ECONOMIC IMPLICATIONS AND CONSEQUENCES OF POPULATION GROWTH, LAND USE TRENDS AND URBAN SPRAWL IN SOUTHERN ONTARIO

Final Report

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ABBREVIATIONS

a.k.a.	-	"also known as"
CD	-	Conventional Development (scenario)
CPI	-	Consumer Price Index
CVM	-	Contingent Valuation Method
DC	-	Development Charge
ECO	-	Environmental Commissioner of Ontario
ERT	-	(Ontario) Environmental Review Tribunal
GDP	-	Gross Domestic Product (a category of National Income Accounts)
GICs	-	Guaranteed Interest Certificates
GNP	-	Gross National Product
GPP	-	Gross Provincial Product
GTA	-	Greater Toronto Area
kt	-	Kilotonne = 1,000 metric tonnes
MG	-	Managed Growth (scenario)
MMAH	-	(Ontario) Ministry of Municipal Affairs and Housing
MNDM	-	(Ontario) Ministry of Northern Development and Mines
MNR	-	(Ontario) Ministry of Natural Resources
MPMP	-	Municipal Performance Management Program (of the MMAH)
MOEnv	-	(Ontario) Ministry of the Environment
NGO	-	Non-Governmental Organization
OMB	-	Ontario Municipal Board
p/k^2	-	Persons per square kilometer
RERC	-	(US) Real Estate Research Corporation
SUV	-	Sport Utility Vehicle
TIF	-	Tax Increment Financing (District)
VMT	-	Vehicle Miles Traveled
WTAC	-	Willingness to Accept Compensation
WTP	-	Willingness to Pay

1 RATIONALE AND PURPOSE

1.1 Land Use Planning and Development - Problems and Issues in Southern Ontario

Beginning even before the end of WWII, urbanization of the rural lands on the periphery of cities and metropolitan areas through the construction of residential subdivisions and commercial strip developments along highways became the conventional pattern for development in the US and Canada. These developments are characterized by vast tracts of low-density, often isolated, 1-2 floor single-family homes that were built on agricultural and pristine forest or open space lands. Construction firms were initially able to build housing subdivisions where-ever they could find cheap land. Host municipalities would often welcome these developments in anticipation of increased employment and tax rolls. These municipalities would then incur bond debt to pay for transportation, water, sewer and waste management infrastructure and raise taxes to pay off this debt.

The pattern, popularly referred to as urban sprawl, soon emerged in the periphery farming or rural open space areas around major growth centres of the nations. Much of the new residential construction consisted of isolated subdivisions located far from places of employment, retail shopping centers, schools, libraries and other urban amenities. New developments leapfrogged over existing ones ever farther from urban services and amenities. Because single-family homes on large lots dominated these developments, population densities were typically too low to support public transit and the curva-linear street patterns of these developments presented further barriers to efficient transit systems. Providing the transport, water, sewer, waste management, police, fire and educational services for these ever more sprawling and remote communities imposed mounting debt and tax commitments for the rural jurisdictions in which they were located.

Such remote, low-density residential "bedroom communities" could not have been established without the automobile and low-cost fuel to power it. The vast majority of the residents of these new developments thus spend more than an hour each day commuting to and from their workplaces, which were usually located in the central cities. The automobile or special purpose bus transport is required for any and all purposes and destinations away from the residents' homes.

This pattern of development has also dominated the major suburban areas around Toronto, Vancouver, Ottawa, Halifax, Quebec City and Montreal in Canada. By the year 2000, 24% of all (3,091) counties in the United States also evidenced residential development patterns typical of urban sprawl, which were expected to affect 13.1 million of the 23.5 million new households that were forecast for the period, 2000-2025 (Burchell and Mukherji, 2003).[1]

According to Miron (2003), the adverse effects and consequences of urban sprawl in the US were first broached in the social science and planning literature as early as the 1950's.[2] Since then a major body of academic, governmental and popular literature has arisen to document the problems and issues associated with these development patterns as well as proposed remedies to these problems. The Environmental Commissioner and his staff have contributed to this literature regarding land use planning issues, urban sprawl and conflicting priorities between population and economic growth versus environmental protection in Ontario (ECO 2005, 2007). Alleged problems and issues that are caused by, or at least associated with, urban sprawl include the following:

a) irreversible losses of forests, green space, wetlands, wildlife habitat, natural environments, open space and scenery,
b) loss of agricultural lands and their production,

c) increased traffic congestion and political pressures to build more roads,
d) increases in air pollution (mainly due to automobile emissions) and water pollution (mainly due to increases in sewage generation),
e) inefficiencies due to high costs of providing utilities, roads, highways and infrastructure to scattered, low density subdivisions and bedroom communities,
f) generation of "fiscal deficits" and rapidly increasing taxes for jurisdictions where infrastructure capital and servicing operating costs exceed the development charges paid by developers and additional tax revenues paid by property owners,
g) increased conflicts with rural businesses and land uses that are incompatible with residential areas, eg. rendering plants, livestock farming operations, abattoirs, stone and gravel quarries,[3]

In most areas that have experienced urban sprawl, municipal services and infrastructure would eventually catch up to the peripheral subdivisions as subsequent developments "in-filled" vacant spaces between the original subdivisions and shopping malls, schools, parks, offices and other types of land uses were constructed. However, awareness of and dissatisfaction with the magnitudes of the problems and losses that have been caused by urban sprawl have been growing among citizens, elected officials and environmental advocacy groups. Furthermore, municipalities have become more sophisticated in their dealings with developers and now impose site requirements on builders to provide all roads, utilities and other infrastructure elements within the subdivision as well as per-unit "development charges" to pay at least part of incremental costs of infrastructure and services that will be associated with new residential developments.

Consequently, State and provincial governments in the US and Canada have enacted a plethora of new planning legislation, amendments to existing statutes, regulations and policies purported to provide more direction and order to growth and changes in land use and to better protect natural environments, environmental quality and heritage parks and farm lands from conversion and degradation. At least 5 new land use planning statutes have been enacted and implemented since 2002, which have been summarized and critiqued by the Environmental Commissioner (2005, 2007). Major planning initiatives such as the 2005 Provincial Policy Statement regarding land use planning, the Niagara Escarpment Commission, the Green Belt, the Oak Ridges Moraine, the Greater Golden Horseshoe Plan and Ontario's Living Legacy have all been implemented within the past decade. However, as documented by the Environmental Commissioner's office, even these laudable initiatives are often unable to prevent, curtail or even modify developments that are destructive to local environments or financially disadvantageous to communities. More than 50 years of the conventional sprawl land use patterns and development trends and governmental policies to accommodate unlimited population and economic growth have created urban forms that now impose substantial financial, environmental and social burdens on municipalities and citizens, particularly those that are located in Southern Ontario.

Underlying these trends and their associated consequences are economic forces and institutions that help to drive them. People migrate from rural Canada and from other countries to Canadian cities in search of economic opportunities, employment and an improving quality of life. Growing populations demand more housing, transportation, food, education, health care and consumer goods, which are supplied by private businesses and various levels of government. Markets are the primary economic institutions wherein customers and suppliers meet, sometimes literally, but most often figuratively, to buy and sell products and services required for every-day living. When it comes to housing, transportation and all non-residential construction activities, land is a fundamental input. Because land is in fixed, finite supply, it quickly becomes scarce in desirable locations. Things that are scarce and desired become valuable, which is manifested by rising market prices in market economies. Where commodities such as land are inputs to the production or manufacture of other products and services, rising prices due to

scarcities translate into higher production costs and, eventually, higher prices for consumer goods and services. Where governments are suppliers of products and services, rising costs for labour and other key inputs translate to higher taxes and user fees.

These and other economic principles help to analyze and explain the actions and behaviours of groups and sectors who stand to gain or lose from land-use related markets and the statutory frameworks that are intended to regulate them. Understanding of the economic implications of land use policy choices and the economic incentive structures facing various stakeholders can help responsible public officials predict potential outcomes and ultimately make informed policy trade-offs and choices. The economic causes and implications of urban sprawl are thus the focus of this report.

1.2 Plan of Report

Definitions/characterizations of urban sprawl in North America are presented in the following Chapter together with a brief review of economic and population growth trends in Canada and Ontario over the past half century that have contributed to urban sprawl development patterns.

Key participants and stakeholders concerned with land use issues and markets and the economic incentive structures facing them are enumerated and discussed in Chapter 3. The "Development Industry" consists of firms and businesses directly involved in assembling and preparing lands for development projects as well as the construction of residential and non-residential structures and the suppliers of labour and materials for these purposes (eg. construction, real estate, building materials and equipment suppliers, lawyers and consultants, etc.). Governments, public sector institutions and non-government advocacy organizations (NGOs) are also important players in urban growth and development issues. The economic incentive structures facing each of these stakeholders are discussed in order to discern the innate rationality sprawl development behaviours. Determination of the directions (gains or losses) and magnitudes that investments or public policies are likely to impose on each stakeholder can enable forecasts of the likelihood and intensity of opposition or support. Understanding incentive structures can also help redesign policies designs, prepare strategies to manage controversies or defend a particular program.

Chapter 4 reveals how sprawl development is driven by forces and factors on both the demand and the supply sides of the post-war burgeoning housing market. The development "industry" argues that they are responding to the requirements and preferences of prospective home-buyers as well as owners of the commercial establishments that follow the new residential developments. It will be shown that many home buyers do indeed prefer the attributes and features that are offered by low density suburban homes that are located at the fringes of large metropolitan areas. However, the roles of development firms and related businesses, governments and other stakeholders will be examined to determine the extent to which suppliers of these products can influence the location, design and other aspects of subdivisions and commercial developments. The effects of local government planning tools and financial instruments used to pay for infrastructure and other municipal services on urban growth patterns will also be reviewed in this Chapter.

Researchers and commentators on urban affairs have long decried the adverse consequences of low-density sprawl type developments in terms of costs to host municipalities and the consumption of land in urbanization processes. In Chapter 5, alleged costs and other adverse effect associated with land uses that are characteristic of sprawl are enumerated and empirical evidence that have been used to support or dispute these allegations are presented. The role of sprawl also has its supporters who have postulated potential benefits associated with traditional sprawl developments. Evidence of these beneficial

characteristics are also reviewed in Chapter 5. Following these discussions of benefits and costs, a brief review of the proposed advantages of alternative, less expansive, more efficient and potentially more sustainable urban growth and development patterns that can equally satisfy expressed demands for new housing is presented. Difficulties and limitations associated with generating empirical evidence of both the adverse and beneficial economic effects of urban sprawl and of alternative urban designs are noted.

It has been alleged that builders and owners suburban developments and subdivisions do not always pay the full costs of providing the addition infrastructure and other municipal services associated with the growth they engender. Issues, data and information surrounding the financing of municipal infrastructure and service costs of growth and urbanization are presented in Chapter 6. In particular, the degree to which builders and owners of new residential and commercial properties pay their fair share of the costs of municipal infrastructure and other services is assessed to the extent permitted by available data. In addition, economic and planning distortions arising from governmental policies and programs are reviewed to determine how they might influence long term urban growth patterns.

Urban sprawl results in the conversion of agricultural lands and other types of open spaces including forests, parks, wood lots, conservation areas and wetlands to residential subdivisions and commercial plazas developments. Developers and their allies in and out of government argue that building housing estates, strip malls, industrial plants or mining/quarrying operations converts land to it "highest and best" use. "Highest and best" are normally determined by comparing the profits, jobs and tax revenues that are generated by a new development against the monetary revenues, profits jobs and taxes associated with the lands as farms, forests or parks. However, estimates of economic yields associated with farm lands, open spaces and natural ecosystems lands normally omit attributes and services that individuals and society as a whole regard as important benefits and are willing to pay positive sums to preserve and enhance. Consequently, the economic value and importance of open spaces and natural environments are under-stated, often by substantial amounts. Methods to estimate the economic values and importance associated with parks, natural environments such as wetlands and forests, agricultural lands and other types of open spaces are reviewed in Chapter 7. Empirical examples and case studies are summarized.

Key findings and conclusions of this review are summarized in Chapter 8 along with suggestions for further work concerning monitoring and data gathering and evaluations of the economic consequences of land use planning issues and decisions.

1.3 Scope, Limitations and Caveats

The geographical focus of this investigation and for empirical examples is Southern Ontario. However, data, examples and case studies will be cited from other jurisdictions as may be warranted and relevant to the topics being discussed.

Relevant quantitative data, examples and case studies from academic or government articles and reports are presented from the references that were reviewed in the course of this investigation. The references and empirical examples cited are limited by the time available for research. Time limitations have also prevented verification of the accuracy of the quantitative information cited. However, where figures or conclusions appear questionable, this point is noted.

Economic considerations, principles and analytical methods relevant to each of the topics articulated above will include one or more (but not necessarily all) of the following topics and issues

a) elaboration of the incentive structures faced by each of the key stakeholders where appropriate,

b) demand and supply characteristics of housing and other relevant markets,
c) estimates of the magnitudes and incidence of public and private costs and benefits associated with continued urban sprawl and alternative growth and development patterns,
d) external costs and adverse effects including those associated with construction of residential and commercial properties, use of automobiles and other vehicles, generation and distribution of electricity and petroleum fuels, developing and operating mining operations including sand, gravel and rock quarries, etc.
e) employment and economic multiplier effects associated with various activities associated with urban sprawl developments and industrial and commercial activities resulting from new construction on open spaces.
f) fiscal and taxation powers and practices of municipalities and restrictions on these powers and practices that are imposed by the province,
g) municipal expenditures and revenues associated with new residential and commercial developments,
h) empirical estimates of the quantities and monetary values associated with non-marketed services from open spaces and natural environments that are converted to residential, commercial and industrial purposes,
I) benefits, costs and other trade-offs associated with land use conversions from open spaces, agricultural land and natural environments such as wetlands and forests.

In addition, comments are provided concerning the measurement and monitoring of the economic issues or objectives associated with land use planning.

In the interests of brevity, detailed descriptions and discussions of methodologies and computational procedures used to generate estimates are omitted although potential uncertainties and ranges of errors are noted if provided in the relevant documentation. References are cited and copies of all digital documentation and references will be provided on disk.

Because of the wide range of linkages and interrelationships that urban sprawl shares with other components or participants in the provincial and national economies, the urge to pursue interesting digressions and subplots will be resisted.

All monetary values cited are in Canadian dollars unless otherwise noted.

At the end of each chapter, key findings and conclusion are summarized and recommendations for additional work are presented as warranted.

2 URBANIZATION, GROWTH TRENDS AND THE CONSEQUENCES OF URBAN SPRAWL

In the paragraphs below, defining characteristics of urban sprawl are presented together with the adverse and beneficial effects and consequences that various authorities allege are associated with this phenomenon. Demographic and economic trends that are either causes or effects of sprawl development patterns are enumerated in Section 2.2. Assessments based on data from the Ontario Ministry of Municipal Affairs and Housing Municipal Performance Measurement Program will be presented in Section 2.3.

2.1 Definitions, Characteristics and Consequences of Urban Sprawl

In their seminal review of the causes and consequences of urban sprawl in the U.S., *The Costs of Sprawl - Revisited*, Burchell *et al.* (1998) reference virtually the entire literature on urban sprawl in the US through 1998. Definitions and characteristics of urban sprawl cited in most of the articles and reports that were reviewed for this project are derived from Burchell *et al.* (1998).

Low population density, measured as some variant of persons per square kilometer (km^2), is a defining characteristic of sprawl (Burchell *et al.*, 1998). Formerly rural areas that surround all major metropolitan centres have much lower densities than core sections of the cities, which slowly increase as subsequent developments fill in vacant lands among initial subdivisions and commercial parks. Trends in population densities in Ontario and Canada are reviewed in Section 2.2

Additional characteristics of urban sprawl include (Burchell *et al.*, 1998):

a) developments, including residential subdivisions and commercial strip malls or regional shopping malls, expand in an unlimited and noncontiguous (leapfrog) manner,
b) land uses, including residential, commercial, shopping, schools, public buildings, are spatially segregated,
c) no regional or provincial authority for regional planning and coordination,
d) total reliance on the automobile or other motor vehicles for all transportation in and out of residential subdivisions and to and from work, shopping, schools and recreation,
e) use of prodigious amounts of agricultural lands, green spaces and environmentally sensitive areas,
f) fragmented governmental jurisdictions with little or no integrated land use planning and zoning (new subdivisions and commercial developments in rural counties, towns and villages tend to induce these jurisdictions to consolidate their authority rather than merge into larger, more efficient municipal entities),
g) great variance in local fiscal capacities for new infrastructure and local services required by new developments,
h) low income housing ill-served in suburban and exurban sprawl developments, which are aimed at middle to high income, single-family home buyers.

Burchell *et al.* (1998) summarize the linkages among these defining characteristics and both adverse and beneficial consequences and effects. They also assign judgmental weighting values ranging from 2 (a consensual, proportional linkage) through 0 (no linkage) to -2 (a consensual inverse or negative linkage), as can be seen in Tables 1 and 2.

Table 1 lists 27 different "negative" or adverse effects that have been alleged to be associated with sprawl development. These adverse effects can be considered to be costs because they represent losses or sacrifices, whether monetary or physical, tangible or psychic perceptions, that must be given up to obtain the benefits of the prevailing, sprawl type urban development patterns. Linkages between characteristics of sprawl and potential beneficial effects are summarized in Table 2. These alleged costs and beneficial aspects of sprawl shown in Tables 1 and 2 are listed under five broad categories:

a) public and private capital and operating costs and expenses,
b) costs related to transportation and travel,
c) use of various types of undeveloped lands including agricultural, forests, wetlands, sensitive environmental habitats and green spaces,
d) quality of life,
e) social issues.

Many of the descriptors of sprawl have been difficult to quantify in empirical assessments of their effects and consequences. Burchell *et al.* (1998) note that "Most analyses of sprawl focus too narrowly on only a few of its key aspects." It is also likely that data to quantify and characterize many of adverse and beneficial effects noted in Tables 1 and 2 would be difficult and costly to gather and actually relate to relevant characteristics of sprawl.

For example, the Ontario Municipal Performance and Accountability Project obtains cost data from municipalities that represent some of the cost items listed in Table 1. However, the Ministry of Municipal Affairs and Housing (MMAH) does not, to this author's knowledge, collect data on most of the above-noted characteristics of sprawl. MMAH collects and reports only two measures that are directly concerned with land use:

a) the percentage of new lots, blocks and/or units with final approval and which are located within settlement areas,
b) the percentage of land designated for agricultural purposes, which was not re-designated for other uses during previous periods of time.

It is conceivable that additional data could be collected by MMAH or that available data could be adjusted to better represent sprawl characteristics or some of the adverse effect indicators.

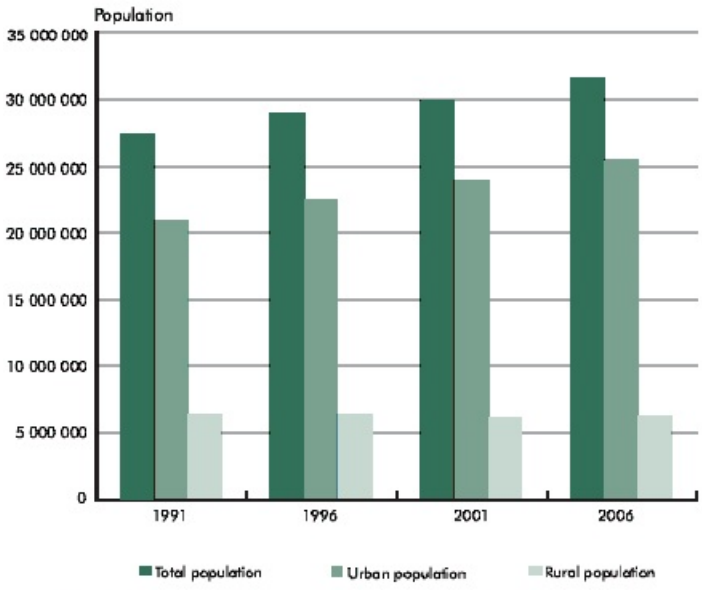
Note that some of the beneficial effects listed in Table 2 are the converse of certain cost indicators. This implies that there is no consensus among authorities as to whether prevailing development patterns constitute a problem or that some of the adverse effects listed in Table 1 even exist. More will be said of these uncertainties in subsequent Chapters.

2.2 Economic and Population Growth Trends that Contribute to Sprawl

Various economic and demographic indicators that will be cited in this section are associated with the causes of sprawl or they may be indicative of some of the effects of sprawl. Of particular concern in this report are the indicators of the economic forces that drive or otherwise influence urban sprawl.

Key driving forces of urban growth have been, and continue to be, population and non-farm economic growth. Population growth for Canada and Ontario from 1901 to 2007 is summarized in Table 3. From 1901 to 1951, Ontario's population doubled to 4.6 million. During the last half of the 20th century, population in Ontario had increased by 160% to 11.9 million in 2001. By 2007, 12.8 million people lived

Figure 2-1
Total, urban and rural population, Canada, 1991 to 2006



Source: Statistics Canada. n.d. CANSIM 153-0037. In: Statistics Canada. 2007 Canadian Environmental Sustainability Indicators: Socio-economic Information. Catalogue no. 16-253-XWE. Ottawa, Ontario.

Ontario. Between 1991 and 2007, Canada's population grew by 17.6%. While Canada's overall population density is low, total populations and population densities of urban centres have grown steadily over the 20th and into the 21st Centuries. As can be seen in Figure 2-1, urban populations increased by 21% between 1991 and 2007 while rural populations decreased by 2%. In 1996, 83.3% of the total Ontario population lived in urban centres with 100,000 or more persons implying that nearly all of the population growth of the past 50 years has taken place in and around cities (Statistics Canada, June 2000). In fact, more than 90% of all Canadians live in a relatively narrow band along the southern border with the US (Statistics Canada, February 2001). As in other provinces, urbanization in Ontario has been concentrated in the South.

Population growth in Canada and Ontario has been characterized by steady net migrations from farms and rural areas to the cities during the first half of the 20th Century. While this internal migration has declined in the face of falling fertility rates among Canadians of European extraction, immigration from outside Canada has fed continued high rates of growth in the major Canadian urban centres, Toronto, Montreal, Vancouver and, during the first 7 years of this century, Calgary and Edmonton, and in the rural areas surround these cities (Malenfant, Millan, Charron and Belanger, April 2007).

Indeed, recent Statistics Canada data have revealed that non-caucasian ("visible minorities") immigrants and their progeny now constitute nearly 43% of all Greater Toronto Area residents. In Markham and Brampton, "bedroom" municipalities that have experienced major sprawl growth and development, the proportions are 65% and 57% (Toronto Star, April 3, 2008). The same article also reported that 4.8% of GTA residents walk to work and 1% use a bicycle whereas, in Victoria, BC, these percentages are 10.4% and 5.6%, respectively. Figure 2 shows the extent of automobile use versus transit, walking and cycling on a national basis. These statistics emphasize the extent of automobile dependence in Canada and particularly in Ontario.

Economic activity in Canada, as measured by the value of the Gross Domestic Product (GDP), has grown steadily through out the 20th century, from about $20 billion 1992 dollars in 1900 to more than $810 billion 1992 dollars in 1998 (Statistics Canada, June 2000).[4] Annual rates of growth in national GDP have declined from about 5% during the 1960's to 2% per annum during the 1990's 1972 (Statistics Canada, June 2000). However, declining economic growth rates are to be expected as the total value of the economy rises. Between 2005 and 1007, growth of the Ontario GPP has averaged about 2.1% per annum. As a recession in the US begins to spread, the Ontario Ministry of Finance expects growth to drop to 1.1% through 2008 and (hopefully) to return to above 2% per year in subsequent years (Ontario Ministry of Finance, March 2008).

High levels of economic activity translate into employment, which people need to buy and pay for new

homes, vehicles, furnishings, groceries and other consumer goods and to pay taxes. Many families now depend on two incomes to support a two-car suburban lifestyle. An economic downturn may result in one earner losing their job thus reducing disposable income and expenditure choices and forcing families to make priorities and, sometimes, difficult tradeoffs.

The composition of Ontario's GDP (a.k.a. Gross Provincial Product) for 2006, which totals $450.5 billion, is presented in Table 4. As the result of trends in Ontario and Canada over the past 50 years, services producing industries generate the majority, 71.9%, of the total GPP. At the national level, the comparable figure was 65.2% of total GDP in 1996 (Statistics Canada, June 2000). The sectors listed in Table 4 provide or generate most of the new jobs annually in Ontario. Moreover, services producing industries are primarily urban-oriented in terms of their customers' preferences, the need for high densities of population to make these businesses profitable and the constituent firms' own locational preferences.

Canadian cities and towns have expanded steadily in terms of land area during as well as population over the past 40 years. Drawn by employment and urban amenities, urban populations throughout Canada increased by 37% from 16.4 to 22.5 million people between 1971 and 1996 (Statistics Canada, February 2001). These migrations dramatically expanded the demand for new housing. As noted, over 84% of the Ontario population lives in or near municipalities with populations of 100,000 or more.

While much new housing was provided during the 70's and 80's in the form of high density multiple dwelling apartment buildings, town houses and semi-detached housing estates within city limits, consumer preferences for many home buyers ran toward larger, single-family detached houses on large lots in a rural location. Almost 60% of all dwellings in Canada are single-family detached houses (Statistics Canada, 1997). Growth in the number of occupied private dwellings and households, the numbers of collective dwellings and the populations inhabiting them from 1961 to 2006 are shown in Table 5. Collective dwellings are institutions such as hospitals, prisons, boarding schools, nursing homes, etc. While the population of Canada cited in Table 5 grew by 73%, the number of occupied private dwellings has grown by 173%. The average number of persons per household has declined by 36% to 2.5 in 2006.

Single family dwellings consume more land than multi-family apartments and townhouse communities. In addition, the shopping malls, industrial parks, schools, recreational facilities, roads, utility corridors and facilities and other support infrastructure for these new communities required even more land. As a result, the average urban population density in Canadian cities declined from 1,030 persons per square kilometer in 1971 to 799 by 1996, a key consequence of urban sprawl (Statistics Canada, February 2001). Consumer preferences for housing types and neighborhood forms will be examined further in Chapter 4 when demand factors are identified and discussed.

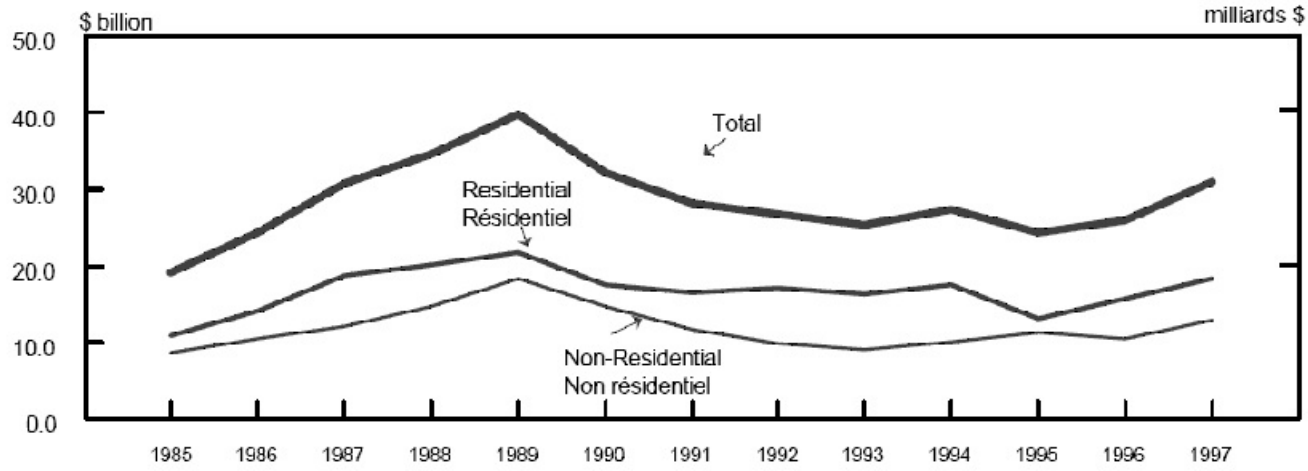
Table 6 reveals that the annual value of building permits in Ontario grown by only 15% between 2003 and 2007 as compared with 136% in Alberta and 113% in Saskatchewan. However, Ontario accounts for 36% of the total value for all of Canada in 2007 and nearly all of this construction takes place in southern Ontario.

