between Canada's 76 economic regions (including HAM-ER). In contrast, MRIO15R from the previous regional sections, does not attempt to predict the volume of trade between regions but rather takes the trade quantities as a given.

Within this model, each economic region has a certain demand for commodities to be consumed locally (note that there are 43 commodities in total, as in the MRIO15R model). Such demand can be met locally or from other regions through trade relationships. For two given regions i and j, the volume of a particular commodity flowing from region i to j is based on the level of consumption in region j and the propensity to trade from i to j. Several key factors determine the propensity to trade, including the price of the commodity at i, the market size of i (i.e. where the commodity is produced), and the cost of transporting the commodity from i to j. Transportation cost is dependent on the modes that can be used to ship the traded goods from i to j. Each transport mode m has a utility V_m associated with it, where the cost of using that mode is an exponent of the utility (i.e. Exp (V_m)). The overall transportation cost is then the sum of the individual costs for the various available modes. Further technical details on the implementation of the model are provided in Maoh et al. (2008).

Although the original C-MRIO model estimates the flow of dollars between the economic regions of Canada, some extensions were applied to translate these dollar flows into tonnage flows. This was done using fixed rates on the cost of shipping one tonne of a given commodity (physical good) a distance of one kilometer. Consequently, the model is capable of estimating the total tonnage shipped between any two regions. Furthermore, to be able to test the impacts of shipping goods by sea vessel, the mode choice model of C-MRIO was extended to include sea (or any navigable waterway) as a third mode, in addition to highway and rail. Finally, C-MRIO was extended to assess the environmental impacts associated with inter-regional trading. Using the factors listed in Exhibit 4.17, the model can estimate the emissions and fuel usage associated with shipping goods by all three modes of transport: Highway, Rail and Sea.

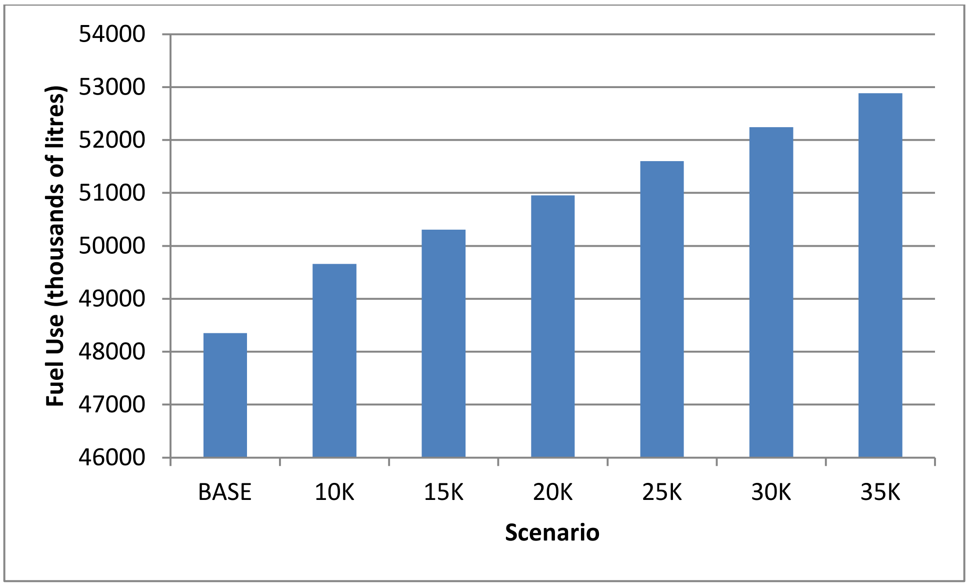
Exhibit 4.17: Emission and Energy Use Factors

Mode	Fuel Use *[Litres/tonne*km]*	Hydrocarbons (HC) *[g/tonne*km]*	Carbon Monoxide (CO) *[g/tonne*km]*	Nitrogen Oxide (Nox) *[g/tonne*km]*
Ship	1/312	0.008	0.011	0.253
Rail	1/181	0.024	0.092	0.30
Truck	1/75	0.04	0.49	0.83

Source: Lawson (2007)

To assess the environmental impacts, along transport corridors, of gateway development, the C-MRIO model is utilized to simulate the different growth scenarios including the BASE case for the year 2031. Exhibit 4.18 relates to total fuel use and Exhibit 4.19 relates to changes in emissions. Both exhibits are based on the combined inflow and outflow of goods to the Hamilton Economic Region, under the base and gateway scenarios for 2031. Goods movement within Hamilton is not under consideration here.

Exhibit 4.18: Total Fuel Use from Goods Flows In/Out of Hamilton Economic Region (2031)



As can be seen from Exhibit 4.19, there is a roughly linear increase from the base scenario across all measures as the magnitude of growth under the various gateway scenarios increases. In particular, across all measures, there is an approximate 2.7% increase between the base and 10K scenarios, while that figure increases to approximately 9.5% for the 35K scenarios relative to the base.

Recall that the idea of these scenarios is that increased economic activity in Hamilton will result in more shipping activity to and from the region and thus more emissions. It is worth noting that these types of emissions occur in transit to or away from Hamilton. Hence changes in the base tonnages may be directly due to changes in Hamilton but the emission burden is much more spread out along transportation corridors outside the region.

Exhibit 4.19: Emissions Goods Flows In/Out of Hamilton Economic Region

Scenario	HC (tonnes)	CO (tonnes)	NOx (tonnes)
BASE	145	1763	3017
10K	149	1810	3098
Change from BASE	2.76%	2.67%	2.68%
15K	151	1833	3139
Change from BASE	4.14%	3.97%	4.04%
20K	152	1858	3179
Change from BASE	4.83%	5.39%	5.37%
25K	155	1881	3219
Change from BASE	6.90%	6.69%	6.70%
30K	156	1904	3259
Change from BASE	7.59%	8.00%	8.02%
35K	159	1928	3298
Change from BASE	9.66%	9.36%	9.31%

4.3.6 Environmental Impacts of Increased Port Inflow

Ideally for Hamilton Gateway development, there will be an increase in the flow of goods to and from Hamilton, via the St. Lawrence Seaway. These flows represent a diversion from trucking to more efficient marine vessels, which is in keeping with gateway ideals, as well as with existing initiatives such as "Hwy H2O". In order to gain some idea of the likely impacts of increasing the share of goods being transported along the St. Lawrence Seaway, a sensitivity analysis is performed using the C-MRIO model. In particular, the share of goods moving by boat (the "sea-share") from the Montreal region to the Port of Hamilton is systematically increased for the year 2031. As the base case, the 35K scenario is used, and sea-share increases occur on top of the original percentages of goods movement by ship, for each commodity. Note that these increases in goods movement by ship are accompanied by an equal tonnage decrease in goods movements by truck. Also note that the scenario changes are applied only for goods originating from the Montreal Economic Region and moving to the Hamilton Economic Region, as this is an extremely important existing supply line. The tonnage modal split under the 35K base is 98.5, 0.4, and 1.05 percent for truck, rail and sea. These shares will change to 94.3, 0.4 and 5.3 percent for the three respective modes under the most optimistic marine scenario considered. These figures are based on all inflows into Hamilton, not just from Montreal. Flows that originate from Montreal make up nearly 10% of the total flows into Hamilton.

Exhibit 4.20: Total Hamilton Goods Inflow Impacts under Short-Sea Shipping Scenarios (2031)

	35K (BASE)	10p	20p	30p	40p	50p
Tonnes (millions)						
Truck	7.624	7.562	7.500	7.438	7.377	7.315
Rail	0.031	0.031	0.031	0.031	0.031	0.030
Ship	0.081	0.148	0.214	0.280	0.346	0.412
Total Tonnes	7.736	7.740	7.745	7.749	7.753	7.757
Tonnes-km (millions)						
Truck	2642.5	2603.5	2564.5	2525.4	2486.4	2447.4
Rail	57.5	57.4	57.3	57.2	57.1	57.0
Ship	41.3	80.4	119.5	158.6	197.7	236.8
Total Tonnes-km	2741.3	2741.3	2741.3	2741.3	2741.3	2741.3
HC (tonnes)						
Truck	105.7	104.139	102.578	101.018	99.457	97.897
Rail	1.38	1.378	1.375	1.373	1.37	1.368
Ship	0.33	0.643	0.956	1.269	1.582	1.895
Total HC	107.41	106.16	104.909	103.66	102.409	101.16
CO (tonnes)						
Truck	1294.820	1275.700	1256.585	1237.470	1218.354	1199.239
Rail	5.290	5.281	5.271	5.262	5.253	5.243
Ship	0.454	0.884	1.314	1.745	2.175	2.605
Total CO	1300.564	1281.865	1263.170	1244.477	1225.782	1207.087
NOx (tonnes)						
Truck	2193.27	2160.88	2128.50	2096.12	2063.74	2031.36
Rail	17.25	17.22	17.19	17.16	17.13	17.10
Ship	10.44	20.34	30.23	40.13	50.02	59.92
Total NOx	2220.96	2198.44	2175.92	2153.41	2130.90	2108.38
Fuel use (1000s of litres)						
Truck	35,145	34,626	34,107	33,588	33,070	32,551
Rail	316	316	315	315	314	313
Ship	132	257	382	508	633	758
Total Fuel use	35,593	35,199	34,805	34,411	34,016	33,622

By way of results, Exhibit 4.20 above shows absolute changes in tonnes, tonne-km, emissions and fuel use under the various sea-share scenarios relative to the 35K BASE scenario. This table reflects total goods movement into the Hamilton Economic Region with the 10p through 50p scenarios reflecting changes to the various totals induced by the modal shift from Montreal. The results are disaggregated by mode, in order to see the relative contributions of truck, rail and ship. Furthermore, the results are presented for the year 2031. The results indicate a systematic decrease in emissions and fuel consumption as the sea-share from Montreal increases. The estimates indicate a decrease of 5.1 to 7.2 percent in overall emissions and fuel usage in moving ship from a 1.05% to 5.3% market share for total goods movement into the Hamilton Economic Region. Note that while the overall modal shift to ship is not huge in the context of goods movement into Hamilton, the portion that originates in Montreal is being shifted by a much larger percentage depending on the scenario.

Note also that Exhibits 4.21 to 4.23 show the change in tonnes of emissions, for HC, CO and NOx, respectively, across all modes. These emissions are the result of goods being shipped into the Hamilton Economic Region under the various sea-share scenarios. For each of the emissions (HC, CO, and NOx), there is a steady linear decrease in absolute tonnes produced, as the scenarios move towards higher reliance on water-borne shipping. This result is both expected, and encouraging, as it clearly demonstrates the environmental advantages which could be gained through wider use of waterways for the transport of goods. Finally, Exhibit 4.24 shows the overall fuel use (in litres), resulting from the movement of goods into Hamilton-Niagara, across all modes. Again, a similar pattern as with the emissions is observed, where there is a steady decrease in fuel use as sea-shares increase.

One other point worth noting is that sea-share increases would offset a significant proportion of the increased emissions forecast in Section 4.3.5. Gateway development would cause more goods movement to and from Hamilton (and emissions) but short-sea shipping would help to balance the picture.

Exhibit 4.21: Tonnes of HC Under Sea-share Scenarios (2031)

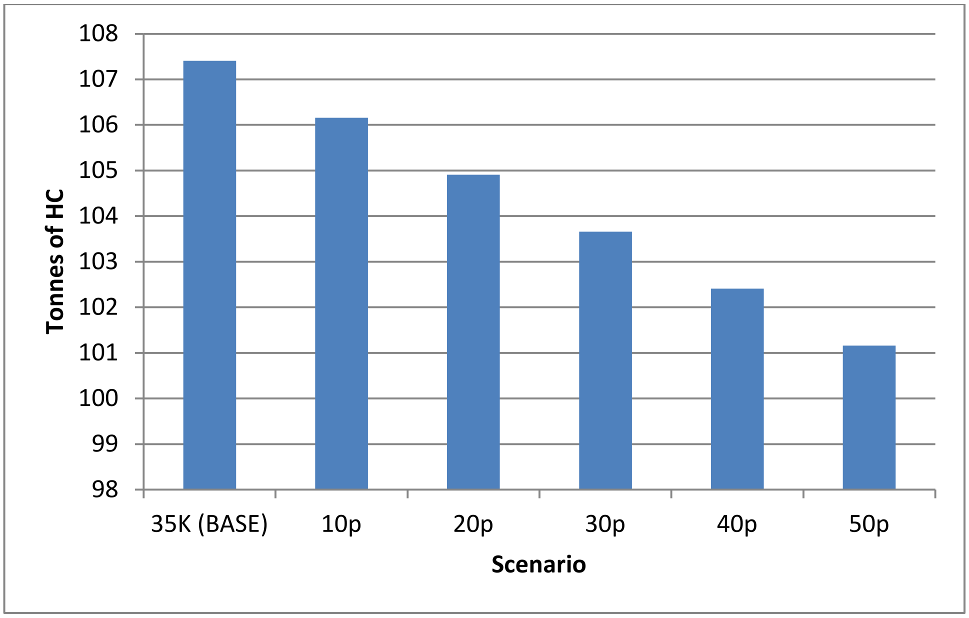


Exhibit 4.22: Tonnes of CO Under Sea-share Scenarios (2031)

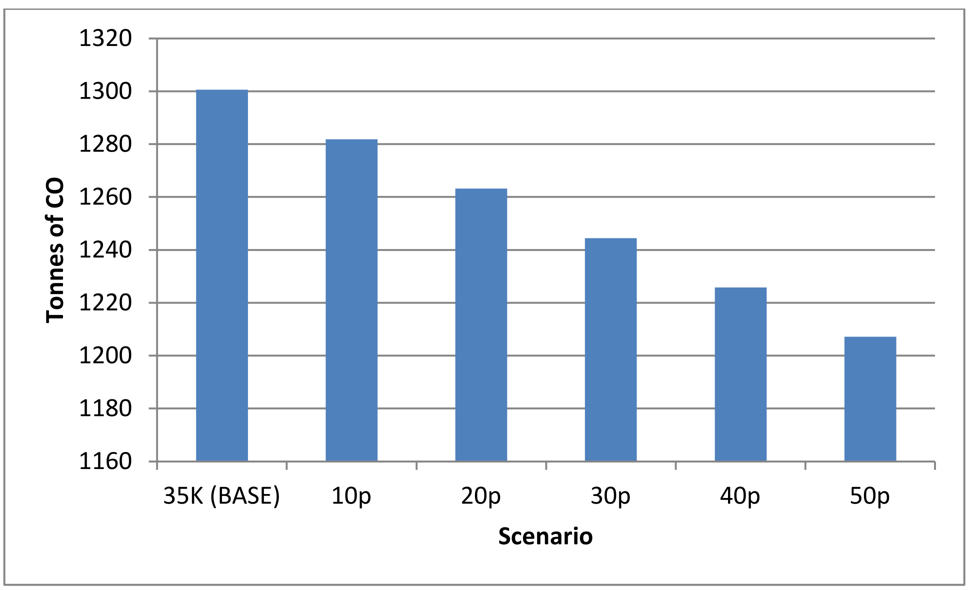


Exhibit 4.23: Tonnes of NOx Under Sea-share Scenarios (2031)

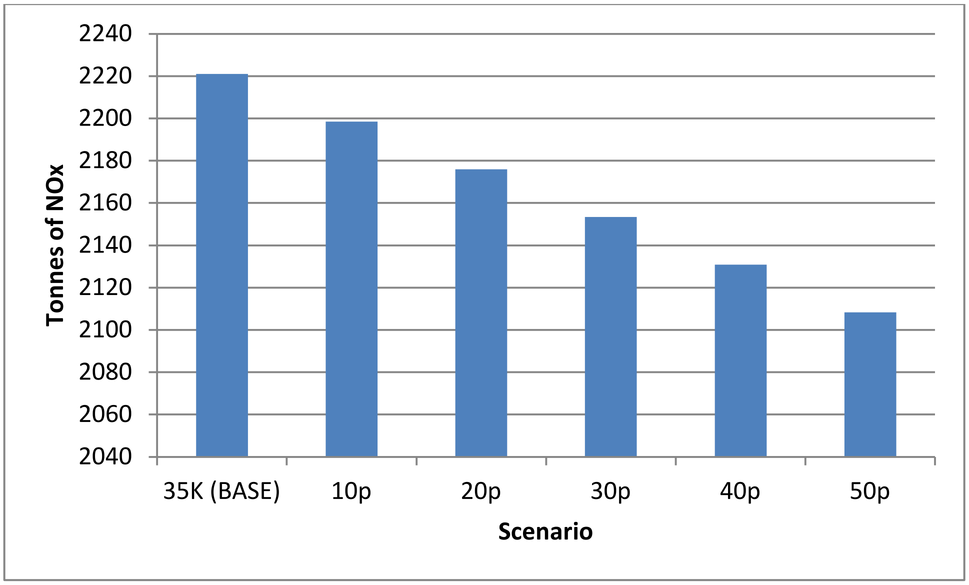
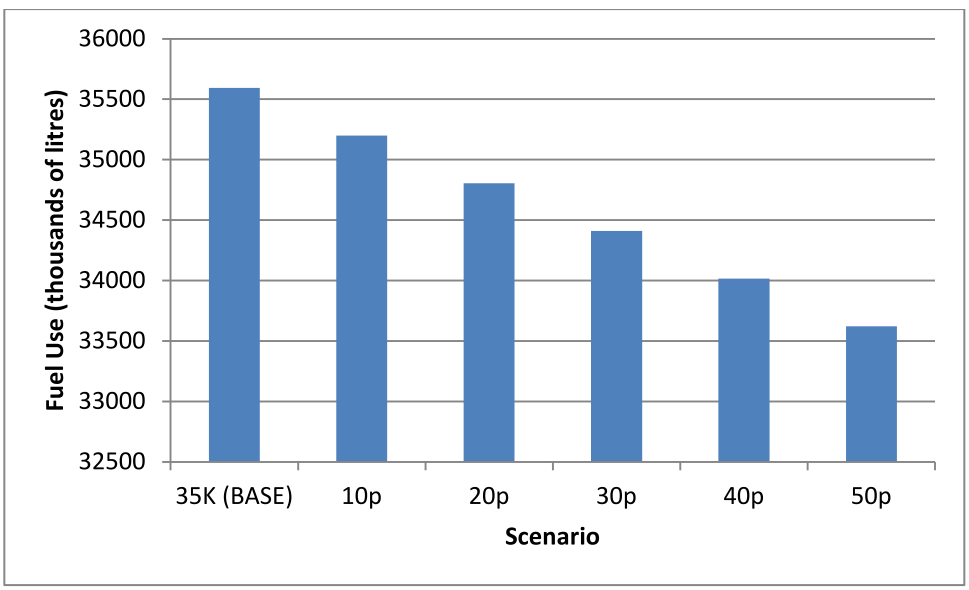


Exhibit 4.24: Total Litres of Fuel Use Under Sea-share Scenarios



4.4 Local Level Modelling

In Chapter 4 so far, the modelling has taken place at the regional level. This means that any changes in employment and final demand could only be applied at the level of the Hamilton Economic Region as these are the regions maintained by Statistics Canada. I/O modelling techniques were the tool of the regional analysis. In this second major section of the chapter, the emphasis shifts to the modelling of the immediate Hamilton area. In particular, the integrated urban model that is used (IMULATE) is designed for the Hamilton CMA. Gateway employment changes though, will be applied to the City of Hamilton (especially the port, airport and business parks) since such information can be managed at the tract level in IMULATE.

4.4.1 Outline of Local Scenarios

As a precursor to the local level analysis, four scenarios are devised (see Exhibit 4.25 for a brief description of each). The BASE case (Exhibit 4.26) and Gateway-Sprawl scenarios in particular assume a sprawled residential development pattern. In the latter case, 80% of the assumed future development is allocated to the suburbs of the CMA (see Exhibit 4.28). The Gateway Scenario in Exhibit 4.27, on the other hand, exhibits similar properties as the BASE case with the exception of an additional 35,000 direct jobs.

Another two gateway scenarios reflect changes in housing development policy, as well as public transport policy. In particular, the Gateway-Compact scenario maintains the distribution of employment from the Gateway scenario, but follows a 'compact growth' policy for new dwellings built after 2011. Compact growth is similar to the concept of 'urban intensification', a smart growth strategy in which new dwellings are primarily assigned to areas already having high population densities in the urban core. Exhibit 4.29 shows the distribution of new dwellings under the Gateway-Compact scenario.

In the Gateway-Compact + LRT scenario, both urban intensification and improved public transit are combined with the Gateway employment distribution. The distribution of new dwellings remains as in the Gateway-Compact scenario. The main public transit improvement realized in the Gateway-Compact + LRT scenario is the addition of a light rail transit system (LRT) to Hamilton's public transport infrastructure, while improvements in the service of existing public transport is also realized in terms of increased frequency to areas serviced by the new LRT lines and other origin/destinations where intensive land use development is to take place.

Exhibit 4.25: Brief Description of Local Level Scenarios

Scenario	Description
BASE Case Growth	Business as usual, similar to the regional level base case growth scenario
Gateway (35K) Growth	
Sprawl Scenario	Successful Gateway development with an extra 59,500 new jobs (35,000 directly related to Gateway and 19,500 indirect growth), similar to the regional level 35K scenario
Compact Scenario	Successful Gateway development with an extra 59,500 new jobs (35,000 directly related to Gateway and 19,500 indirect growth), combined with residential intensification
Compact + LRT Scenario	Successful Gateway development with an extra 59,500 new jobs (35,000 directly related to Gateway and 19,500 indirect growth), combined with residential intensification and public transit improvements

Exhibit 4.26: Base Employment Distribution (2031)

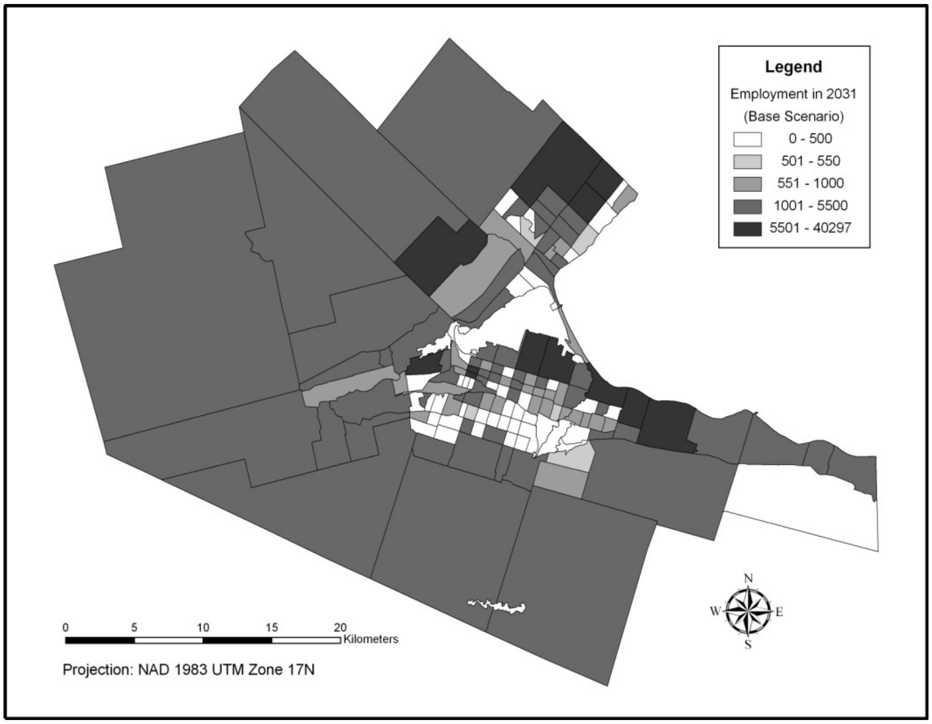


Exhibit 4.27: Gateway (35K) Employment Distribution (2031)

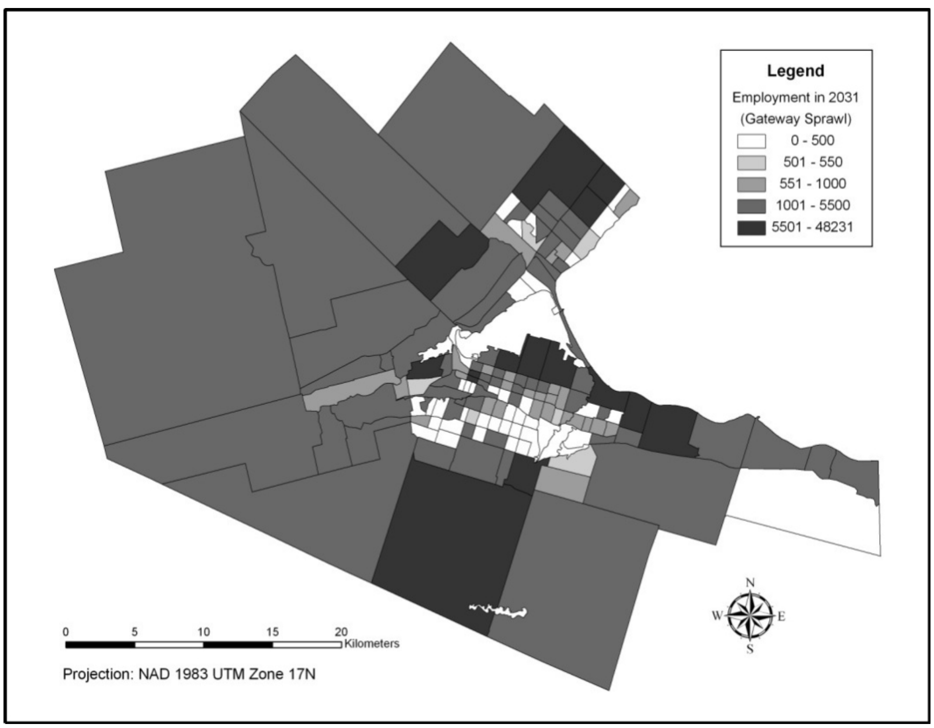


Exhibit 4.28: Gateway-Sprawl New Dwelling Distribution (2031)

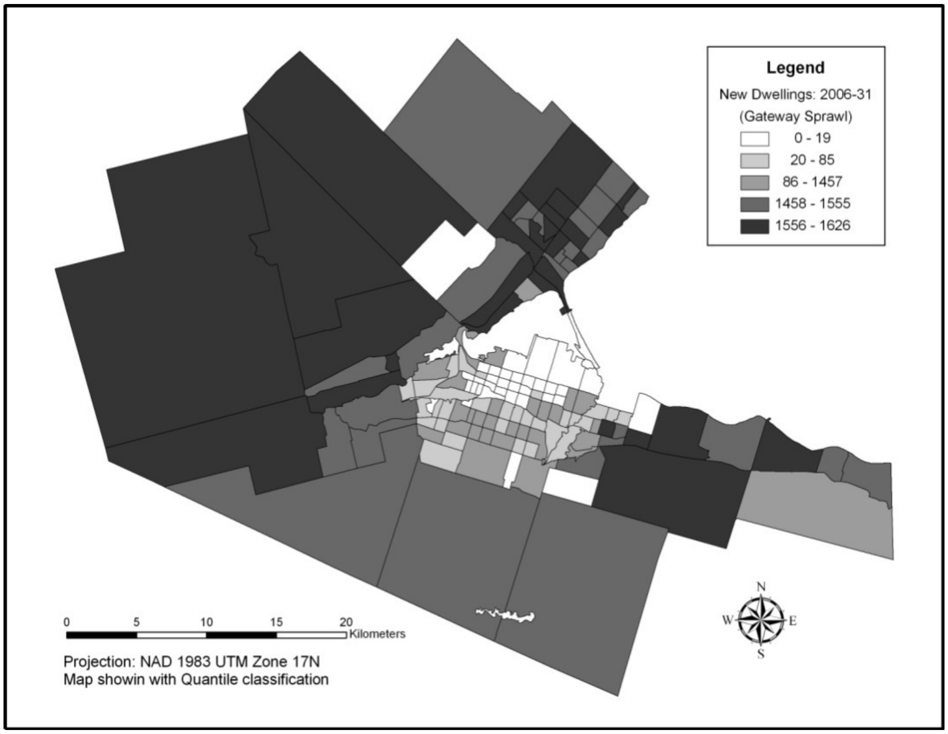
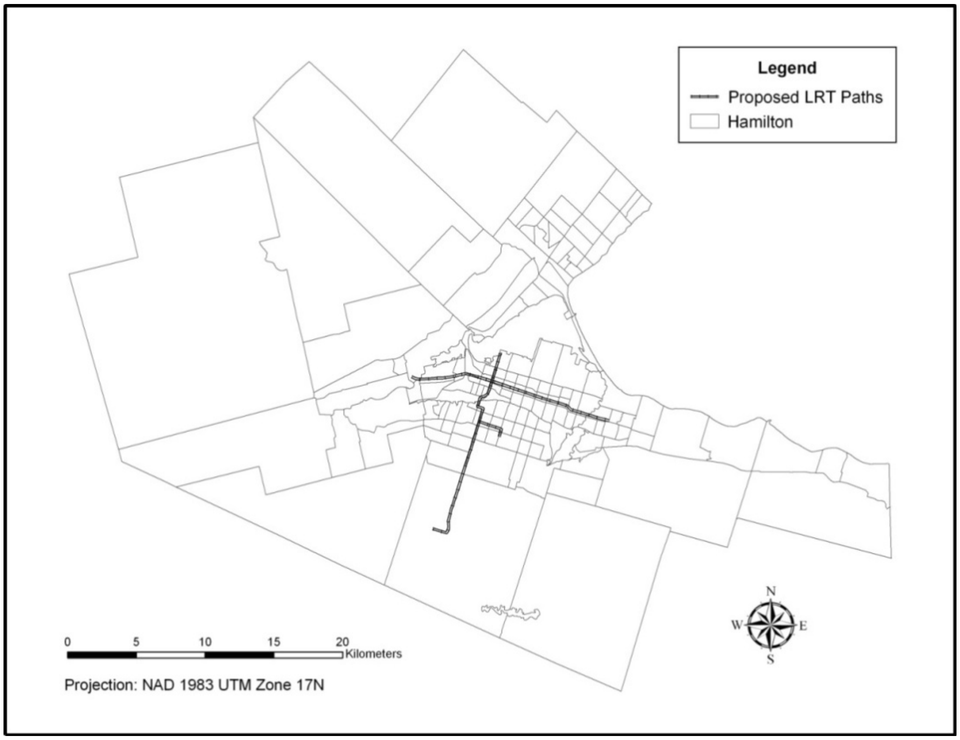


Exhibit 4.29: Gateway-Compact New Dwelling Distribution (2031)

Exhibit 4.30: Proposed LRT Routes for the Gateway-Compact + LRT Scenario



Note that the employment distribution of the basic 35K Gateway scenario, which makes no assumptions about changes in urban form, is shown in Exhibit 4.27 Finally, Exhibit 4.30 shows the proposed route of the LRT system, as realized in the Gateway-Compact + LRT scenario.

4.4.2 Measures of Transportation System Usage

Several important measures of transportation system usage in an urban area can be estimated with IMULATE. These include: Vehicle Kilometers Traveled (VKT), Vehicle Minutes Traveled (VMT), Energy Use (usually expressed in litres of gasoline), and modal split, which quantifies the types of transport modes being used for travel. If all else is equal in a transport system, then the minimization of VKT, VMT, and Energy Use implies higher levels of sustainability, and lower emissions. In addition, minimizing the ratio of VMT to VKT implies less traffic congestion, which also translates into a more sustainable transport system. Where modal split is concerned, it is desirable to shift trips from more polluting modes, such as automobiles, to more sustainable modes such as public transport and walking.

Exhibit 4.31: VKT Changes by Scenario

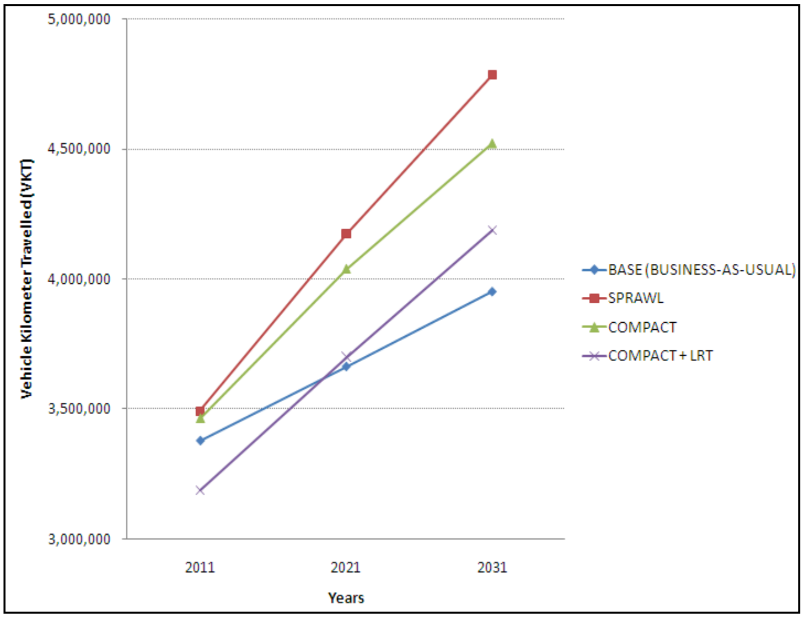


Exhibit 4.31 shows VKT over time, for all four scenarios. Note that the two scenarios which minimize VKT are the Base and Gateway-Compact + LRT. On the other hand, VKT is maximized in the Gateway-sprawl scenario. Among the gateway scenarios, it is clear that compact development helps minimize VKT, and that compact development combined with public transport improvements accentuates the effect. The results presented in Exhibit 4.31 speak to the fact that growth and sustainability can both be achieved if growth is properly planned. For instance, overall VKT in the period 2011 – 2031 will be lower under the 35K COMPACT + LRT scenario.

Exhibit 4.32: VMT Changes by Scenario

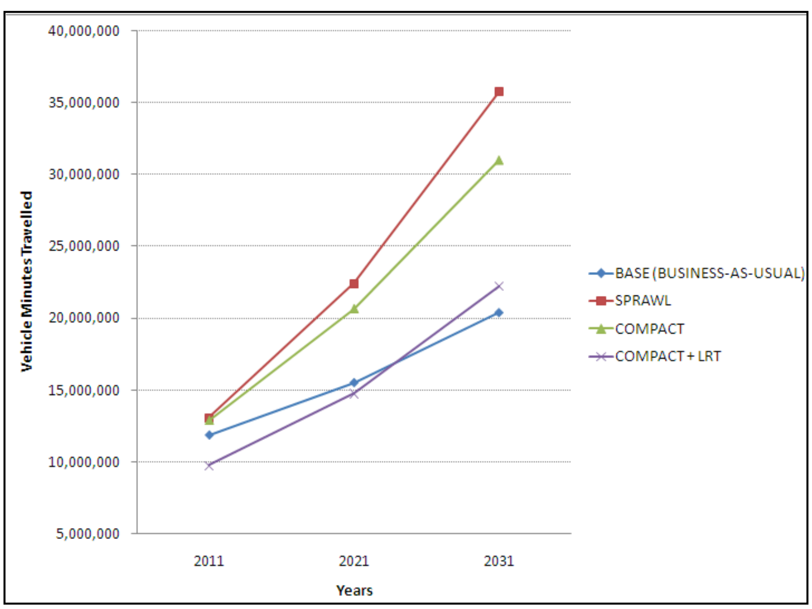


Exhibit 4.33 below shows the ratio of VMT to VKT for all four scenarios. As previously mentioned, this ratio can be taken as a proxy for system-wide congestion, with a higher ratio implying more congestion. Here we see the same scenario pattern as with VKT and VMT individually. Although there is still an increase in congestion under the gateway (Compact + LRT) scenario relative to the base, this increase is not significant. This suggests that compact development and LRT can mitigate the effects of growth on congestion.