Also, despite the fact that the value of building permits has been increasing in Ontario over the past 5 years, the annual number of new housing starts has declined by 20% between 2003 and 2007 as can be seen in Table 7. Indeed, Table 7 shows that new housing starts have declined in all 6 eastern Canadian provinces during the period while housing starts in western provinces have grown by a lowest rate of 33.6% in Alberta to the highest rate of 81.2% in Saskatchewan. Note that Ontario still accounts for

nearly 30% of all housing starts in Canada. Growth in western Canada is fueled by the oil and resource demand and price boom. Declines in building permits in eastern provinces are possibly reflective of down-turns in manufacturing and other industrials as well as interprovincial migrations to the west that have been occurring over the past 3-4 years. Figure 2-2 indicates that annual values of both residential and non-residential building permits are somewhat cyclical so that growth in construction in Ontario may well resume in the future.

Figure 2-2

Value of Building Permits Issued in Canada
Valeur des permis de bâtir émis au Canada



Source: Statistics Canada (1997) Building permits - Annual Summary. Investment and Capital Stock Division, Current Investment Indicators Section. http://www.statcan.ca/english/freepub/64-203-XIB/0009764-203-XIB.pdf

Urbanization in Canada is concentrated in four major regions where half of the Canadian population resides:

a) Ontario's extended "Golden Horseshoe" from Oshawa to the Niagara Frontier;
b) Montreal and its adjacent townships;
c) British Columbia's Lower Mainland and southern Vancouver Island; and
d) the Calgary-Edmonton corridor (Statistics Canada, 2002).

Ontario has the highest concentration of urban land in Canada.[5] In 2001, approximately one in every three square kilometres (km^2) of urban land in Canada was found in Ontario (Hoffmann *et al.*, 2005). Ontario had the largest urban land area of any province in 2001with 9,800 km^2, an area nearly as large as the urban land found in all three Prairie Provinces and British Columbia combined.

Quebec had the second largest area of urban land, almost 7,500 km^2 followed by British Columbia with approximately 4,100 square kilometres (Hoffmann *et al.*, 2005).

Table 8 shows that, between 1971 and 1996, urban land use increased by 12,140 km^2 throughout Canada to 28,045 k2. Urban areas in Ontario were increased in area by nearly 3,500 km^2, to 9,017 km^2 in 1996, or by 63% over the 1971 provincial urban area of 5,545 km^2. By 2001, urbanization had consumed about 15,200 km^2 of rural lands in all of Canada, an increase of 96% in urban land between 1971 and 2001 (Hoffmann *et al.*, 2005). During this same period, Ontario's urban land are grew by 4,300 km^2, nearly an

80% increase. Most of this expansion in Ontario occurred in rural jurisdictions that surround Toronto, Hamilton, London, Kitchener, Guelph and other smaller cities in Southern Ontario. Figure 1 confirms that this trend continues over the entire country.

The trends toward urbanization continues in Ontario so that total urban use currently occupies about 12,000 km2 in Ontario or 1.3% of the 917,741 km2 that make up the total land area of this province. Furthermore, land for planting crops in Ontario has increased by about 6% between 1986 and 2006, as can be seen in Table 9. What has declined are the numbers of farms (down by 21.3% since 1986) and the total area of land owned by the farmers who work these lands (down by 14.9% since 1986). The average area of farms have increased by 20.5% since 1986. The total area of lands rented or leased and the average area of leased lands per farm have increased by 26.3% and 43.1% respectively. Therefore, farms are getting larger land-wise and they seem to be leasing more land rather than buying and owning it. The reasons for these trends are not clear. However, the following hypotheses are worthy of investigation:

a) demand for land for residential and commercial developments may be pushing prices beyond the affordability of farmers who must therefore rent land in order to make their farming operations large enough to be profitable,
b) developers may be offsetting their carrying costs of land inventories by leasing them to farmers. Governments do this as well. For example, in the 1970's, the federal government expropriated farmlands in Pickering for a second Toronto airport. However, the airport was never built so the government leased some of the lands and homes back to farmers and residents for the past 30 years.

Hoffman *et al.* (2005) have shown that, while the area of total cultivated land in Canada has increased from nearly 380,000 km^2 to 455,000 km^2 between 1951 and 2001, urbanization and other non-agricultural uses have covered 40,400 km^2 of dependable farmland in Canada as of 2001.[6] Trends in the areas of conversions of dependable agricultural land to other uses between 1951 and 2001 are shown in Table 10. The provinces of Ontario, Manitoba, Saskatchewan and Alberta are home to 99 percent of Canada's Class 1 agricultural land, which totals 492,727 km^2 (Hoffmann *et al.*, 2005, p 5). More than 76,500 km^2, or 15.5%, of this land is concentrated in southern Ontario. By 2001, over 11% of the province's best agricultural land had been converted to urban and other non-agricultural uses. Although the losses of agricultural land to urban uses in Ontario and elsewhere appear to be small, in some regions such as the lands around Toronto and in the Niagara peninsula, loss of agricultural land reduces the supply of land for specialty crops such as grapes and soft fruits. Loss of agricultural lands which were formerly truck gardens around major cities has also contributed to the need to import fresh food from much longer distances, resulting in added transport costs, increased vehicular pollution and increasing amounts of lower quality produce found in food stores.[7]

It is instructive to compare Canadian urban population densities with those for US metropolitan areas. Area densities for major US and Canadian cities are displayed in Table 11 along with the area density for each nation. The US and Canada have similar land areas but the overall population density of the US is ten times that of Canada, as would be expected with ten times to total population. However, densities of Canadian metropolitan areas tend to be larger than US metro areas. Toronto's density of 793 persons per square kilometer k2 (p/k2) is slightly higher than New York City's 783 p/k2. Urban areas with populations between 1 and 4 million and 100,000 and 1 million in Canada have higher densities than similar areas in the US.

Table 12 shows comparisons of densities among US and Canadian cities using 3 different density measures over two census periods (1995-96 and 2000-01). The cities are sorted on the basis of the L2

density, a measure that is proposed by Miron (March 2003) as a more precise indicator of population density than area density. Based on these data and other analyses, Miron (March 2003) concludes that, on average, Canadians live in higher local densities than Americans. One reason for this trend can be seen in Table 12. Both Canadian and US cities have increased their populations from 1996 to 2001. However, while most of the US cities have increased their land areas through annexations, the areas of Canadian cities were reduced substantially through redefinition by Statistics Canada for the 2001 census. While this redefinition makes comparisons between 1996 density values with those for 2001 uncertain, comparisons of densities among Canadian and US cities during 2001 are more accurate than those for 1996.[8]

Consumer preferences for low density, single family "ranch" homes in a rural setting within automobile commuting distance to the city and jobs have been aided and abetted not only by the marketing ploys of builders and their real estate broker allies but also by local and provincial government policies and activities that provide subsidized public infrastructure and services to the new residential and commercial developments so that new home owners do not pay the full costs of living and operating in their new communities.

New roads, sewers, water systems, solid waste management facilities, policing and fire protection that are required for new dispersed, low density developments require higher taxes to pay for them. However, if these costs exceed the additional taxes that are raised from the new properties, existing property owners in higher density areas who require fewer infrastructure investments and other municipal services may end up paying higher taxes to subsidize the new, sprawl developments. Where new residents and proprietors of sprawl developments pay less than the true infrastructure and operating costs, demand for sprawl developments will be enhanced. These issues will be examined in greater detail in Chapter 5.

Where developers do not pay the full value of the lands they acquire for their subdivisions, land costs will be lower and more structures and developments can be built. Land values may be underpriced if environmental or heritage attributes associated with these lands are ignored or cannot easily be valued and capitalized into the prices of new homes and offices. However, open spaces, parks, water bodies and undisturbed habitats are attributes that attract home buyers. Properties located adjacent to water bodies and large, natural forest or parklands command premiums, which buyers are willing to pay. Higher prices for such properties result in higher assessments and property taxes relative other properties. These premiums and differences in property values are implicit values of the non-marketed open spaces and natural environments that are near these properties. There are other methods for estimating the intrinsic monetary values of non-marketed natural environments and the intangible qualities of wetlands, park lands and open spaces. These concepts, methods and their applications will be presented in Chapter 7

Finally, various stakeholders and parties involved in urban sprawl developments make choices and decisions based in large part on the economic incentive structures facing them with respect to these issues. However, due to distortions that some stakeholders impose on markets as well as the preferences and choice of home-buyers who endeavour to maximize their self-interest, urban and suburban developments and designs result which are not in society's best interests. In many respects, people seem to make irrational choices that can be shown to be consistent with different personas and psyches that individuals display under various conditions and circumstances.[9] The economic and psycho-social factors and conditions that give rise to these choices are the subject of the next chapter. can be predicted.

2.3 Analyses of Ministry of Municipal Affairs and Housing Performance Management Program Results

The Ministry of Municipal Affairs and Housing (MMAH) Municipal Performance Management Program (MPMP) staff were asked for the following data concerning land use performance measures, which they kindly provided.

a) Hectares of open space.....DATA 114
b) Hectares of open space per 1,000 persons.....DATA 115
c) Percentage of new lots, blocks and/or units with final approval which are located within settlement areas .....DATA 140
d) Percentage of land designated for agricultural purposes, which was not re-designated for other uses during the reporting year .....DATA 143
e) Percentage of land designated for agricultural purposes, which was not re-designated for other uses relative to the base year of 2000 .....DATA 144
f) Number of hectares of land originally designated for agricultural purposes, which was re-designated for other uses during the reporting year.....DATA 147
g) Number of hectares of land originally designated for agricultural purposes, which was re-designated for other uses since January 1, 2000.....DATA 150

Data for the above-noted performance measures were provided for all municipalities. In addition to the arcane titles of DATA items 143 and 144, these data could not be used during the time available for this review to test any hypotheses about the relationships of these indicators to performance indicators of costs of services for the following reasons:

a) the MPMP does not provide data on relevant indicators of urban sprawl, eg. population densities, vehicle density data on, ratios of land uses in given areas, ratios of public parklands and other open spaces to total areas, etc., that can be used to monitor this phenomenon.
b) compiling and submitting MPMP forms is time-consuming, costly and currently not mandated by statute. Therefore, data are missing for some key municipalities such as all data for Toronto in 2006 and for other municipalities in prior years.
c) while MPMP staff were cooperative in responding to the above-noted data request, it took several weeks for them to generate the data compilations that were requested. A proper study of the correlations among indicators of sprawl and various service costs would require discussions with MPMP staff to formulate data requests and, perhaps, development of new indicators to be collected from municipalities in future annual MMAH financial data submissions.
d) for many indicators, there are no clearly defined baseline or benchmark data on which to discern trends or to judge whether conditions are improving or deteriorating.

Compilations and some simple analyses were carried out for the top 10 municipalities in terms of population and for all other municipalities which had populations over 100,000. The findings and comments that arise from these assessments are noted below:

a) The average hectares of open space per 1,000 persons amount to 4.4 for 3 of the 10 largest Ontario cities (the only cities that provided these data) during 2006 (the only year for which these data are available). The total open space for the 3 cities was 9,695 hectares.
b) The average hectares of open space per 1,000 persons amount to 4.9 for 22 out of 32 of all Ontario municipalities with populations greater than 100,000 during 2006. The total open space for 17 municipalities was 15,601 hectares. However, there are no baseline data or time series

data for this indicator with which to discern trends and one would need data from other jurisdictions to judge whether these ratios are high, low or commensurate with other similar cities.

c) As can be seen in Table 13, the total "number of hectares of land originally designated for agricultural purposes, which was re-designated for other uses during the reporting year" amounted to 8,729 hectares during 2001 through 2006 in the top 10 Ontario municipalities. The comparable figure for other municipalities above 100,000 population over the same period was 17,636 hectares. Again, one would need baseline data on the hectares of agricultural lands within municipalities in order to assess trends and their implications.

d) Also shown in Table 13 are the total redesignated lands as a percent of the total settlement areas of the above municipalities, which amount to 2.5% for the top 10 municipalities and 8.2% for the remaining municipalities with populations above 100,000. Of greater interest and significance would be the ratio of the area these redesignated lands to the area of the total agricultural lands within the settlement areas.

e) The "average annual % of land designated for agricultural purposes which was not re-designated for other uses during the reporting year" for the years 2001 through 2006 are also shown for the two sets of municipalities in Table 13. This indicator seems to be declining for all municipalities above 100,000 population, which (I think) means that more agricultural land is being converted to other uses in 2005 and 2006 than in previous years. Further discussions with MPMP staff would be required to interpret this indicator.

f) Population densities of settlement areas in persons per hectare were computed from the MPMP data and are shown in Table 13 for 2004 and 2006. The density value increased from 18 persons per hectare in 2004 to 21 in 2006 in the 10 largest Ontario cities but remained at 14 persons per hectare over the 3-year period in the other municipalities with populations above 100,000. There are 100 hectares in a square kilometer so that equivalent densities per km^2 are between 1,400 persons per km^2 and 2,100 persons per km^2. These densities are high compared with the values for these same Canadian cities shown in Tables 11 and 12. However, the settlement area used in these calculations are smaller that the total areas of the municipalities but may be a more realistic figure for the actual densities experienced by most people living in a given municipality. The areas of some municipalities used for computations in Tables 11 and 12 include urbanizing areas in jurisdictions adjacent to the municipal boarders as with the GTA.

It would be useful to hold discussions with MPMP staff to determine whether data that they are already collecting could be used to better monitor and evaluate the trends and consequences of unchecked growth in and around Ontario municipalities. If there is little that can be done beyond what is shown in Table 13 and discussed in the above noted findings, then discussions should focus on what additional data should be collected in future MPMP surveys.

3 KEY PARTICIPANTS AND STAKEHOLDERS AND ECONOMIC INCENTIVE STRUCTURES FACING THEM

Participants and stakeholders refer to groups of individuals, firms, government agencies, non-governmental organizations and other human endeavours that are involved and/or have an interest in a given set of activities and enterprises. Economic incentive structures refers to the pattern of costs and benefits, gains and losses that each participant or stakeholder incurs or realizes under a given set of economic, social and policy conditions. A change in the particular pattern of potential gains and losses that face each stakeholder can be used to help forecast the subsequent expected behaviour of the stakeholders.

3.1 The "Development Industry"

The development "industry" is an agglomeration of various, related businesses that generate incomes and employment from activities associated with the construction and sale of residential and commercial properties in areas of urban expansion and sprawl. The core members of this industry are major, vertically integrated real estate and construction firms, which assemble the land, generate site and structure designs, obtain the approvals and permits, arrange financing, manage construction phases and ultimately sell the properties. In addition, lawyers, architects, engineering consultants, building materials suppliers (lumber, concrete, bricks, windows, etc.), equipment suppliers (heating, electrical, plumbing, etc.) and building trades workers (carpenters, brick layers, electricians, plumbers, etc.) are directly dependant on residential and non-residential construction activity. The lumber, steel, non-ferrous metals and non-metallic mineral industries sell considerable quantities of their products to the construction industry.

Once construction is completed, the gas and electricity production and distribution industries gain additional customers and demands for their products as does the household insurance sector. The automobile manufacturing, sales, insurance and repair sectors are greatly benefitted by urban sprawl developments because families living in these areas are usually entirely dependant on automobiles for their transportation. Indeed, most households are multi-vehicle owners. The oil industry also owes an unknown, but likely substantial, proportion of its fuel and lubricant sales to the conventional sprawl-type development patterns in Canada and the US.

Sand, gravel and stone quarries, metal and mineral mining operations and forest (lumber) companies owe a substantial proportion of the demand for their products to residential and non-residential construction. In Southern Ontario, virtually 100% of the production from sand, gravel and stone quarries is consumed by residential and non-residential construction in the major urban growth centres of the province.

Each of these often powerful economic and business sectors and firms, along with their investors and employees, find their interests aligned with prevailing unrestricted, sprawl-inducing patterns of economic and population growth, land use planning and residential and non-residential construction. When necessary, these varied interests can coalesce into well financed and often influential opposition to reforms in land use planning rules or policies aimed at reducing population or economic growth rates. It is a fundamental economic truth that people, individually or communally, are more concerned about the costs and losses that result from government policy actions than they are about the gains or benefits that may result (Kahneman and Tversky, 1979; Knetsch and Sinden, 1985; Knetsch, 1990). Consequently, people will demand more value in compensation for a loss of a product or a service than they would be willing to pay to obtain the same product or service as a benefit.

Thus, with hundreds of millions of dollars in annual economic activity and incomes and thousands of jobs at stake, concerns raised by these stakeholders quickly catch the attention and affinity of elected officials at the municipal and provincial levels of government. The Environmental Commissioner (2007) has explained how new planning statutes and guidelines have been implemented in Ontario, which are purportedly more protective of natural environments, heritage lands and open spaces than previous statutory and policy frameworks. However, these new laws and updates to the Provincial Policy Statement on land uses have incorporated special provisions, exemptions and technical language that protect the interests and incomes of the largest developers and their closest allies and allows for the perpetuation of sprawl development patterns. The Commissioner (2007) has described how these exemptions and concessions have created serious conflicts or "irreconcilable priorities" in the provincial plans for balancing growth and ecosystem sustainability. "...priorities that reinforce unsustainable approaches to community development in Southern Ontario remain ingrained and unchallenged in recent provincial initiatives, trumping priorities and options that would more effectively promote ecosystem and community sustainability."

3.2 Financial Institutions

Banks, Trust companies, insurance firms and other financial institutions are linked to these entities in two major ways. First, they provide financing and loans so that developers and builders can buy and prepare lands, obtain permits, pay development charges to municipalities, purchase materials and build model houses before any properties are sold. Some builders also initially provide mortgages to home buyers, which are then sold to financial institutions. Interest paid on these loans, the amount of collateral that is required and the terms and conditions of loan agreements will influence the magnitude of the projects undertaken and the ultimate pricing of the properties being built.

Second, insurance companies provide the various types of insurance policies that builders are required to carry. Insurance companies also provide performance bonds, which builders are normally required to provide to private sector clients and to municipalities in order to secure contracts..

Lenders and insurers can exert pressure on firms to behave in more environmentally responsible and sustainable manners. The motive for banks and insurance firms to impose such conditions on their clients derives more from a desire to avoid liability than from philanthropy or altruism. When considering loan applications, lenders are most concerned about a borrower's credit history, the availability of assets to secure the loan and the borrowers ability to repay the loan. Issuers of performance bonds will want to review the builder's default history where insurers had to pay any claims. Insurers will impose specific operational conditions or requirements if it is likely that they will reduce the risk of defaults. Insurers may also include exemptions from some risks in bond contracts if the risks cannot be curtailed or eliminated by some other means. Finally, insurers can, and often do capitalize the such risks into higher premiums.

3.3 Municipal and Provincial Governments

Growth and development patterns around the Greater Toronto Area (GTA) and other fast growing regions demand the time and attention of municipal elected officials and staff. Among other things, municipal government officials and staff are charged with preparing and implementing master plans that are intended to direct the growth and development of their jurisdiction. Master plans are intended to reflect the social values and preferences of the majority of the local residents and, along with local by-laws, provide rules and guidance for individuals and enterprises who want to renovate or build new homes and businesses in the municipality.

Economic growth objectives are often imbedded in master plans and other municipal policies. Municipalities want to attract new investment and businesses who will provide employment for residents as well as expanded tax assessments for new infrastructure and services. Indeed, municipal jobs are directly dependant on administering plans, bylaws and permits for new residential and commercial construction activity as well as applications for new or expanded industrial operations such as pits and quarries. Municipal councillors and staff must often try to balance growth and development projects against the protection and conservation of heritage lands and green spaces, controlling air and water pollution and collecting taxes, fees and charges from property owners and from property developers to pay for infrastructure and services. While these regulatory activities often impose restrictions, costs and delays on developers, municipal staff are undoubtedly aware of the priority that many councillors give to the perceived economic benefits that new developments bring to the municipality.

Besides promulgating the Provincial Policy Statement on land use planning and enacting various provincial land use planning and regulatory statutes and regulations, provincial government authorities and ministries such as the Ministries of Northern Development and Mines (MNDM), Natural Resources (MNR) and Environment (MOEnv) also issue permits and approvals directly to developers and other enterprises for various activities including mining, quarrying, harvesting trees, taking ground or surface water and discharging liquid, solid and air-borne wastes. The Environmental Commissioner has commented on the relative ease and certainty with which permits and approvals from MNR, MNDM and other provincial agencies are ultimately issued, due in part to concessions and exemptions in the relevant planning statutes or regulations.

Officials from both levels of government administer regulatory powers with respect to new or expanded residential, commercial and industrial developments. However, both municipal and provincial governments and their officials often face compelling economic incentives to approve and even expedite applications for permits and approvals for construction and industrial developments that are perceived to generate investments, incomes and employment in their jurisdictions. Officials in both levels of government are often confronted with issues, conflicts and decisions which require the balancing of benefits and costs that accrue to different stakeholders who possess wide ranges of wealth and influence. Where economic interests (ie gains or losses) are large, political influence may be brought to bear. In such cases, both civil servants and elected officials are understandably loath enforce regulatory requirements or withhold operating permits that would impose financial losses on regulated parties. Where serious infractions of the rules or standards are encountered, municipal and provincial authorities have attempted to withhold approvals and permits and negotiate with the applicants to eliminate or mitigate the worst of the offences. The most egregious and flagrant violations can lead to administrative penalties, prosecution, fines or even, in rare instances, incarceration. However, through most of these regulatory and permitting systems, builders, industrial applicants and regulated parties have recourse to appeal boards and tribunals, which themselves become stakeholders in the overall provincial development landscape.

Furthermore, since the late 1960's, the provincial government has been grappling with growth by creating a plethora of plans, planning agencies and regional bodies and institutions intended to develop and coordinate the implementation of various plans in order to direct growth and minimize its adverse effects. These regional bodies also tend to dilute the responsibilities and authorities of municipal councils (Stein, 2008). The succession of plans and institutions around Toronto is particularly illustrative of these trends.[10]

3.4 Provincial Appeal Boards and Tribunals

Municipal/developer disputes are taken to the Ontario Municipal Board (OMB) whose government-appointed panelists are mandated to favour of development projects that represent "the highest and best use" of the land in question. Highest and best use usually means development that generates the most revenues, incomes, jobs and taxable assets. Where permits or approvals are issued by the Ministry of the Environment, regulated parties can appeal to the Environmental Review Tribunal (ERT). The OMB and its decisions are often contentious, especially when they overturn rulings of municipalities to refuse applications for development projects which are not in compliance with local planning rules and by-laws. Critics, including some municipal stakeholders, have complained for years that OMB decisions are biased toward development applications and have called for its termination (Lorinc, May 2001).[11]

Both the OMB and the ERT consider the economic implications of the appeals and their decisions although they seldom state these considerations explicitly. However, to the extent that the OMB uses economic measures to judge what is the “highest and best use” of a property, its decisions and the distribution of the economic costs and benefits associated with particular decisions can be predicted and evaluated. Moreover, when applications or issues are brought to the OMB or the ERT, the costs of participating in such proceedings often constitute economic barriers to participation by volunteer advocacy groups and individuals who have an interest in the applications being considered. Individuals and advocacy groups constitute the last of the key stakeholders that are directly concerned with growth and land use issues and the inexorable disappearance of agricultural lands, natural environments and open spaces in Southern Ontario.

3.5 Individuals, Advocacy Groups and the Public

Non-government public interest and advocacy groups (NGOs) have raised alarms and warnings about urban sprawl and the loss of open spaces to urbanizing developments. Along with academic researchers, NGOs often reveal the recipients of economic benefits that are generated from prevailing patterns of unrestricted urban expansion. For example, the Sierra Club of Canada (February 2003) published estimates of the adverse physical effects of urban sprawl and the monetary values associated with some of them. The Pembina Institute published a progress report on the Ontario Government “Smart Growth” initiative, which had been announced in 2001 (Winfield, August 2003). In these and other similar reports, key problems and deficiencies were identified, quantified and valued where possible. Recommendations for public actions and government policy changes were also presented.

NGOs have become more adept in recent years at using economic data and analyses to support their arguments and positions. Moreover, NGOs in Ontario and elsewhere have moved away from their activist roots, which involved raising awareness by means of imaginative demonstrations of street theater and protest rallies. Members of these organizations are now more apt to wear a suit and carry a laptop to meetings with top management in business and government than picket these organizations in jeans and a t-shirt. Moreover, NGOs typically have greater credibility with the public than do business or government.

Individuals become stakeholders at first when they buy homes or properties within sprawl developments. The relationship and the incentive structure changes somewhat when new developments intrude upon existing residents’ life style or property in some adverse manner. As noted earlier, people value losses they incur to a much greater degree than gains they receive. Where homeowners perceive the adverse effects of dust and noise from nearby construction sites or wake up to find a neighboring wood lot has

been cut down to make room for a new subdivision, they are motivated to protest such developments to a level of effort that is directly proportional to the subjective value of the perceived loss. Where governments or private firms have set out to compensate landowners for adverse nuisance effects that diminish a person's ability to use his/her property, the amount of compensation demanded is often found to be 3-5 times greater than the amounts that those paying the compensation have estimated to be "fair" based on remediation costs or the replacement value of the items or services lost. (Knetsch and Sinden, 1985; Knetsch, 1990)

It is likely that the public will be strongly conflicted regarding the effects and implications of urban sprawl. In Canada, a large proportion of the public will have grown up in sprawl type suburbs such as Scarborough, Mississauga or North York. Moreover, it is likely that a larger proportion of the public today will be living in subdivisions that are even further away from the central cores of Toronto, Ottawa, Hamilton or Windsor. While people deplore the loss of open spaces and wetlands to the bulldozer and pavement, many are at the same time placing offers on new homes in Richmond Hill, Milton or Ajax where there were once corn fields, pastures, forests, wetlands and meandering streams down to Lake Ontario. And, once ensconced in the new subdivisions, and they find that the commute to the office takes 2 hours one way, many will then lobby their governments for new roads, more buses, subways or rail links with more parking spaces.

It is also likely that proponents of growth and urban expansion in the "development industry" will attempt to exploit the conflicted incentive structures facing the public in Southern Ontario who may well rather have more transportation options built to their new subdivisions than preserve habitats for rabbits, foxes, frogs and fish. Also, while people may say that they prefer more centralized and dense housing options with greater access to public transit and nearby work places and shopping, such urban environments are not yet widely available at affordable prices, at least in the GTA or Ottawa. Until they are more widely available, householders in the most remote subdivisions will be more likely to demand expenditure for transportation infrastructure extended to their neighborhoods than to support curtailment of developments outside settlement boundaries.