Exhibit 4.33: Ratio of VMT to VKT (2031)

Scenario	VMT/VKT
BASE (BUSINESS-AS-USUAL)	5.15
Gateway (SPRAWL)	7.47
Gateway (COMPACT)	6.85
Gateway (COMPACT + LRT)	5.31

A similar picture arises when we look at energy consumption across the four scenarios. Estimated VKT (Exhibit 4.34), VMT (Exhibit 4.35) and energy consumption (Exhibit 4.36) are shown under the four simulated scenarios. Not surprisingly, the figures indicate an overall growth in all measures of system transportation usage (VKT, VMT and energy) under gateway development. However, the nature of this development will have significant impacts on the transportation system. The results indicate an overall decrease in VKT, VMT and energy consumption under the Gateway-Compact + LRT scenario. Compared to the Gateway-Sprawl scenario, compact urban form and LRT development will result in reducing VKT, VMT and energy consumption by 11, 34 and 12 percent, respectively. Substantial gains could thus be attained from adopting a more sustainable development approach.

Exhibit 4.34: Tabular VKT by Scenario

Scenario	2011	2021	2031	Total*
BASE (BUSINESS-AS-USUAL)	**3,380,340**	**3,666,180**	**3,954,525**	**11,001,045**
GATEWAY				
SPRAWL	**3,495,110**	**4,175,946**	**4,784,943**	**12,455,999**
COMPACT	**3,466,698**	**4,041,651**	**4,523,972**	**12,032,321**
Change from SPRAWL	-28,412	-134,295	-260,971	-423,678
Percent Change	-0.81	-3.22	-5.45	-3.40
COMPACT + LRT	**3,191,111**	**3,702,417**	**4,187,953**	**11,081,481**
Change from SPRAWL	-303,999	-473,529	-596,990	-1,374,518
Percent Change	-8.70	-11.34	-12.48	-11.03

Exhibit 4.35: Tabular VMT by Scenario

Scenario	2011	2021	2031	Total*
BASE (BUSINESS-AS-USUAL)	**11,895,238**	**15,533,689**	**20,387,843**	**47,816,770**
GATEWAY				
SPRAWL	**13,103,101**	**22,429,512**	**35,762,617**	**71,295,230**
COMPACT	**12,884,042**	**20,665,845**	**31,012,007**	**64,561,894**
Change from SPRAWL	-219,059	-1,763,667	-4,750,610	-6,733,336
Percent Change	-1.67	-7.86	-13.28	-9.44
COMPACT + LRT	**9,791,383**	**14,776,893**	**22,231,762**	**46,800,038**
Change from SPRAWL	-3,311,718	-7,652,619	-13,530,855	-24,495,192
Percent Change	-25.27	-34.12	-37.84	-34.36

Exhibit 4.36: Estimated Energy Consumption (litres) by Scenario

Scenario	2011	2021	2031	Total*
BASE (BUSINESS-AS-USUAL)	**275,034**	**299,534**	**324,809**	**899,377**
GATEWAY				
SPRAWL	**284,752**	**343,421**	**398,258**	**1,026,431**
COMPACT	**282,384**	**331,884**	**375,214**	**989,482**
Change from SPRAWL	-2,368	-11,537	-23,044	-36,949
Percent Change	-0.83	-3.36	-5.79	-3.60
COMPACT + LRT	258,958	302,065	344,284	905,307
Change from SPRAWL	**-25,794**	**-41,356**	**-53,974**	**-121,124**
Percent Change	-9.06	-12.04	-13.55	-11.80

* Note: Total is the sum of values from the three years 2011, 2021 and 2031

For morning peak work trips, the observed modal splits for the Base, Gateway (Sprawl), and Gateway Compact scenarios are very similar. There is, however, a small increase in the percentage of persons "walking" in the Gateway-Compact scenario. Exhibit 4.37 and Exhibit 4.38 are showing the modal splits of these trips for the Gateway-Compact and Gateway-Compact + LRT scenarios, respectively.

It is between the Gateway-Compact + LRT scenario and the remaining three scenarios that the largest difference is observed. With the Gateway-Compact + LRT scenario, the transit mode jumps to approximately 17% from 3% in the other scenarios, with the difference coming mainly from the auto mode. This shows that there is a good degree of responsiveness by commuters to this type of public transport improvement. Furthermore, school trips are also affected by the introduction of the LRT lines and the general enhancements to the transit system in the city. The results under compact development indicate that with the LRT, transit ridership shares for school travel will jump by 5% from 35% to 40% in the morning peak period (see Exhibits 4.39 and 4.40).

Exhibit 4.37: Modal Split of Work Trips under Gateway-Compact Scenario

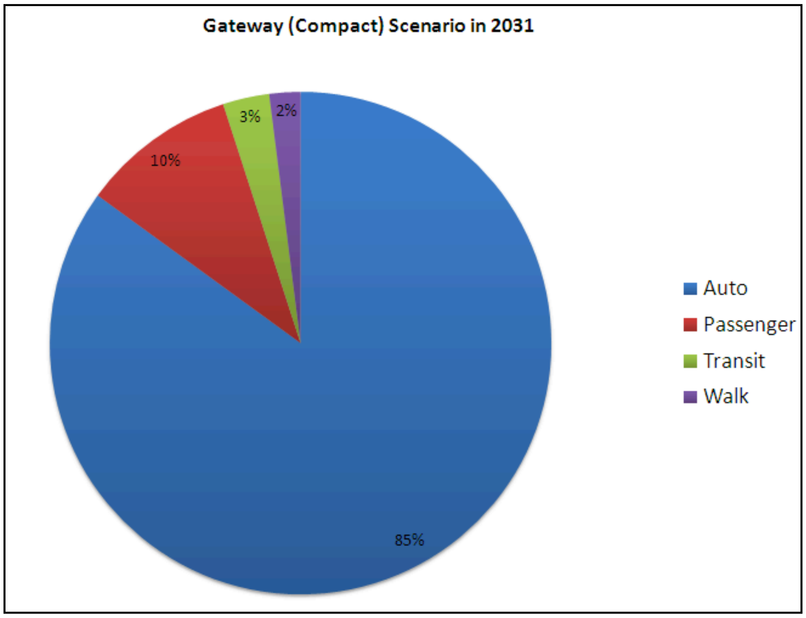


Exhibit 4.38: Modal Split of Work Trips under Gateway-Compact + LRT Scenario

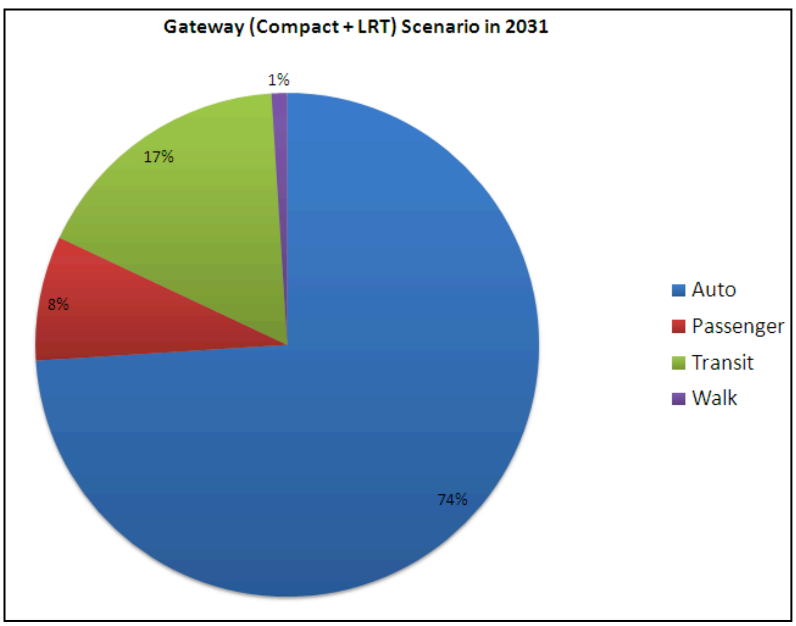


Exhibit 4.39: Modal Split of School Trips Under Gateway-Compact Scenario

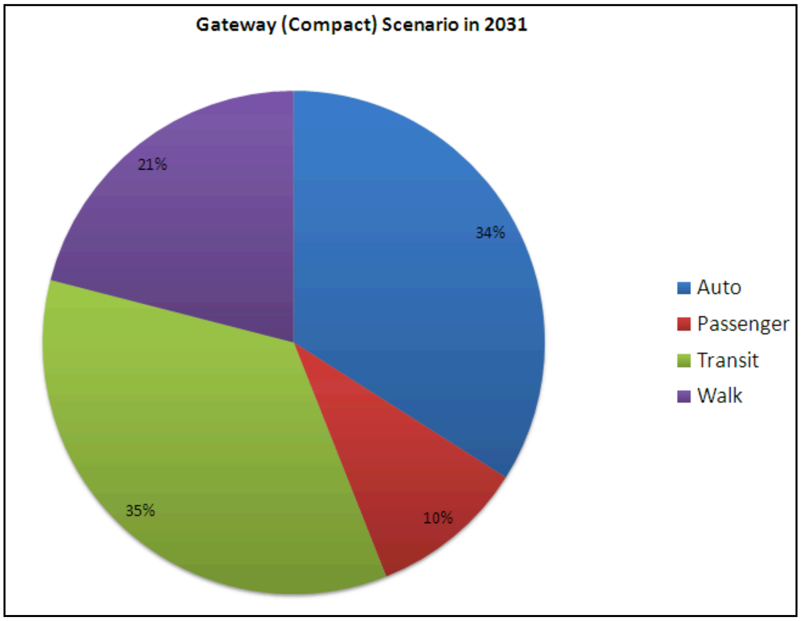
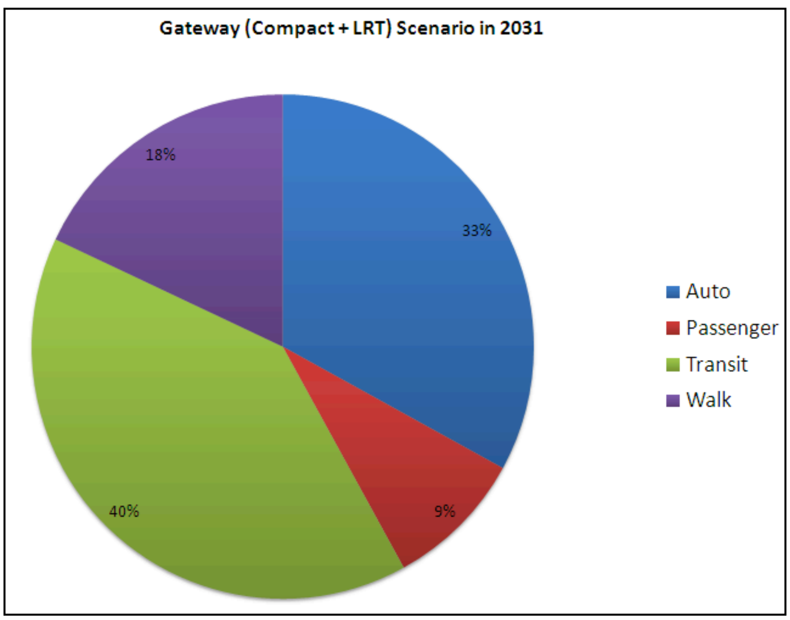


Exhibit 4.40: Modal Split of School Trips under Gateway-Compact + LRT Scenario



4.4.3 Vehicle Emissions

Several key emissions and pollutants, which are released into the environment as a result of passenger and commercial vehicle use, are Hydrocarbons (HC), Carbon Monoxide (CO), Nitrogen Oxides (NOx), and Particulate Matter under 2.5 Microns (PM25). Exhibits 4.41 to 4.44 (graphs) and Exhibits 4.45 to 4.48 (tables) show the levels of HC, CO, NOx, and PM25 emitted by vehicles over time in the Hamilton CMA, respectively, for all four scenarios. All the numbers represent the amounts in Kg that would be emitted over the peak morning hour in the Hamilton CMA. So for example, from Exhibit 4.45, the estimate for hydrocarbons in the peak morning hour in the year 2021 is just greater than seven metric tonnes.

The emission results are as expected from the analysis in Section 4.2.2. The BASE case and Gateway-Compact +LRT scenarios are generating the least amounts of harmful emissions, where as the Gateway-Sprawl scenario is generating the highest levels of emissions. The Gateway-Compact + LRT scenario is producing less HC and CO emissions compared to the base. The scenario is also generating minimal and insignificant increases of NOx and particulate matter emissions compared to the base. This is again an indication that, despite the substantial growth in population and employment under the gateway project, proper land use and transportation infrastructure planning is the key for mitigating the negative environmental impacts of economic growth.

When comparing the results from the three Gateway scenarios, a more interesting picture can be seen. Overall, the adoption of a more compact residential development pattern coupled with the establishment of rapid transit via light rail (i.e. LRT) can reduce emissions substantially. The results in Exhibits 4.45 to 4.48 indicate that, relative to the Gateway-Sprawl Scenario, the levels of HC, CO, NOx and Particulate matter emissions will decrease by approximately 27, 18, 13 and 11 percent under the Gateway-Compact + LRT scenario. Exhibit 4.49 shows tabular results for PM10 also.