3.6 Concluding Comments

Prior to WWII and for several decades after, urban development and planning were primarily the purview of municipalities, which would combine and ally themselves in limited ways to deal with problems that would occur as populations and cities grew. Population growth generated the demand for new homes and commercial buildings. The development industry (land developers, construction companies and their suppliers) supplied the products and banks and insurance companies supplied financing.

It was not until the late 1970's and early 1980's that the provincial government began to play an increasing role in growth planning and management. First, much of the focus was on removing barriers and facilitating economic growth and employment with little attention or thought given to influencing and directing growth and the urban forms that were evolving. However, growth inevitably brings conflicts. The environmental movement and its population of NGOs had grown more active and influential since the early 1970's and municipalities began to have conflicts as their expanding boundaries intruded upon each other. The provincial government was increasingly called upon to deal with environmental and planning issues that transcended municipal boundaries and enact legislation to create consistent, province-wide goals, standards and rules that all citizens and institutions in the province would live by. The Provincial Government also created new institutions to help sort out the conflicts and disputes that would invariably arise, including the OMB and the ERT.

By the first years of the 21st Century, the efforts by NGOs, municipalities, academics and certain Provincial Government institutions (such as the Environmental Commissioner) proceeded to document the many current and potential problems and costs associated with prevailing urban forms and patterns. The Provincial Government was finally motivated to develop new land use planning goals and objectives and the regional plans, legislative tools and institutions to implement them. These new directions, plans and legal tools are, in part, intended to alter the economic incentive structures facing the various stakeholders listed in this chapter. These tools are particularly intended to motivate developers, municipalities and individuals, as consumers of housing and other municipal services, to build, buy and live in denser and more efficient urban designs that are more pedestrian and transit friendly and less dependant on automobiles. Only when economic incentive structures are properly aligned with key planning goals and objectives will the various stakeholders and participants change their behaviour sufficiently to divert growth and development patterns away from sprawl to more efficient and less energy- and land-intensive urban forms.

4 ECONOMIC DRIVERS ASSOCIATED WITH URBAN SPRAWL

A growing population demands jobs and housing. Intuitively, one would expect most people to want to locate their housing across the street from their job. However, several key factors have allowed Canadians to purchase and reside at homes that are far from their workplaces: affluence, the automobile and a large and growing system of roads and highways. Consequently, home-buyers have been able satisfy their preferences for locations, living environments and other features and attributes by purchasing single-family dwellings in the countless new developments that were being built at the "rurban" fringes of nearly all metropolitan areas in North America.

In this chapter, economic factors and forces that influence and drive residential and commercial developments toward the urban sprawl form. Supply and demand factors are examined in the following subsections. These discussions are followed by a review of the roles that municipal financial policies and tools play in supporting and promoting urban sprawl.

4.1 Supply Factors

Supply elements associated with housing and commercial property markets include, first and foremost, land, followed by capital financing, labour and building materials. Prices of homes and commercial properties provide the signals that developers need to decide where to build, how many units to build and the forms and patterns of urban developments.

During the early post WWII years (*ie*. 1946 and later), demand for housing grew rapidly in the US and Canada as thousands of military personnel were demobilized and re-entered the civilian work force and began to form new families. Moreover, many more thousands of people living in apartments and rooming houses in cities while working in defense industries moved to single family homes that were being built with the new capital and labour that had been freed up from the war effort on remaining farmlands and open spaces near the cities' edges. As economies and populations grew through the 1950's and 60's, builders found new supplies of land on farm lands and open spaces beyond metropolitan boundaries. These land were particularly attractive to developers for the following reasons.

First, many of the farm lands became available from farmers who were ready to retire, whose children had left the farm and who regarded the money from the sale of the old homestead as a well-earned pension endowment. In some jurisdictions, the willingness of farmers to sell land was enhanced as land taxes were raised to fund the rising costs of providing new infrastructure and services demanded by the citizenry and by senior governments. Second, developers and land speculators would initially purchase options from rural land owners to buy lands at a specified price (or price formula) and within a specified time. Options and land prices in the rural areas beyond the city limits tended to be low because such lands were abundant and needed new roads to make them accessible. Third, township, county or small town governments were often cooperative and eager for the new jobs, investments and increased tax revenues that were promised by developers. Furthermore, permitting requirements, zoning bylaws, planning restrictions and fees and charges were usually much less extensive and complex than within the larger cities. Finally, it is also likely that some developers attempted to gain local favour by means of contributions to local infrastructure projects institutions such as schools, libraries, police and fire departments. Some developers may have even attempted to win local government support through contributions of cash and kind to growth-friendly candidates (Lorinc, 2001).

In later years (1970's-1980's), rural jurisdictions adjacent to major urban centres began to aggressively

compete for commercial developments with tax and other fiscal concessions. Motivations for such behavior included achievement of increased tax assessments and economic growth within the jurisdictions (Lorinc, 2001; Slack, 2002). Governments also wanted to attract new employment for their residents so as to stem the crush of commuters into the center cities. However, as these projects were completed, they tended to be separated from residential areas by many kilometers with little or no public transit, thus continuing the dependence on the automobile. Both of these characteristics define sprawl. For those who work in these new islands of commerce, there is little to engender community character or attraction.

Prices in competitive markets are also influenced by scarcity. The quantity of land in a given district or region is finite, although the area in a municipality can by increased by annexing lands at its borders. Therefore, as demand for a fixed number of desirable locations increases, prices will be bid up. Land owners enjoy increases in their "rent," which is the technical term for the difference between the price of a piece of land and its original cost and the costs of maintaining it (eg. taxes, etc.). Builders can increase the effective area of a property by digging down and/or building up many floors, which is the normal pattern of development of a city. Prices for single family homes also appreciate substantially under these conditions.

High land prices drive builders (suppliers of housing and commercial space) to seek lower cost lands in order to reduce costs and sell more product. Lower priced lands were to be found among the farms and forests at the outer boarders of the cities. Prices of these lands were low because sales among people who farmed, logged or trapped generated prices for farm land and wood lots that were based on what they could earn from these uses. A common approach for estimating the value of land for agriculture or some other commercial use is the *capitalized value,* which is, in essence, the average net revenue (profit) per acre/hectare from the land in question divided by an appropriate interest rate (usually rates of return for GICs or some other benchmark rate). For example, if the average annual net revenue from an acre of farm land in previous years is $100, the capitalized value would be $1,667 per acre using an annual rate of return (or interest rate) of 6%. Other factors such as soil type, proximity to roads, water frontage, etc. could affect farm or forest land prices and are then factored into the capitalization calculation. Thus, rural land values are low where net returns on farming and logging are used to set land prices.

Additional supply factors, which are essentially cost components of constructing and marketing residential and commercial properties include costs of financing (which are a function of the prevailing interest rates), site preparation, construction, installation of roads and utilities and any other charges or exactions taxes imposed by the host county or municipality.[12] Other costs may be imposed by provincial regulations and by local zoning and ordinances. Water and sewer pipes as well as roads to the new subdivision or commercial buildings are installed by municipalities who then recover their costs from property taxes on the new owners. However, if the subdivision or commercial development is too far from municipal services for immediate hook ups, the developer must build and operate its own water and sewage treatment plants until the municipality extends its systems to the new developments and takes them over.

Interest rates are a key financial factor in the development industry. Builders usually borrow money to develop and build their subdivisions or office buildings and thus pay interest on these borrowings until their buildings are sold. High interest rates increase builders' costs who then build fewer projects which will yield higher returns. High interest rates also depress real estate sales because fewer people can (or should) qualify for mortgages. Alternatively, lower rates stimulate more building and buying.

From the perspective of economic and social efficiency, it is important that the residents and businesses

who purchase or rent the homes and offices in new subdivisions be required to pay for all of the social, environmental and direct financial costs, or their best estimates, of the new properties. Municipal financial instruments that are used to pay for the costs of infrastructure and services associated with new subdivisions and commercial development can distort the incentives facing builders and home-buyers and thus exacerbate urban sprawl and its undesirable effects as can planning tools (eg. zoning, planning by-laws, etc.) if they are applied incompetently or not at all. Federal assistance to home buyers through the Canada Mortgage and Housing Corporation and the *National Housing Act* may also affect the economic incentive for or against sprawl. The implications and effects of municipal financial instruments will be discussed in more detail in the next chapter, after examining demand factors and their implications.

4.2 Demand Factors

On the demand side, millions of people in the US and Canada were attracted to the new suburbs for a variety of features including perceived safety, peace and quiet, less crowding, larger homes, open spaces, rural environment, cultural homogeneity, cleaner air and lower purchase prices than in the cities. Indeed, the proximity to natural environments, water bodies, forests and open spaces is primary attribute and attraction for semi-rural subdivisions for many home-buyers. In addition to lower house prices (or more house and property for a given expenditure) than in central cities, Burchell (1997) lists the following features of sprawl type development that are favoured by potential home buyers:

a) reduced congestion while accommodating unlimited use of the automobile,
b) neighborhoods in which housing prices will appreciate,
c) perceived lower property taxes,
d) removed from fiscal and social problems of core areas,
e) neighborhoods in which schools will provide a better education (than urban core schools) and "appropriate socialization" for youth (reduced exposure to crime, drugs and sex).

Burchell and Mukherji (2003) further postulate that home buyers may also be attracted by the greater opportunity for participation in governance owing to the multitude of small jurisdictions found in the fringes of metropolitan areas.

Proximity to water, parks and open spaces are highly desired and builders apply premia to properties that are adjacent to these features. Estimation of the additional values that are endowed by these attributes are discussed in Chapter 7.

The development industry claims that suburban and rural developments are merely responding to consumer demands. While it is true that there is clearly a demand for the types of housing that sprawl developments produce, it is also true that developers, State and Provincial governments and some local municipalities have been complicit in creating conditions that favour and encourage these types of developments. These conditions include building new highways and roads to and through ex-urban areas that will enable new developments. Furthermore, in Ontario, the provincial government has imposed restrictions on development charges that municipalities can impose on builders so that it may be more difficult to pass the full costs of the new developments on to property owners who enjoy the benefits.[13] Also, in Ontario, certain kinds of activities and projects are exempt from protections and restrictions against disturbing sensitive ecosystems, surface and ground waters and land formations that are provided under the 2005 Provincial Policy Statement and other land use statutes. Activities that are exempt include:

a) "infrastructure" projects such as water and sewer pipes, electric power generation and

transmission, communications, waste management systems, transit and transportation corridors (include roads and railways), oil and gas pipelines,

b) agricultural and storm drainage facilities,

c) exploration and mining for minerals including aggregates and sand used in construction.

These exemptions tend to reduce the implementation costs of these activities at the expense of environmental damages or losses. Lower costs of the products and services that are associated with these activities may ultimately contribute to lower product prices which translate to higher demands for these products and services than would be the case if the full costs of environmental protections were imposed on these businesses. To the extent that environmental and other social costs are not internalized by firms or government agencies, distortions, inefficiencies, economic waste and inequitable allocations of costs and benefits are imposed on society, which can result in lower overall social welfare.

To the extent that special interests, such as aggregate extraction firms or electric power companies, have contributed to the formulation and enactment of these kinds of legislation and policies, they will likely have helped to increase demand for their products and services to their own benefit.

Demand is further determined and driven by population and household income growth. Birth rates in Ontario are relatively low for native born Canadians but are higher among aboriginal and immigrant ethnic communities. Typically, immigrants initially settle in major cities where they are most likely to find employment, public transit, social services and their own communities who can help with the transition to Canada. When their incomes rise after obtaining jobs and equity, many immigrants follow their predecessors to single family homes in the suburbs or beyond city limits. Barring unforseen economic shocks or natural disasters, continued high levels of immigration, rising incomes and prevailing low interest rates will contribute to strong demand in Southern Ontario housing markets for the foreseeable future.

There seems to be an abiding and wide-spread preference for the kinds of housing that creates sprawl. According to Burchell *et al.*(1998), a survey of US residents, which asked whether respondents favoured current development patterns which are characterized by urban sprawl, found that 80% of the respondents identified a single-family home with a yard and attached garage as the ideal place to live. Furthermore, these respondents also stated that they would prefer to live further away from their work places, take a second job, tie up savings, put children in day care or incur heavier debt in order to afford the suburban lifestyle. However, even those who admit that sprawl has an ugly look and that the suburbs are becoming increasingly congested have been reluctant to move back into the city.

Burchell and Mukherji (2003) also pose the question, “Why is conventional development, with its resource consumption excesses, so popular?” Based on their research, these authors suggest that the answer involves 3 considerations:

a) From a *market* perspective, as long as society is willing to provide adequate public services at a great distance from where these services currently exist at less than full cost to the recipient, single-family housing on large lots will be less expensive at greater distances from the center of a metropolitan area and, as long as this development form is desired, people will purchase in these locations.

b) With respect to *policies*, if (US) mortgage interest costs and real estate taxes continue to be tax deductible, gasoline prices remain at relatively low levels and do not incorporate the provision of roads or external pollution costs, and home owners do not pay the full costs of infrastructure and services associated with remote subdivisions, there will be a continued quest for unrestrained

development in the United States.

c) Finally, from a *personal* perspective, if public safety and quality of life continue to be perceived as greater in peripheral suburban areas than in the central cities and if home prices and property taxes are lower because of distortions due to the misapplication of municipal fiscal tools, the quest for peripheral development will continue.

Each of these considerations results in distortions in economic incentive structures so that, as firms (developers), individuals (home buyers) and governments maximize their respective private welfares and satisfaction, conventional development or sprawl is preferred and encouraged. Under these conditions, short run individual, private welfare maximization trumps the longer term social good. However, continuation of these patterns and behaviours are dependent on continued rising incomes and the availability of relatively low-priced resources.

Closer to home, Gorrie (2008) reports that municipal planners in the GTA are trying to straighten out circular roads and crescents and eliminate *cul-de-sacs* in all new developments. These street designs are a defining characteristic of urban sprawl. However, the alleged sins associated with these street layouts include the following:

a) they take up much more land than grided streets and neighborhoods,
b) like other sprawl neighborhoods, they create car-dependant zones along with the resulting traffic congestion,
c) "A widely quoted American study concluded that people on cul-de-sacs weigh nearly 3 kilograms more than those in traditional grid neighbourhoods of straight streets and right-angle intersections,"
d) people who live in cul-de-sacs become isolated, insular, self-absorbed, petty and lose touch with the wider world,
e) a British study concluded that burglary rates in cul-de-sacs in Britain are as much as 20% higher than on regular streets.
f) costs of firefighting, snow-plowing and other city services are higher than for neighborhoods built on a standard grid pattern.

Proponents and supporters of the cul-de-sac lay-out, which significantly include residents of these neighborhoods are said to "scoff." First, they point out that houses on cul-de-sacs normally fetch a premium of as much as a $10,000 per lot. According to Gorrie (2008), people interviewed who live on cul-de-sacs say they would live nowhere else. Other responses to the above-noted criticisms indicate that consumer preferences for various attributes associated with sprawl-type residential designs and developments are strong. These responses noted below also indicate that the proponents for at least this aspect of urban design believe that their arguments are just as logical and compelling as those who argue for curbs on sprawl and its associated neighborhood designs.

a) the UK crime study is disputed; other studies in the US are cited where neighborhoods that were restructured into cul-de-sacs enjoyed lower crime rates. They further argue that residents have a better view of each others' homes than on a regular street and there is normally only one escape route for intruders,
b) cul-de-sacs are safer because there is no through traffic,
c) excess weight and obesity are symptoms of wider behavioural and nutrition issues, to which street designs contribute little or no causation,
d) neighborliness and gregariousness are a function of personalities, similarities in backgrounds, age and family status, not street designs. Cul-de-sacs attract families with similar incomes, ages,

family patterns, education levels and, for the residents that Gorrie (2008) interviewed, these characteristics result in much camaraderie,

e) the large lots and quiet, rural living conditions associated with cul-de-sac neighborhoods are precisely the characteristics that residents of these areas were seeking and were willing to pay whatever premiums existed to obtain them.

Defenders of cul-de-sacs admit there is a trade-off between the beneficial features of these neighborhoods and the costs associated with lengthy commutes and greater dependence on the automobile for virtually all transportation requirements. However, according to realtors interviewed by Gorrie (2008), there are many home buyers waiting in line to make these trade-offs.

Recall that Table 1 lists 37 postulated adverse effects of urban sprawl while Table 2 records only 14 potential beneficial consequences. Burchell *et al.* (1998) comment on the degree to which there is consensus in the literature that the benefit actually exists and whether or not it can be shown to be linked to sprawl development. Where these beneficial effects are the reciprocal of certain adverse effects, the Burchell *et al.* commentaries tend to support the cost arguments while criticizing the likelihood of achieving benefits. However, their review of the relevant literature highlight the debate and controversies that persist to this day regarding the potential benefits and costs of sprawl-type developments. Fischler (2004) articulates these arguments even more succinctly:

> "One side sees sprawl as an acute ill, best captured by worrisome statistics on air quality and respiratory diseases; the other considers it a normal condition, indeed a desirable one, as made clear by the continued departure of urban households to the periphery and by the high level of satisfaction that suburbanites express when asked about their living conditions."

4.3 Market Prices, Trends and Implications

The integration of demand and supply factors and forces in a reasonably free market yields prices for the products or services being bought and sold. Over the past 30 years, this writer has observed prices of 3-bedroom bungalows in Scarborough increase from about $60,000 to nearly $300,000, depending on location. This increase amounts to 400% or about 13% per year, a generally satisfactory rate of return for an investment.

Of particular concern is whether greater concentrations of housing and other types of development in urban areas will raise the price of homes. Using a 2000 data set for 452 census-designated urbanized areas in the US, Wassmer and Baass (2006) investigated the question, "does a more centralized urban form raise housing prices?" These authors adjusted and controlled for differences across residents' economic status, demographics, number and type of households, climate, household growth, non-residential land uses and the structural characteristics of houses. They found that a more centralized area exhibits a lower median home value (in the range of a 0.2-0.3% price reduction for each 10% increase in the centralization of population, land or housing units) and a lower median percentage of homes in the upper-end price ranges than do low density areas. Therefore, the authors rejected the hypothesis that greater urban centralization (and densification) itself raises the area's middle house prices (ie. US$100,000 - US$150,000) or increases the proportion of higher priced homes (ie US$300,000+). Wassmer and Baass also concluded that pursuing greater urban centralization, or what some call Smart Growth, will result in the reduction of the social costs of sprawl such as traffic congestion, air pollution from vehicles, destruction of green spaces and habitat, etc. without incurring significant private costs in terms of higher housing prices.

Wassmer and Baass argue that their findings indicate that housing consumers will respond to economic or regulatory restrictions on sprawl development (eg. steep increases in the costs of owning and operating automobiles or more restrictive local or provincial planning or fiscal policies) by choosing to live in smaller dwellings on smaller lots or in multi-unit structures within built-up city boundaries. However, this interpretation presumes that home buyers will be willing to forego larger homes on larger lots for the perceived benefits of higher density urban developments. In any event, it should be understood that houses and lots that are typical of sprawl areas will become rarer and more costly within urban centres by economic forces or by policies that result in greater population densities within a jurisdiction. Moreover, the expectation that home buyers will "buy down" in terms of house and lot sizes seems to fly in the face of revealed preferences for large homes and lots found in the sprawl areas. Consequently, acceptance of smaller scale housing and a reduced private domain of indoor and outdoor space may well result in reduced utility for those transitioning to these smaller urban accommodations.

To better understand recent residential housing price trends in Canada, Table 14 presents New Housing Price Indexes for main Canadian cities, by province, for the past 5 years, 2003-2007, where the index equals 100 for prices in 1997. Annual percent changes in the indexes, hence prices, along with the average annual percent change between 2003 and 2007 are shown in this table. The indexes reveal how much prices in each metropolitan area have changed (usually risen) over the 5-year period, relative to prices in 1997 and to each other. With caution, these indexes can be compared between municipalities to determine which markets are most active. However, higher indices in one province or municipality compared to another does not necessarily mean that actual prices are higher than prices in a jurisdiction with a lower index.

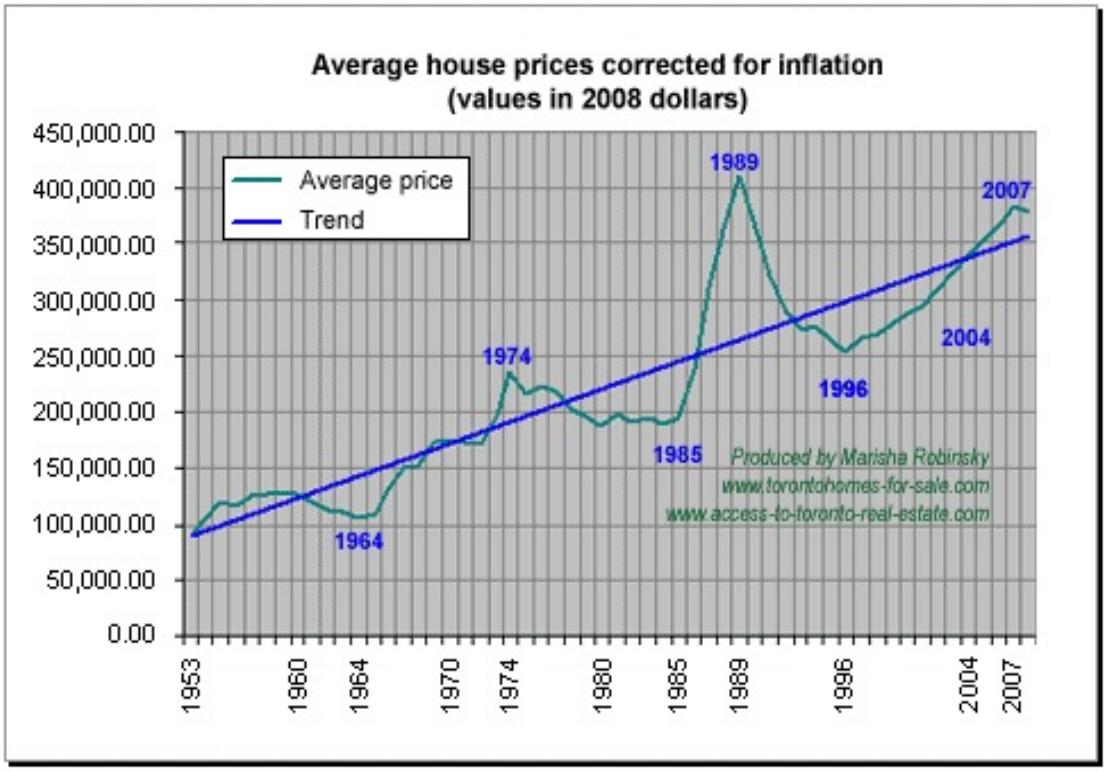
Note that housing prices appear to have fallen lower than 1997 levels in Thunder Bay and Sudbury during 2003-04 and earlier years. Prices in Windsor have also declined during the past two years. All of these metropolitan areas exhibited average annual housing price increases above the average for Ontario of 3.8% except Kitchener, Windsor and Sudbury. St. Catharines/Niagara Falls, Hamilton and London exhibited the highest rates of price increases, which were between 2.6% and 3.7% above the average rate of consumer inflation, which has been around 2% or less through 2006.

Explanations of these price trends would require analyses beyond the scope of this project. Consequently, the relationship, if any, between these particular price trends to sprawl issues and characteristics is undetermined. However, the following comments may be made. Where population growth is lower than the provincial average, which was 6.6% between 2001 and 2006 (Statistics Canada, 2008), any price increases are likely to be a function of scarcity of land for new construction and/or higher than average cost increases for other supply/cost factors such as labour or municipal development charges. Where population growth is higher than the provincial average, demand factors are likely to provide much of the impetus for housing price increases. Of the 8 Ontario municipalities listed in Table 11, population growth between 2001 and 2006 exceeded 6.6% per year only in Kitchener. Population growth in Kitchener was 7.5% but house prices increased by an average of 3.8% per year between 2003 and 2007, which is the provincial average value. Highest population growth municipalities in Southern Ontario are in the GTA region surrounding Toronto.[14] Indeed, as shown in Figure 4.1 below, average house prices across Toronto have risen from about $200,000 in 1980 to over $380,000 by 2007, with a spike up to $400,000 in 1989. Given this steady and growing demand, it is little wonder that urban sprawl has overwhelmed the GTA and the Golden Horseshoe regions.

In this Chapter, allusions have been made to perverse economic incentives caused by government fiscal and planning policies and by efforts of firms involved in land development and construction to further their own economic interests which result in economic incentive structures that favour urban sprawl

development in the US and Canada. The nature of these policies and activities and their economic consequences and implications are examined in more detail in Chapter 6 along with relevant empirical evidence. In the next Chapter, selected empirical studies of the costs and benefits associated with urban sprawl and alternative urban development designs are reviewed. Advantages and disadvantages of analytical methods for comparing and evaluating alternative development designs are reviewed as well.

Figure 4.1



Source: Robinsky, Marisha (2008) "Housing Price Trend in Toronto" at http://www.torontohomes-for-sale.com/4a_custpage_2578.html

5 COSTS (AND BENEFITS) ASSOCIATED WITH URBAN DEVELOPMENT DESIGNS

In this chapter, empirical studies that evaluate and compare costs and other adverse effects of urban sprawl development with alternative urban development forms are enumerated and documented where possible. Discussions and debates regarding the alleged beneficial (positive) effects and consequences of urban sprawl that have been postulated by some authorities are also noted. Results and conclusions are presented from empirical studies and estimates drawn from the literature for Ontario, other provinces in Canada and the US, where work on this topic has been more extensive than in Canada.

In the first section, the two key questions are addressed. First, are alternative urban development patterns potentially or actually less costly than prevailing sprawl patterns? Second, are the benefits of urban sprawl developments commensurate with their perceived and measured benefits? The cost-effectiveness analysis methodology is applied to compare the economic consequences of alternative urban forms and development models. Urban development models and forms that are used to compare with the current urban sprawl patterns are defined. Results from empirical studies and estimates are then summarized. Issues and limitation associated with these types of studies are noted.

In Section 5.2, the health effects of alternative development patterns are reviewed in more detail. While the primary health consequences relate to air pollution from vehicles, other detrimental health trends have been associated with sprawl development patterns and the life styles that have evolved with them.

The advantages and the difficulties of applying the benefit-cost analysis framework to comparisons of urban development forms is briefly reviewed in Section 5.3.

Given the importance of transportation to human existence and to economic activity, development and growth, the costs and benefits associated with transportation infrastructure and activities under different development patterns, and with emphasis on the automobile, are examined in Section 5.4.

5.1 Costs and Benefits Associated with Urban Sprawl

With respect to the magnitudes of the costs associated with sprawl development versus alternative urban development patterns, researchers have generally focused on the first three categories of costs listed in Table 1: public and private capital and operating expenditures, transportation costs and the loss of natural habitat lands to urban development. Of particular interest have been a) infrastructure/service costs incurred by municipalities, b) housing and commercial property prices and costs incurred by individuals and businesses, c) energy costs incurred by individuals, businesses and municipalities and d) environmental losses and damages experienced by society as a whole, including the appropriation of lands from other uses or natural states.

A key hypothesis that studies of the costs of sprawl attempt to formulate and test is whether the costs incurred to build and maintain the prevailing patterns of urban land use in the US and Canada are excessive in terms of money spent, land appropriated, pollution generated and energy used. If the answer is yes, or even maybe, then following questions invariably arise:

a) to what extent are these costs excessive?
b) who, or what groups or sectors, bear these costs and what groups or sectors stand to gain from the prevailing development patterns?

c) do those individuals, groups or business sectors who benefit from sprawl residential and commercial developments pay their full and fair share of the costs?

In an economic context, costs are excessive when it can be shown that

a) other patterns of urban designs and developments could be implemented to yield the same or higher levels of consumer or citizen satisfaction but at lower costs for individuals, businesses, governments and society as a whole. (This rationale is called the *cost-effectiveness criterion*), or
b) the costs associated with these urban patterns are judged to exceed the entirety of the material and perceived benefits derived from them (This rationale is called the *benefit-cost criterion)*.

If costs are found to be excessive with respect to one or both of these criteria, economists consider the development patterns to be inefficient. Moreover, development patterns are also inefficient if builders and buyers of residential properties do not pay the full costs of their products. As indicated in the previous chapter, this consequence can occur because of distortions caused by government regulatory and tax or fiscal (expenditure) policies or because environmental or social costs associated with the change in land use or the construction activities are not prevented, curtailed or compensated in some way.

Most studies of the costs of urban sprawl evaluate the cost-effectiveness of various types of residential and commercial developments that have been completed or could be undertaken in the future. The monetary costs and revenues that flow to and from municipalities, builders and home buyers are of key concern to many stakeholders.

Benefit-cost evaluations examine whether the net financial and perceived (psychic) gains for communities, home buyers and other stakeholder would be increased under a different pattern of urbanization that results in greater population density within cities and towns with constrained land areas.

Empirical cost-effectiveness studies compare the magnitudes and distribution of various cost factors (from those listed in Table 1) for existing or hypothetical urban communities or neighborhoods with features characteristic of a sprawl development pattern against observed or estimated costs resulting from alternative urban development patterns. These alternative development patterns consist of combinations of higher population densities, grid street layouts, mixed land use and restricted growth policies, which are variously called “managed growth,” “Smart Growth,” “compact development or design” or the “New Urbanism.” Characteristics of these alternative urban forms are listed and compared with related features of sprawl in Table 15. Results of selected empirical cost-effectiveness studies are presented in the paragraphs below.

Real Estate Research Corp. (RERC), The Costs of Sprawl, 1974

This study is cited in Burchell *et al.* (1998), which itself is an update of the 1974 RERC report. The 1974 RERC study is of one of the earliest and likely the most comprehensive cost analyses of urban sprawl of its time. The study generated estimates of the costs and consequences for communities with 5 different land development patterns and for neighborhoods with 5 different housing prototypes. These prototypes range from low density sprawl to high density planned communities and from single-family, large lot homes to high-rise apartments. Capital and operating costs are expressed in per unit values.

As can been seen in Table 16, total unit capital and operating costs of these communities and neighbourhoods for infrastructure components were inversely proportional to density and degree of planning – the lower the density and degrees of planning, the higher the capital and operating costs, as

postulated. The public sector proportion of capital and operating costs was computed for each development pattern.

Starting with 5,000 acres for 10,000 housing units, the amount of land to be developed under each community prototype declines as density patterns increase (or as sprawl declines), which is also expected. Nearly 4,600 acres of land would be needed for low density sprawl development while high density planned developments required 2,173 acres or 47% of the land used by sprawl patterns.

Air pollution emissions and resource (water, energy) usage is proportionately higher under low density sprawl developments. It appears that sewage effluents do not change because storm water and sewer pipe inflows are included in the estimates.

This work attracted much attention and criticism. According to Burchell *et al.* (1998), critics have argued that, among other things, RERC (1974) underestimated the demand for services by higher-density developments and commingled the effects resulting from high density and smaller-unit size. Furthermore, some reviewers cited the RERC for ignoring the benefits of sprawl that are implied by the revealed preferences of many thousands of home buyers who have purchased single-family detached homes on large lots peripheral, exurban areas. Finally, other reviewers argued that additional characteristics besides density were likely responsible for cost differences. Nevertheless, this study set the bar for future work.

Burchell, 1992-1997

Rutgers University researchers, led by Robert W. Burchell, undertook studies to more systematically quantify the consequences of different patterns of urban and exurban development. Results of some of this work are summarized in Tables 16 and 17. In these results, current (a.k.a. "trend", development is essentially sprawl development as described in Table 15. In these studies, the following sprawl characteristics were emphasized: consumptive of sensitive and agricultural lands, inefficient use of available land at or near the core of the metropolitan area, and requiring significant investments to build accompanying infrastructure in the form of roads, water and sewer lines, public buildings, and the like. Compact or planned growth or development envisions efforts to direct growth and construction to already existing locations of development while preserving open spaces as parks or conservation areas.

As can be seen in Tables 16 and 17, planned or compact development is estimated to reduce road building costs by 14% to 24%. Water and sewer utility capital costs could be reduced by about 7%. Planned development could reduce overall land consumption by as much as 60% and "frail" (ie. sensitive) land consumption by more than 83% in the New Jersey study (Table 17). However, in the various studies cited in Table 18, overall land consumption could be 20% to 24% lower while use of agricultural and frail lands could range from 17% to 39% lower than current or trend developments. Median house prices in compact growth areas could be about $10,500 or 6% lower than in current or trend developments. Burchell states that his own work and that of other researchers, provide a weight of evidence that compact development would be more efficient in terms of its costs, less land-consumptive and requires lower development infrastructure investment.

Burchell and Mukherji, 2003

Burchell and his colleague Mukherji formulated and applied multi-equation mathematical cause-effect models to generate differences in resources consumed in all 3,091 counties across the US under two growth scenarios: conventional sprawl development and a managed and planned growth (also referred to

as “Smart Growth” in the article). The model applications produced estimates for the period 2000-2025. A key aspect of the planned or smart growth scenario is that development would be directed toward areas (counties) with excess infrastructure service capacity, as opposed to locations that would have to expand their public services and infrastructure capacities. Furthermore, some of the benefits of sprawl development (eg. both single-family purchase costs and public service expenditures are lower in areas away from urban centres) are incorporated into the models.

The following disadvantages associated with managed growth, which were taken into account in the analyses, include:

a) increased housing costs owing to the land development limitations posed by managed growth,
b) extra governmental costs arising from the administrative requirements of imposing a growth management regimen, and
c) the thwarting or driving away development potential because of an over-controlled real estate market.

Another key feature of these models is that all future developments were accommodated within the model equations by incorporating forecasts of annual increases in housing and commercial capacities. However, as noted, developments would take place in counties with excess infrastructure capacities rather than in “greenfields” counties which would need to have new infrastructure installed. Finally, development incentives facing builders in the form of increased density allowances were included in the managed growth scenario, which would induce developers to build in areas closer to existing development.

Burchell and Mukherji generated growth forecasts of conventional sprawl development and a managed and planned growth pattern in order to show comparative estimates of the following indicators

a) employment;
b) number of households;
c) consumption of land;
d) water and sewer infrastructure;
e) road construction;
f) the costs of infrastructure and public services net of revenues;
g) property development costs.

Over the next 25 years, Burchell and Mukherji estimated that the United States could build 26.5 million new housing units and 26.5 billion square feet (2.5 billion square meters) of new nonresidential space on 18.8 million acres of land.

Estimates for each parameter under the Managed Growth scenario were subtracted from the estimates for the same parameter under the Conventional Development (CD) scenario. Where the Managed Growth (MG) scenario values are lower, the differences over 25 years reflect the savings in costs and other consequences that are associated with the MG scenario. Results from Burchell and Mukherji (2003) are summarized in Table 19 and reveal several interesting findings:

a) Except in the Northeast, costs exceed revenues for estimated total public service infrastructure and utility costs under both scenarios in each of the 3 remaining regions and for the US as a whole;
b) In the Northeast, net revenues under the MG scenario are double the amount estimated for the

CD scenario;

c) Net costs for the MG scenario in the three other regions are equal to or lower than the net costs for the CD scenario. Eg. Net costs for MG are 43.8% lower than net costs for CD in the Midwest and are virtually the same in the West;

d) Residential property development costs (ie. house prices) average about 8% lower under the MG scenario. However, savings of only about 1% are achieved for non-residential property development costs under the MG scenario;

e) Across the US, a MG scenario could reduce road construction by as much as 188,304 lane miles (302,981 kms) for a potential savings of US$109.7 billion over 25 years (ie. US$972 bil. under the CD scenario versus US$817.3 bil. under the MG scenario);

f) Savings in total expenditures on water and sewer infrastructure could range from US$1.3 bil. (7.9% savings) for the Northeast to US$4.2 bil. (7.2% savings) for the West and a US$12.6 bil (6.6%) savings for the entire US.

Thus, more compact developments (Managed Growth) throughout the country could yield substantial savings for local and State governments and, possibly, for home buyers. These results also indicate that fiscal deficits often associated with municipal government public services and infrastructure expenditures could be reduced. Burchell and Mukherji note that these savings could be realized primarily in 740 suburban counties (or 68% of 3,091 counties in the US) located adjacent to and surrounding major metropolitan centres where most of the growth and development will take place. They also argue that their models have shown that the benefits of sprawl such as freedom of choice as to where to live and who to live with, plus lower housing costs, can be preserved while realizing a significant savings in money and natural resources. Some critics apparently have argued that the savings indicated by their models are small in comparison with the consequences of curtailing the ability to build anywhere and that the public savings would not be sufficient to warrant broad-based regulatory changes in land use patterns. In response, Burchell and Mukherji (2003) contend that the policies implied by their MG models could result in much larger absolute savings in money and natural resources than could be accrued if the government were merely to tax or charge citizens to achieve them.

Burchell, Downs, McCann and Mukherji, 2005

The ever busy Burchell has also teamed with 3 other colleagues to produce a book, *Sprawl Costs: The Economic Impacts of Unchecked Development*, in which the results of more extensive applications of the models described in Burchell and Mukherji (2003) are analyzed and reported. The authors focus on the top 20 sprawling metropolitan areas in the US plus their adjacent rural counties. They document the costs associated with current levels of sprawl for the 20 urban regions as well as the 4 broad regions that were cited in Burchell and Mukherji (2003). These estimates are contrasted with potential savings of more compact development patterns that could be implemented closer to the core cities.

According Burchell, Downs, McCann and Mukherji (2005), "...we are all paying a staggering price for sprawling development... and that price will only go up as gas prices increase." They reiterate the conclusions found in the previously noted references and provide new empirical modeling results to support them.

Burchell and his colleagues found that shifting 25% of low-density development to more compact growth (ie. the managed growth scenario) would save American taxpayers

a) US$2.6 billion over 25 years (from 2000 – 2025) because 4.6 million fewer water and sewer hookups would be needed for single-family, detached homes;

b) US$110 billion over 25 years in road construction costs because the need for local roads would be reduced by 188,000 lane-miles;
c) US$420 billion over 25 years in development costs because the average cost of a home would drop by US$16,000;
d) US$24 million/day in costs associated with the automobile because Americans would drive 56 million fewer miles each day (NB. this figure was calculated prior to $3+ per gallon gasoline).

Burchell *et al.* (2005) note that lower house prices and smaller mortgages in outlying communities give the false impression that the overall cost of living in these areas is lower than costs in central cities. The total costs of transportation, utilities and municipal services are higher but, due to the vagaries and distortions of municipal and State taxation and fiscal policies, people in the sprawl areas may not pay the full amount of these costs.

The authors state that, over the next thirty years, the US is expected to become home to 90 million more people. An additional 75% of all the development on the ground today will be needed to support this boost in population. To accommodate this rate of growth, sprawl development will cost US$6.4 trillion during the period 2000 – 2025. Under compact development, costs would be reduced by US$420 billion, or 6%.

These authors' findings show that States in the West and the South, where growth is expected to be highest, will bear the biggest cost burden from sprawl. For example, Statewide infrastructure costs for the period 1995 to 2015 in South Carolina are estimated to be more than US$56 billion, or US$750 per citizen per year over 20 years, if sprawl continues unchecked. A 2¢ per gallon gasoline tax, the tolling of all interstates at thirty-mile intervals and an increase in property taxes of 12.5% would have to be implemented to fund these extra costs. However, if the State of South Carolina switched to compact development and managed growth measures to curtail sprawl, Burchell *et al.* (2005) estimate that it could save US$5.6 billion in infrastructure costs alone over 25 years. The authors also argue that overall quality of life would not be greatly affected if compact growth were to replace sprawling development. They cite a study that purports to find that people living in more sprawling counties are more likely to be overweight and have hypertension.

Discussions of the empirical estimates and trends for individual cities and counties provide context and a greater affinity for readers. For example, Atlanta has tolerated urban sprawl for decades and, as a result, has expanded more rapidly than most other urban areas in the US. Between the mid-1980s to the mid-1990s, Atlanta's population grew by 32% while total vehicle miles traveled during this period grew by 17%. The number of people commuting in a single-occupancy vehicle grew by 15% while commute times grew by 1%. In contrast, Portland, Oregon, one of the few US cities with a long-standing urban growth boundary, has pursued a comprehensive strategy to create walkable neighborhoods. Consequently, from the mid-1980s to the mid-1990s when Portland's population grew by 26%, total vehicle miles traveled in Portland increased by just 2%, the number of people commuting in a single-occupancy vehicle dropped by 13% and Portland's commute times dropped by 9%. Analyses of this nature are presented for 20 other medium to large US metropolitan or economic areas.[15]

Canada Mortgage and Housing Corporation (CMHC), in partnership with the Regional Municipality of Ottawa-Carleton (RMOC), 1996

As usual, Canadian references on empirical studies on the costs of urban sprawl are rare. The key Canadian study to which many other articles and reports refer was prepared by Phillips-Desjardins Associates Ltd. for the Canada Mortgage and Housing Corporation (CMHC) (1966). The CMHC study

compared conventional suburban development with a mixed use, more compact development in accordance with the principles of "New Urbanism."[16] The authors of this report also refer to this development design as the "alternative plan." The analysis generates and compares estimates of the long-term life-cycle costs of various linear infrastructure and community services, and differentiates these estimates between public and private (i.e., developer) costs. An existing residential development in Ottawa-Carleton was used as a case-study on which to base cost estimates under the two development patterns.

Conventional development patterns feature curvilinear and cul-de-sac street designs, relatively low residential densities, separation of land uses and dependence on private cars. Typical planning standards for a conventional residential site include 20 m local right-of-way widths, single family lot frontages of 10.7 m to 15.2 m, lot depths of 30 m to 34 m, front yard setbacks of 6.0 m, and rear yard setbacks of 7.0 m to 9.0 m, which all add up spacious homes and large private spaces in terms of yards and gardens. New Urbanism plans and designs specify smaller lot frontages, depths and setbacks and the inclusion of more apartments so as to contain 71% more dwelling units than under conventional designs.

Some other key differences between the two development patterns include:

a) a greater mix of land uses under the alternative development pattern, with twice as much land devoted to commercial uses and 20% more public open space;
b) narrower vehicle rights-of-way and pavement widths than conventional development;
c) a grid street and a transit supportive design;
d) the alternative development plan has 16% more road length (not including rear alleys or lane-ways), and almost 15% more asphalt road surface area (also not including rear lanes or alleys).

The alternative development plan consists of a series of individual neighbourhoods, each defined by a 400 m radius (a five-minute walk) from edge to centre. Each neighbourhood has a central green, or neighbourhood park, surrounded by a mix of land uses, including commercial, office and higher density housing. Net residential densities for the conventional and alternative plans are 21.7 and 43.3 units per hectare respectively.

The two forms of development are compared on the basis of their life-cycle infrastructure costs, including emplacement, replacement, and operating and maintenance costs. Long-term, life-cycle costs of various linear infrastructure and community services are estimated and differentiated between public and private (i.e., developer) costs.

Table 20 reveals that the total capital costs per housing unit of emplacing (installing) the requisite alternative plan infrastructure is approximately $5,300 per unit or 15% less than the conventional design plan. Table 21 shows the total life-cycle costs per housing unit for Conventional and Alternative Development Patterns as well as the % savings under the Alternative Development Plan for each cost component. The cost items in Tables 20 and 21 are ordered by the "% savings" column. Emplacement (capital) cost components with the highest savings are roads and water-related infrastructure. While these cost components incur higher total costs under the alternative plan because there are more road length and intersections than under the conventional scenarios, on a per-dwelling basis there is a net savings of nearly $2,000 per unit for road construction in the alternative plan. The increase in residential density in the alternative plan spreads the cost of roads over more dwelling units, and the higher proportion of non-residential land uses (7.5% more) in the alternative plan lowers the percentage of total road costs apportioned to the residential sector.

Table 21 shows that the lifetime costs of infrastructure replacement and operating and maintenance (O&M) of the alternative plan were also found to be lower than the conventional urban design. Total life-cycle replacement and O&M costs of the alternative plan are approximately $11,000 per unit over a 75-year period.

Schools and school transportation (i.e., busing) represent approximately one-half of their total life-cycle costs in both plans. Approximately 60% of this cost is associated with transportation, which include buying, operating, maintaining and replacing buses. Schools and school buses account for approximately one-third of total infrastructure emplacement costs, and between 57-60% of total operating and maintenance costs in both plans.

Emplacement, replacement, operating and maintenance costs, as a proportion of total lifecycle costs, remain relatively constant in both plans, at approximately 26%, 7%, and 65-68%, respectively. Life-cycle savings of approximately $11,000 per unit generates approximately $77 million in savings over a community of 7,000 dwellings. Over a 75-year period, the annual savings amounts to over $1 million for the alternative "New Urbanism" plan.

Smart Development for Smart Growth - The Economics of Smart Development Projects

In early 2002, the Province established five Smart Growth Panels, each representing a Smart Growth "Zone." The region extending from Niagara to Northumberland, and north to Haliburton and Georgian Bay was dubbed the Central Ontario Zone. With a population of 7.5 million and 3.7 million workers, the Central Ontario Zone is expected to grow by some 3 million people and 2 million jobs over the next 30 years. The Province established the Smart Growth Panel for the Central Ontario Zone to provide advice to the Minister of Municipal Affairs and Housing. Results of studies and recommendations from these Panels ultimately contributed to subsequent Provincial Growth Plans such as the Growth Plan for the Greater Golden Horseshoe (Ministry of Public Infrastructure Renewal, 2006).

The work of the various Smart Growth Panels was aimed at unlocking gridlock and promoting livable communities by implementing what they termed, "Smart Growth." The Smart Growth Secretariat, a provincial body charged with coordinating and administering the Central Ontario and other Smart Growth Panels in the other Zones, commissioned the Neptis Foundation to carry out research projects to assist the Panel in developing its recommendations.[17] Subsequently, Neptis produced a series of research papers including the report, *Smart Development for Smart Growth*, which, among other things, evaluated the economic feasibility of so-called "smart developments" and the role they could play in "Smart Growth" (Blais, 2003).[18]

Elements that constitute smart growth and development include the following, now familiar, patterns and features:

a) increasing the density of urban settlements and developments;
b) directing investment toward brownfield sites;
c) protecting significant natural areas;
d) providing a wider range of housing and building options;
e) a closer mix of employment and residential uses;
f) better integration of different modes of transportation, including road, rail and transit, and
g) a greater share of development in nodes and on already-urbanized lands.

According to Blais (2003), while Smart Growth is usually envisioned at the regional level, it is really the

cumulative result of thousands of new housing developments, millions of square feet of commercial buildings and kilometres of infrastructure that will be built over the coming years. Therefore, in order to achieve Smart Growth at the regional level, it must first be implemented at the project level. The financial feasibilities of both residential and commercial smart development projects were assessed by Royal LePage Advisors and published in Appendix B of the Blais (2003) report. These evaluations were focused on a range of strategic locations where smart development has, so far, failed to materialize.

Royal LePage Advisors developed *pro forma* financial analyses for relatively dense residential developments and office buildings in four areas: the suburban city centre of Vaughan, a suburban corridor in Mississauga, an area around the GO station in Whitby (an exurban transportation "node" and the centre of St. Catharines, a representative small town. The residential projects were high density, multi-dwelling townhouses and mid-rise apartment condominiums. Both residential and commercial projects included underground parking structures which, according to Royal LePage Advisors, would not normally be included in residential or commercial projects built in these areas at the time of the study. The results of these analyses are listed in Table 22. The third column in this table shows the minimum price for which a housing unit must be sold and the minimum per square foot rental rate for commercial space that must be charged to earn a 12% profit for the builders. Columns 5 through 11 display the proportions of 6 key cost elements plus additional elements not common to each project. Three of the cost items reveal some interesting and rather surprising conclusions.

First, except for the Hurontario St. (in Mississauga) residential project, land costs only account for between 2.3% and 7% of the total project cost. Land costs in the project areas are low relative to overall project costs. Second, because of the relatively low land costs, developers would not normally build structured or basement parking spaces in projects located in these areas or in areas even further away from metropolitan Toronto. They would acquire sufficient land to allow for surface parking surrounding the projects. Multi-storied basement or parking structures are a key element of Smart Development projects but, where land costs per unit of parking space are lower than construction costs per unit of parking space, it will be cheaper and yield more competitive sale prices or rents to construct surface parking spaces rather than more costly parking structures. Third, the authors express concerns about unspecified "government induced costs" (in addition to development charges and permit fees). It appears that these costs, which range from less than 2% to 7.6% of total project costs, arise from land transfer taxes, site remediation (where required) and certain other planning and related fees. It is not known whether costs of delays in dealing with municipal and provincial authorities are included. As noted in Table 22, the proportions of project costs do not add up to 100% because percentages for financing, sales and marketing costs and for profit were not provided. Four of the six cost components reported exhibited higher proportions of total costs in residential projects than for commercial projects. Commercial projects incurred higher proportionate costs for *financing*, *leasing* and *other items*.

The authors conclude that, while the cost structure of each project was not a particular problem, such developments would not find easy customers in these areas for several reasons. With regard to the residential units, at the time of the study, grade-level detached homes and townhouses were still available in the case study areas at comparable or lower unit prices. Furthermore, as noted by Blais (2003), "Townhouses are a tough sell when a detached house can be had for $199,999." Office space was in particularly high supply during the period of study (2002-03) so that rents were very competitive. Moreover, adding structural or underground parking to an office building adds costs that competing buildings with surface parking do not incur. Thus, given the prevailing prices of land in these areas, saving land by building denser building types does not result in sufficient cost savings to justify the expense of parking structures.

Based on the foregoing analyses, Blais (2003) suggests the following possible approaches to supporting smart development in strategic suburban and exurban locations:

a) Reduce smart development project costs primarily by reducing government-related costs and adjust building codes that builders allege impose excessive costs on some types of smart development structures. Moreover, as long as surface parking is cheaper than underground and multi-story parking structures, high density, "smart" developments will be at a cost-competitive disadvantage. Municipally financed parking structures could alleviate this burden but the distributional implications could raise objections from tax-payers.
b) Ensure prices of competing developments reflect actual infrastructure costs incurred. Smart development must either be offered at a significantly lower price than available detached, grade-level housing or offer more amenities in the form of measurably better urban environments than currently exist, easier access to good transit connections and higher-quality construction features which would attract customers.
c) Stimulate demand for smart developments by ensuring that municipalities assist in creating environments at their strategic smart growth locations that are of the highest quality including a reliable, frequent transit system, walkable environment, landscaping, human-scaled streets, wider sidewalks, a more eclectic mix of uses (residential, commercial, employment places), convenient, grade-level retail and nearby recreational centres and schools.
d) Finally, Blais recommends "correcting" (ie. reducing or eliminating) perverse incentive structures that are perceived to be associated with the application of development charges. This issue will be examined further in Chapter 6.

5.2 Health Effects and Damages Associated with Sprawl

Abelsohn *et al.* (2005) contend that there is a direct relationship between urban sprawl and various adverse health effects and implications. That is, as quantitative indicators or indexes of urban sprawl increase, the risk of certain adverse health effects will also increase. They conclude that the primary pathway from urban sprawl to public health is via air pollution emissions from vehicles. They also argue that people cannot continue to lead healthy lives without sufficient farmland to produce local food, nearby forests to help purify the air, and protected watersheds, reservoirs or ground water to provide safe drinking water. Thus, according to these authors, neither of these complementary goals - protecting environmental systems and protecting human health - can be fully accomplished without curbing urban sprawl.

The best known health effects which may be associated with urban sprawl characteristics and indicators include:

a) mortalities and morbidities (illnesses) due to air pollution,
b) diabetes, obesity and hypertension due to lack of physical activity which is largely the result of dependence on automobiles,
c) mortalities and injuries due to increased incidence of vehicular and pedestrian accidents,

The economic importance of these health effects may be judged by estimating the monetary values for individual incidents of mortalities and specific diseases or injuries that may be attributed to the relevant sprawl-related characteristics or factors. These unit values would then be multiplied by the numbers of each of these occurrences in a given location or municipality, over a specific period of time, usually per year. Monetary values of mortalities are based on individuals' willingness to pay to reduce a collective risk of death by specific amounts and then aggregating these values over the exposed population.

Monetary values associated with morbidity effects and measures (illnesses, hospital admissions, visits to doctors, etc.) are based on the willingness to pay to reduce

a) the risks or incidence of these effects,
b) the costs of relevant health care services incurred and/or
c) losses in productivity (eg. lost work days) due to illnesses.

Respiratory and cardio-pulmonary diseases are caused by concentrations of fine particulates that are emitted directly from stationary sources (buildings, factories) and are formed by reactions among SO2, NOx and VOC emissions in the atmosphere. Table 23 displays data on air pollutant emissions from selected sources for 1999, the latest year available from the Ontario Ministry of the Environment (Ontario Ministry of the Environment, 2003).[19] Note that motor vehicles in Ontario emit about 2% of SO2, 35% of NOx, 20% of VOCs and 5% of total Particulates while residential sources comprise 0.7%, 3%, 12% and 11% of the totals for these same pollutants, respectively.

The numbers of cases of various pollution-related diseases in a given location over given time periods may be estimated using appropriate dose-response functions between concentrations of pollutants and exposures to human populations over time. The extent to which non-traumatic mortalities and morbidities, particularly with reference to hospital admissions due to respiratory (including asthma) and cardiovascular diseases, are attributable to automotive air pollutants and greenhouse gas emissions are summarized in Abelsohn *et al.* (2005). However, the air pollutant concentrations that people are exposed to are the result of pollutant emissions from various industrial sources located in rural areas (eg. mining and smelting, pulp and paper) in addition to those associated with urban sprawl (eg. residences, buildings and automobiles) in Southern Ontario. In addition, transboundary flows of air masses carry large amounts of air pollutants from other jurisdictions into Ontario, especially from the US.

DSS Management Consultants (2005) estimated the monetary values of health damages as well as selected environmental damages that can be attributed to air pollutants generated from within Ontario and from extra-jurisdictional sources via transboundary atmospheric transport. A summary of these estimates are shown in Table 24. The total values of environmental and health effects associated with pollutants generated from Ontario sources was $8.3 billion per year, of which $4 billion was attributed to health effects and $4.3 billion was associated with damages to agriculture, forestry, materials, visibility and soiling. An additional $10.6 billion worth of damages were attributable to transboundary sources of air pollutants, of which 45% ($4.8 billion) was associated with health effects and 55% ($5.8 billion) were due to environmental damages.

However, the value of mortalities and illnesses attributable to air pollutants associated with urban sprawl in Ontario likely constitute a relatively small proportion of these damages. For example, the main sources of pollutants that are associated with exurban sprawl developments are “total vehicles,” “residences” and “commercial” establishments under “area sources” in Table 23. These three sources account for 32.3% of VOC’s, 5.1% of NOx, 2.8% of SO2 and 16.4% of total particulates. If the values of damages are directly proportional to pollutant emissions (a possibly reasonable assumption for those pollutants that are perfectly mixed in the atmosphere), then the total value of damages attributable to these sources would be about $273 million per year.[20] Given the conservative basis on which the original estimates were generated by DSS Management Consulting Ltd., it is likely that this estimate of damages potentially associated with urban sprawl would be on the low side of the uncertainty range.