Exhibit 4.41: HC Emissions by Scenario

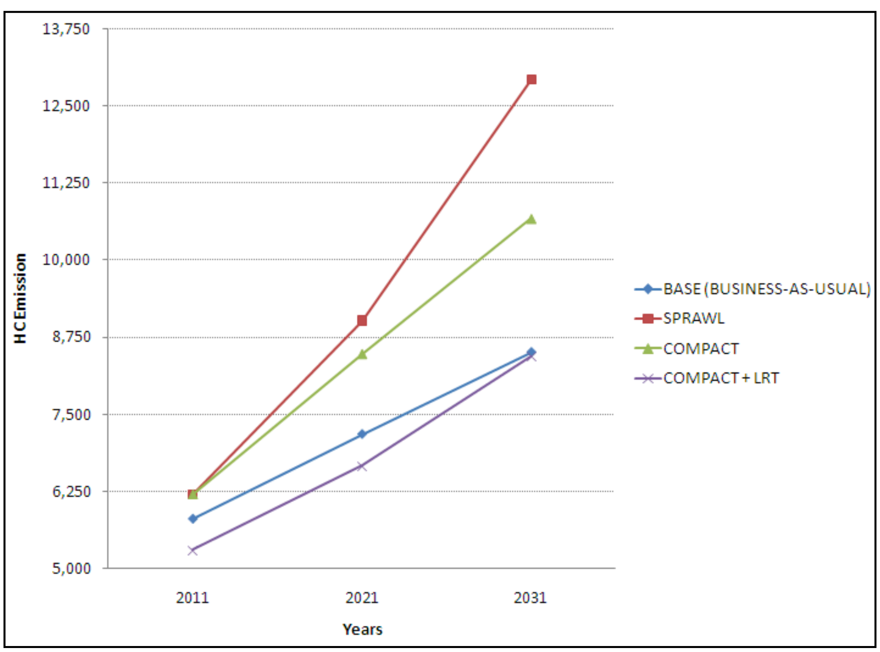


Exhibit 4.42: CO Emissions by Scenario

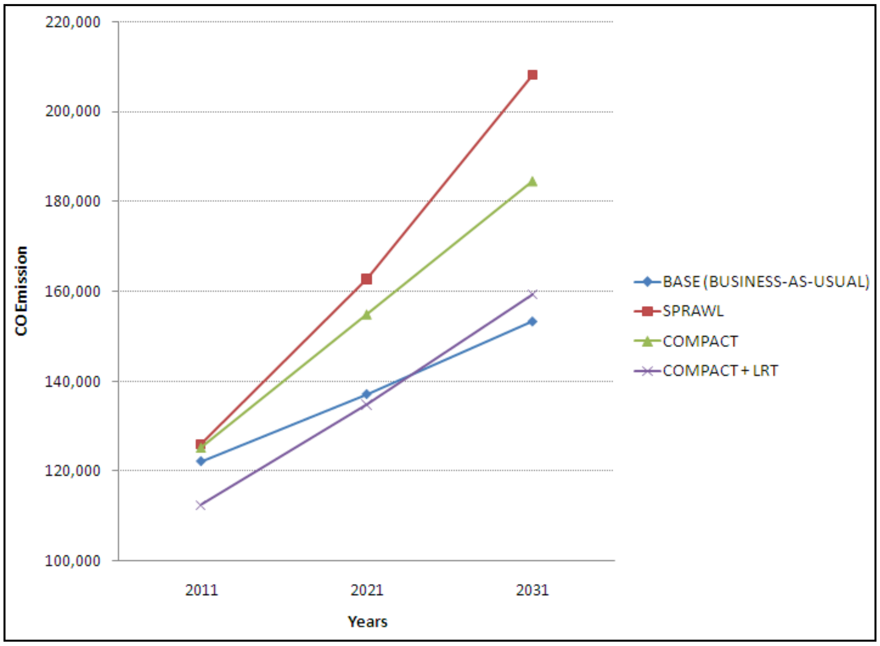


Exhibit 4.43: NOx Emissions by Scenario

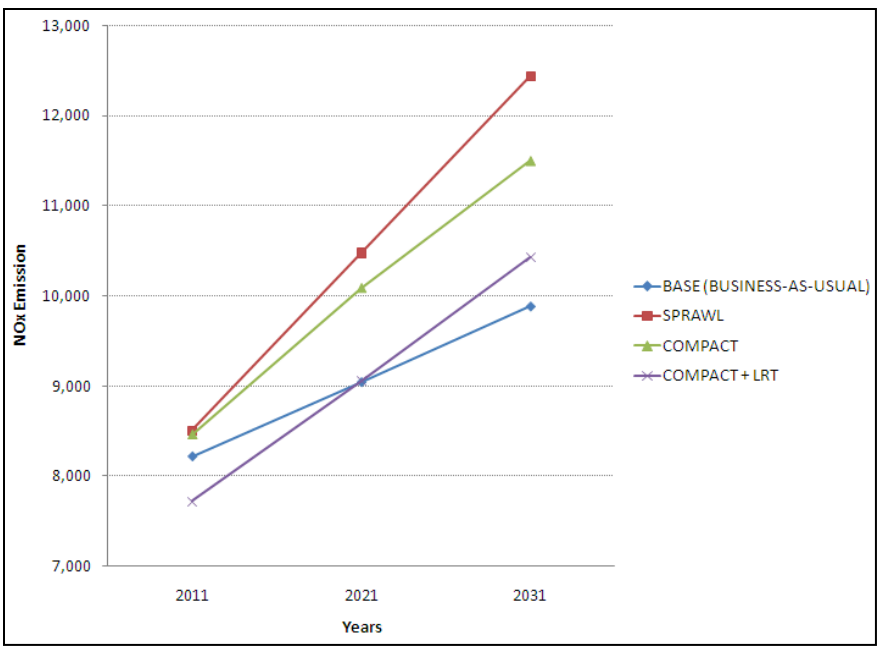


Exhibit 4.44: PM2.5 Emissions by Scenario

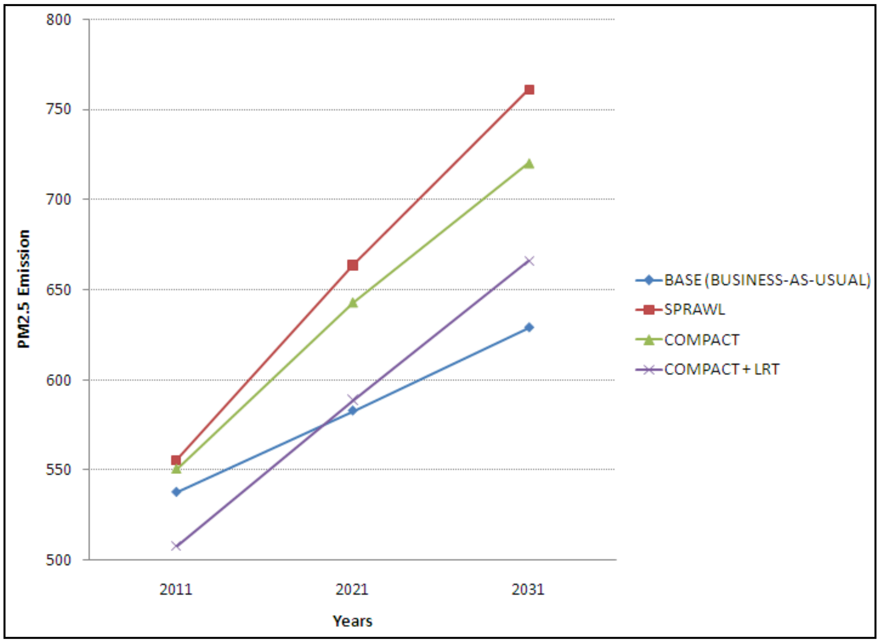


Exhibit 4.45: Estimated HC Emissions (Kg) by Scenario

Scenario	2011	2021	2031	Total*
BASE (BUSINESS-AS-USUAL)	**5,818**	**7,185**	**8,507**	**21,510**
GATEWAY				
SPRAWL	**6,201**	**9,017**	**12,914**	**28,132**
COMPACT	**6,204**	**8,477**	**10,666**	**25,347**
Change from SPRAWL	3	-540	-2,248	-2,785
Percent Change	0.05	-5.99	-17.41	-9.90
COMPACT + LRT	**5,309**	**6,668**	**8,439**	**20,416**
Change from SPRAWL	-892	-2,349	-4,475	-7,716
Percent Change	-14.38	-26.05	-34.65	-27.43

Exhibit 4.46: Estimated CO Emissions (Kg) by Scenario

Scenario	2011	2021	2031	Total*
BASE (BUSINESS-AS-USUAL)	**122,184**	**137,123**	**153,293**	**412,600**
GATEWAY				
SPRAWL	**126,183**	**162,816**	**208,071**	**497,070**
COMPACT	**125,338**	**154,922**	**184,505**	**464,765**
Change from SPRAWL	-845	-7,894	-23,566	-32,305
Percent Change	-0.67	-4.85	-11.33	-6.50
COMPACT + LRT	**112,627**	**134,866**	**159,390**	**406,883**
Change from SPRAWL	-13,556	-27,950	-48,681	-90,187
Percent Change	-10.74	-17.17	-23.40	-18.14

Exhibit 4.47: Estimated NOx Emissions (Kg) by Scenario

Scenario	2011	2021	2031	Total*
BASE (BUSINESS-AS-USUAL)	**8,219**	**9,045**	**9,887**	**27,151**
GATEWAY				
SPRAWL	**8,511**	**10,484**	**12,440**	**31,435**
COMPACT	**8,461**	**10,088**	**11,498**	**30,047**
Change from SPRAWL	-50	-396	-942	-1,388
Percent Change	-0.59	-3.78	-7.57	-4.42
COMPACT + LRT	**7,727**	**9,060**	**10,424**	**27,211**
Change from SPRAWL	-784	-1,424	-2,016	-4,224
Percent Change	-9.21	-13.58	-16.21	-13.44

* Note: Total is the sum of values from the three years 2011, 2021 and 2031

Exhibit 4.48: Estimated PM 2.5 Emissions (Kg) by Scenario

Scenario	2011	2021	2031	Total*
BASE (BUSINESS-AS-USUAL)	**538**	**583**	**629**	**1,750**
GATEWAY				
SPRAWL	**556**	**664**	**761**	**1,981**
COMPACT	**551**	**643**	**720**	**1,914**
Change from SPRAWL	-5	-21	-41	-67
Percent Change	-0.90	-3.16	-5.39	-3.38
COMPACT + LRT	**508**	**589**	**666**	**1,763**
Change from SPRAWL	-48	-75	-95	-218
Percent Change	-8.63	-11.30	-12.48	-11.00

Exhibit 4.49: Estimated PM10 Emissions (Kg) by Scenario

Scenario	2011	2021	2031	Total*
BASE (BUSINESS-AS-USUAL)	**588**	**638**	**688**	**1,914**
GATEWAY				
SPRAWL	**608**	**727**	**833**	**2,168**
COMPACT	**603**	**703**	**787**	**2,093**
Change from SPRAWL	-5	-24	-46	-75
Percent Change	-0.82	-3.30	-5.52	-3.46
COMPACT + LRT	**555**	**644**	**729**	**1,928**
Change from SPRAWL	-53	-83	-104	-240
Percent Change	-8.72	-11.42	-12.48	-11.07

* Note: Total is the sum of values from the three years 2011, 2021 and 2031

4.4.4 Traffic Flows and Congestion

Although broad system-wide measures of usage and performance were presented in Section 4.4.2, it is informative to visually examine traffic flows to identify congestion hot spots under the devised scenarios. Exhibit 4.50 shows the 2031 simulated traffic flows on Hamilton's road network resulting from the BASE case scenario. As can be seen, a significant volume of passenger vehicle traffic is present in the traditional core of the city, as well as on major expressways and highways such as the QEW, 403, Lincoln Alexander and Red Hill Creek. By comparison, while commercial vehicles are also utilizing road links in and around the city of Hamilton, a fair amount of traffic is occurring in suburban areas, especially to the east (Stoney Creek), the west (Flamborough and Ancaster) and the south near the Hamilton International Airport. As expected, the observed trends in commercial vehicle flows correlate well with the suburban distribution of jobs in the study area.

In examining the results from the Gateway scenarios, several interesting points are worth noting. Exhibit 4.51 to Exhibit 4.53 present the difference in simulated traffic flows from the BASE case under the three Gateway scenarios, for the year 2031. The sprawled scenario map (Exhibit 4.51) indicates that suburban road links will experience a significant increase in traffic flow for both passenger and commercial use. This result is expected since more people would be residing in the suburbs. Furthermore, the development of business parks including the airport will attract businesses, resulting in more commercial activities and goods movement.

In considering compact development to combat the effects of sprawl, a new picture emerges. More traffic, both for passenger vehicles and commercial vehicle use, is generated in the core of the city (see Exhibit 4.52 and Exhibit 4.53). This outcome is due to higher levels of population and population oriented-businesses occurring in the central parts of the city. Finally, when introducing LRT into the picture, a further interesting result can be seen. Comparison of the two maps indicates that with LRT, less passenger vehicle traffic is generated in the core. This is discerned from the thickness of lines on the two maps. Congestion levels in the city are thus reduced, leading commercial vehicles to move more freely. Less commercial traffic will take place on particular roads, such as the Upper James corridor (a major commercial artery in the City of Hamilton) and on other major arteries.

In Exhibit 8.4, in the Appendix, an interesting traffic volume map is displayed which compares the Sprawl scenario with the Compact+LRT scenario directly rather than using the base with two maps as is done here. That map is revealing in showing that Urban Sprawl will generate much more passenger car traffic. Interestingly, the map also shows where the Compact+LRT scenario would generate more traffic, which of course if for the vast minority of links.

Exhibit 4.50: Simulated Passenger and Commercial Vehicle Flows under Base Case (2031)

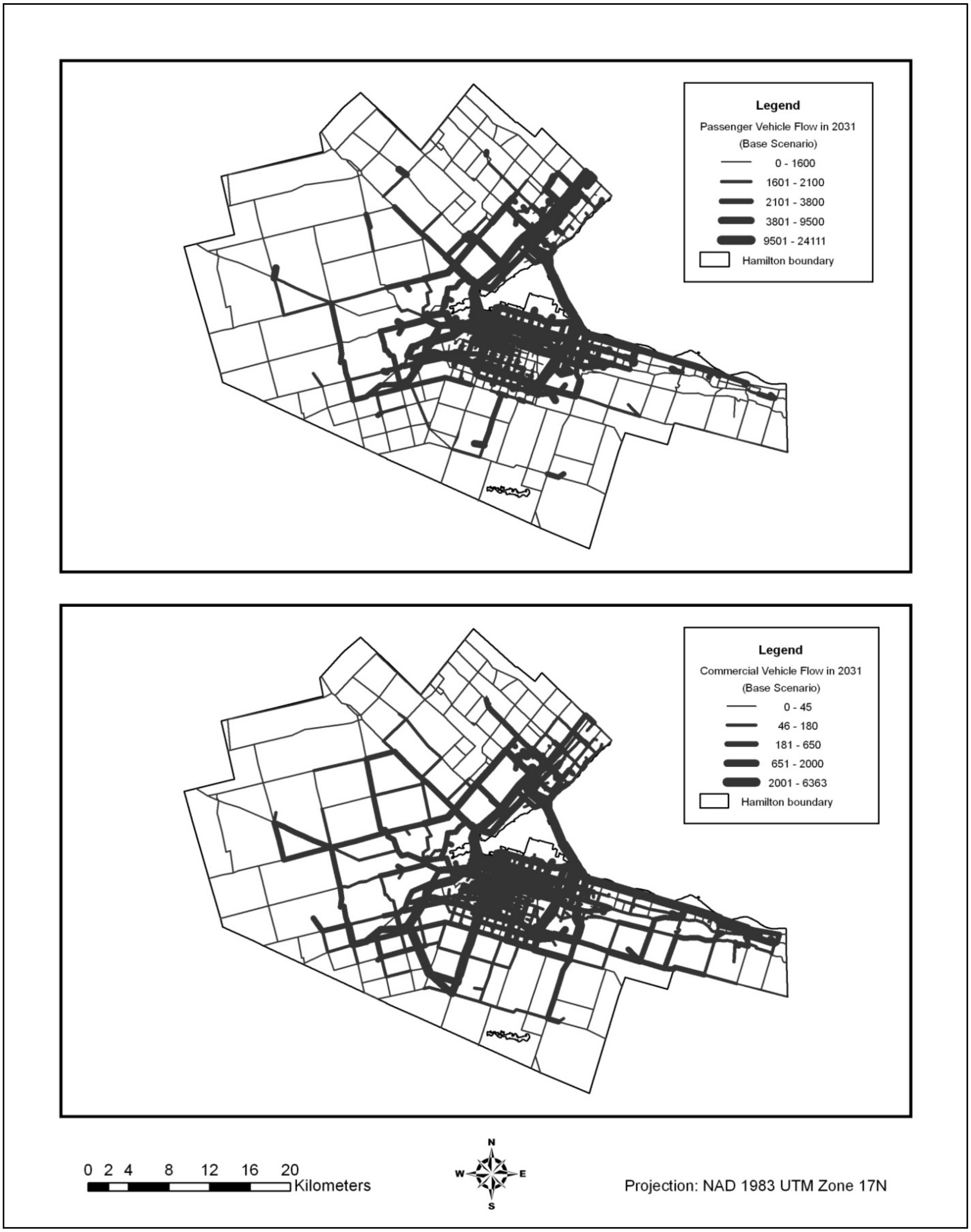


Exhibit 4.51: Differences in Traffic: Gateway-Sprawl Vs. Base (2031)

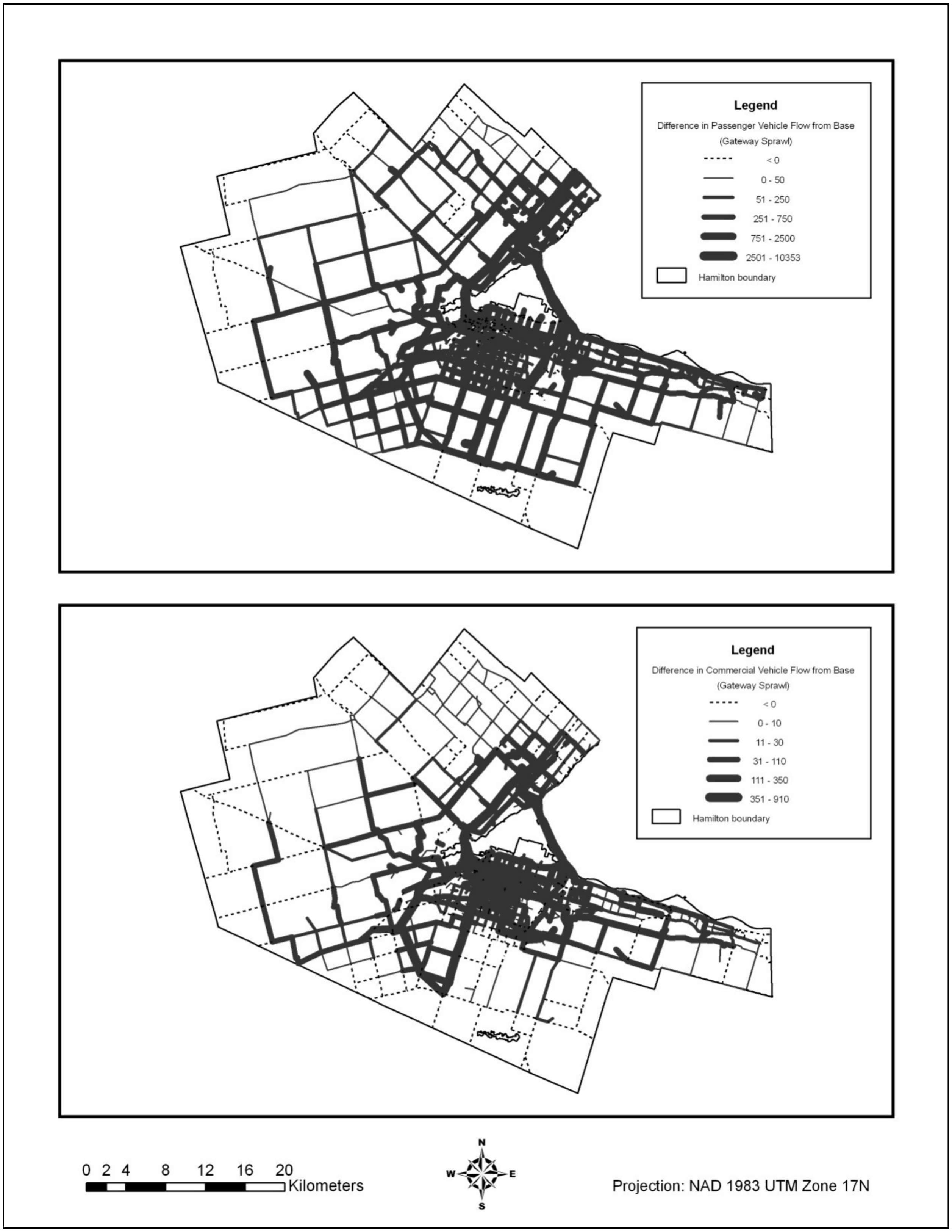


Exhibit 4.52: Differences in Traffic: Gateway-Compact Vs Base (2031)