Bray *et al.*(2005) note that some cancers such as leukemia in children have been linked to exhaust toxicants. Evidence that road accidents and fatalities are higher in sprawl areas was also cited. Other

links to health effects include the low walkability of sprawl neighbourhoods and the resulting increase in car use may contribute to the growing obesity epidemic, especially in children; a lack of safe pedestrian thoroughfares may lead to increased traffic accidents; diminished natural environments can also lead to the decline of social capital and psychological well-being, and urban sprawl may contribute to social isolation and age segregation between the elderly and young. Indeed, in some cases, the elderly and disabled may be experience reductions in access to social or medical services (Bray *et al.*, 2005).

Traffic-related accidents are the leading cause of death in the U.S. of people between the ages of 4 and 35 and the third highest cause after cancer and heart disease in terms of years of life lost prematurely in the entire US population (Subramanian, 2003). According to Bray *et al.* (2005), Ewing and Ewing (2003) and Ewing *et al.* (2003b) compared fatal traffic accident rates per 100,000 population to a complex index of sprawl in 450 U.S. counties with urban and suburban developments and which included over two-thirds of the total U.S. population. The sprawl index was designed so that, the higher the index value, the more compact or dense was the region or municipality. Vehicle fatality rates were found to vary inversely with the sprawl index. In the 10 most compact counties studied, which included cities such as New York, Philadelphia, Boston and San Francisco, the average sprawl index was 218 while the average traffic-related fatality rate was 5.6 deaths per 100,000 population. Conversely, in the 10 least dense urban areas (eg. Cleveland, Atlanta and Minneapolis), the average sprawl index was 69 while the fatality ratio was 26 per 100,000, almost 5 times higher than the average fatality rate in the denser communities. Ewing's analyses revealed that, for every 1 % increase in the sprawl index function, which implies increasing density, the fatality rate would be reduced by 1.5%.

Traffic death rates in Canada are generally lower than in the US. However, Bray *et al.* (2005) hypothesize that the inverse relationship between traffic fatalities and population density holds in Canada because of the similarities in the cultural behaviours, urban design, automobile ownership patterns and urban traffic characteristics between the two nations.

The economic losses that are specifically associated with the health effects of urban development patterns and sprawl designs in Canada have not been estimated. Moreover, there seems to be little interest in doing so. However, where mortalities, various illnesses and health risks, health care costs and productivity losses can be shown to be directly associated with urban sprawl patterns, intensification policies and programs that comprise the alternative development patterns and styles discussed earlier in this Section would likely reduce such mortalities. Such estimates can also be applied in order to more comprehensively and accurately assess the benefits and the costs associated with major initiatives such as the "Growth Plan for the Greater Golden Horseshoe" region of Southern Ontario or to justify some of the contentious projects associated with such initiatives. The methodology that is best suited for these types of assessments is the benefit-cost analysis framework, which is discussed in the next section.

5.3 Benefit-cost Analysis and Urban Sprawl

While all of the foregoing researchers and their studies generally support the hypothesis that curtailment of urban sprawl by means of policies that induce and enforce compact, managed or "smart" growth will likely achieve greater cost-effectiveness and save money, few say anything about the fundamental factors that drive urban sprawl; population and economic growth. Even if sprawl can be curtailed or controlled so that urban developments can be made more cost-efficient, continued growth will inevitably consume and deplete the resources that have been saved through controlled, managed or compact growth.

The cost-effectiveness methodology applied in the studies cited above provide little insight about the consequences of continued growth. Comprehensive assessments of the benefits and costs of proposed

developments and their designs would provide better evidence to document the long-term societal losses and sacrifices associated with inexorable expansion of the built urban environment, whether sprawl or planned. Moreover, cost-effectiveness analysis techniques and comparisons evaluate only the cost differences among different options, in this case urban-suburban development designs. Beneficial consequences, distributional implications and long-term, inter-generational considerations are absent from cost-effectiveness analyses. Only those factors that constitute or affect current costs are considered, although non-monetary cost consequences such as the amounts of land used or the incidences of diseases can also be incorporated into cost-effectiveness assessments.

The strengths of a benefit-cost analysis framework for evaluating alternative urban designs, transportation system options and other policies and programs intended to influence urban residential and commercial developments are enumerated below:

a) requiring clear statements of the issue or problem to be resolved, formulating the questions to be addressed and/or objectives to be achieved and constructing feasible options to be evaluated,
b) systematically identifying, quantifying (in relevant non-monetary, physical units such as areas of land, reduced air pollution, reduced health effects, etc.) and valuing (in monetary or other, agreed to weighting measures) relevant benefits and costs that result from various options being evaluated,
c) revealing and taking account of uncertainties about outcomes and results with respect to different options,
d) estimating the monetary values of benefits and costs where possible; where valuation is not possible, display quantitative effects along with value estimates that are available,
e) displaying the quantitative and the monetary consequences (benefits and costs) of each option in a manner that facilitates comparison and ranking,
f) revealing cost-effectiveness of options,
g) incorporating and accounting for future changes and trends in costs and benefits,
h) applying theoretically consistent and empirically practical evaluation methods and criteria,
I) showing the distribution of benefits and costs geographically and/or temporally among relevant income, ethnic, social and gender groups in order to assess fairness and equity.

A benefit-cost framework is comprised of the elements and steps listed in Table 25. There are many books, reports and journal articles that describe and reconfigure economic assessment methods for application to issues and questions that involve identification, quantification and valuation of intangible and un-marketed, but nevertheless real, benefits and costs of various social and environmental policies and programs. Litman (2007) describes these elements in more detail and presents examples of results from evaluations of transportation policy options that are intended to implement or install “Smart Growth” principles in new or retrofitted developments. Empirical case studies of the application of these techniques are cited by Litman as well.

Benefit-cost assessments as well as other economic evaluation tools such as cost effectiveness, financial affordability and economic competitiveness assessments do not always unequivocally reveal the “best” option or choice. However, such assessments can identify options that are clearly losers and help get them off the table. The information provided from these assessments will also inform decision makers to help them make better choices.

There are also an evolving set of new evaluation methods intended to assess the sustainability characteristics of programs and policies. These methods complement economic evaluation techniques and draw greater attention and clarity to wider and deeper problems that are often ignored when so much

attention is paid to trees rather than forests as a whole. Assessment of the sustainability of policies, programs and economic activities allows one to turn a critical eye toward the fallacies inherent in uncontrolled economic and population growth.

For example, application of the Ecological Footprint methodology is expanding yearly. This methodology involves estimating the area of land required to supply all of the food, building materials, water, energy, natural resources and other inputs that are used to support the consumption levels of a given population in a city, town or region. The Federation of Canadian Municipalities commissioned assessments of the ecological footprints for 26 municipalities (Wilson and Anielski, 2005). For example, the consumption of an average Canadian requires approximately 7.25 hectares of land and water, per person, to grow or extract the necessary resources and energy, and the global world biocapacity per person is only 1.9 hectares. However, several of the faster growing municipalities in Southern Ontario require even more land and water area to support their consumption patterns: York Region consumes resources per person each year that require 8.28 hectares to produce while the Halton Region consumes the equivalent of 8.91 hectares and Ottawa 8.59 hectares per person per year. Toronto's ecological foot print is 7.36 hectares. Edmonton and Calgary are the national champions for excessive resource consumption with 9.45 and 9.86 hectares per person per year, respectively. Energy demands make up the largest portion (55%) of ecological footprints that have been estimated in Canada. Other sustainability assessment techniques, many of which are currently under development and testing, are reviewed in Aurora and Donnan (2006).

The economic costs, burdens and influence associated with the automobile and its relationship with suburban sprawl are reviewed in the next Section.

5.4 Costs and Economic Issues Associated with Automobile Use and Links to Sprawl Development

Transportation is exceeded only by shelter, food, and possibly, health care, education and waste disposal as a necessary activity for human existence and for economic development. The automobile is the pre-eminent form of transportation in North America where it has become symbiotic with urban sprawl. As Americans and Canadians migrated to suburbs, they have become entirely dependent on the automobile for all their transportation needs. For example, in Canada, the proportion of people 18 or over who traveled exclusively by car, either as a driver or a passenger, rose from 68% in 1992, to 70% in 1998 to 74% in 2005 (Turcotte, 2008). Conversely, in 2005, 19% of people over 18 years walked or pedaled from one place to another, down from 26% and 25% in 1992 and 1998 respectively (Turcotte, 2008). Finally, persons over 18 who live 5 km or less from city centre, and made at least one vehicle trip during the survey period, spent 55 minutes a day in a car as a driver or passenger. If they lived 25 km or more from a city centre, they would spend, on average, 83 minutes in a car each day (Turcotte, 2008).

Automobiles, along with their supporting industries and infrastructure, are also the causes of enormous private and societal costs and damages. Health related damages and effects have been enumerated and discussed in Section 5.2. In the present Section, a more comprehensive listing of the adverse consequences and implications of automobile predominance in the North American transportation system is presented. This discussion is followed by comments on the perceived importance of the automotive industry and sectors associated with it on the provincial and national economies. Finally, some ways in which transportation policies and plans can affect automobile use and sprawl patterns are examined in the last sub-section.

Private and Public Costs Associated with Automobiles

Life-cycle costs associated with automobiles include those that are related to their manufacture and sales, their use, their maintenance, their storage and their final disposal include both *private* costs (borne by owners who enjoy the benefits of their use) and *public* (a.k.a. *social*) costs which are borne by other members of society otherwise unconnected with the owners and operators of vehicles.[21] Costs may be further disaggregated into financial and intangible or psychological costs that are perceived by owner/operators and by recipients of public costs but do not involve a direct expenditure of money. The latter are also called *external damages*. The use of automobiles also generates private benefits for owners, which are almost all intangible or psychological, such as comfort, convenience and efficiency in the amount of mobility time required to get from one place to another. Vehicles may also generate tangible revenues if they are used for business. Presumably, the private financial and intangible costs borne by vehicle owners are perceived to be greater than the mainly intangible private benefits (such as convenience) enjoyed by them.

Transportation is the second largest cost item after housing for the average household. While house prices in new developments are often lower than residential properties nearer the city centre, the cost of transportation to jobs in the city will be higher the farther people live outside the city. Smith *et al.* (2004) compared trends in housing and travel costs as well as housing and travel costs as a proportion of income in Toronto and the five Regional Municipalities surrounding it to determine how total transportation and housing costs vary with distance from the central city, Toronto. Table 26 shows that average annual housing plus travel costs in the GTA ranged from $18,700 per year in 1986 to $20,000 per year in 1996. The average ratio of housing plus travel costs to income for the total GTA shown in Table 27 increased from 32.4% in 1986 to 33.8% in 1996. A factor that may have helped keep travel costs relatively stable was strong employment growth in Peel region, which includes Mississauga, during the 1990`s. Average trip lengths for Peel residents may therefore have been reduced. Currently, according to Smith *et al.* (2004), more GTA residents commute into Mississauga to their jobs than out of it. Smith *et al.* note that these figures are comparable to similar data for U.S. cities.

Smith *et al*. (2004) also found that both housing costs and travel costs tend to increase as one moves away from the central areas of the region's cities, particularly from downtown Toronto. Increasing average travel costs are expected, due to longer average trip lengths, the need to do more travel by automobile and the fact that many families own more than one vehicle in suburban/rural areas. Increasing average annual housing costs are less expected. However, this finding may reflect the larger size (and, perhaps, other amenities) of suburban/rural housing relative to more centrally located housing which, on average, is older and smaller. The costs of large homes offset lower land values as one moves away from city centres.

From a public policy perspective, the public costs are of particular interest since private costs are voluntarily incurred for the most part and are generally under the control of purchasers. Therefore, public costs, both financial and intangible, will be the focus of this Section.

The manufacture of automobiles and their transportation to markets generate air- and water-borne and solid wastes which, if not reduced, processed or treated properly, can cause external environmental and human health damages. To the extent that release of these waste products and contaminants conform to environmental regulations, the potential for damages and health effects is reduced substantially to or below government sanctioned risk levels. The costs of abatement and prevention systems and technologies are incorporated into the cost and price structure of the products and are thus included in the private cost of a vehicle.

Motor vehicles generate air pollutants during their operation including fine particulates worn from tires,

brakes and other moving parts as well as internal combustion products. Over the past two decades, vehicle manufactures have been subjected to ever more stringent emission standards for the combustion residuals which has resulted in declining per-vehicle emission rates. Again, the costs of the technology changes and on-board equipment to reduce these emissions are private costs, which are incorporated in the prices of new vehicles. However, declining pollutant emission rates have been off-set by the steady growth in vehicle populations, increases in the average miles driven by individuals and the reduction in pollutant removal efficiency that occurs as vehicles age. Quantities of the air pollutants released by vehicles in Ontario are enumerated in Table 23.

The aggregate quantities of health effects and damages associated with air pollution as well as estimates of monetary values of these effects in Ontario are summarized in Table 24. Estimates of the proportion of health damages and values for all of Ontario that were associated vehicular emissions plus residences and commercial establishments were generated in Section 5.2. The City of Toronto Public Health Dept. and Environment Office completed a study which presents estimates the adverse health effects of air pollution from traffic in Toronto (Toronto Public Health, 2007). The authors of this work estimated that traffic gives rise to about 440 premature deaths and 1,700 hospitalizations per year in Toronto. Moreover, while the majority of hospitalizations involve the elderly, children experience more than 1,200 acute bronchitis episodes per year as a result of air pollution from traffic. Children are also likely to experience about 68,000 asthma symptom days annually, given that asthma prevalence and hospitalization rates are about twice as high in children as adults (Toronto Public Health, 2007). The Toronto study also estimated that people suffer about 200,000 restricted activity days per year (ie. days spent in bed or days when people cut back on usual activities due to illness) for reasons linked to vehicle-related air pollution. Mortality-related costs associated with traffic pollution in Toronto are estimated to amount to a staggering $2.2 billion. A 30% reduction in vehicle emissions in Toronto is estimated to save 189 lives and result in $900 million in reduced morbidity effects.

Fatalities, injuries and property damage from multi-vehicle collisions and single-vehicle upsets while driving comprise a major risk and cost to vehicle owners/drivers, passengers and vulnerable road users such as pedestrians, cyclists, moped and motorcycle riders. Annual injuries and fatalities due to vehicle collisions in Canada from 1987 to 2006 displayed in Table 28 reveal that fatalities have fallen by 32.5% to 2,889 while total injuries have dropped by 29% to 199,337.

Nevertheless, current mortality and injury levels associated with the automobile can impose enormous financial and psychological damages on people. Table 29 presents estimates of the monetary values associated with fatalities, injuries and property damages in 1996 that were generated by the Transportation Safety Board of Transport Canada. These estimates tally to $15.4 billion in one year. A more accurate estimate of these values are likely to be lower for at least two reasons. First, the "compensation value" of a mortality is sensitive to age, income and other factors that affect an individual's willingness to buy insurance and recent work has indicated that monetary values of mortalities due to involuntary accidents are more accurately valued at between $500,000 and $1,000,000. Second, the "compensation value" per occurrence of injuries is likely to vary widely. Using the high and low ranges of this compensation value in computations would probably yield a more informative set of results. In any event, these costs are not trivial.

Other public or external damages and costs associated with the automobile and its complementary supporting industries; dealers, petroleum, road builders, repair and maintenance, parts makers, wreckers, etc., include the following:

a) pollution and contamination of streams, water bodies and groundwater from industrial and

commercial waste water discharges,
b) siltation of streams and water bodies from road and bridge construction site runoff,
c) destruction of wetland and other natural environments by road building,
d) wildlife and domestic animal road kill,
e) appropriation of land for roads, parking lots and parking structures, fuel depots and gasoline stations and other vehicle related commercial establishments,
f) visibility loss from vehicle-related smog,
g) soiling and corrosion of buildings from air-borne nitric oxides and fine particulates,
h) contributions to global warming,
I) pollutants released from recycling a final disposal of junked vehicles.
j) congestion on streets and highways.

In a report for Metrolinx, the provincial transportation planning agency for the GTA, the IBI (consulting) Group (2007) stated that the economic costs associated with traffic congestion in the GTA were in the order of $2.2 billion per year, although the derivation of this estimate was not explained in the document cited.

There is little doubt that aggregations of these consequences would amount to billions of dollars in health care costs, in lost productivity, in repair and compensation, in reduced enjoyment and satisfaction, in land-use opportunities foregone on lands used for vehicle-related functions and in terms of the amounts that many people are willing to pay to maintain or preserve open spaces, clean waters and habitats annually. Further work would be needed to quantify and value these various consequences. However, it is not without irony that society and its economic institutions (ie. markets) have either adjusted to these consequences by spending millions each year to prevent, clean up or repair some of these damages or they (people and markets) have chosen to ignore those damages and loss of environmental resources that no one owns, which generate no private revenues and that are free to exploit, depreciate or pollute in the course of using them. In fact, the millions, or perhaps billions, of dollars incurred to pay for health care, repair damages and compensation for losses actually adds value to the national or provincial Gross Domestic Products while losses or additions to green spaces or the safety and psychological well-being of the citizenry are normally omitted from the national or provincial economic accountings.[22] Moreover, as noted in earlier Sections of the present report, many of these external or public costs and damages are not included in the costs of vehicles and the products and services needed to keep them running and repaired. This means that the prices of automobiles and other related products are too low, so that more vehicles are purchased and operated than would be socially or economically desirable.

The automobile stands at the crux of key public policy issues and conflicting objectives in Ontario and in other jurisdictions. On the one hand, its manufacture, use, maintenance and disposal are the source of possibly hundreds of millions of dollars in external or public environmental damages and social costs as discussed above. On the other hand, the automobile yields highly valued private benefits to owners, most of which are intangible although they can be measured in terms of time savings (over public transit), convenience, enjoyment and willingness to pay for alternative forms of transportation. And, on yet another hand, the manufacture of vehicles and parts and the maintenance, repair and other industries complementary to the automobile generate employment and economic activity that are considered essential by government leaders, the business community and many citizens to the sustained growth and prosperity of this province. Indeed, the automobile and its complementary industries are perceived by many to be the mainstay of the Ontario economy. This premise is examined in the next sub-section.

Economic Importance of the Automobile for Ontario and Canada

As vehicle owners and drivers have become addicted to the automobile, so too have the economies of the US, Canada and, especially, Ontario. According to the Ontario Ministry of Finance (2008), the auto parts and assembly industry employs over 130,000 people and all Canadian-built cars and light trucks are manufactured in this Province. Moreover, nearly 85% of finished vehicles built in Ontario are exported to the United States.

Premier Dalton McGuinty reminds his constituents often that the auto industry is a pillar of the Ontario economy. Mr. McGuinty recently observed that the industry "...accounted for 45% of Ontario's exports in 2003. There are 331,000 jobs in the auto industry -- in everything from manufacturing to sales to service. And, it supports thousands of additional jobs in supplier industries such as steel, plastics and glass."

According to data from the Ontario Ministry of Finance (2008), the automobile assembly and parts industry generated $23.7 billion in production value in 2007, or 4.8% of the total value of production in the Province for that year, $494.3 billion in 2002 dollars. Unfortunately, the gross business production value of the automobile assembly and parts sector has declined steadily from $25.3 billion (2002$) in 2004 when it accounted for 5.5% of the total Provincial production value of $460.4 billion. Automotive assembly and parts plus two additional transportation equipment manufacturing sectors recorded a total production value of $50.4 billion (2002$), which amount to 10.2% of the total value of industrial output. However, total business production values of these three sectors and their share of the total provincial business production values have also declined each year since 2004.

These declines are worrisome to the industry and to the provincial and local governments. While the percentage share values seem small on a provincial basis, automotive assembly and parts operations are major employers in Hamilton, Oakville, Oshawa, London, Windsor and other smaller communities in Southern Ontario. The firms and their employees pour millions of dollars into the local businesses of these communities. Moreover, the fortunes of other industrial sectors are linked to the production and use of automobiles and other vehicles in Canada and the US. These sectors include petroleum, steel, chemicals, repairs and services, highway and road construction, insurance, banks and perhaps a few others. All of these industries and their employees add up to enormous economic interests and political influence.

Consequently, the Ontario Government has committed at least $500 million toward training workers for the industry and for other purposes over the past 4 years. Growth in this industry is viewed by provincial government Ministers and agencies concerned with the economy as a key component in maintaining overall growth in employment and economic output. In contrast, and at the same time, other provincial and municipal government agencies, elected officials and NGOs are working hard to actually reduce (by implication if not by stated intent) the population of vehicles, their use and the degree of dependence that so many people have on them. The economic implications of these competing interests and objectives are obviously complex. However, three comments will be made at this point.

First, for the present, economic and political power and advantage (which derives in part from revealed consumer preferences) weigh heavily on the side of the automobile and its continued growth in use and numbers. Moreover, there is powerful economic and political forces help to cement the symbiotic relationship between automobile use and sprawling residential and commercial developments. Given these forces and conditions, transitions to alternative, more compact, less resource-intensive urban designs with less dependence on the automobile will be difficult and rancorous. Moreover, to the extent that policies intended to mitigate or prevent the costs and adverse effects of sprawl development are perceived to threaten these established economic interests by increasing their costs or by reducing their

opportunities for “business as usual,” these sectors will, as they have in the past, respond with strong political lobbying and opposition efforts.

Second, rising fuel prices and recessionary economic trends in the U.S. and Canada will likely result in substantially altered demand profiles for consumers. Increased fuel prices will shift consumer demands to smaller, more fuel efficient cars as well has having a dampening effect on driving habits for people who own the existing, less fuel efficient stock of vehicles. To the extent that the recession results in business failures, plant closures and job losses, the demand for new vehicles will likely contract and families affected by layoffs may be inclined to sell off their second cars. Depending, in part, how fast these shifts in consumer behaviour take place, the adverse economic consequences for the automobile industry, particularly the dominant firms of the North American industry, could be substantial.

Third, many will claim economic ruin if alternative transportation or urban development plans are implemented. However, no matter what economic or social conditions prevail, demands for housing and transportation will persist. If, for example, the costs of owning and operating private automobiles rises sharply beyond average inflation rates or if resource shortages develop due to natural disasters (eg. Katrina), political intrigues or upheavals (eg. OPEC, Iraq conflict), major economic down-turns or recessions or preference and/or behavioural changes of consumers, people will sacrifice comfort and convenience to achieve their basic need to get to work and to other destinations through a variety of means, not the least of which will be to shift more of the household budget to pay for higher vehicle fuel and operating costs. However, it is hoped that greater numbers of drivers will be attracted from their vehicles to more affordable and convenient communal and cooperative transport alternatives. Moreover, even if higher costs of operating private vehicles become more permanent and the demand for, and use of, automotive vehicles declines significantly and permanently, the resources formerly spent on automobiles and their care and feeding would not disappear from the economy. They would, in fact, be diverted to other goods and services that would supply transportation needs. This money would thus be directed to new firms, public agencies or even cooperative entities that would supply the transportation needs and who would require employees and expenditures to provide these services. This is not to say that the transition to a new economic and political reality or, as economists would put it, a new equilibrium, would be easy and painless. In any event, the implications of scenarios with drastic reductions in automobile use and production should be seriously considered by government planners.

While automobile assembly and parts plants in Oshawa, Oakville, Windsor and other communities throughout Ontario might partially or entirely close and reduce employment (as has been happening recently), most of these resources should not remain idle for long. If it is to survive, the auto industry itself will have to shift production to new types of vehicles that operate on less costly power sources and fuels or on petroleum with vastly greater efficiency than is now the case. Plants and machinery can be converted to produce alternative fuel vehicles, equipment for transit systems or other lower cost transportation options just as some of these same plants were converted to produce planes and tanks during WWII in the 1940's. While such transitions could be costly and painful for companies like Ford, GM, Chrysler and even Honda and Toyota and their employees, shareholders and host communities, the net adverse economic effect on the provincial and national economies would be much smaller. These effects could be lessened further if the provincial and national governments engaged in the planning and sensible policy making that would support and guide such a transition rather than impeding it by continuing to support a failing automotive sector in the name of employment. Indeed, to the extent that alternative, automobile-free transportation solutions are less costly in the aggregate, both private and public resources would be freed up to devote to other purposes that could be even more valued by, and, hopefully, beneficial to, society.[23]

In the next section, some "sensible" policies and approaches that have been suggested for reducing dependence on the automobile for transportation in suburban and exurban peripheries are proffered.

What to Do?

Numerous environmental advocacy groups and some government agencies promote various policies, restrictions and programs aimed at reducing automobile use and dependence. However, even with greater clarity about the various public, private, market and non-market damages and costs associated with the automobile, it is unlikely that regulatory exhortations or more "education" alone will sufficient to induce Canadian or American suburban car owners to give up or even reduce their use of personal vehicles.

Metrolinx is developing a regional transportation plan for the GTA. It is intended to build a program of short-, medium- and long-term actions to be carried out over the next 25 years. Key considerations for design and evaluation are "people, the environment and the economy" (IBI Group, 2007). The Crown organization is releasing six Green Papers and a Final Report with recommendations. The Metrolinx Plan is purported to have the following elements and "themes:"

a) Consumer focus,
b) Comprehensive planning,
c) Technology,
d) Mix of public and private sector involvement,
e) Great design, and
f) Innovations and best practices from around the world

Expanded public transit and urban designs that favour walking and cycling are also noted in the Metrolinx publications.

This and other notable efforts to address these transportation problems and design sustainable transportation systems and infrastructures would do well to incorporate two key conditions that could provide economic incentives to achieve a measurable reduction in private vehicle ownership and use in suburban and rurban Canada.

a) car owners must perceive that the costs of owning and operating one or more automobiles are high enough that they will sacrifice convenience and other tangible and intangible benefits for less costly alternatives, and
b) transportation alternatives to the automobile must emulate the capabilities and benefits of the automobile to some degree, especially in terms of availability and transportation times, if they are to be seriously considered by the driving public.

At this writing (May 2008), fuel prices are rising rapidly ($1.22 + per litre for unleaded and higher for diesel in the GTA April 2008), but are not yet high enough to deter operating personal cars or to induce the use of available transit alternatives.[24] In fact, according to various authorities, gasoline and diesel fuel prices are not yet high enough to offset the price premium for hybrid vehicles such as the Prius over the average ownership period of the car (Toronto Star, ≈2005). Therefore, one potential strategy or policy direction would explore mechanisms that would internalize at least part of the public damage costs that are associated with automobiles and their use into the price of vehicles and/or the costs of their use. Several policies and trends are being implemented or contemplated to accomplish this:

a) *tax vehicle ownership*. The City of Toronto has recently imposed a vehicle registration tax which would be paid whenever at vehicle's ownership is transferred. The mayor and other City officials have given no other reason than revenue generation as justification for this tax. To the extent that this tax is based on factors that are related to fuel consumption, more fuel efficient vehicles will be favoured. Moreover, such a tax will increase the cost of automobile ownership and will likely have a slight dampening of demand for vehicles and their use.
b) *tolls for the use of roads.* A blue-ribbon panel on the City of Toronto finances revealed in February 2008 that imposing tolls on key city highways could bring in as much as $700 million per year (Girard, 2008). Toronto Mayor David Miller says this approach deserves very serious consideration and Metrolinx, the provincial transportation planning agency, is also studying toll options (Girard, 2008).[25]
c) *carbon taxes on fuels*. This policy has been studied intensively for years by regional, national and international bodies but is widely disliked by politicians and their car-owning and driving constituents. Few jurisdictions have actually imposed such taxes, British Columbia and Norway being among them.

Justification and support for further fees and charges on vehicle ownership may be gained by generating credible estimates of the public damages and costs associated with vehicle use and by ear-marking some of these revenues for specific uses, such as R&D for more fuel-efficient, alternative power sources and lower emission vehicles..

Alternative transportation options that would get people out of their cars are being considered and experimented with by jurisdictions the world over. The following are examples of options that could provide intra-urban transportation alternatives that might entice the traveling public from their cars.

a) expansions of existing public transit systems in terms of coverage, accessibility and capacity. The rapid (subways and RT) portion of Toronto's transit system has about 15 km of track per million people whereas Vancouver has 22 km, Boston 27 km, Madrid and San Francisco about 41 km each (IBI Group, 2007). Toronto plans to expand it's rapid transit by about 7% whereas Vancouver, Boston, Madrid and San Francisco, plan increases of their rapid transportation systems by 64%, 18%, 37% and 27%, respectively (IBI Group, 2007).[26]
b) establishment and expansion of vehicle cooperatives. Members join, pay dues, reserve vehicles by phone or internet and pay mileage. Vehicles parked in locations near subway stations or other transit nodes, hence dependent on transit system.
c) expansion of call-pick up services similar to "Wheel-Trans" for disabled or seniors. Patrons order pick-ups by phone or by computer. This approach could work for suburban areas with no subways or RT service.
d) expand commuter buses and collection points at designated parking lots or collections points highways, malls, etc.

The costs of these transportation system alternatives (irrespective of who pays them) are likely to be huge. It would, therefore, behoove the relevant authorities such as Metrolinx to undertake benefit-cost assessments of these or other specific proposals. Properly done and considering intangible, and well as tangible, benefits and costs, such assessments can yield the following advantages:

a) assumptions and forecasts of relevant parameters, costs, revenues and relevant environmental and social effects and consequences are more likely to be generated, explained and displayed in a policy-relevant manner,
b) discovery and refinement of options and design features that reduce costs and improve the

proposed project often result from a comprehensive benefit-cost assessment,

c) cost increments associated with interventions by rent (profit)-seeking special economic and political interests can be isolated and displayed,
d) values and preferences of all interested parties can be revealed,
e) projects whose costs are clearly excessive (eg. that they exceed all quantified and valued benefits and any optimistic estimates of the values associated with intangible, non-marketed benefits) can be identified and justifications for rejection can be derived.

Since people love their cars and trucks so much, there may be a role for alternative fuel/power source vehicles to reduce petroleum consumption and provide a transition from individually owned cars and trucks to more convenient and acceptable communal transportation systems. One such option could be all-electric, rechargeable "low speed vehicles" (LSVs) such as the one offered by Toronto-based ZENN Motor (which stands for Zero Emissions, No Noise). While this firm and others in Canada who manufacture electric LSVs are exporting their products to the US and Europe, they have yet to be approved for use on the streets and highways of Canada and Ontario. Unfortunately, in December 2007, Transport Canada proposed to limit the use of LSVs to military bases, university campuses, retirement communities and other "planned" environments and the Ontario Ministry of Transportation appears to follow this approach under the claim of driving safety (Hamilton, 2008).[27] However, given the stakes involved in this particular regulatory decision, it would benefit from a benefit-cost evaluation that would identify, quantify and value the magnitudes and distribution of the key consequences for all stakeholders associated with this issue.

Transportation planning is intimately related to and affected by urban planning that is carried out by the central cities and their surrounding municipalities. Metrolinx is an attempt to provide regional planning that transcends the jurisdictional fragmentation that accompanies leapfrog urban growth. However, in the next chapter, it is shown how the design and application municipal financial tools such as property tax and development charges can encourage urban sprawl and inefficient development of infrastructure and services.

6 Financing Municipal Infrastructure and Service Costs Associated with Urbanization and Implications of Financing Tools

A question of concern to many is whether builders and real estate developers and their customers pay the full costs of new infrastructure and services capacities (eg. roads, utilities, schools, recreational parks and facilities, etc.) that are associated with new residential and commercial developments in municipalities throughout the province. This question is addressed and answered in Section 6.1 to the degree possible given available data. Furthermore, as discussed in Chapter 3, the costs and benefits that are incurred or enjoyed by the various stakeholders, sectors and groups that are involved in urban developments will induce predictable responses and behaviours. The extent to which relevant municipal fiscal tools may create incentives for continued urban sprawl is thus examined in Section 6.2.

6.1 Do the Builders and the Owners of New Residential and Commercial Developments Pay the Full Capital Costs of Required Infrastructure and Municipal Services?

Municipalities are normally responsible for building and maintaining roads, water and sewer distribution and treatment, solid waste management, educational and recreational infrastructures within their boundaries. Large municipalities are responsible for electricity distribution systems within their boundaries as well. Builders of new homes or commercial properties hook up their structures to these utilities. To the extent that new construction requires the construction of additional sewer, roads, water systems or waste management capacities or that of other municipal services such as libraries, recreation or education, builders are obliged to pay toward these capacity expansions by means of development charges (DCs) which are imposed per residential building (unit) or per square foot (or meter) of commercial floor space. These charges are then passed on to purchasers of these properties in their sale prices.

DCs are imposed and enforced by means of by-laws enacted by municipal councils. However, the derivation and application of development charges are dictated by the Ontario Development Charges Act, 1997.[28] A brief description of how DCs are periodically updated and recalculated is presented in Appendix A. This material is based on the procedures used by the City of Mississauga to update their development charges every five years as required by the Development Charges Act. A recent development charge schedule for Mississauga is shown in Table A-4 of Appendix A.

The Development Charges Act is prescriptive as to how DCs are to be derived, when they are to be updated, what is exempted, how complaints should be handled and appealed, how they are to be collected and placed into reserve funds and how the reserve funds are to be managed.[29] The statute also requires a discount of 10% on charges for all municipal service items except for the following:

a) water supply services, including distribution and treatment services,
b) waste water services, including sewers and treatment services,
c) storm water drainage and control services,
d) services related to a highway,
e) electrical power services,
f) police services, and
g) fire protection services.

However, even with development charges by-laws, some critics, such as the Suzuki Foundation, the Sierra Club of Canada and academic researchers argue that "...neither the development charges nor the

property taxes actually pay for all the new infrastructure costs" (Gurin, 2003). It is further asserted that the incremental costs of the expansion of infrastructure and municipal services such as road realignments, sewage and water services, police, fire, garbage collection and disposal, etc. that are associated with each and every new residential or commercial development contribute to an enormous and growing "infrastructure gap" of inadequate and/or deteriorating sewer and water systems, treatment plants, roads, bridges and public transit (Gurin, 2003). The media offers examples almost daily of instances where developers are alleged to have inveigled municipal or provincial governments into bearing all or part of the infrastructure costs that are in support of new developments.[30]

Writing for the Sierra Club of Canada, Neill *et al.* (2003) charge that "...any increased tax revenue (from new developments) is overwhelmed by the costs of delivering new services, the loss of farmland, and increased commuting distances. Ultimately, taxpayers finance the high cost of suburban sprawl." Neill *et al.* also state that, "An examination of taxation in major urban Ontario centres (excluding the GTA) reveals that, contrary to conventional wisdom, tax rates are...variable, and tend to be marginally higher in the fastest growing communities." And so, "whereas new developments in the City of Toronto occur on existing infrastructure, the surrounding municipalities are well known for their extensive greenfield development on farms and forest lands that require expensive new infrastructure." (Neill *et al.*, 2003)

With regard to the last statement, it should be noted that most economists would agree that it is appropriate, in terms of both equity and efficiency criteria, that tax-payers pay higher taxes in areas of the municipality where the costs of infrastructure and other municipal services are higher than areas of the municipality where these costs are lower. However, Neill *et al.* go on to cite studies from the American Farmland Trust, which found that, in the Northeast and Midwest US, servicing residential areas costs, on average, US$1.17 for every tax dollar collected. "In contrast, servicing farmlands and forests costs only US$0.34 for every tax dollar collected..." and commercial properties require expenditure only US$0.33 per tax dollar collected from the owners of these properties. From this finding, the authors conclude that "Farmlands and forests that remain protected are a great municipal tax benefit..." as, it would seem, are commercial properties. The authors note that similar values for Canadian municipalities were not available.

Unfortunately, these criticisms and allegations are a bit confused. It is an economic truth that property owners should pay taxes, fees and other charges that are proportionate to the marginal (incremental) costs of municipal infrastructure and other services. Therefore, in areas where municipal costs are higher, taxes and user fees should also be proportionately higher. However, while farm and forest lands require fewer direct services from a municipality, hence lower municipal costs, it is also true that property tax yields and other municipal revenues from such lands are also far lower than revenues from residential and commercial properties. It is, therefore, likely that the "tax benefit" from agriculture and forest lands in a municipality is not all that great, although no Canadian empirical data are readily available to verify this hypothesis. Furthermore, if farm and forest lands were taxed at the same higher rate as residential and commercial properties, owners of these lands would face powerful incentives to sell their lands to developers. In Chapter 7, it will be shown how parks and other types of open spaces can actually generate extra property tax revenues for a municipality that provides these lands.

While the public infrastructure gap is of concern to all three levels of government, the causes of this fiscal problem cannot be attributed entirely to costs associated with growth. TD Economics (2004) points out that much of this potential deficit consists of deferred maintenance, repair and replacement expenditures in addition to capacity expansions to service growth.[31] The magnitude of the gap is subject to debate but the Canadian Society for Civil Engineering pegs the amount at $57 billion or 5.0% of the Canadian Gross Domestic Product (TD Economics, 2004).[32] According to TD Economics (2004), the

gap could be as high as $125 billion or 6-10 times current annual governmental investment flows. Moreover, deferred capital spending can be found at all levels of government.

The origins of these public investment shortfalls can be found in the era of rising budgetary deficits during the 1980's. When the federal and provincial governments implemented methods to reduce these deficits in the 1990's, they found it would be more politically palatable to decrease capital spending rather than operational expenditures, which would be noticed quickly by people who are affected by reductions in municipal services (TD Economics, 2004).[33]

While the above factors applied also to municipalities, additional trends and changes in senior government policies conspired to place cities, towns and villages into a fiscal vise which forced their own budget imbalances to grow rapidly. First of all, federal and provincial governments were able to achieve much of their cost-cutting by eliminating grants and subsidies and by down-loading responsibilities for various programs and services to the next subordinate governmental level. Municipalities thus took three hard punches to their respective fiscal sustainabilities:

a) they lost financial support for many of their programs from upper tier governments,
b) they were made financially responsible for airports, ports, harbours, ferries, social housing and other local facilities and programs and
c) they were not given substantially greater revenue generation powers or even the right to determine levels of service delivery (TD Economics, 2004).

Municipalities in Ontario are forbidden by law to spend more than they take in through taxes and fees and thus show deficits in their current or operating accounts. However, municipalities are permitted to incur loans or other types of debt to finance capital expenditures. Many municipalities have adopted a pay-as-you-go budgetary strategy and thus have avoided or minimized debt by creating reserves, reserve funds and/or trust funds with current revenues, which can be used to fund planned capital projects or unplanned expenditures for emergencies.

Another factor that contributed to the infrastructure investment gap or deficit is the penchant for all levels of governments to allocate funds to the construction of dramatic new projects and assets at the expense of funding more mundane repair and maintenance activities that would extend the use of existing infrastructure (TD Economics, 2004). Capital projects are attractive to governments because they yield a large, tangible “monuments” that can be exhibited to constituents. Moreover, capital projects only require one-time expenditures rather than a commitment of recurring salaries and overhead costs that are associated with a commitment to new, on-going programs. Capital projects are also easier to monitor than programs with less tangible outcomes.[34]

The economic consequences of deferred, delayed and insufficient capital expenditures for infrastructure are likely to have been substantial. As noted earlier, annual economic losses associated with congestion and delays in shipping of goods in Canada have been valued at nearly $2 billion. In addition, significant economic and utility losses were incurred by various groups and sectors as the result of foregone investments in public capital assets. Hauchaoui *et al.* (2003) concluded that a one-dollar increase in the net U.S. public capital stock generates approximately 17 cents in average private-sector cost savings. In the same study, the U.S. transportation industry was projected to save more than 40 cents as the result of each dollar of public capital investment in roads and other transport-related infrastructures. The benefits of public capital investments also include reductions in adverse environmental and social consequences such as lower pollution and risks from safety hazards. Finally, delaying and foregoing repairs and maintenance of existing capital stocks results in declines in the marginal productivity of the relevant

capital assets.[35]

The hypothesis that DCs collected by municipalities do not pay for all of the infrastructure and service capital costs imposed by new residential and commercial developments will be examined in the following ways.:

a) provisions of the Ontario Development Charges Act that tend to limit the values of DCs are reviewed,
b) relevant financial statements of selected municipalities are examined and compared, and
c) contacts in municipal finance departments were interviewed.

While these sources and analyses are by no means comprehensive or definitive, they provide a basis for informed discussion and debate as well as chart the direction of future research.

The following provisions of the Development Charges Act impose restrictions and limitations that result in reducing the amounts of DCs that might otherwise be applied.

a) Sections 4 (1) and (2) state that, "If a development includes the enlargement of the gross floor area of an existing industrial building..." and "If the gross floor area is enlarged by 50 per cent or less, the amount of the development charge in respect of the enlargement is zero." Section 4 (3) states that "If the gross floor area is enlarged by more than 50 per cent the amount of the development charge in respect of the enlargement is the amount of the development charge that would otherwise be payable multiplied by the fraction determined as follows:"

$$\text{Area of enlargement} \times \text{DC } (\$/ft^2 \text{ or } m^2) \times \left(\frac{\text{Area of enlargement} - (\text{Total area of plant})/2}{\text{Area of enlargement in } ft^2 \text{ or } m^2} \right)$$

Thus, as long as the area of enlargement in an industrial building is just under 50% of the total area of the plant, no DC is applied.

b) Section 5 (1) 4. states that " ...estimate(s) under paragraph 2 must not include an increase (in costs) that would result in the level of service exceeding the average level of that service provided in the municipality over the 10-year period immediately preceding the preparation of the background study..." Therefore, development charge derivations require the use of 10-year averages of relevant costs in the computations.[36] This requirement results in a bias toward a lower charge than would be the case if fewer years were used in the averaging due to inflation. Moreover, if an activity or service that is being implemented by the municipality, or that may even be imposed on the municipality by the province, is new and there is no cost history on which to develop the 10-year averages, the municipality may not impose DCs for the service nor collect DCs for the purpose of recovering these costs. Thus, municipalities are forced to incur un-remunerated new costs for up to 10 years before DCs can be imposed.

c) Section 5 (1) 7. states that "The capital costs necessary to provide the increased services must be estimated. The capital costs must be reduced by the reductions set out in subsection (2). What is included as a capital cost is set out in subsection (3)." Subsection (2) states that "The capital costs, determined under paragraph 7 of subsection (1), must be reduced...to adjust for capital grants, subsidies and other contributions made to a municipality or that the council of the municipality anticipates will be made in respect of the capital cost." The capital costs that are exempted in paragraph 7 above include the following:

    1) costs to acquire land or an interest in land, including a leasehold interest,

2) costs to improve land,
3) costs to acquire, lease, construct or improve buildings and structures,
4) costs to acquire, lease, construct or improve facilities including:

    i. rolling stock with an estimated useful life of seven years or more,
    ii. furniture and equipment, other than computer equipment, and
    iii. materials acquired for circulation, reference or information purposes by a library board as defined in the Public Libraries Act,

5) costs to undertake studies in connection with any of the matters referred to in paragraphs a) to d),
6) costs of the development charge background study that is required under section 10 of the Act,
7) interest on money borrowed to pay for certain costs specified in other sections of the Act.

d) Under Section 16, a developer may appeal a DC by-law to the Ontario Municipal Board OMB). The Board may dismiss the appeal in whole or in part or it may order the council of the municipality to repeal or amend the by-law in accordance with the Board's order. If a particular DC by-law in question is repealed in whole or in part, the municipality must refund all or part of charges collected under the by-law, with interest, within 30 days. However, the Act does not allow the OMB to amend or order the amendment of a by-law so as to,

    1) increase the amount of a development charge that will be payable in any particular case,
    2) remove, or reduce the scope of, an exemption,
    3) change a provision for the phasing in of development charges in such a way as to make a charge .. payable earlier;
    4) change the date that the by-law will expire.

    Thus, the OMB can reduce DCs or repeal the by-law that imposes them, but it cannot increase them.

The above-noted provisions tend to depress the overall level of development charges that can be imposed by municipalities. In addition, municipalities can offer further discounts in order to attract developments to their jurisdictions. According to Robert Rossini (2008), Director of Finance at the City of Mississauga, such discounts have been offered primarily to developers of commercial properties in order to lure new businesses and jobs.[37] Mr. Rossini stated that he was not aware of any municipalities currently offering discounts to residential developers. In any event, the extent to which limitations and restrictions of the Development Charges Act, or the discounts offered by municipalities to attract new businesses, have contributed to any deficits between the capital costs incurred and the DCs collected is unknown and no specific studies of this topic were found.

The second analytical approach for assessing the extent to which municipalities do or do not subsidize residential or commercial development test is to compare the amounts of development charges (a.k.a. lot levies, development levies, developer contributions, etc.) collected for the year 2005 and 2006 with the infrastructure-related capital expenditures incurred during these years as reported by various municipalities. The financial statements for the municipalities of Brampton, Mississauga, Oakville and Oshawa were chosen for this analysis because they have each experienced substantial urban sprawl within their boundaries and they are, of course, heavily influenced by growth within the Greater Toronto Area (GTA).

Development Charges are normally deposited into Trust Funds, which the municipality holds and collects interest until needed. Trust funds are earmarked for special purposes and cannot be diverted to the Operating Fund or other purposes. DCs are then restricted to growth-related capital expenditures, which are included in the "Consolidated Schedule of Capital Fund," a table that is included in the financial statements of all municipalities. However, municipalities do not make a distinction between growth-related expenditures and non-growth related capital expenditures in this Statement and discussions with Mr. Rossini and others confirmed that such information was not available from published municipal financial statements. However, these contacts agreed that, since DC revenues could only be applied to growth-related expenditures under the Development Charges Act, reported development charge revenues in the Capital Fund statement would be a reasonable estimate of the growth-related capital expenditures incurred in the same year.

Schedules of Capital Fund Operations are displayed in Tables 30 - 33 for the municipalities of Mississauga, Brampton, Oakville and Oshawa. As noted, DCs appear as revenues in these statements. Revenues recorded in the Capital Fund Statements also include grants from the federal and provincial governments, donations, investment income, "Federal Gas Tax Revenue" and other unspecified sources. Expenditures are listed for various service areas which may or may not be disaggregated by item. For example, Brampton, Oakville and Oshawa provide expenditures for each service item while Mississauga (Table 31) only lists expenditures for transportation and one consolidated cost figure for all of the other service items.

Expenditures normally exceed revenues. This deficit is then "paid for" by transferring money from reserves and reserve funds (which also contain development charges), from the Operating (a.k.a. the Current or the Revenue) Fund or by incurring debt. Applying the convention that DC revenues represent the growth-related service expenditures, the proportions of DC revenues as a % of total expenditures for each municipality are listed below along with the % change in population.

Municipality	% Population Change 2001-2006	DC Revenues as a % of Total Expenditures		
		2006 Budget	2006 Actual	2005 Actual
Brampton	30%	78.4%	56.8%	65.8%
Mississauga	15%	38.3%	47.6%	23.4%
Oakville	13%	40.0%	24.3%	33.2%
Oshawa	12%	N/A	3.5%	15.7%

The data in Tables 30 - 33 reveal the following additional findings and insights.

a) Development charges are generally the largest revenue source for the capital fund operations in each municipality,
b) Terminology and the degree of disaggregation of revenue and cost components are not consistent from one municipality to another, which makes comparisons difficult,
c) Oshawa and Oakville indicate that the recently established gasoline tax sharing is a revenue source for these capital funds,
d) The municipalities' financial position with respect to funding capital activities appear to vary widely from Brampton with a healthy capital fund balance in 2006 of $237.3 million and

Mississauga with a growing capital fund balance of $107.7 million to Oakville with a declining balance of $4.8 million and Oshawa with a deficit balance of -$1.7 million (down from $37.8 million in 2005).

e) Oshawa seems to fund the bulk of its capital expenditures from debt of one kind or another. However, the relative seriousness of the Oshawa deficit position for the capital fund is not known.

f) As noted, capital expenditures exceeded revenues for each of the four municipalities during the two years (2005 and 2006) for which data are shown. Because it is not known what proportion of the expenditures are apportioned to growth projects and what proportion are allocated to repair and replacement of existing infrastructure and services, one cannot determine explicitly from these data whether or not development charges exceed growth-related expenditures in a given fiscal year. Moreover, notes to the financial statements of these municipalities did not elaborate on this question.

If these revenue to expenditure ratios truly reflect the proportion of growth-related expenditures, then they indicate that Brampton is experiencing the highest growth. Indeed, population growth is correlated to some degree with the proportions of growth-related expenditures indicated for these municipalities. Oshawa has experienced the lowest population growth of this set of municipalities as well as the lowest growth-related expenditure ratios. Mississauga and Oakville are in the middle on the basis of both indicators. Based on the Capital Fund statements reviewed, Oakville and Oshawa finance part their net expenditures with debt while Mississauga and Brampton use only internal funds, such as transfers from reserve funds and the Revenue Fund accounts, to finance these "net expenditures" on a "pay as you go" basis. Based on this small sample, it appears that high growth municipalities with relatively large revenues from development charges are better able to fund their non-growth expenditures than municipalities with lower growth and few contributions from developers. These latter municipalities appear to experience shortfalls in available funds for non-growth capital expenditures and are thus prone to funding net capital spending with debt. Thus, growth-related capital expenditures do not seem to be the cause of financial stress for these municipalities as indicated by the need to borrow money to pay for such expenditures.

Finally, Mississauga's Rossini was asked whether sprawl development resulted in an excess of growth-related infrastructure and municipal service costs over the DCs collected, and to what extent urban sprawl contributed to the infrastructure investment gap. With regard to the first question, Rossini opined that this problem was generally non-existent in municipalities that a) followed the procedures in the Development Charges Act when deriving their development charge rates and b) were vigilant with respect to oversight of development projects and enforcement of relevant by-laws. Rossini also explained that infrastructure and service expansion costs could be contained by regional, long range (5-10 years) capital expenditure planning and managing expenditures on a pay-as-you-go basis so as to remain debt free. These were the goals and standards that Mississauga and other like-minded municipalities have worked toward and, for the most part, have achieved.

Rossini admitted that he really did not know how much, if any, of the infrastructure gap could be contributed to urban sprawl. He cited several of the already-noted public finance issues such as down-loading and reductions in grants and funding from the federal and provincial governments as key reasons why some municipalities might have gotten behind in maintenance and repair of roads, bridges and other municipal capital assets. Rossini admitted that leap-frogging residential developments continue to happen throughout the "First Tier" of GTA regional municipalities, including Mississauga. He also agreed that the initial costs to provide services to these subdivisions were higher than average per household cost for the municipality. However, in Mississauga and elsewhere, undeveloped agricultural

lands and wood lots were filled in by subsequent developments at much lower municipal services costs so the total costs evened out over time. Rossini said that he was certainly aware of the claim that infrastructure and service expansion costs to municipalities that are associated with subdivisions and commercial developments were much greater than development charges and developer contributions intended to pay for these costs. However, he was not able to cite any studies that examined this claim in a substantive manner. Rossini stressed that key challenges for Mississauga and other GTA municipalities currently included how to finance the expansion and integration of transit systems and to achieve compliance with post-Walkerton drinking water system requirements. He also mentioned that municipalities faced perennial challenges in trying to maintain the balance between the generation of sufficient revenues against the maintenance of competitiveness for businesses and affordability for homeowners.

Rossini clearly was not greatly concerned about urban sprawl and its adverse effects for Mississauga. It was also clear that Mississauga and other Ontario municipalities are faced with major financial challenges that divert them from explicitly including un-priced environmental and social consequences in assessments of residential and commercial developments. Moreover, based on the documentation one finds from or about municipalities in Southern Ontario (and just about everywhere else), the a predominant objective is to stimulate and attract economic, if not population, growth to their jurisdictions. There is certainly no serious consideration given to limiting growth by most municipalities. Few evidence official awareness that continuous, unmitigated expansion in human populations, economic production and activity and low density urbanization across the landscape is fundamentally unsustainable.

Development charges paid by builders are intended to cover just the one-time capital costs new streets, roads, pipes, pumps and capacities of sewage, water and solid waste treatment and disposal facilities as well as hook-ups to these systems. Moreover, while it is true that new subdivisions and commercial developments ultimately result in higher levels of annual costs for municipal services, it is widely understood that these costs are properly funded by taxes and service fees paid directly by the owners of the properties. Consequently, even though the Development Charges Act tends to depress the charges that municipalities can impose, the foregoing evidence and analyses do not clearly reveal that the initial, growth-induced infrastructure and service costs to municipalities greatly exceed the revenues and contributions from development charges and related levies. Nor is it likely that growth-related costs are the primary cause of the infrastructure investment gap that afflicts jurisdictions across Canada. A primary fiscal challenge faced by municipalities is the growing inventory of repair and replacement requirements for public infrastructure assets that are delayed or postponed each year due to static or declining municipal revenues and to increased fiscal responsibilities assigned to municipalities as the result of downloading.

Indeed, this infrastructure repair deficit is an indication that property owners do not, in fact, pay the full costs of municipal infrastructure and other services that are provided to them. Canadian and US studies cited in Chapter 5 show that municipal service costs increase directly with distance from the city center and inversely with density (ie. the higher the density, the lower the costs). Consequently, the more extensive and capacious urban sprawl communities become, the higher the incremental costs to provide infrastructure and municipal services in new development at the fringes of the cities. If owners of sprawl properties do not pay the full costs of these services, then demand for these properties will be greater relative to more costly properties in the city centres. This result is reinforced when builders do not incur expenditures to prevent or compensate all of the costs and losses, tangible and intangible, that are associated with residential and non-residential construction projects. Such avoided costs create distortions and incentives that favour exurban sprawl type development with all the attendant external

costs and adverse effects Municipal fiscal rules and policies are a primary source of these distortions. These issues are taken up in the Section 6.2 below.

Unfortunately, the available data do not allow easy documentation and verification of these hypotheses. Recall that the costs used to derive development charges were averaged over ten years. These costs and financial data reported by municipalities do not reveal the differential municipal infrastructure and services costs in more remote, peripheral subdivisions as compared with neighborhoods within the city. Consequently, analyses of the distortions resulting from these differential service costs and from avoiding some of the costs associated with land acquisition and preparation may have been achieved more by logical deduction than by empirical inference.