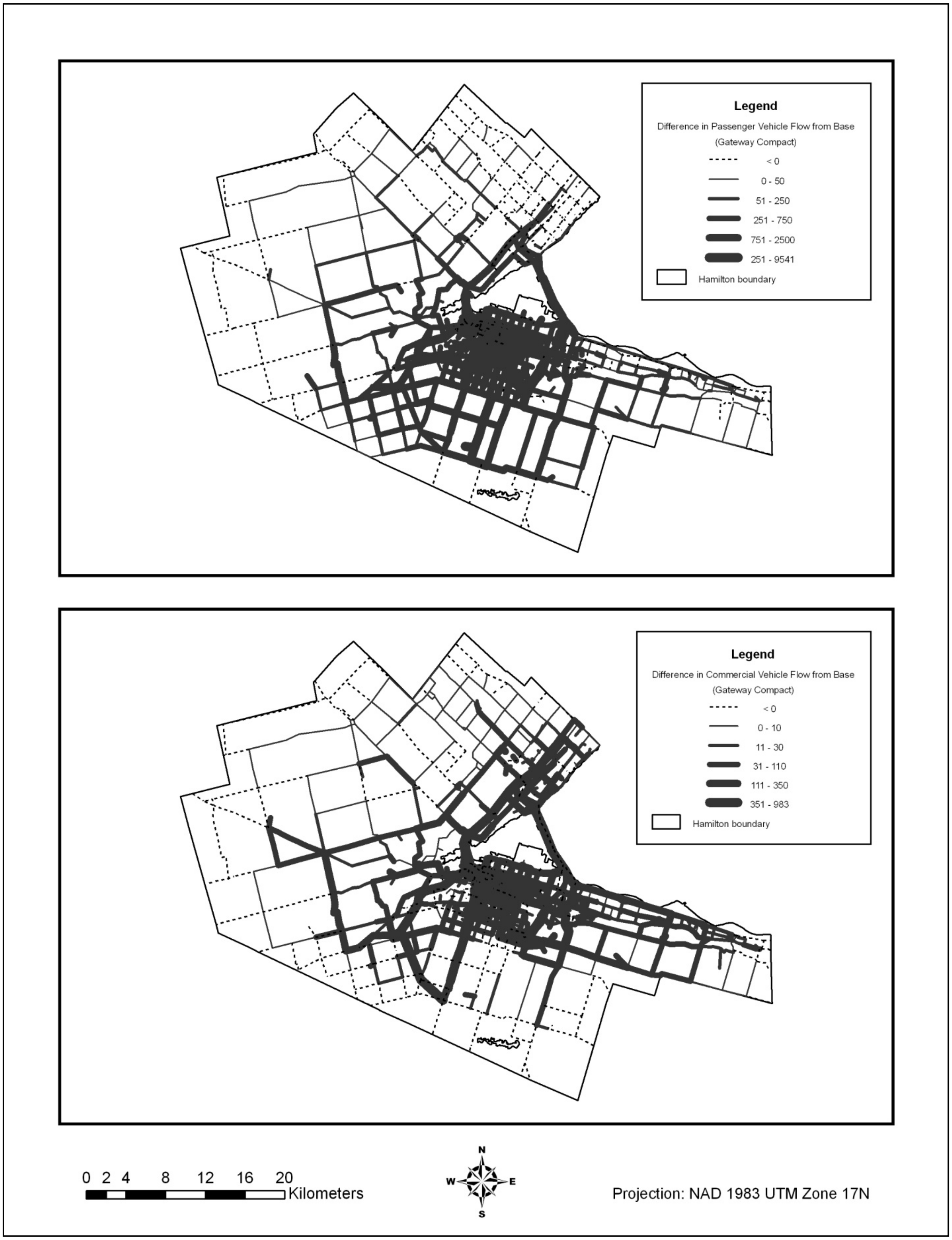
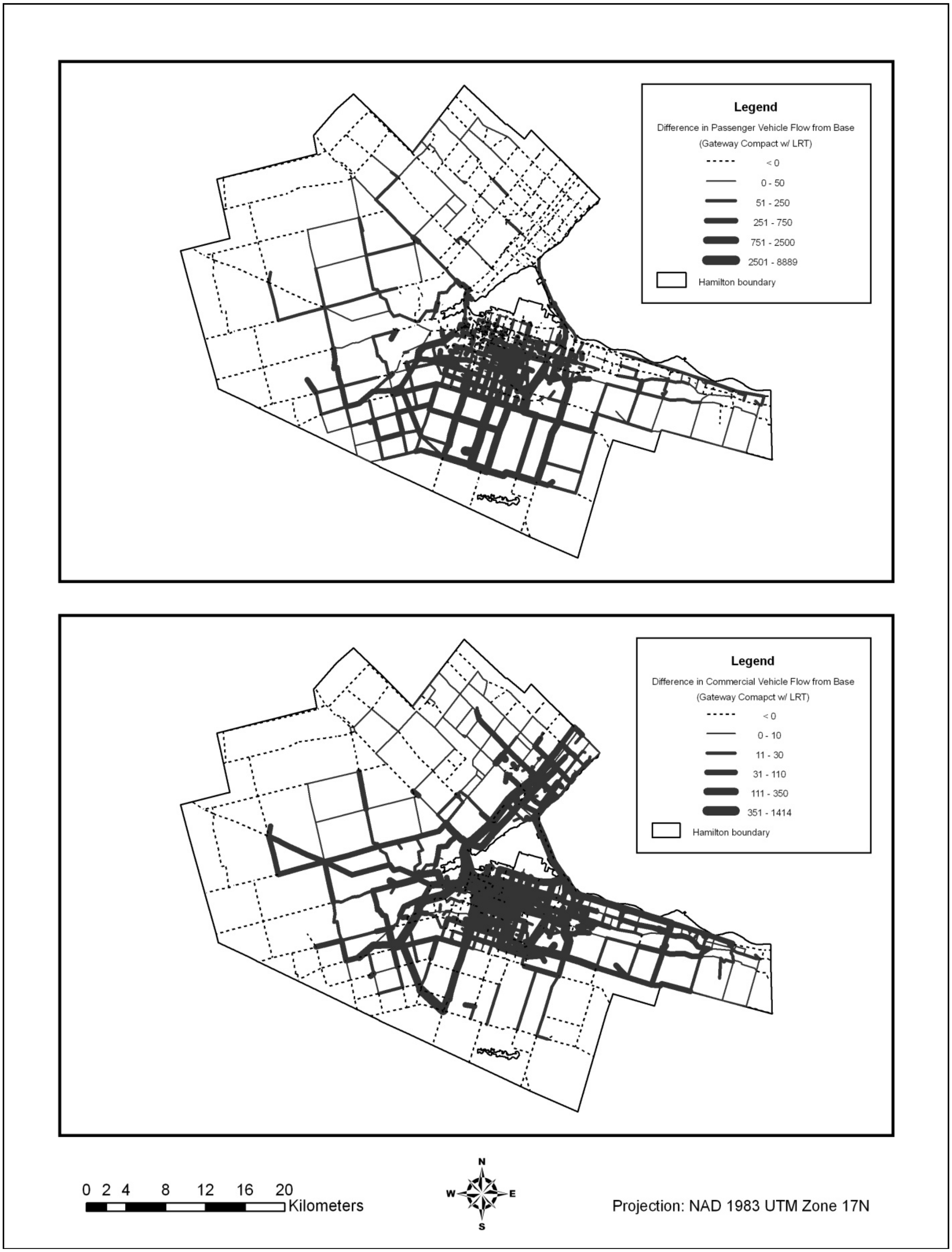
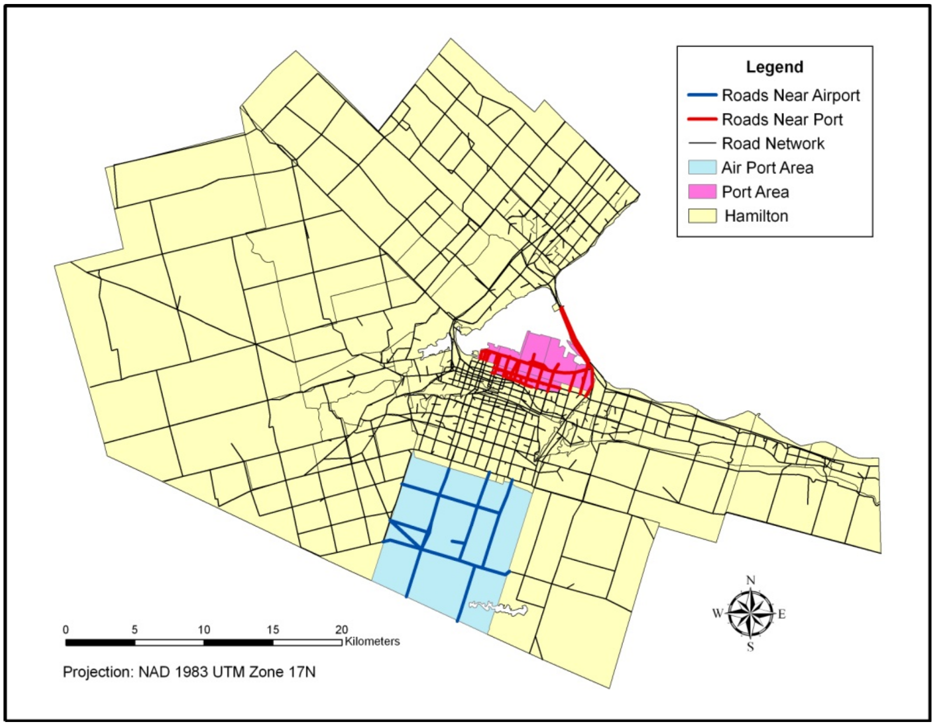


Exhibit 4.53: Differences in Traffic: Gateway (Compact+LRT) Vs Base (2031)



Land use planning, including the implementation of the LRT, will impact Hamilton's overall traffic patterns. However, it is important to assess the impacts of these plans on traffic in the vicinity of the port and airport. It is also useful to explore whether areas directly impacted by the development of the LRT will experience a decrease in traffic flow over time. Exhibit 4.54 and Exhibit 4.55 present the road links that are analyzed to assess traffic in the vicinity of the port, airport and LRT lines.

Exhibit 4.54: Road Links in Vicinity of Port and Airport



Traffic flows for the road links designating the port, airport and LRT areas are summarized for the four scenarios in Exhibit 4.56. The results indicate an increase in traffic on the road in the vicinity of the three areas (port, airport and LRT lines), under gateway development. This is not surprising since the gateway will be associated with an increase in both population and jobs by the year 2031. However, the nature of land use planning will have its impact on the amount of generated traffic.

Exhibit 4.55: Road Links in Vicinity of LRT Lines

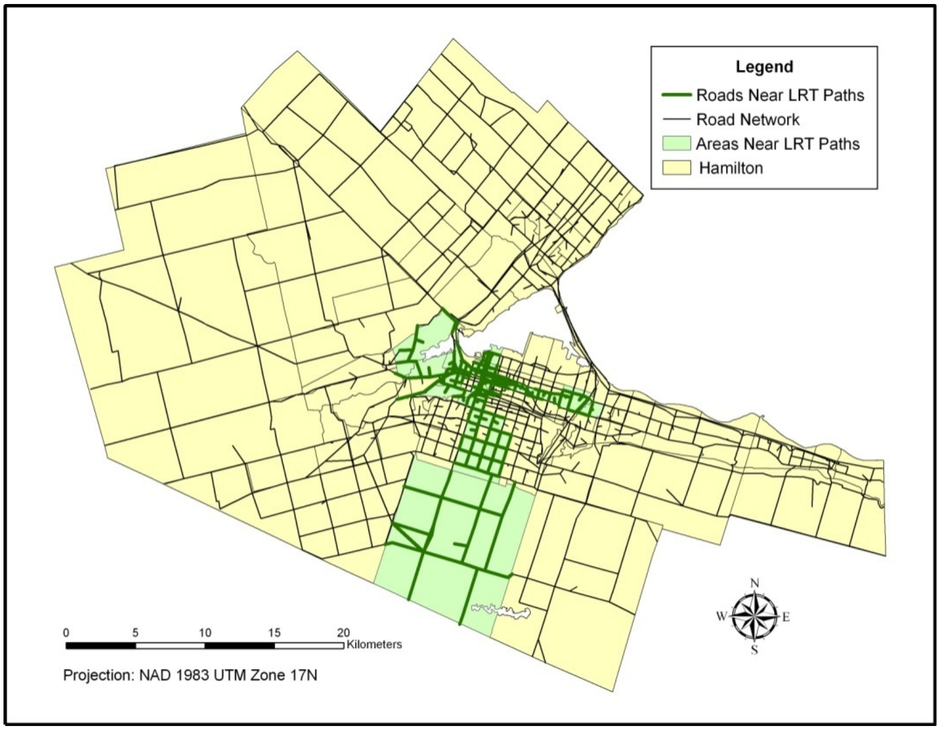


Exhibit 4.56: Total Traffic Flow (morning peak) by Area and Scenario

Scenario	Port Area	Airport Area	Areas near LRT
BASE (BUSINESS-AS-USUAL)	**463,064**	**57,282**	**1,608,909**
GATEWAY			
SPRAWL	**516,951**	**125,475**	**1,872,028**
COMPACT	**529,385**	**120,373**	**1,909,952**
Change from SPRAWL	12,434	-5,102	37,923
Percent Change	2.41	-4.07	2.03
COMPACT + LRT	**464,119**	**113,710**	**1,714,618**
Change from SPRAWL	-52,832	-11,765	-157,410
Percent Change	-10.22	-9.38	-8.41

Compared to the SPRAWLED scenario, compact residential development will slightly increase (by approximately 2%) motorized traffic around the port and areas in the vicinity of the LRT lines. On the other hand, traffic in the vicinity of the airport will be reduced by approximately 4%. Further benefits can be attained when considering compact residential development along with the implementation of the LRT lines. The figures suggest a notable decrease in traffic on road links in the three investigated areas. Compared to the SPRAWL scenario, the COMPACT + LRT gateway scenario reduces traffic by approximately 10, 9 and 8 percent on roads in the vicinity of the port, airport and areas near LRT lines, respectively. As such, proper integrated land use and transportation planning is vital for reducing traffic congestion in these areas where infrastructure projects (gateway development and LRT lines) are likely to take place in the city.

5

A Vision of Hamilton as a Gateway City

In this chapter, a vision of Hamilton as a gateway city is developed, bearing in mind the results of Chapter 4. Being a gateway implies that Hamilton takes a larger role in regional goods movement, both inbound and outbound. Furthermore, Hamilton as a gateway city would facilitate increased levels of passenger movement, both within the City, and through it. In order to meet objectives, gateway development should create growth in the local economy, and improve the environment, both at a local and regional level. But a multi-faceted approach is necessary, allowing for a more flexible course and the incorporation of information as it becomes available. Developments in Hamilton ideally should be planned intelligently, and with caution, always considering potential economic and environmental costs and benefits.

5.1 Developments at the Port of Hamilton

The Port of Hamilton is of key importance to developing the City into a gateway and is already vital to Hamilton's economy, primarily for its role as importer of input materials for the steel Industry. For gateway purposes, the port must expand its traditional role to include more diversified goods movements, for both import and export. Although this expanded role depends to some degree on the decisions of other firms, there is a good deal that can be done by the Port of Hamilton itself, including: attracting appropriate firms to the port; facilitating container movements and intermodalism;

redeveloping port lands and brownfields for transportation and logistics uses; and forming partnerships and alliances with other ports and transport firms. The Port of Hamilton is depicted in Exhibit 5.1 below.

Exhibit 5.1: The Port of Hamilton

The Port of Hamilton has created a Land Use Plan which details planned developments and redevelopments of port lands. The Land Use Plan is available from the Port of Hamilton website: www.hamiltonport.ca. Although the Land Use Plan is not primarily concerned with Hamilton's role as a gateway, it calls for actions that are mainly in line with the gateway vision. In particular, it identifies several areas where transportation and logistics related activities can be emphasized, notably Pier 15, Pier 22, and Piers 26 and 27. Pier 15 is located at the north end of Sherman Avenue, and is identified in the Land Use Plan as "the largest long-term development opportunity for the HPA on the southern edge of the Port." There are available acres of land at Pier 15, which may be bolstered in the future by the 'capping' of Randle Reef by 2018. Although transportation and logistics uses requiring water access will be emphasized on Pier 15, there is also space away from the waterfront which will be available for warehousing, industrial use, and business park or office use. Pier 15 clearly offers an opportunity for the development of intermodal logistics facilities that could serve the needs of the Hamilton Gateway. In general, all port locations are well served by road, rail, and marine infrastructure, making them natural choices for multi-modal operations.

Pier 22 has recently been acquired by the HPA, and is slated for major developments, including a new wharf and terminal operations. As stated by former HPA President and CEO Keith Robson, "the proximity to our other property holdings strengthens the port's intermodal potential and supports our stated goal of transforming the Port of Hamilton into a major distribution centre for southwestern

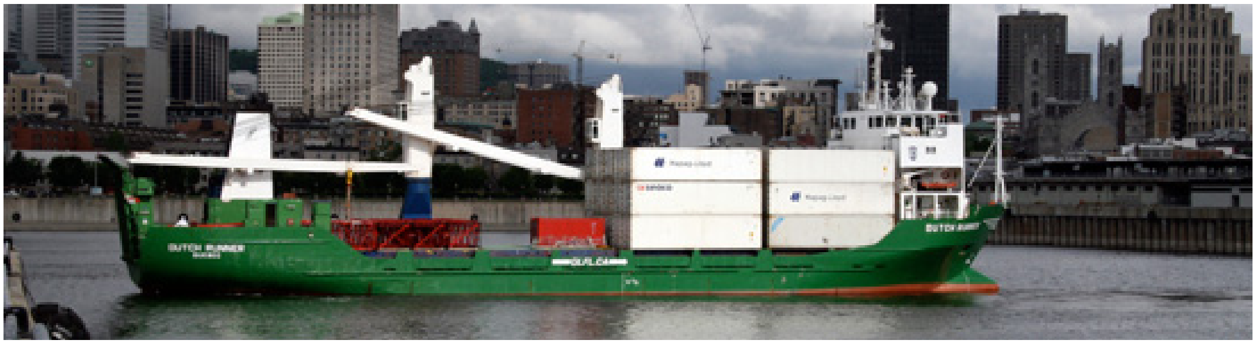
Ontario." (http://www.hamiltonport.ca/_pdf/2006/060830-StelcoLandP22.pdf). In particular, the 103 acre site is located near Piers 26 and 27, which form a part of "Eastport". These latter Piers have been identified by the HPA as areas for future development, including large scale inter-modal logistics uses such as a container terminal, and RoRo facilities. While Pier 22 is likely to host bulk operations, it is on Piers 26 and 27 (see Exhibit 5.2 below) where an initial, central container handling facility is recommended.

Exhibit 5.2: Proposed Container Terminal Location (shown in red)

Part of Pier 27 is currently being in-filled, and once this is complete, there will be ample room for the expansion of such a facility, as well as for container storage. It is important to note, however, that due to the mobile nature of ships and container handling equipment such as cranes, container logistics operations can be located in numerous areas of the port, while still functioning cohesively.

In April, 2008, Great Lakes Feeder Lines closed a deal on the purchase of Canada's first dedicated European style modern short sea shipping vessel 'Dutch Runner'. The ship has made her way to Canada where she began operations on the St. Lawrence and Great Lakes in May, 2008. The Dutch Runner is a Ro/Ro - Lo/Lo, double skin, single deck, fully fitted container vessel with its own cranes, and with a stern ramp leading to the weather deck. She is ice class 1D and has a deadweight capacity of 3.056 metric tons and a total container capacity of 221 TEU's. The ship, pictured in Exhibit 5.3 below, is an example of the self-loading vessels that will be seen in the Port of Hamilton in the early stages of the containerization process. Vessels of this kind represent a great opportunity for the Port of Hamilton to capitalize on its existing infrastructure.

Exhibit 5.3: The Dutch Runner Self-loading Great Lakes Container Vessel



While port lands are primarily located to the North of Burlington Street; the Burlington Street corridor itself is ripe with brownfields and underutilized lands that are not owned by the Port of Hamilton. This provides another set of areas within close proximity to the Port that can be developed for container handling, or for industrial uses which would see outbound shipping from the Port increase.

The vision of the Hamilton Gateway begins with the expansion of intermodal logistics facilities at the Port of Hamilton. These will facilitate a higher level of goods movement both in and out of Hamilton, for a more diverse set of goods than has been previously realized at the port. Furthermore, transport and logistics land-uses at the port represent an alternative to the heavy industrial sector that currently dominates there. As exemplified by the acquisition of Pier 22 from U.S. Steel Canada (Stelco) by the HPA, a loss of manufacturing land can translate into an opportunity for the transportation and logistics sector.

It is useful to consider the types of firms that would benefit the gateway by locating on or near port lands. In general, the desired firms would be involved in transportation and logistics, value added industrial processes, and other industrial processes which stimulate goods flows through the Port, both inbound and outbound. Exhibit 5.4 shows a breakdown of current land-uses at the Port of Hamilton. Of these land-uses, 'Warehouse/Storage' and 'Light Industry' might increase their presence under gateway development.

There has been a great deal of discussion regarding the establishment of a ferry service between Hamilton and Toronto. Such a service would increase the connectivity between the two cities, and help to diversify port operations. Furthermore, this would be an excellent way to further engage Hamiltonians with the port, and generally raise the port's profile. Another proposal has been to create a truck ferry for goods movement between Hamilton and Oswego, NY. This service would help to realize some of the goals of the gateway and would help raise the profile of the Port of Hamilton.

Exhibit 5.4: Current Land Use at the Port of Hamilton

Property Use	Property Count	Gross Acres
Residential < 1 acre	808	51.64
Residential/Structure > 1 ac	0	0.00
Utilities (Undevelopable)	44	458.17
Institutional	8	14.65
Office	12	15.59
Retail	115	77.89
Warehouse/Storage	27	72.66
Light Industry	24	30.63
Medium Industry	263	798.82
Heavy Industry	32	2013.54
Farm with Retail/Industrial Uses	0	0.00
Parking Lots	11	17.34

(Source: Hamilton Economic Development)

Consider the inter-connectedness of distant places nowadays and how changes thousands of miles away might benefit the Port. In particular, changes to the Panama Canal may increase opportunity for Hamilton. At the canal, modifications to the toll structure and reservation system have reduced transit times. These advancements have been accompanied by physical improvements in the depth and straightness of the canal with the net result that tonnage through the canal has increased substantially, while the number of vessels using the canal has remained relatively constant. This expansion of the canal has allowed for greater access between Asian and East Coast North American markets. However, not all East Coast ports can handle these newer, larger vessels. There is thus an increasing need for transshipment from Caribbean or larger East Coast ports to smaller vessels capable of navigating the inland waterways of the North American subcontinent such as the St Lawrence Seaway. Halifax is trying to position itself to take advantage of this trend, which might well tie in nicely with the possibility of short-sea shipping to Hamilton and then further distribution to South West Ontario and the GTA. This type of bigger picture thinking may prove beneficial for Hamilton. Chapter 4, of course, has outlined the potential significant environmental benefits of short-sea shipping.

5.2 Utilizing existing Industrial Parks and Lands

There are currently nine industrial (or business) parks in Hamilton. According to city plans, employment growth is to be further concentrated on these sites in the near future. Exhibit 5.5 shows the locations of Hamilton's business parks. The shaded hatched area in the southwest corner of Exhibit 5.5 denotes the suggested site of the Airport Employment Growth District. The remaining shaded areas mark the sites of Hamilton's existing business parks. Exhibit 5.6 gives a breakdown of the developable lands available in each business park, as tabulated by Hamilton Economic Development.

In general, the gross developable acres tally is a subset of the total acres and the dominant current property use of the GDA category is vacant land. Note that the Bayfront Industrial Area, which corresponds to the Port of Hamilton, is listed as having 55 developable acres of land available. This clearly does not account for lands which are available for re-development, such as the 103 acre Pier 22 acquisition by the Port. Similar logic applies to the West Hamilton Innovation district near McMaster which is currently being redeveloped and is shown above with zero GDA. Nevertheless, Exhibit 5.6 gives an idea of the capacity for growth existing within the boundaries of business parks, without the complications of redevelopment or zoning issues. In total, there are 2378 developable acres of business park lands in Hamilton. Of these, 1667 acres are located within the Ancaster, North Glanbrook, Airport and Mountain business parks, which all have the advantage of proximity to the Hamilton International Airport.

Exhibit 5.5: Hamilton's Business Parks

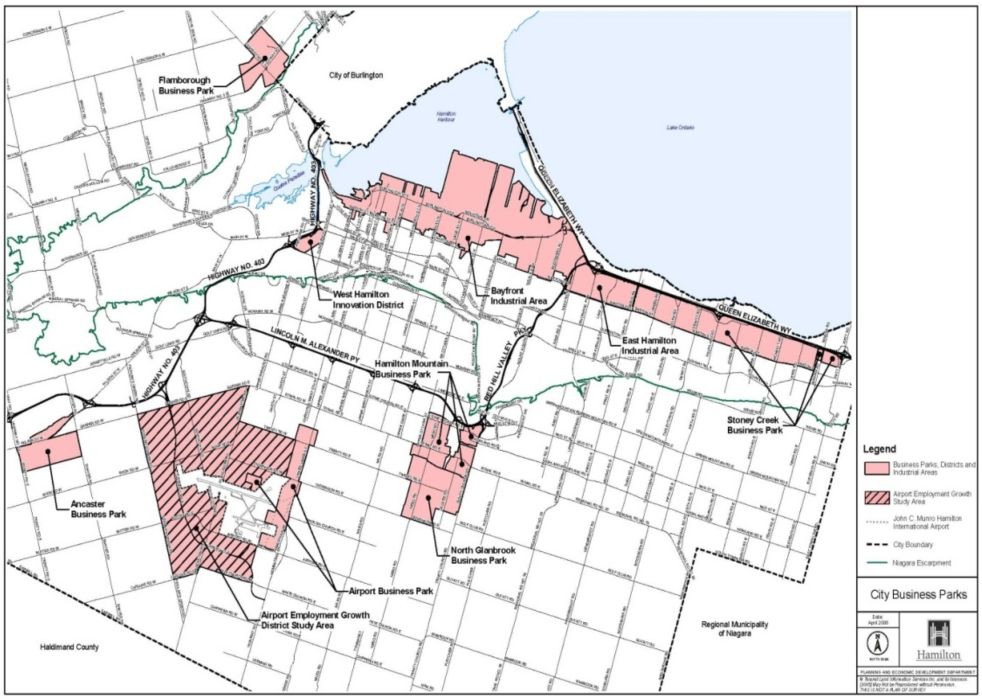


Exhibit 5.6: Hamilton Business Park Land Areas

Park	Total Acres	Gross Developable Acres
Flamborough Business Park	630	290
Ancaster Business Park	635	377
West Hamilton Innovation District	116	0
Airport Business Park	735	441
North Glanbrook Business Park	980	591
Hamilton Mountain Business Park	708	258
Bayfront Industrial Area (Port)	3713	55
East Hamilton Industrial Area	560	21
Stoney Creek Business Park	1694	345
Total	**9771**	**2378**

source: www.investinhamilton.ca

Exhibit 5.7: Employment Densities per Sector

Employment Type	Employment/Acre
Utilities	14
Construction	14
Manufacturing	17
Wholesale trade	10
Retail trade	33
Transportation and warehousing	10
Information and cultural industries	44
Finance and insurance	44
Real estate and rental and leasing	44
Professional, scientific and technical services	58
Management of companies and enterprises	44
Administrative and support, waste management and remediation services	44
Accommodation and food services	26
Other services (except public administration)	18
Public administration	26

Source: AEGD Land use report

The vision of the Hamilton Gateway supports the intensification of employment onto business park lands, whether through new developments of unoccupied land, or re-developments of occupied land. Any developments that do occur should make the best possible use of the lands available, in terms of providing quality infrastructure, and encouraging high employment densities. In order to attract the right kind of tenants, business parks should consider two key issues. First, business parks should provide tenants with high quality infrastructure, such as high speed internet access, and connections to the power grid. In addition, amenities such as restaurants and rest areas in the parks may also be an important element in attracting and retaining firms and their employees. Second, business parks should encourage the tenancy of firms from industry sectors that typically have high employment densities. Exhibit 5.7 above shows the employment densities associated with various industry sectors.

While intensification is important, it is also useful to keep in mind that space is already at a premium in some of the industrial parks and that there are examples of Hamilton being passed over by prospective firms, at least partially due to a lack of space. A final consideration for business parks is that they be well connected to each other, as well as population centres and other relevant city locations. This issue will be discussed in section 5.5.

5.3 Targeted Growth at the Hamilton Airport

Exhibit 5.5 above shows the location of the proposed Airport Employment Growth District (AEGD), surrounding the Hamilton International airport. Currently, the proposed 3000 acre area is not zoned for industrial use, which would be necessary in order for a business park to be created there. The re-zoning and creation of the proposed AEGD is actively opposed by several citizens' groups, namely Environment Hamilton, and Hamiltonians for Progressive Development. Several reports have been commissioned by the city to study and make recommendations on the AEGD.

A phased expansion of the lands surrounding the airport is recommended. This would allow for a concentrated development of industries which require proximity to the airport, while minimizing encroachments on environmentally sensitive lands. Consider also that there are 1,667 developable acres available in nearby existing business parks (namely Ancaster, North Glanbrook, Airport, and Mountain business parks), for specialized industrial uses that benefit from proximity to the airport. This airport expansion area will be referred to as the targeted airport employment growth district (TAEGD).

As with the Rickenbacker Air Industrial Park, and others mentioned in section 2.2, creative taxation and zoning policies can be used to encourage appropriate firm locations in the TAEGD. In particular, if the TAEGD could operate as a duty-free zone, then light industrial firms that perform value-added processes on foreign goods would have an incentive to locate there. The key consideration is to attract firms which will make excellent use of the airport resource, inducing more through-fare, and raising the profile of the TAEGD and the airport itself.

In addition to the TAEGD expansion, the vision includes an expansion of the role of the HIA as a passenger airport. Research in Chapter 2 has revealed that the largest multiplier effects associated with airports are achieved through large passenger counts, especially business-oriented passengers. Increasing passenger movements through the airport is thus, understandably, a goal of the HIA as per the HIA 2004 Master Plan. To a large extent, developments in this regard are dependent on the decisions of airlines such as WestJet and Air Canada. The recent elimination of Air Canada Jazz service to Hamilton, for example, was a blow.

Nevertheless, passenger movements through the airport could be facilitated through certain means. A light passenger rail line connecting the wider area, as well as Hamilton population centres, to the airport would help to make the HIA more accessible to potential customers. The HIA can take advantage of its 24 hour window of operations to offer evening and red-eye flights to both Canadian and foreign locations. Finally, an increase in amenities such as hotels and restaurants at the airport would help to better facilitate elevated passenger numbers.

5.4 Brownfield development

Brownfield development involves the development of previously developed, but subsequently cleared sites that have become vacant, derelict or contaminated. This term is derived from its undeveloped opposite, "greenfield land". The environmental restoration and development of brownfield sites serves to remove threats to the health of workers and residents in communities by improving the environmental quality of soil and ground water. Positive impacts are not limited to individual sites. Environmental restoration of individual sites can have a cumulative positive impact on the environment, including the protection of ground water resources, wetlands and wildlife habitat.

While the economic and environmental benefits of brownfield development are more obvious, it can also generate significant social benefits at the local level. Based on an analysis of a dozen brownfield projects across Canada, the National Roundtable on the Environment and the Economy concluded that brownfield development can be an engine for urban renewal. This renewal can take the form of neighbourhood, employment area and downtown revitalization, improved aesthetic quality of the urban environment, provision of affordable housing opportunities, creation of recreational and public open spaces, improved safety and security and an increased sense of community participation and civic pride.

Brownfield sites typically require preparatory regenerative work before any new development can go ahead. The City of Hamilton has a proactive approach here, where they offer numerous assistance grants to companies considering the development of such sites. The City's Economic Development and Real Estate Division operate the ERASE (Environmental Remediation and Site Enhancement) program. Through ERASE, the Study Grants Program (SGP) makes funding available whereby the City will pay for up to one-half the cost of a Phase II and/or a Phase III Environmental Site Assessment (Remedial Action Plan). The maximum City contribution per study is $15,000 to a maximum of two (2) studies and $20,000 per property. Redevelopment grants are also available to provide financial relief to property owners who undertake and complete brownfield redevelopment projects within the project area. These grants cover environmental remediation and environmental studies, demolition, and site preparation including construction/improvement of on-site public works. The Redevelopment Grants Program (RGP) is only payable on brownfield properties where the redevelopment results in an increase in assessed value and property taxes.

The City's Tax Assistance Program (TAP) provides a financial incentive in the form of a freeze or cancellation of part of the educational tax portion on a brownfield property. Under the TAP, the Province of Ontario may match the municipal tax treatment for the education portion of the property tax that results from remediation and rehabilitation of the property and is paid on annual basis for up to 3 years, commencing once the redevelopment is complete. The Economic Development Division administers this program.

The Municipal Acquisition and Partnership Program (MAPP) is a program of City property acquisition, investment and involvement in pilot projects with the private sector to clean up and redevelop brownfield sites. Pilot projects can showcase the use of innovative tools such as new environmental remediation technologies. Another City program available for brownfield developers is the Development Charge Reduction Program (DCR). Once an application has been approved under the ERASE redevelopment grant program, the developer has the option of applying the costs of environmental remediation on that property against development charges payable for that property (after any demolition charge credits are applied). If the applicant chooses to exercise this option, the costs of environmental remediation applied against development charges payable will be deducted from eligible costs under the ERASE RGP.

The City offers a variety of services to aid in the site selection process. Hamilton Economic Development already has an online mechanism in place to support the site search process. This tool allows companies to search a database of industrial, commercial, agricultural and investment lands as well as properties. Searches can also be specified to include desired square footage of properties and whether the site is for sale or lease. Such a tool could be easily adapted to identify brownfield sites, thus facilitating their identification and redevelopment.

The Hamilton Gateway should feature intensified use of brownfield sites, and increased incentives for firms to develop the sites. Significant employment intensification on brownfields near the Burlington Street corridor is desirable in order to bolster gateway operations at the port.

5.5 Increased Connectivity between Employment Hubs

In order to create a successful gateway, complimentary land uses must be well connected. In particular, employment areas such as business parks should be connected to each other, and to population centres, via a variety of high quality modes. Currently, the main connection between business parks is the road network. Rail lines and ships service the port area, while the airport provides a natural high speed connection with numerous national and international points. A major goal of the gateway is to strengthen and intensify the connections which already exist in Hamilton. In this way, goods can arrive by any given mode, be moved within Hamilton for further handling or value added processing, and finally be moved out of the Hamilton gateway via the most convenient mode. The more seamless and efficient this set of connections becomes, the more effective Hamilton becomes as a gateway for goods movement. In addition to goods movement, however, the gateway should provide for efficient, comfortable and environmentally sound means of moving people. This will be discussed in the following section.

5.6 Expanding the Role of Public Transport

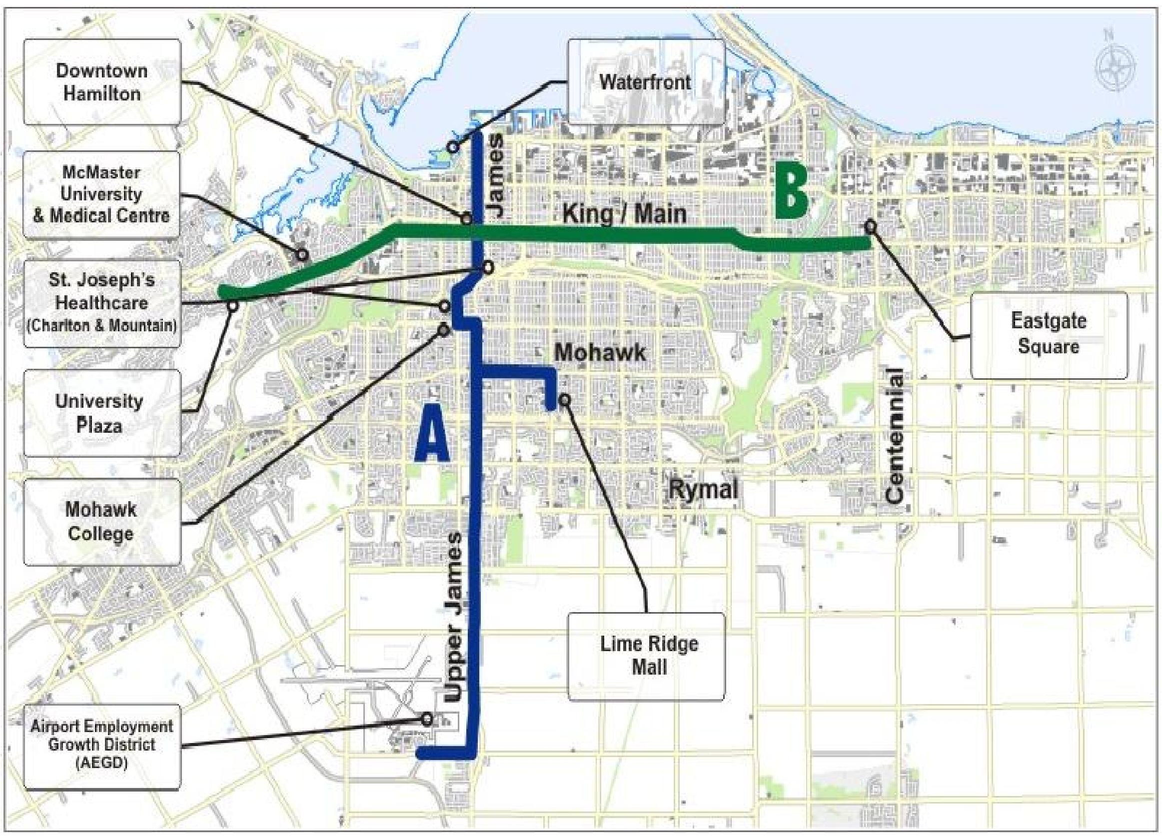
One key element of gateway development is the efficient movement of people. This includes movements within the city, as well as through it. Congestion not only has negative environmental ramifications, but can disrupt the flow of goods and by extension the operations of the gateway. People are required as employees at various points in the gateway, and public transit can be used to facilitate this need, in an environmentally friendly and stress free manner. Connecting Hamilton to the wider region with public transit will also help to open up the Hamilton market to a wider consumer base. As a particular example, having a passenger rail connection from the Greater Golden Horseshoe directly to Hamilton International Airport would increase the accessibility of the airport to a large pool of potential customers.