6.2 Economic Distortions Arising from Government Policies and Programs That Can Influence Urban Growth Patterns

Few federal policies directly affect the direction and form of urban growth patterns. However, a key federal power that strongly affects growth within urban areas of Canada is the federal immigration policy. Canada's total fertility rate (TFR) is currently about 1.55 births per woman, down from 3.5 births per woman in 1951 (Beaujot *et al.*, 2007). As the TFR continues to decline, perhaps as low as 1.3 by 2020, deaths per year will overtake births so that immigration could become the sole source of population growth within 25 years (Beaujot *et al.*, 2007). As reported by Beaujot *et al.*, the majority of new immigrants to Canada settle within the three main metropolitan areas: Montreal, Toronto and Vancouver. In the neighboring jurisdictions where suburban growth is highest and in smaller metropolitan regions (eg. Kitchener-Waterloo, London, Kingston, Calgary, Edmonton, etc.), population growth is mainly due to internal migration. Therefore, federal immigration policy will play a major role in Canada`s overall population growth for the foreseeable future as growth in the 3 major destination cities for immigrants will, in turn, feed the growth of the surrounding jurisdictions.[38]

The Ontario government plays a much greater role in formulating and implementing policies and legislation that can influence urban form and development than the federal government. The Environmental Commissioner of Ontario (ECO) (2005, 2007) has commented extensively on the various provincial planning policies, legislation and initiatives and has expressed concerns that these various laudable efforts will actually "...achieve the intended goals of ecosystem protection and the creation of truly sustainable urban communities in Southern Ontario" (Environmental Commissioner of Ontario, 2007). The Environmental Commissioner is particularly concerned that the provincial government's panoply of land use planning statutes and initiatives, which are intended to promote sustainable communities and development are, in fact, seriously conflicted with deeply ingrained legislation, priorities and institutions that place essentially unrestricted population and economic growth well above policies and initiatives that seek to promote ecosystem and community sustainability. The Commissioner has labeled this situation as the dilemma of "irreconcilable priorities."

Underlying these irreconcilable priorities is the fundamental commitment of both the federal and provincial governments to free enterprise and to minimum managed economic growth targets. There is also an implicit dedication to the principle of private property and the rights of owners to use their property as they wish without undue hindrance. However, there are legal restrictions and requirements intended to protect the environment and to prevent the actions of some property owners from interfering with other property owners. Manifestations of environmental-economic conflicts where economic goals seem to prevail against protection of natural environments and green spaces most frequently include:

a) applications for investments intended to extract aggregates, minerals, forest products and water

for agriculture,

b) applications to the OMB which can over-rule local municipal decisions and by-laws that block residential and commercial developments and investments,

c) construction of various types of "infrastructure" capital projects which, as noted in Section 4.2, are exempt from protections and restrictions against disturbing sensitive ecosystems, surface and ground waters and land formations as provided under the 2005 Provincial Policy Statement and other land use statutes. Roads are prominent among these exempt activities.

The foregoing policies and behaviours are also premised, in part, on the erroneous belief by many authorities that the rural lands and natural environments which are expropriated by suburban and exurban growth and development patterns are essentially "un-used" and have little or no "real" economic value for individuals or society as a whole until the man-made residential and commercial structures were built. This question will be addressed in Chapter 7 where evidence of the values associated with open spaces, natural environments and their various attributes to property owners and to society as a whole is presented.

In the remainder of this chapter, it is shown how financial policies and fiscal tools at the municipal level can influence urban forms, for better or worse. The three most commonly used municipal financing tools are *property taxes, user fees* and *development charges*. The design and application of these revenue sources can either encourage urban sprawl or provide incentives to favour residential and commercial developments more characteristic of Smart Development or "the New Urbanism." Four relatively new and less widely used funding mechanisms are discussed briefly in terms of their effects on growth pattern and urban forms include *site-value taxation, land-value capture taxation, tax increment financing districts (TIFs) and municipal fuel taxes.*

Given the evidence in Chapter 5 that the cost of services increases directly with distance and inversely with the density of development, the most costly areas to service logically tend to be outlying, low-density residential and commercial developments. If property owners in these high cost areas pay higher taxes and fees commensurate with the higher marginal cost of services provided to them (the cost to produce an additional unit of the service) while residents of central, more densely populated areas pay the lower taxes and user fees corresponding to lower infrastructure and service costs, the resulting incentive structure should point toward efficient patterns of development.

However, lower prices of exurban homes has been one of the key attributes that have attracted families to the ever expanding peripheries of metropolitan regions in their hundreds of thousands in Canada and in their millions in the US. Lower house prices have been due primarily to the lower cost of land. Land prices are, in turn, affected by municipal tax policies. Higher property taxes (whether due to higher property assessments or higher tax rates) will deter some potential purchasers and thus tend to depress land prices. On the other hand, beneficial attributes of a property such as location and available municipal services and amenities, will tend to attract demand and increase land prices. Lower land prices favour low density development while higher land values induce more dense residential and commercial developments. When builders initially acquired land for developments, it was usually farm or woodlands that were taxed at low rates relative to developed lands.

However, once development starts and buyers consider purchases, additional costs have been incurred by the developer that are incorporated into the price of houses and rentals of commercial space. Moreover, property buyers face higher taxes and user charges because of the costs of infrastructure and municipal services that will be supplied to the new property owners. Consequently, to understand how municipal financing tools affect development patterns, one must determine how closely the financing tool

approximates the marginal cost of the services provided. To the extent that property owners pay taxes, charges and fees that are lower, on average, than the costs of infrastructure and services provided, premature sprawl development of fringe lands is encouraged. Where taxes, charges and fees are higher than service costs, more compact development in areas with developed infrastructures will be perceived to be less costly and thus preferred.

The potential economic distortions and incentive effects of property taxes and special assessments, user fees and development charges and other "exactions" on the form of urban development are reviewed below.

Traditional Property Taxes

The traditional property tax system includes assessed values of residential and non-residential properties times the tax rate, which is normally expressed as cents per dollar of assessed value, equals the total tax owed. The property tax, which is levied on residential, commercial and industrial properties, is the main source of revenue for local governments throughout Canada, accounting for 57% of their revenues, on average (Kitchen, 2000). For the past decade, property taxes in Ontario have been based on the assessed market value of real property (which is defined as the price that would be struck between a willing buyer and a willing seller in an arm's-length transaction). The assessed value of each residential and non-residential property in Ontario is produced by the Ontario Municipal Property Assessment Corporation. Property tax rates are established by each municipality and may differ with land use or type of structure. For example, residential, commercial, industrial, agricultural and forest properties can each be subject to different tax rates. Moreover, until recently, multi-unit residential dwellings were taxed at a higher rate than single-unit housing, which clearly favoured lower density developments.

Even where tax rates for single and multi-unit dwellings are the same, a property tax favours lower density development over time, and other conditions being equal. Since the tax is levied on the assessed value of land and improvements, any improvements to the property, including the installation of apartments or rooms for rent, raises the assessed value and makes the property subject to a higher total tax where such improvements result in higher market values.

Slack (2002) cites the following empirical studies, which corroborate the expectation that property taxes are statistically correlated with changes in the density of development.

a) Grieson (1974), using 1970 US data, found that housing density would increase by 23% if a 3% property tax were replaced by a tax not related to property,
b) Haurin (1981) found that an increase in the property tax in one municipality not matched by increases in other, nearby municipalities would reduce the size of the municipality, its population and the density of residential building,
c) Steen (1987) concluded that moving from a head tax to a property tax would lead to reduced population density in the central city and to sprawl as the urban area moved outward into undeveloped land,
d) in a survey of municipal planners, finance officers, and developers, Skaburskis and Tomalty (2000) reported that, while most respondents stated that property taxes have little or no impact on urban form, answers to further questions indicated that such taxes could, in fact, encourage lower-density development and more sprawl, depending on how they were designed and applied..

The same property tax rates are usually applied to all properties in the same class (eg. single-family residential, multiple-unit residential, commercial, farm, etc.) throughout the municipality irrespective of

where they are located. Moreover, where, as in Ontario, properties are assessed at market value, then higher priced properties at the center of a city pay relatively more than those in the outlying suburban areas. Since the cost of services is normally lower in the central area than in outlying, fringe areas, properties in the centre are therefore likely to be subject to higher taxes relative to the costs of services while property owners in the outlying suburbs often pay less in taxes relative to service costs that are incurred in their areas. Under these conditions, the disequilibrium in property taxes would, over time, discourage development in the central areas and favour less densely populated areas at the suburban periphery.

Before market value based property assessments were introduced in Ontario in the 1990's, residential property assessments in suburban Metro Toronto Boroughs were, on average, higher than for similar sized and quality properties in the original City of Toronto despite the much higher property prices in the City. The author appealed the assessment of his own Scarborough home after comparing assessments and tax bills with colleagues who lived in Toronto. He was successful in having his assessment lowered until the next reassessment. However, the fact that property taxes were somewhat higher in Scarborough and other fringe (at that time) suburbs than in the City possessed a degree of economic logic in that the costs of city services and the newer infrastructure being installed in the low-density suburban Boroughs were certainly higher per household than the services and existing infrastructure in the, then, more densely settled City of Toronto. This differential distribution of residential property taxes may well have been more economically efficient than the current property value-based assessment system. [39]

Property tax systems also favor single-family residential property in other ways (Kitchen 2000; Kitchen and Slack 1993). In some provinces, the property assessment process assigns a lower percentage of market value to residential than other property types. In addition, not all residential properties may be taxable and the tax rate may be lower on single-family than on multi-family residential properties. Finally, property tax relief mechanisms exist in most provinces for residential homeowners (and sometimes for renters) (Slack, 2002).

Tax rates on nonresidential commercial and industrial as well as multi-unit residential structures are usually higher than on single-family residential properties (Slack, 2006).[40] Kitchen (2000) argues that higher taxation of nonresidential property has little economic justification because nonresidential properties normally use fewer municipal services than residential properties. In Toronto, commercial and industrial nonresidential property owners often must provide their own garbage collection and security services.

In some provinces, for example, apartments are over-taxed relative to single-family homes.[41] To the extent that the property tax system favours single-family homes over apartments, the property tax constitutes an incentive for reducing the density of development.[42] Moreover, the property tax system generally does not differentiate among types of single-family homes, such as single-detached, semi-detached, and townhouses, even though they may require different municipal servicing expenditures.

Farm properties are favoured in the property tax system in most provinces as part of a general policy of protecting farmland, often by assessing farms according to prices the land would fetch under the current (farming) use rather than the prevailing land values, which are based on residential or commercial property use. Alternative uses of the farm, or its speculative value, are not considered in determination of the assessment value. Other ways of granting farm properties lower taxes include providing exemptions for parts of the farm property and assets, lowering tax rates on farms, or providing farm tax rebates. In Ontario, legislation requires that farms (and managed forests) be taxed at 25 percent of the

rate on residential property (Slack, 2006). Where farm land is optioned by developers, municipalities are able to phase in higher tax rates when the farmland is registered for a subdivision or when a building permit on the land has been issued.

Slack (2006) questions the extent to which the above noted tax concessions actually preserve farmland on the urban fringe. As long as farm land owners are free to sell their land for development at any time, long term preservation of farmland is not guaranteed. In the worst-case scenario, lower taxes for land under the greatest development pressure (close to the urban fringe) would only induce leapfrog development farther into the countryside. The protected land will then be developed at a later date for greater profit. Leapfrog development and the associated need for infrastructure expansion can, therefore, become unintended consequences of efforts by individual communities to restrict growth on the urban fringe. Preservation of agricultural land requires legal limits on development (e.g. through zoning, agricultural preservation easements, etc.) rather than, or in addition to, tax concessions (Slack, 2006).

Special assessments (or “local improvement charges”) are imposed on residential, commercial and industrial properties to pay for additions or improvements to existing capital facilities that border on those properties. They are most commonly used to finance repaving of streets, installing or replacing water mains or sewers, constructing sidewalks and providing streetlights. To apportion costs among the abutting properties, tax authorities base assessments on frontage lengths (the most common method), lot areas or the assessed value of properties benefitting from the improvements. In some cases, all properties within a particular zone are charged. Sometimes the authorities attempt to tax the value of properties.

Special assessments and local improvement levies are more efficient than property taxes because they are proportional, to some extent, to benefits that property owners receive. Slack (2002) suggests that property taxes may also affect business location decisions within metropolitan areas but not necessarily between such areas. What is not clear, however, is how much the property tax actually influences land use decisions. Stocker (1973) observed that there is a fair bit of agreement on the direction of the incentive effect but "not much evidence on the strength." Perhaps all that can be done from a policy perspective is to reduce the distorting effects of property taxes by making them as closely related to the benefits received from municipal services as possible.

User fees

Direct user fees are currently charged by local governments across Canada to pay for services such as water, sewers, transit, garbage collection, recreation facilities, parking, and homes for the aged. Efficiency advantages to charging directly for local public services include the following:

a) user fees serve as a rationing mechanism that limits the demand and use of services and avoids excessive, wasteful and financially unsustainable levels of use that result when people perceive such services to be “free,”
b) they act as signals that help local governments determine the quantity and quality of services to provide.
c) they promote efficiency in the consumption of goods and services by allowing users to determine the level of use that is most beneficial to them. For example, where water is charged a flat rate per household per month or quarter, consumers can use virtually any amount of water they want (for lawn watering, pool filling, driveway washing, etc.) for the same price. However, when water is priced per unit (eg. cubic meter) used, consumers must decide how valuable each incremental amount of water used is worth to them. Many make trade-offs by using less water in order to save money. Similarly, establishment of graduated fees for mixed garbage collection,

> combined with free (to home owners) collection of recyclables, provides effective economic incentives to divert wastes from final (landfill) disposal. However, the degree of effort that households devote to separation and recycling will vary according to the benefits and satisfaction they perceive from this activity.

Some economists have claimed that the pattern of urban development would be improved if *marginal* cost pricing is used to derive user fees for municipal services.[43] Most municipalities, however, use *average* cost pricing where the total costs are divided equally among all users. If average cost pricing is used, those in outlying areas (where costs are relatively higher) would tend to pay less than the marginal cost of the service and so would receive a subsidy, while those in the central, high-density area would be likely to pay more than the marginal cost of the service. To the extent that these patterns persist, residents in lower cost areas thus subsidize the use of services by customers in the higher cost areas.

Although user fees can be a useful tool in helping to achieve desired development patterns, derivation of fees with this purpose in mind is rarely applied in Canadian cities (Kitchen 2000). In fact, municipalities have long applied perverse user fee structures wherein unit charges for water, sewer, electricity and other utilities actually declined for users that consumed larger quantities of the relevant commodities. Utilities managers did this because the marginal cost of delivering extra quantities of the commodity was very low (or even perceived to be zero by some authorities) within the existing capacity range. However, such a pricing structure stimulates excessive use and the need to increase capacity which pushes average costs higher for all users. Rates must then be increased but the brunt of these increases are borne primarily by the smallest users who pay the highest rates. Thankfully, many municipalities are abandoning these declining block structures and are now charging larger volume users higher unit (or marginal) prices.

Development Charges

As discussed earlier, development charges are levied by local governments in order to cover the growth-related capital costs associated with new development (or, in some cases, redevelopment). In Canada, development charges (a.k.a development cost charges, development cost levies, development levies, off-site levies, or assessment levies) are levied in BC, Alberta, Saskatchewan, Ontario, and the Yukon and Northwest Territories (Slack, 2006). Development charges are levied for officially mandated programs and the funds collected have to be used to pay for the infrastructure made necessary by the development. Municipalities in Canada have, historically, required developers to provide or pay for on-site services such as streets, street lighting, sidewalks, and other public facilities within the subdivision. Subdivision agreements between municipalities and developers also require that builders take responsibility for providing (or funding) these services to meet municipal specifications as a condition of subdivision approval. More recently, developers have been required to pay for the off-site costs associated with new developments.

Development charges can be a useful tool in encouraging efficient land use and infrastructure use. To be efficient, however, these charges should be structured to reflect the true costs of providing public services. Area-specific charges can be designed to allow municipalities to vary the charge by areas of the city where different infrastructure costs are incurred. Whatever the reason for the differential costs, efficient land use implies that developments which impose higher infrastructure costs on the city should pay higher charges than developments that impose lower costs.

If the development charge reflects the full costs and benefits, private and social, of the development, then developers will face incentives to make more efficient location choices. In the absence of a development charge, the developer considers only the private costs and benefits of alternative locations, not the impact

on the municipality's costs of providing services. Within a municipality, developers compare the expected net return to development on various sites and first develop those sites that yield the highest return. Consider two sites, A and B, which are identical except that developing site A imposes higher infrastructure costs on the city. If these costs are funded by a uniform development charge, the share of the costs imposed on each of the two sites is the same, and the developer is indifferent to selecting site A or site B. If, on the other hand, the costs are funded by an area-specific charge that recognizes the higher costs on site A, then the developer chooses B, the lowest-cost site, first. Thus, area-specific development charges that reflect differential costs can help shift development from high cost sites to more efficient lower-cost sites within a municipality.

Costs of municipal services may vary by area for at least three reasons (Tomalty and Skaburskis, 1997):

a) the distance between each development and major facilities may be different; developments that are distant from water and sewage treatment plants may require an additional pumping station and so should pay higher development charges than a subdivision located closer to the treatment facilities,
b) there may be infrastructure cost savings for nodal or infill developments because the infrastructure is already in place; these types of developments should pay lower charges than new developments that require new infrastructure to be built, and
c) service standards may be different in different developments or established on an area-wide basis to reflect different levels of efficiency in terms of per-household water use, waste generation, automobile use etc.

With respect applying differential development charges in different areas of the city, a municipality can apply charges to:

a) all developments in the municipality for all services,
b) part of the municipality for all services,
c) different amounts in different municipal service areas to reflect cost differentials, or
d) a uniform charge across the municipality plus area-specific charges for specific services in specific areas.

Whatever the reason for the differential costs, more efficient land use would require that developments that impose higher infrastructure costs on the city pay higher development charges than developments that impose lower costs. If the development charge reflects the full (private and public) costs and benefits of the development, then developers will face financial incentives to make more efficient choices about where to locate their development.

Other "exactions" are often leveraged from the developer, such as,

a) land dedications by the builder for roadways, school sites, public works or environmental purposes,
b) parkland dedications (or a cash payments in lieu of such dedications),
c) provision of day care facilities,
d) preserving historic buildings in return for permission to build to a higher density than permitted in the official plan (density bonusing),
e) connection fees, which permit developers to buy into existing capacity of water and sewer facilities, and
f) over-sizing provisions (sometimes called "front-end financing") that require developers to

provide more infrastructure than is required for their developments. The municipality may agree to recover part of the costs from future benefitting owners on behalf of the developer.

According to Lorinc (2001), developers are required to cleave off about half of the gross area of a development property for public uses, including wide residential roads, generous rights-of-way, parks, storm water management ponds, recreation centres, and schools with playing fields. Meanwhile, subdivisions are becoming denser in terms of lot size and setbacks. The result is relatively dense, downtown-style housing projects floating in a sea of rural, vacant space.

The main rationale for development charges is simply that growth should pay for itself and not be a burden on existing taxpayers.

Alternative Financing Tools

Having considered the three municipal revenue sources most commonly used in Canada, the consequences and implications for three relatively new fiscal revenue generation tools are reviewed below. These new methods include site-value taxation, land-value capture taxation and tax increment financing districts (TIFs). While these tax instruments are currently not in wide use across Canada, some Canadian cities have begun to consider them. There is more interest and experimentation with these tools in US jurisdictions.

Site-value taxation involves taxing only the land portion of the property. The assessment base defined under this taxation program excludes structures and other improvements.[44] According to Slack (2002), a form of site value taxation was applied in some western Canadian provinces in the early 1900s. To this day, land is taxed at a higher percentage of market value than are improvements in several western provinces (Slack, 2002). Other things equal, under the most common property tax systems, where the tax base and tax rates tend to focus on improvements to a property, improvements that lead to more intensive uses are discouraged. Low density development is therefore encouraged. Alternatively, taxes that are weighted on the land portion relative to structures and other improvements would encourage more dense construction or renovations that increase densities. Site value taxation thus increases holding costs so that holding land for speculation becomes more costly and provides an incentive to owners of undeveloped property to put their land to a more profitable use. Therefore, site value taxation tends to favour and encourage the development of housing or commercial on open spaces.

In theory, a site-value regime taxes the returns from a particular location (a.k.a location rents) regardless of the improvements to the site. Assuming land is in fixed supply (ie, the quantities of land offered for development is unresponsive to price changes), the tax cannot be shifted to others so that the landowners income from the land is reduced by the value of the tax. Site-value taxes also tend to lower property values. Moreover, in theory, a move from a traditional property tax, which taxes and therefore discourages investment in structures and improvements, to a site-value tax leads to increased investment in structures and other improvements and encourages more intensive use (Slack, 2002).

Therefore, site-value taxation should induce development of vacant land in inner cities and, thus, may reduce pressures to develop more remote greenfield sites. On the other hand, a site-value tax can increase the difficulty of preserving open space and farmland on the urban fringe. Unless farmlands or lands held specifically for conservation purposes are exempt from the tax or are taxed at a lower rate, site-value taxation will increase the costs to farmers and other land owners to hold land and thus increase the incentive to sell to developers. Finally, site-value taxation can be difficult to implement because accurate, defensible valuation of the land component of a property can be a challenge to appraisers.

Land value capture taxes (also called "land-value increment taxes," "betterment levies," and "valorization taxes") are designed to appropriate all or part of the increase in property value that is created as the result of a major public investment in infrastructure. This form of taxation would be applicable where a municipality builds a new subway line, a new highway interchange, schools or parks or other public investment that increases the value of adjacent land. It is often applied only for a few years until the assessment values are increased to reflect the new, enhanced property values.

A large public investment, such as a subway, requires a capital outlay of billions of dollars immediately but the benefits will not likely accrue until several more years into the future. Such benefits consist largely of property tax revenues to municipalities and added profits to businesses and landlords. The public sector decision to construct a subway thus results in a windfall gain for the owners of nearby property as well as increased demand, hence prices, for housing and offices on properties located near it. Increased densities and land values will be reflected in property tax revenues if market value assessment is the base of the tax. A land-value capture tax allows the municipality share the windfall gain that its investment has created.

Unlike traditional property taxes, the land-value capture tax does not penalize the development of unimproved land by increasing taxes when new structures or improvements are installed. However, the land-value capture tax does tend to encourage more intensive uses and developments by making it less profitable for owners to hold land for speculation as land values increase. The landowner either avoids the opportunity cost of holding the land vacant by investing to generate a more profitable use or he/she sells it to someone who will make such investments. Overall, a land-value capture tax is likely to be more effective in increasing the intensity of land use than a site-value tax because the former tends to be a large tax assessed over a short period of time.

It can also be a challenge for appraisers and assessors to estimate changes in property values that result from a public investment. In many instances, public expenditures in infrastructure is contemporaneous with other events and market forces that contribute to rising land prices.

Tax increment financing districts (TIFs) are used most frequently by cities in the United States, but not currently in Canada, to revitalize blighted urban downtown areas. More than 40 US states have TIF enabling legislation (Slack, 2002). TIFs are intended to stimulate private investment in urban cores and to assist these areas in competing with outlying suburban and exurban areas. According to Slack (2002), TIFs have been applied to downtown areas that need revitalization, to the remediation of brownfields and to the rehabilitation of deteriorating infrastructure.[45] TIF districts are popular in the U.S. because municipal officials apparently believe these designations are effective at revitalizing deteriorating neighborhoods and thus increase the urban living standards, neighborhood security and desirability, property values and future tax revenues.

A TIF generally works as follows:

a) A TIF district is proposed on the basis of planning criteria and what is permitted in the enabling legislation. The geographic boundaries reflect the area that needs redevelopment,
b) Public consultation is held, and a redevelopment plan is prepared,
c) Once the area has been designated as a TIF, a specified amount of annual property tax revenues accruing to all taxing authorities within the district (the municipality, the county, school boards, and so on) is frozen at pre-revitalization levels, known as "base-level property taxes",
d) Over a period of 15 to 35 years, all or part of the tax that is generated above the base level amount is ear-marked for redevelopment projects,

e) While redevelopment is normally implemented by private firms and financing, projects are overseen by a city board or a community redevelopment agency, which may use the designated tax revenue for expenses and leveraging,
f) Municipalities undertake infrastructure rehabilitation, land assembly, land write-downs and other improvements over the TIF period; financing of these expenditures may be accomplished by municipal borrowing or with bonds issued against expected incremental tax increases,
g) After the TIF period expires, all tax revenues from the expanded assessment base again flow through the taxing authorities.

Within a TIF, developers benefit from obtaining inner city sites at a low cost plus repaired or new infrastructure provided by the municipality. This scheme does not provide a tax reduction or a tax holiday. Once completed, owners of new developers pay normal property taxes at normal rates. If the TIF operates as expected, there will have been no direct subsidies from government or from one business to another. Dedication of TIF moneys to the redevelopment areas reduces risk and uncertainty for private sector investors as well as greater protection of their investments.

Critics of TIFs argue that TIF spending may receive less public scrutiny than normal budgetary spending by local governments. Moreover, where a TIF district may not generate the expected tax revenues, the resulting lack of funds can threaten efforts to revitalize the designated area. Other commentators argue that TIFs merely accelerate development that would have occurred in any event. Other taxing authorities such as school boards have complained about freezing of their property tax incomes at a time when they experience growth in demand as a result of the revitalization. Finally, TIFs are criticized for targeting funds to a designated area at the expense of overall municipal growth or of areas on the periphery of the district. However, to the extent that a TIF stimulates and improves downtown redevelopment, it can be seen as a tool to discourage sprawl (Chapman, 1998).

6.3 Summary Comments

It is widely alleged that the costs of new infrastructure and increased municipal services for new sprawl type residential developments are not fully paid for by the builders and residents of these subdivisions. There is some evidence that this allegation (or hypothesis) may be true in certain jurisdictions. For one thing, the costs of infrastructure and services to new subdivisions on the periphery of municipalities are higher than the average over the entire municipality. However, property taxes and the development costs paid by developers are derived from average costs for the various services across the whole municipality rather than the higher servicing costs for the new subdivision. Moreover, under the Ontario Development Charges Act, municipal service costs, which are used to derive development charges, are also averaged over 10 years. These procedural requirements thus depress the final average values on which development charges are based. Furthermore, property taxes in Ontario are a function of market value assessments of the properties, not the actual costs of supplying municipal services. If property values in outlying areas are lower than prices for comparable properties closer to the city centres, the taxes for properties in the rural areas at the edge of the municipal boundaries should be lower than taxes for city central properties, even though the costs of services are lower for the older properties in the city centre.

However, data needed to test the hypothesis that development charges do or do not pay the full costs of incremental infrastructure or services proved to be lacking from published municipal financial statements of municipalities. Published municipal financial data on revenues from development charges could not be compared meaningfully with relevant capital expenditures. Interviews with individual municipal finance officers would be another method to test the above-noted hypothesis. However, only one such source could be interviewed during the course of the present contract. This contact (from Mississauga)

was of the opinion that development charges were sufficient to cover most of the eligible incremental infrastructure costs in his jurisdiction. He did note that restrictions in the Development Charges Act constrained the amounts of these charges that could be collected. A more systematic and dedicated research effort would be needed to properly test hypotheses about the sufficiency of development charges to pay for growth-related incremental infrastructure and service costs.

Economists and urban planners argue that growth management is needed in Canada to achieve a balance between pressures to support growth and the desire to protect farmland, open spaces, and environmentally sensitive areas. Although there is debate over whether compact development or urban sprawl is the best way to achieve this balance, there appears to be considerable evidence to support the idea that the cost of providing services is higher in low-density, outlying developments than in central cities. Therefore, it appears that both planning and financial tools are needed to reduce the costs associated with development by directing new housing and commercial construction to open spaces or brownfield redevelopments within urban boundaries where infrastructure is already installed and other municipal services are well established.