Metrolinx has put forth several possible plans for passenger rail connections throughout the area (Exhibit 5.9 and Exhibit 5.10). Ideally passenger rail should connect all of the major points between Niagara Falls and Oshawa along with a local level Light Rail Transit (LRT) system providing passenger connectivity within Hamilton.

Exhibit 5.8 shows a possible configuration of LRT routes through the City of Hamilton. The major goal of such a system would be to connect employment, shopping and recreational land uses with residential areas, improving personal mobility and the sustainability of the transport network. Aside from connecting land-uses, a LRT system will also begin to change land-uses, for instance intensifying retail activity at certain nodes. Several cities which have experienced extremely successful LRT implementations include: Portland, Oregon; Minneapolis, Minnesota; and Calgary, Alberta.

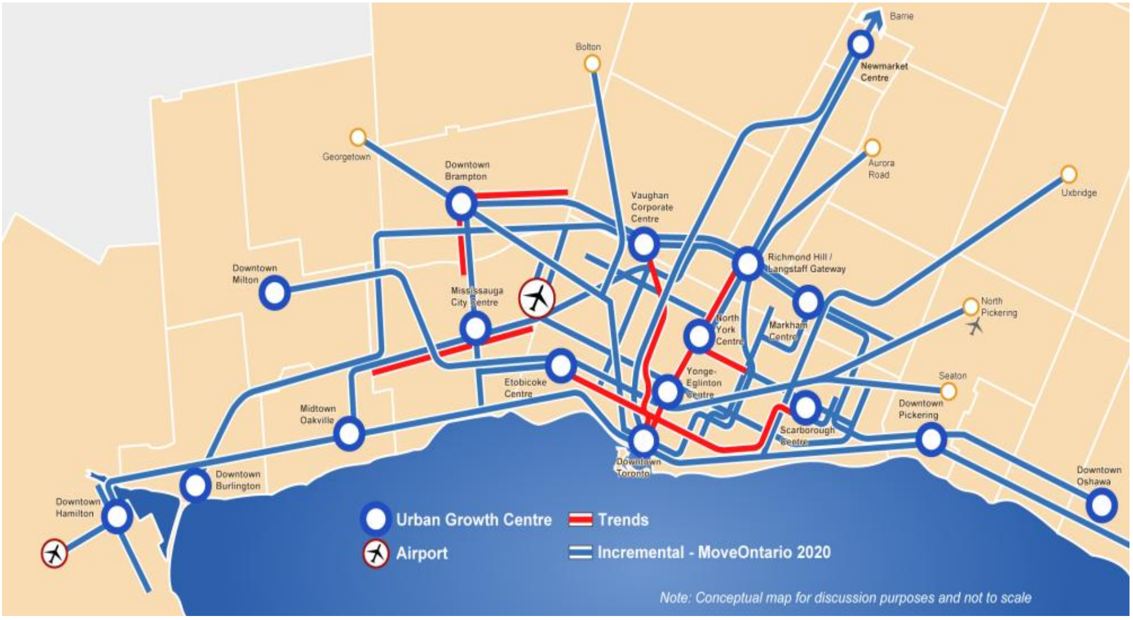
Exhibit 5.8 clearly shows that the focal point for the proposed LRT system would be King and James Streets which is the very centre of Hamilton's core. It would be beneficial for the city to have the focal point at this location as it would encourage people to live downtown and would promote further developments in the urban core. This is central to the vision of a compact gateway city. From this focal point, a wide range of employment opportunities from McMaster to the airport to Eastgate square could be accessed with minimal effort and in a matter of minutes with minimal emissions.

Exhibit 5.8: Proposed Routes for LRT in Hamilton



Source: City of Hamilton, Rapid Transit Project

Exhibit 5.9: Transit Trends and Incremental Alternative



Source: Metrolinx Green Paper #7

Exhibit 5.10: Bold Transit Alternative

Source: Metrolinx Green Paper #7

5.7 Limiting Urban Sprawl

In order to pursue sustainable futures for Hamilton, urban sprawl must be constrained. This goal can be achieved through a mixture of smart planning and government participation. Specifically, urban sprawl can be limited through urban intensification and public transport. Urban intensification refers to the efficient use of urban residential areas. There need to be incentives to build and renovate in urbanized areas, as well as to live in them. Aside from zoning and taxation laws, one incentive for urban intensification is the presence of high quality public transport, such as the LRT systems discussed in the previous section. Here, public transport serves to increase the value of properties in its catchment area, which encourages higher density development.

While public transport can be used to encourage residential developments and intensification in desirable locations; it can equally be used to discourage undesirable urban sprawl in other locations. For instance, a major fear among environmentalists regarding business park expansions adjacent to the airport is that land prices will be driven up, and developers will be encouraged to build low density housing developments in the area. To avoid this, public transport and zoning laws are necessary. Public transport has the potential to make remote business parks such as these highly accessible to employees living in dense urban areas, which removes some of the pressure to build nearby housing. Of course, land speculation will still occur unless there are firm zoning laws in place to curb housing developments in the area.

In general, as part of the gateway vision, policies of urban intensification and smart public transport planning are recommended as a means of curbing urban sprawl. Such policies lead to efficiencies in the movement of people and reductions in traffic congestion.

5.8 Creation of a transport-focused gateway organization

Hamilton has the infrastructure, demographic base, geographic location and the economic drive to become a transportation gateway for the Southern Ontario region and beyond. These strengths alone may not suffice in enticing new firms to locate here. The creation of such an organization would be an invaluable medium through which the city could be promoted and advertised. Such a group would operate with the sole goal of fulfilling Hamilton's objective of becoming a multimodal transportation gateway. The entity would also develop initiatives to improve on the aforementioned strengths.

Such a body would promote brownfield sites and market them for redevelopment, as the City of Hamilton Economic Development already does. The organization would provide transportation and logistics solutions to prospective tenants. Other initiatives could include the facilitation of employee searching on behalf of prospective tenants. Another role would be to identify corporate targets with logistics operations and directly inform them about Hamilton's strengths. The group would partner with City of Hamilton Economic Development and tap into their experience in marketing the city and running informational and promotional events. In September 2007, U.S. based Site Selection Magazine rated the City of Hamilton as the 5th best location in Canada for investing and growing a business. Facts like this would be broadcast by this gateway organization.

The group might partner with MITL or the city/province's transportation departments to determine critical elements of the transportation system needed for new investments. The group would also develop relationships with other ports and cities to promote cooperative seamless logistics systems between Hamilton and its global and regional trading partners.

The reader is referred back to the case study for Kansas City in Chapter 2 to learn more about this type of organization and how it benefits that region. One of the main themes from Kansas City SmartPort is that of partnership. As was noted, SmartPort is a private, non-profit organization with wide representation. Whether it is public or private is probably less significant than the latter point about representation. The board of directors has over twenty members from private and public sources. There is representation from competing firms for example. In the context of Hamilton, there may be questions about critical mass as it relates to such an organization. Given this argument, and also the economic interconnectedness of Hamilton with the GTA and Southern Ontario, it could be that the Southern Ontario Gateway Council is the closest analogy to SmartPort. If so, it could be that Hamilton's gateway interests might be well-represented through this existing forum.

5.9 Marketing Hamilton and the Gateway Concept

Although it is peripheral to the gateway itself, the role of advertising in making the gateway successful cannot be ignored. One major goal of the gateway is to attract new and appropriate firms, investors and customers to Hamilton to take advantage of an efficient and well planned intermodal goods movement system. In order to do this, these firms, investors and customers must be well aware of the assets which the Hamilton gateway provides. This affirms the need for advertising, and targeted advertising. The approach should be wide reaching, with some advertising simply promoting Hamilton as a good place to do business and live, and other advertising directly targeting customers and businesses that could make use of Hamilton's goods movement system.

A related theme is Hamilton's industrial image and the fact that thousands of people pass through Hamilton at its tangent via the QEW without ever visiting Hamilton proper. One recent report (IBI, 2005) pointed out that the vast majority of trucked goods passes through Hamilton via the QEW without stopping. No doubt something similar happens with the general public not residing in Hamilton. The strong visual images of heavy industry that are formed in the minds of these passersby are not easily replaced with something more representative of Hamilton. Addressing the issue at its source through any permissible tactics of beautification or diversion could be extremely helpful for Hamilton's image in the long run.

Returning to the more general theme of marketing, consider an interesting case study from Oakland, California. A recent article by Neil Everson (Panorama magazine, winter 2008) reports on the city's success in advertising itself to the business community. In 2001, Oakland business, community and government leaders launched a marketing campaign with five specific goals:

1. Enhance Oakland's profile as a great city for business;
2. Transform the perception of Oakland as more of a working class city than a world class city;

3. Generate a positive buzz;
4. Get the attention of CEOs, site selectors, and the business community at large;
5. Generate new business leads.

The marketing campaign helped to increase Oakland's role in the regional economy, and resulted in numerous enquiries for information about the city, as well as a good deal of positive media coverage. This lesson from Oakland should not be lost on Hamilton, which occupies a relatively similar regional position. That is, both Hamilton and Oakland are excellent locations for business development, although they are somewhat overshadowed by a large neighboring city (Toronto and San Francisco, respectively), and have a reputation as "working class" towns.

A key element of the steering body will be advertising Hamilton and the gateway along similar lines as the Oakland campaign. Included in the advertising campaign should be news-paper ads (particularly in the Globe & Mail), a website, and a presence at conferences and meetings relating to goods movement and business.

Conclusions and Recommendations

Prior to presenting a set of concrete recommendations, intended to guide Hamilton toward the goal of sustainable regional goods-movement gateway, some conclusions resulting from this investigation are considered. These help both to sum up the investigation, as well as to better create a context in which to view the recommendations. Overall, Hamilton Gateway development can be a key enabler on the path to sustainable growth.

6.1 Conclusions

6.1.1 General Conclusions

As discussed in Chapters 3 and 4, Hamilton is already a significant economic player on a national and regional scale. In fact, the Hamilton Economic Region (which includes Burlington, the Niagara Peninsula, Brantford and some smaller centres) accounts for a larger portion of Canada's overall GDP than the economies of Saskatchewan, Manitoba, Nova Scotia, New Brunswick, PEI, or Newfoundland and Labrador. This point is often overlooked, due to Hamilton's proximity to the Greater Toronto Area, which is the best-developed economic region in Canada. That being said, Hamilton has not reached its full potential from a goods movement perspective, nor from a sustainability, or economic development perspective. With regard to Hamilton gateway development, one overarching conclusion is the need for a holistic approach, which balances and harmonizes economic growth, population growth, infrastructure investments, and sustainable practices. Economic, environmental and social goals can and should be given simultaneous strong weightings.

Now is the time to act towards the vision of a Hamilton Gateway. There is currently a rare opportunity, given the recessionary economic environment, where varying levels of government are eager to invest in infrastructure. In the recent federal budget, there was no specific mention of a Hamilton project in the infrastructure context, while the CentrePort infrastructure development in Winnipeg was identified as a high priority. Hamilton has an opportunity to use, for example, the federal *Building Canada* initiative to undertake local infrastructure projects that will have regional implications. There is fertile ground to cover here whether it relates to intermodal developments at the Port of Hamilton, or the John C. Munro International Airport, or the proposed Light Rail Transit development through the core of the city, among other possibilities.

6.1.2 Conclusions from Regional Level Modelling

In many ways, the analytical Chapter 4 forms the foundation of this report. In particular, the regional level analysis is extremely useful for scientifically quantifying the economic impacts of potential gateway scenarios. Some of the key results are:

- A higher growth scenario assumes the creation of 59,500 jobs in Hamilton directly and indirectly associated with gateway developments. 35,000 of these are direct and 24,500 are indirect. Under this scenario, the regional model forecasts an incremental boost in GDP of $4.8 Billion for the Hamilton Economic Region.

- Under this same scenario, Canada as a whole would receive a boost of approximately $10 billion dollars from gateway developments centred in Hamilton. The province of Ontario, including the Hamilton Economic Region, retains about 80% of this GDP increase.

- Employment growth targeting specific industrial sectors (e.g. airport-oriented, port-oriented) can have an impact on local, regional and even national economies. The modelling frameworks explored in this report can facilitate these types of targeted scenarios and assist in the understanding of their differential impacts.

- With respect to inter-regional goods movement to and from Hamilton, it was found that gateway development would increase emissions along shipping corridors by approximately 9% in the 35,000 job scenario. However, diverting goods currently moved by truck, to water borne modes, has a significant impact on regional level emissions and could offset much of this emissions increase. In particular, if the tonnage share of short-sea shipping increased from a very low 1% to an also low 5% about half of the emissions increase would be offset. Higher market shares could result in further reductions.

6.1.3 Conclusions from Local Level Modelling

With regard to the local level impacts of gateway developments, here are some of the important findings as determined from IMULATE which is an Integrated Urban Model customized for the Hamilton CMA:

- When compared to the business-as-usual future growth in population and employment, gateway development will produce favourable environmental and traffic outcomes in the period 2011 – 2031. Such outcomes are dependent on compact residential development patterns and enhanced transit level of service via light rail (LRT).
- Under the compact development and LRT approach scenario, automobile commuting levels as depicted by indicators such as vehicle kilometers traveled (VKT) and vehicle minutes traveled (VMT) would be approximately 11 and 34 percent less than under the Gateway-Sprawl scenario.
- If the Gateway-Sprawl scenario is compared to the Gateway-Compact+LRT scenario, the latter is associated with emission levels that are 35, 23, 16 and 12 percent less for HC, CO, NO_x and particulate matters by 2031.
- Compact residential development and the LRT can lessen the dependence on the automobile for both work and school trips in Hamilton. The analysis suggests that transit ridership could increase from a 3% share to a 17% share for work trips and from a 35% share to a 40% share for school trips in the morning peak period. This will be accompanied by a similar decrease in auto dependency in that period and for the two types of trips.
- Locally, the implementation of the gateway can impact traffic, emissions and energy consumption in Hamilton. However, proper urban planning is the key to successful gateway development and the achievement of a more sustainable transportation system.

6.1.4 Conclusions from Gateway Case Studies

A number of existing Gateway projects and cities were examined in Chapter 2 and a summary was assembled at the end of that chapter. It was discovered that the best gateways in the world:

- place a lot of emphasis on being uncongested; which is good for the flow of goods and for the minimization of emissions;
- have developed new and effective transport-focused organizations;
- are effective at building consensus, partnerships and alliances involving the public and private sectors and other jurisdictions when required;
- are very good at self-promotion and creating a compelling value proposition to attract business;
- do not rest on their laurels even if they have significant locational advantages;

- have fully embraced containerization;
- do all of the “little” things well even as they maintain compelling visions.

6.2 Recommendations

As we have seen throughout this report, the Hamilton Gateway cannot be separated from city planning (land-use, transport, and residential development), environmental concerns, or national and global economic factors. As such, developing the Hamilton Gateway requires a multi-faceted approach. Based on the lessons learned from this report, the following are **recommendations** for developing Hamilton as a goods-movement gateway:

1. **Create a transport-focused gateway organization**

   In order to facilitate cooperation among stakeholders, as well as to co-ordinate gateway development, a dedicated organization should be created. Such an organization would help to brand the gateway and conceptualize Hamilton, in the minds of others, as a noteworthy transportation and logistics centre. A prototypical organization of this type is the Kansas City SmartPort (see Chapter 2) which has played a very active role in the development of that gateway. The existing Southern Ontario Gateway Council could evolve into the closest local analogy to the SmartPort example but currently is considered as more of an advocacy group.

2. **Pursue prudent residential and public transit development to accommodate gateway growth**

   Hamilton will need to accommodate significant residential growth in coming decades as it develops as a gateway. The future will be a more sustainable one if this development is core-oriented and not sprawl-oriented. Public transport improvements can be a strong contributor to such a vision and have numerous benefits to Hamilton as a whole. These improvements can directly benefit gateway development by reducing congestion, and creating better connectivity between employment lands and residential areas in the city. Furthermore, it is extremely desirable to increase access to the airport via public transport to benefit employees and passengers alike.

3. **Enhance Hamilton’s image through appropriate marketing**

   Hamilton is associated with colourful, stereotypical nicknames such as “Steeltown”. Heavy industry continues to be important to Hamilton but there is a need to effectively communicate that there is much more to this region. Marketing should be a main consideration of a transport-focused gateway organization (mentioned above). It is heartening to note that the promotion of Hamilton’s image is one of the priorities of the Jobs Prosperity Collaborative, which is a prominent local civic organization, as well as local government. Given Hamilton’s heavy industrial past, it is appropriate for this city to be a Canadian leader in the realm of enlightened gateway development. This, especially, would be a useful message to communicate.

4. Pursue targeted developments near the Airport

Industries which directly benefit from proximity to the airport should be encouraged to locate near it. In addition to the industrial park adjacent to the airport, greenfield development should proceed in phases and should be planned and zoned as soon as possible. Such a development would cater to possible future demand for space from specialized firms and will minimize the likelihood of Hamilton losing out to other jurisdictions in the competition for new firms. In line with recommendation #2, development near the airport should not be residential. Since the Glanbrook and Ancaster industrial parks are in close proximity to the airport, it will be important to maintain or improve access to them from the airport. Enhancing transit access would be beneficial in this regard.

5. Develop containerization facilities at the Port

As was learned from the study of existing gateways in Chapter 2, a primary gateway service is the handling of containers. To capture a greater share of regional goods flows, Hamilton should further develop its capacity for handling containers. Initially, containerization should focus on the port, as the port has space for such operations; access to water, rail, and roads; and already has a containerization precedent. Enhanced containerization will also tie in nicely to increased short-sea shipping via the St. Lawrence Seaway.

6. Pursue Intensified use of Hamilton's business parks

Hamilton's existing business parks provide an excellent medium for new business growth. Ideally, industries with high employment densities should be sought to develop on them as intensification is a strong theme of this report. Such industries will promote the greatest multiplier effects throughout the local economy.

7. Emphasize brownfield development

Hamilton has a large number of brownfields (unused industrial properties). This reality presents an opportunity to combine environmental remediation with economic development. In particular, the brownfields bordering the port lands are well placed to host value added services to goods moving through the gateway and may assist in promoting greater outbound shipping. While it may be true that brownfields are a "tougher sell", the core-oriented vision advocated in this report may well increase the attractiveness of such sites over time. The developing McMaster Innovation Park is an important example of a desirable transition.

8. Adopt sound taxation and regulatory policies to benefit the Gateway

A number of tax and regulatory policies could assist gateway development and guide it in the direction consistent with the vision of this report. These include the formation of duty free zones, where value added processes can be applied to imported goods. Such zones are very popular in the United States and can be adopted here. There may be issues at the federal level which need to be resolved in this regard as there is no exact current parallel to the U.S. model of the free trade zone. With regard to other policies, reductions in tariffs and duties associated with short-sea shipping would benefit gateway development. The removal of regulatory barriers that hamper some modes needs to be addressed.

9. Develop required human capital

An efficient gateway will require appropriately skilled labour. Steps can be taken locally to develop this pool of labour. Programs could be developed at local educational institutions which are tailored to the needs of gateway development. The idea that transportation and logistics oriented careers are particularly well-suited to Hamilton's needs is a message that needs to be communicated. The establishment of the MITL, at McMaster University, is one step in this direction as the Institute provides a focal point where the gateway-oriented interests of the private sector, government and academia can converge. There is also the possibility of spinoff training programs in transportation and logistics. On a related theme, Hamilton must retain and attract young people to help stem the tide of an aging population.

10. Continue to maintain and improve Hamilton's existing transport infrastructure

Considerable recent progress has been made with respect to infrastructure. The recent completion of the Red Hill Creek Parkway and the Highway 6 south extension are examples. It will be important in the future for Hamilton to be relatively uncongested to permit the free-flow movement of goods and people. The absence of congestion can serve as a strong competitive advantage given Hamilton's excellent strategic location. Good maintenance of current infrastructure and a commitment to further improvements are thus very important to the future of the Hamilton Gateway.

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Appendix

Exhibit 8.1: Commodities of the Multi-regional Input-output Model

Exhibit 8.2: Commodities of the Multi-regional Input-output Model

Exhibit 8.3: Commodities of the Multi-regional Input-output Model

Exhibit 8.4: Sprawl Scenario Volumes Minus Compact/LRT Scenario Volumes (2031)

Exhibit 8.5: Commodities of the Multi-regional Input-output Model

Commodity Name	
Grains	Goods
Other agricultural products	Goods
Forestry products	Goods
Fish, seafood and trapping products	Goods
Metal ores and concentrates	Goods
Mineral fuels	Goods
Non-metallic minerals	Goods
Services incidental to mining	Services
Meat, fish and dairy products	Goods
Fruit, vegetables and other food products, feeds	Goods
Soft drinks and alcoholic beverages	Goods
Tobacco and tobacco products	Goods
Leather, rubber and plastic products	Goods
Textile products	Goods
Hosiery, clothing and accessories	Goods
Lumber and wood products	Goods
Furniture and fixtures	Goods
Wood pulp, paper and paper products	Goods
Printing and publishing	Goods
Primary metal products	Goods
Other metal products	Goods
Machinery and equipment	Goods
Motor vehicles, other transport equipment and parts	Goods
Electrical, electronic and communications products	Goods
Non-metallic mineral products	Goods
Petroleum and coal products	Goods
Chemicals, pharmaceuticals and chemical products	Goods
Other manufactured products	Goods
Repair construction	Services
Transportation and storage	Services
Communications services	Services
Other utilities	Services
Wholesaling margins	Services
Retailing margins	Services
Other finance, insurance and real estate services	Services
Business and computer services	Services
Private education services	Services
Health and social services	Services
Accommodation services and meals	Services
Other services	Services
Transportation margins	Services
Operating, office, cafeteria and laboratory supplies	Goods
Travel and entertainment, advertising and promotion	Services

Exhibit 8.6: Final Demand by Commodity by Scenario (2031)

	Scenarios						
Commodity	**base**	**10k**	**15k**	**20k**	**25k**	**30k**	**35k**
Grains	-74.97	-74.97	-74.97	-74.97	-74.97	-74.97	-74.97
Other Agricultural Products	356.62	372.75	380.82	388.88	396.95	405.01	413.08
Forestry Products	-4.67	-4.80	-4.87	-4.94	-5.00	-5.07	-5.14
Fish, seafood and trapping products	-0.81	-0.85	-0.87	-0.89	-0.90	-0.92	-0.94
Metal ores and concentrates	11.64	11.64	11.64	11.64	11.64	11.64	11.64
Mineral fuels	-620.80	-620.80	-620.80	-620.80	-620.80	-620.80	-620.80
Non-metallic minerals	14.53	14.53	14.53	14.53	14.53	14.53	14.53
Services incidental to mining	26.18	26.18	26.18	26.18	26.18	26.18	26.18
Meat, fish and dairy products	1085.53	1134.63	1159.18	1183.73	1208.28	1232.82	1257.37
Fruits, vegetables and other food products, feeds	2362.34	2431.79	2466.52	2501.24	2535.97	2570.70	2605.42
Soft drinks and alcoholic beverages	362.49	378.72	386.83	394.95	403.06	411.18	419.29
Tobacco and tobacco products	103.30	106.90	108.70	110.50	112.30	114.10	115.90
Leather, rubber and plastic products	85.66	89.02	90.71	92.39	94.07	95.75	97.43
Textile products	11.31	11.81	12.06	12.31	12.56	12.81	13.06
Hosiery, clothing and accessories	119.61	125.01	127.72	130.42	133.13	135.83	138.54
Lumber and wood products	128.86	129.67	130.07	130.47	130.87	131.27	131.68
Furniture and fixtures	440.82	457.29	465.53	473.76	482.00	490.24	498.48
Wood pulp, paper and paper products	280.84	286.56	289.41	292.27	295.13	297.99	300.85
Printing and publishing	150.04	153.56	155.33	157.09	158.86	160.62	162.39
Primary metal products	-1.27	-1.29	-1.30	-1.31	-1.32	-1.33	-1.34
Other metal products	275.39	286.74	292.42	298.10	303.78	309.46	315.13
Machinery and equipment	362.70	387.41	399.77	412.13	424.48	436.84	449.20
Motor vehicles, other transport equipment and parts	4137.07	4228.41	4274.08	4319.75	4365.42	4411.09	4456.76
Electrical, electronic and communications products	159.61	166.33	169.68	173.04	176.40	179.75	183.11
Non-metallic mineral products	-3.32	-3.40	-3.45	-3.49	-3.54	-3.58	-3.63
Petroleum and coal products	104.28	106.64	107.82	108.99	110.17	111.35	112.53
Chemicals, pharmaceuticals and chemical products	-97.81	-99.48	-100.32	-101.16	-102.00	-102.84	-103.67
Other manufactured products	171.67	175.39	177.25	179.11	180.97	182.82	184.68
Repair construction	3.21	3.21	3.21	3.21	3.21	3.21	3.21
Transportation and storage	696.66	723.44	736.83	750.22	763.61	777.01	790.40
Communications services	434.38	451.67	460.31	468.95	477.60	486.24	494.89
Other utilities	594.58	615.01	625.23	635.45	645.67	655.89	666.11
Wholesaling margins	3275.87	3429.55	3506.38	3583.22	3660.06	3736.89	3813.73
Retailing margins	4226.57	4446.23	4556.06	4665.90	4775.73	4885.56	4995.39
Other finance, insurance and real estate services	4634.12	4801.05	4884.51	4967.98	5051.44	5134.90	5218.37
Business and computer services	1390.25	1419.19	1433.66	1448.13	1462.61	1477.08	1491.55
Private education services	597.68	623.91	637.02	650.13	663.24	676.35	689.46
Health and social services	1308.08	1367.25	1396.83	1426.41	1456.00	1485.58	1515.16
Accommodation services and meals	2254.64	2356.62	2407.61	2458.60	2509.59	2560.58	2611.57
Other services	2368.92	2465.36	2513.57	2561.79	2610.00	2658.22	2706.44
Transportation margins	442.52	459.05	467.31	475.58	483.84	492.11	500.37
Operating, office, cafeteria and laboratory supplies	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Travel and entertainment, advertising and promotion	4.64	4.85	4.95	5.06	5.16	5.27	5.37
Total	**32178.97**	**33441.77**	**34073.17**	**34704.56**	**35335.96**	**35967.36**	**36598.76**

Exhibit 8.7: % of Increased Economic Output Retained by Hamilton Economic Region (2031)

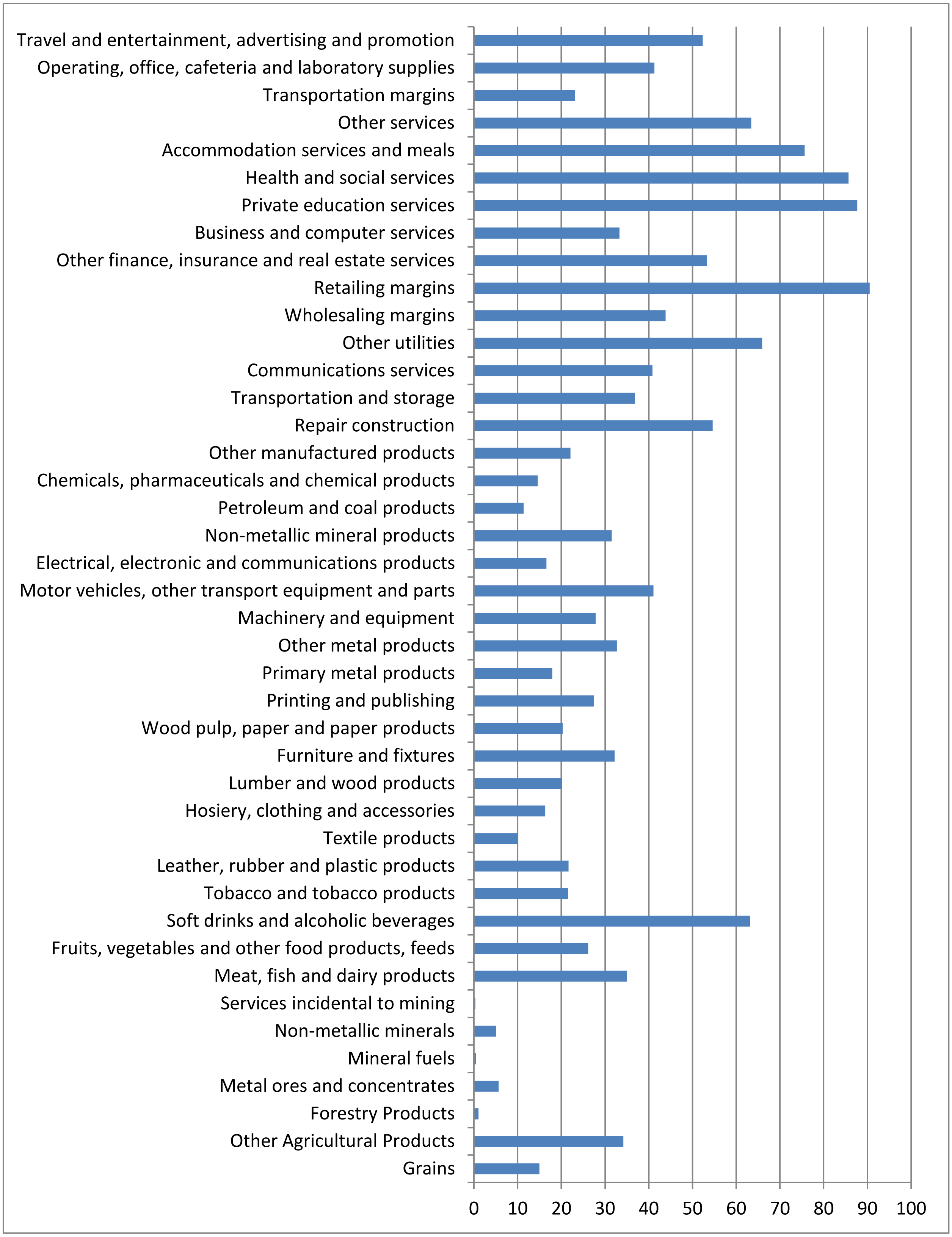
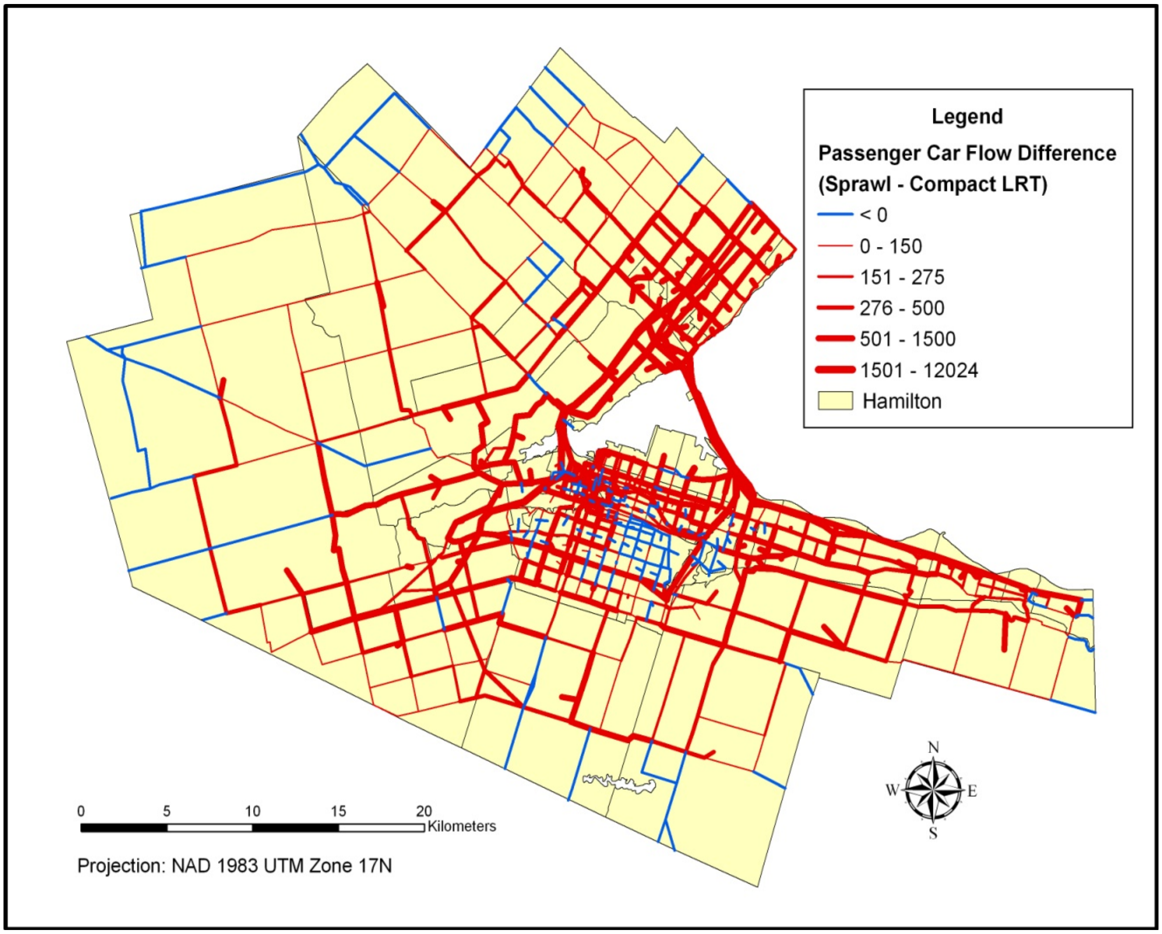


Exhibit 8.8: Sprawl Scenario Volumes Minus Compact/LRT Scenario Volumes (2031)



The red colour indicates that the passenger car traffic volume on a given link exceeds the passenger car volume that would apply were the Compact+LRT scenario in place. Note that for the vast majority of links, the sprawl scenario is associated with more traffic. In links coloured blue, the passenger car volume is higher for Compact+LRT. Largely this is due to more new dwellings in central locations than is the case with the sprawl scenario. There are some outlying links that are counter-intuitively blue. It is important to note that the volume differences in these cases are very small and are related to minor idiosyncrasies in how the traffic assignment algorithm assigns traffic to the links.