Although analysts generally recognize that planning tools have an impact on the nature, type, and location of development within a municipality, the effect of municipal financial tools is less well understood. According to Slack (2002, 2006) and others, the influence of municipal financial powers and instruments is significant and should not be ignored. If a municipality is interested in pursuing compact urban form, it must design its revenue-raising tools so that, at the very least, they do not discourage this form of development. A combination of user fees based on marginal cost pricing and development charges levied on a development-by-development basis could therefore encourage efficient land and infrastructure use and result in developments located closer to existing services. Moreover, user charges should be based on the marginal cost of additional units of service from the infrastructure, and development charges on the marginal cost of extending infrastructure to new developments.

With respect to user fees, economists would argue that municipalities should rely on them more, and user fees should be derived from the marginal costs of the services and utilities that are being consumed. Slack (2002) states that user fees have neither increased in application by Canadian cities nor have they generally been applied correctly. Although mechanisms for levying development charges that vary by location already exist, more cities need to recognize the advantages of area-specific over uniform development charges and then apply them (Slack, 2006). Property taxes should, at the very least, be neutral with respect to land-use decisions. Neutrality can generally be achieved by relating the tax more closely to the benefits received from municipal services by type of property and by location.

Slack (2002) and Kitchen and Slack (2002) argue that cities need to eliminate specific distortions in the current property tax systems, such as the over-taxation of apartments and commercial and industrial properties relative to single-family homes. Moreover, uniform user charges and development charges across the entire city tends to under-charge subdivisions and properties at the low density edges of the city as well as over-charge residential and non-residential properties in the city centers. While it may be difficult for municipalities to optimize these taxes and charges, the design of these financial tools should at least not work against planning objectives and mechanisms.

Of particular concern to Environmental Commissioner and to a great many Ontario citizens is the disappearance of green spaces, agricultural lands and natural environments in Southern Ontario as populations grow and urban, built environments expand. The widespread and rapid conversion of natural lands to subdivisions and shopping malls is due in part to the erroneous conventional wisdom among the development industry and their allies among municipal and provincial politicians and their respective

staffs that green spaces and natural environments have little or no “hard” economic value, particularly as compared with residential subdivisions and commercial or industrial parks. These issues are examined in the next chapter.

7 VALUES ASSOCIATED WITH ECOSYSTEMS, AGRICULTURAL LANDS, FORESTS, WETLANDS, PARKS AND OPEN SPACES

7.1 Valuation of Non-marketed Attributes of Environmental Resources

The 2006-07 ECO Annual Report observes that, "...it appears to be a foregone conclusion that development always generates societal benefits in terms of positive economic returns, employment opportunities, higher property values, and so on. This means that it is often difficult to convince planning approval authorities that other values, such as the protection of natural heritage, are equally worthy of consideration." Blais *et al.*(2000) shows that agricultural land, green spaces and rural areas are protected neither consistently nor well by the Provincial Policy Statement or by the municipal bylaws and policies across the GTA. As noted earlier in this paper, there is a systemic bias toward land use decisions and developments that destroy green spaces and natural environments or facilitates conversion of farm lands and rural areas to suburbs. This bias is due, in part, to systematic underestimations of the value of non-marketed public benefits from uncleared forests and green spaces or undrained wetlands or even well designed and maintained parklands to the public as opposed to the expenditures, employment, incomes, revenues and profits that are generated by private land owners, developers, trades people and other suppliers to builders, financial institutions and the real estate industry.

Developers and other proponents of urban growth and expansion have no incentive to generate estimates of the external costs and damages of their plans or projects. Indeed, some developers would undoubtedly argue that there are no external costs or damages to estimate and value because they comply with all the restrictions and requirements and exactions that municipalities and regulatory agencies impose upon them. Moreover, they would also have powerful incentives to discredit any such estimates that could be used in opposition to their undertakings. It is, therefore, left to public agencies and environmental advocacy groups to generate credible and defensible estimates and comparisons of the private and public economic values associated with green spaces, natural environments and heritage lands to be used in the debates over urban development and sprawl.

Environmental agencies in the US, Great Britain and Canada have carried out or otherwise sponsored a substantial body of effort to develop methods and empirical case studies that generate estimates of the quantities and monetary values of ecosystems, environmental products and services and intangible qualities associated with natural environments. However, these same agencies have yet to systematically bring forward estimates of the quantities and values of public damages or benefits in regulatory decisions when there is opposition from regulated firms who complain that such decisions will adversely affect that their own private costs and benefits.

It is widely agreed by economists and other social scientists that the values or worth that individuals and society in the aggregate place on any type of product, good or service is approximated by the amounts people would be willing to pay to obtain them. This principle applies to public as well as private goods and services.[46] While willingness to pay (WTP) is the theoretical standard for attributing values to either market or non-market goods and services, empirical estimates of such values require the application of a variety of economic and survey methodologies as well as data that are often costly to assemble.

In this chapter, empirical valuation methods, along with examples of their applications, are presented to demonstrate how monetary values of the benefits of parks, open spaces and natural environments are implicitly or explicitly derived and used in land use planning and decision making. First, it is shown in Section 7.2 that the application of referenda for conserving open spaces and farm lands in the U.S.

indicates that citizens are willing to pay, collectively, many millions of dollars to preserve green spaces, agricultural land and endangered wetlands and forests. In section 7.3, it is revealed how the market values of properties that are adjacent or proximate to an open space are generally increased and that cities can realize added tax revenue due to the added "proximate value" of such properties. The use of other methods available for estimating the values of amenities associated with open spaces are reviewed in Section 7.4. Summary remarks are then presented in Section 7.5.

7.2 Using Referenda to Preserve Open Spaces in the U.S.

Banzhaf, Oates and Sanchirico (2008) found that, between 1998 and 2006, about 1,550 referenda items regarding some aspect of preserving open spaces appeared on state, county and municipal ballots across the U.S. Nearly 80 percent of these measures passed, many by a wide margin. These referenda concerned the preservation of farm land; the protection of ecologically sensitive wetlands, meadows, and forests, and the creation of new recreational sites. Some of these measures were initiated by individuals at the grassroots level or by public officials.

Analyses of these referenda indicate that communities that have held such votes are likely to have 5% to 7% higher levels of support for the proposals than communities that have not held conservation referenda. Communities that have held these referenda also tend to be located in areas with more endangered species and with more surface water resources to protect than communities that have not held them. It appears also that environmental and conservation advocates are able to identify communities where referenda have a relatively high likelihood of passage. Moreover, Banzhaf *et al.* (2008) found that many local referenda are approved without outside support. These results constitute *prima facie* evidence of the deep seated values that people hold for various forms of open spaces and natural environments.

Banzhaf *et al.* also found a clear preference for debt (bond) issues over increasing taxes to financing the acquisition of lands for preservation. This preference for debt is due in part to the normal tendency for people to avoid or postpone incurring costs as much as possible. This tendency is enabled by the fact that municipal bonds in the U.S. are low risk and the interest earned is tax exempt. Consequently, there is generally a strong demand for these financial instruments.

Banzhaf *et al.* also found that communities with a larger percentage of their populations living in urbanized areas were more inclined to hold successful conservation referenda, which may reflect a desire to preserve what remains of scarce, hence increasingly valuable, open space. Home ownership in a community was also found to have an effect on the success of these referenda. Communities with a relatively large fraction of renters tended to vote in favor of the referenda, possibly because renters mistakenly believe that higher taxes necessary to pay for these services will not be borne by them. Owners of housing and rental properties are more directly aware of the costs that these referenda may impose on them. In theory, property owners will favor the proposal if the values that they attribute to the intangible amenity benefits derived from open space and park lands are equal to or greater than the increased taxes they will incur. However, property owners may also be influenced to favour preservation by the realization that restrictions on land available for development that may result from the referenda can serve to limit the supply of housing in their vicinity and thereby increase the value of existing homes.

Evidence that various types of open spaces can result in tangible economic advantages for individuals, businesses and municipal governments is presented in the next section.

7.3 Tangible Economic Values, Gains and Returns Associated with Natural Environments and Open Spaces

Tangible economic benefits and monetary can be associated with different types of open spaces whether they are urban city parks, golf courses, rural provincial parks, conservation areas, linear parkways along rivers or even storm water drainage systems. The following types of financial gains or returns can be realized in association with open spaces:

a) property value premia on lots that are adjacent or proximate to open spaces and water bodies,
b) increased property taxes to municipalities associated the higher property values associated with open spaces,
c) expenditures and wages incurred to operate and maintain parks, recreation areas and other types of managed open spaces,
d) expenditures incurred by residents and non-resident visitors to parks, camp grounds, recreation areas and other types of managed open spaces,
e) commercial uses of greenbelt and open space lands in terms of on-site concessions, permittees, special events and film location potentials,

In addition, there are a variety of other methods, indicators and data sets that can provide quantitative estimates of the values of these resources and natural ecosystems. A comprehensive review and summary of the extensive literature and range of empirical studies on the value or economic importance of natural resources, natural environments and other forms of "natural capital" is beyond the scope of this essay. However, selected, representative studies and data sources will be presented in this section.

While most home buyers, real estate agents and even some appraisers find it difficult to separate the value of the land from the value of the structures which stand on it, the factors which affect the price of these two primary components of property differ. Economists have long studied the relationships between property values and various characteristics of the buildings and land. House or building characteristics that influence prices include livable floor area, style (eg. ranch, bungalow, two-story), number of garages, number of bathrooms and bedrooms, age, etc. Characteristics of land that are important to lot prices consist of location, lot area and frontage, available utilities (water, sewers, natural gas, electricity), condition of the neighborhood, air quality and the proximity to water bodies and various types of open spaces. Home buyers quickly learn that lots with frontages on water and condos that face waterscapes will command price premiums of 50% or more.

Texas A&M economist John Crompton is a widely published and quoted authority on the relationships between property prices and various types of parks, water bodies, open spaces throughout the U.S. He is a leading proponent of the "Proximate Principle" wherein residential properties located near an amenity such as a park, open space, conservation area, forest, water bodies or water ways, will attract more buyers who bid up lot prices higher than properties that do not have access to such amenities. Furthermore, these higher land and property prices, which include the capitalized value attributed to the nearby water bodies or open spaces, will eventually yield higher levels of municipal property taxes. Using the difference in prices for marketed products (such a residential dwelling) with and without specific attributes (such as proximity to an open space or park) to estimate the value of the non-marketed attribute is referred to as "hedonic pricing." Crompton has used hedonic pricing models and other statistical techniques to study these values. Hedonic pricing models are widely used by economists to infer willingness-to-pay values of non-marketed attributes and amenities that are associated with marketed goods.

In many such studies, most of which are from the U.S. researchers, Crompton has shown that the aggregate, incremental property taxes associated with adjacent natural environments are frequently sufficient to pay the extra costs associated with land acquisition, development and annual maintenance of the park land or open space (Crompton, 2001, 2005). This principle is illustrated for an hypothetical 50-acre park in Table 34. The total annual debt charges for acquiring and developing the park amount to US$90,000 while the aggregate incremental tax yield per year would be US$98,000. Furthermore, assuming no drastic deterioration in neighborhood quality or safety occurs, the incremental property tax income will continue to accrue well after the normal 20-year debt retirement period. Finally, quality of life and other benefits associated with parks and open space are likely to be enhanced for residents beyond Zone C even though these benefits are not capitalized in property values (Crompton, 2001).[47]

Crompton concludes that the proximate principle is widely observed in both urban (parks, green spaces, etc.) and rural (conservation areas, forests, etc.) settings. Moreover, property values abutting or fronting passive park areas will enjoy, on average, a 20% premium on property values over those properties not so favoured. Key features of a park that will affect the proximate premium for a property are size, maturity, activity level, level of maintenance, degree of development. If a park is large (over 25 acres), well maintained and its use is mainly passive, then the premium would likely be higher.[48] Moreover, providing parks and maintaining open spaces in new developments and subdivisions offers financial benefits to developers, which can be captured through careful design and practice. However, Linda Pim, representing the Federation of Ontario Naturalists, has challenged developers who advertize proximity to ravines or wood-lots as a selling point, but then want to keep the buffer zone between the lots and the natural areas to an absolute minimum (Lornic, 2001). Thus, in practice, it seems that the inclination of developers is to steadily whittle away the natural features that they are using to promote their products.

Golf courses offer particularly lucrative opportunities for residential developers. Crompton (2005) reports that premiums associated with golf courses range from 25-30%, which are higher than premiums associated with parks, but are still lower than those accruing from water bodies. Such premiums are generally limited to dwellings with views abutting the fairways because other residents are not normally allowed to use the golf course unless they play golf. Because of this limitation, Crompton argues that development of parks and open spaces that are more widely accessible would be more remunerative to the developer and the municipality than would a golf course.

Crompton (Fall 2001) also argues that new residential developments result in a net increase in property taxes for existing residents because the public costs associated with residential development exceed the public revenues that accrue from it. Using data from cost of community services analyses carried out in 72 local jurisdictions by the American Farmland Trust, Crompton found that, for every US$1 million received in revenues from new residential developments, the median amount that communities had to expend to provide these services was US$1.15 million, or 15% more than the revenue. In contrast, for every US$1 million in tax revenues that these same communities received from farm/forest/open space uses and from industrial/commercial uses, the median amount that municipalities had to spend to provide public services on these lands was only US$370,000 and US$290,000, respectively. These studies indicate that favouring residential development at the expense of open land is more likely to exacerbate a municipality's financial problems than to alleviate them (Crompton, Fall 2001). Moreover, it was found that communities with larger and faster growing populations appeared to experience greater net deficits on residential lands than did communities with smaller, more stable populations. Rising education costs were the major cause of residential property tax-expenditure deficits.

The Alberta Recreation and Parks Association (2007), in collaboration with the Alberta Real Estate Foundation, commissioned a study of the proximate values associated newer urban subdivision in

Alberta, using Crompton's methods. Inventories and cost assessments of parks, analyses of property markets and property values of properties proximate to parks were carried out in 6 Alberta communities from Calgary (large urban) to Drayton Valley (small rural urban). The focus of the analyses was on parks designated as Municipal Reserves (MR) including a mix of active parks, parks associated with school/playing fields, linear parkways and small neighbourhood "tot lots." None of the communities were near enough to major regional parks to be directly influenced by them. This study confirmed the existence of proximate premiums for parks, which ranged from 15% to a low of less than 1% on the total property (home and lot combined). As has been observed in other jurisdictions, larger, less developed and less used open and green spaces command higher proximate values in Alberta. In semi-arid Alberta, homes adjacent to private access recreational lakes demand very high premiums. However, development and maintenance of communal facilities (eg. beaches, boat houses, etc.) are often supported with resident association fees rather than municipal expenditures.

Zegarac (1996) applied hedonic pricing methods to estimate the incremental property values associated with the existence and maintenance of greenbelts and greenways within urban areas in general and in the City of Windsor in particular. Data from three study areas or neighborhoods, which contain greenbelt lands within Windsor, were analyzed in detail. The greenbelt lands differed substantially from one neighborhood to another. However, in each area, house prices exhibited an expected statistically significant inverse correlation with distance from the greenbelt land (ie. prices decline as distance from the greenbelt land increases). In one of the neighborhoods studied, which contained 2,372 properties, the aggregate property value was about $24 million (1996$) greater than it would have been in the absence of the greenbelt. This amounts to 7% of the $328 million total market value of all properties in the neighborhood. This increment would be equivalent to an additional $482,450 in tax revenue from the study neighborhood. Compared with the total property tax value for the entire neighborhood of $6.27 million, the potential increase in property tax revenue for the neighborhood due to the effect of the greenbelt amounts to about 8% (Zegarac, 1996).[49]

Another approach to measuring the economic importance of green spaces and natural environments to Canadians was applied and supported by Environment Canada and provincial environmental and natural resources agencies in a national survey of the "Importance of Nature to Canadians" (DuWors *et al.*, 1999). This survey and analyses of the results were carried out every 5 years from 1981 to 1996 when it was terminated. These surveys collected data on the time and money that people 15 years and older spent on various nature-related activities in every province. Time devoted to these activities was measured in terms of the number of participants, total person-days and number of trips taken over a defined period of time, ie. one year.

The various activities for which data were collected include the following broad categories:

a) Outdoor activities in natural areas, which are defined as forested areas, water bodies, wetlands, open fields, mountains and other areas and features such as caves,
b) Residential wildlife-related activities such as watching, photographing, studying and feeding wildlife that are found around residences,
c) Wildlife viewing, photographing, studying, feeding or other encounters in natural areas during trips taken primarily for the purpose of such activities,
d) Recreational fishing,
e) Hunting, and
f) Indirect nature-related activities including watching nature films or television programs; reading; visiting zoos, game farms, aquaria or natural history museums; purchasing nature or environment related arts and crafts; joining and participating in nature and environment related organizations,

and contributing to the restoration and acquisition of land for fish and wildlife habitat or to sustain a rural setting.

All of the above-noted types of activities are dependant on and/or would be enhanced by the preservation and expansion of green-spaces and open space lands within and surrounding metropolitan areas to some extent although categories a) and b) would seem to be most directly associated with the maintenance of natural lands. The economic importance of these activities was measured in this study in the following manner.

As explained at the beginning of this chapter, the economic value that people attribute to these activities is indicated by the maximum amount of money they are willing to pay for participating in these activities and to ensure that the complementary environmental resources necessary for these activities are maintained and preserved for current and future use. In the "Importance of Nature to Canadians" surveys and analyses, economic values are measured as the direct financial expenditures made to participate in nature-related activities plus enjoyments that people receive but do not have to pay for. Estimates of this latter component of direct value must be generated by other methods that are listed in Table 39. The "Importance of Nature to Canadians" surveys used a variant of the Contingent Valuation method to elicit WTP values from respondents associated with the enjoyment and satisfaction they experienced but did not have to pay for. In addition to asking respondents how much they spent on nature-related activities, the survey asked participants to report the amount by which their costs would have to increase in order to make them decide not to participate in the various activities. Responses to the second question were used to estimate WTP values of enjoyment and satisfaction beyond what participants actually spent.

The 1996 survey revealed that 20 million Canadians aged 15 years and older participated in one or more nature-related activities during that year. These participants devoted 1.5 billion person-days of their leisure time (out of 7.3 billion total person-days during the year) (DuWors *et al.*, 1999). Table 35 reveals that an estimated 7.6 million Ontario residents (85% of the population aged 15 and older) participated in the various nature-related activities noted above. Nearly as many people were involved in indirect nature-related activities (about 6.6 million) as were those participating in outdoor activities. DuWors *et al.* also report that 1.1 million visitors from the U.S. came to Canada for wildlife viewing or recreational fishing in 1996. A total of 438,000 Canadians (about 40% of the number of US visitors to Canada) traveled the opposite direction to the US for these same activities. While US nature-related tourists spent about twice as many total person days in Canada as did Canadians in the U.S., the U.S. tourists spent three times as much money as did the Canadians visiting the U.S. for these purposes (DuWors *et al.*, 1999). It is likely that these travel patterns and trends have changed since 2001 (9-11) due also to recent fuel price escalations and economic recession. These important Canadian "export" products are highly dependant on the supply of greenspaces, the management of wildlife and its habitat and the maintenance of clean water bodies and rivers. Further investigation of the trends and challenges facing this industry is certainly warranted.

For the 12-month period of 1996, direct expenditures made by Canadians in Canada on nature-related activities amounted to $11.0 billion. Based on responses to the second question in the survey regarding the increased level of cost that would lead respondents to forego the activity, it was calculated that these same participants would be willing to pay an additional $2.0 billion for the enjoyment that they received from nature-related activities during the year. Total expenditures by Ontario residents amounted to $4.28 billion over one year (DuWors *et al.,*1999). Expenditures for Ontario and all of Canada are disaggregated by the expenditure categories listed in Table 36. Note that the largest expenditure item is "equipment" which includes big ticket items such as trucks, boats, motors, RV's, ATV's, snowmobiles, bikes and cameras, to name a few. The next largest cost category is transportation for both jurisdictions.

Expenditures incurred by Ontario residents are broken down by key activities in Table 37. Equipment and transportation dominate these expenditures for all activities accounting for 75% or more of total expenses.

These expenditures indicate the magnitude of the WTP values of these activities for people in all of Canada or in specific provinces. While these are substantial amounts, they are likely to be an under-estimate of the total magnitude of the direct economic value of nature-related activities across Canada. There are still beneficial attributes and qualities associated with the natural and environmental resources that people use, perceive and enjoy but that are not captured in these direct economic value estimates. Estimates based on the question in the "Importance of Nature to Canadians," which asks at what level of expenditure/cost would respondents stop the particular activity, are an attempt to determine these non-market values. Further discussion of these non-market "amenity" values for environmental resources and greenspaces is presented in the next section of this chapter.

These expenditures also have important implications for the national and provincial economies. Measures of these implications constitute incremental contributions to the following economic indicators:

a) Gross business production value,
b) Gross domestic product,
c) Government tax revenue,
d) Employment in terms of the numbers of persons,
e) Aggregate incomes to individuals from wages and benefits paid to the above-noted employees.

These indirect economic consequences and implications are calculated from the expenditure data reported by respondents. Estimates for Canada and Ontario are summarized in Table 38. For example, direct expenditures on nature-related activities supported employment for an estimated 201,400 persons in all of Canada and nearly 77,900 persons in Ontario (Federal-Provincial -Territorial Task Force on the Importance of Nature to Canadians, 2000). This employment accounted for $5.5 billion and $2.4 billion in personal income for Canada and Ontario respectively. Nature-related expenditures also contributed to gross business production values of $16.3 billion in all of Canada and $7.08 billion in Ontario. Governments collected taxes amounting to $5.1 billion for the Feds and a disproportionate $1.46 billion to Ontario. At the national level, for every dollar spent on nature-related activities, almost $1.50 of gross business production was generated.

To put these economic indicators that are based on nature-related activities into perspective, the 1996 total expenditures and gross business production values were inflated to the years 2004 through 2007 using the Consumer Price Index so as to compare with business production values of various Ontario industry sectors at 2002 prices (Ontario Ministry of Finance, 2008). By 2007, the inflated total Ontario nature-related expenditures would amount to $5.4 billion while gross business production value for Ontario that are based on these expenditures would be equivalent to $8.9 billion. Based on these values, direct financial expenditures for nature-related activities by Ontario residents comprise a sector that is greater in value than the "Agriculture, Forestry, Fishing and Hunting" ($5.2 billion in 2007), the "Mining" ($2.9 billion in 2007), and the "Paper Products and Printing" ($5.8 billion in 2007) Industries. In fact, Ontario residents likely spend more on nature-related activities than the gross business production values for 14 (out of 24) "Goods Producing and Manufacturing Industries" but only one "Service Producing Industry." On the other hand, the gross business production value associated with nature-related expenditures amount to about 87% of the 2007 business production value recorded by the "Residential Buildings Construction" industry (Ontario Ministry of Finance, 2008).

In addition, $705.3 million spent in Canada by U.S. visitors in 1996 on wildlife viewing and recreational fishing, went for accommodation (38.9 percent), food (25.2 percent), transportation (21.5 percent) and other items such as guide and equipment rentals (14.4 percent). These expenditures contributed over $732 million to the Canadian GDP, while providing $330 million of revenue from taxes to all levels of government (Federal-Provincial-Territorial Task Force on the Importance of Nature to Canadians, 2000). Expenditures by these U.S. visitors are equivalent to exports and supported more than 13,000 jobs across Canada. Recent data are not available but it is being widely reported at this time that U.S. tourism has fallen precipitously due to high fuel prices, increasingly lengthy and intrusive border crossings and consumer pessimism and uncertainties in the U.S.

As indicated earlier, the empirical estimates of the values associated with open spaces and natural environments, as they are large as they may be, do not encompass all of the relevant uses, services and amenities that people value and are willing to pay for. These additional uses and services and their economic valuation methods are discussed in the next section

7.4 Values of Services, Uses and Amenities of Open Spaces, Natural Environments and Farmlands

Natural areas within and around the settled regions of Canada provide numerous goods and services that have economic values, not only for the people within or adjacent to these natural areas but also for the communities farther away. These goods and services provide benefits that are also enjoyed by people and communities beyond private landowners. The stock of natural resources, environmental and ecosystem resources and lands are called *natural capital* by many economists. They are capital in the sense that these resources are assets that yield goods and services over time including those that are essential to the sustained health and survival of human populations and economies.

The portion of Canada's natural resource wealth that can be easily valued are those that can be extracted and sold in markets. The most important and valuable are energy resources, minerals and timber. The value of these selected natural resource reserves has more than doubled, from less than $500 billion in 1997 to over $1 trillion in 2006 (Statistics Canada, Dec. 2008). This increase can be attributed substantially to the soaring value of oil and natural gas, as well as the less dramatic, but nevertheless steady, rise in mineral and timber prices during this same period. In 2006, energy resources (oil, natural gas, etc.) accounted for 57% of total resource wealth, followed by timber (24%) and mineral (ferrous and non-ferrous metal ores, gem stones, uranium, etc.) resources (19%). Unfortunately, there are no credible estimates of the total value of the non-marketed attributes and characteristics of Canada's natural resource endowments. Along with human capital and produced or manufactured capital (e.g., machinery, structures), natural capital is a key input into the production of goods and services, in addition to being enjoyed for its own sake.

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Ecosystem and natural environment products and services are listed in Table 40. Many of these products and services are irretrievably lost when green and open spaces are converted to urban and even agricultural uses. People are willing to pay positive (but finite) amounts of money for these products and services and the resources and ecosystems that provide them for the following reasons:

a) to preserve these resources, products and services for the individual’s own use in the immediate future,

b) to ensure that they are available for use and enjoyment by future generations,
c) because the resources, products or services can offset the costs of alternative methods of providing the products and services,
d) because the resources, products or services can prevent future damages.

Measurement of Canada's natural capital has focused on stocks of land, energy, mineral and timber reserves. While this is a good start to inventory natural capital, serious data and information gaps exist for the other types of natural capital that provide the services listed in Table 40. Thus, while there is much anecdotal information from organizations such as a World Watch, the Sierra Club and others, there is insufficient systematic, long-term monitoring to assemble a quantitative understanding of what is being lost, where and how fast. Moreover, as resources, species and unique natural environments are depleted, they become more valuable. However, without mechanisms that allow people to capture and realize higher values of these natural capital elements without destroying them further, prevailing economic incentives for continued depletion will persist.

Olewiler (2004) reports that economic valuation studies ecosystem products and services often reveal that the value of sustaining natural areas can be substantial or, alternatively, the cost of finding substitutes for natural capital elements that are depleted or destroyed can be exceedingly high. Furthermore, because of data gaps and uncertainties, estimates of ecosystem products and services and their values can yield probabilistic ranges of values rather than a determinate, single-valued price or cost that is normally desired by decision makers. In the heavily populated and highly developed Lower Fraser Valley, which includes Vancouver, construction of low-density housing and commercial properties is converting more lands from forests and greenspaces to continuous suburbs. In addition, forests, wetlands and riparian habitat are being lost to urbanization, diking and industrial agriculture. As a result, runoff from urban centres, agricultural lands and sewage treatment plants increase the amount of nutrients, sediments and toxic compounds in surface and ground waters. Air and water pollution are also increasing despite stringent environmental standards and rigorous enforcement were human health is threatened.

Olewiler (2004) has compiled estimates of the monetary values associated with the products and services that are being depleted by urban developments in Canada. For example, values of all goods and services provided by wetlands in the Lower Fraser Valley range from a high of $24,330 to $5,792 per hectare per year. The worth of flood protection from wetlands ranges from $2,110 to $408 per hectare per year. Products and services from estuaries can be valued at $22,800 per hectare per year while goods and service from lakes and rivers would be valued at $8,500 per hectare per year. In the aggregate, Olewiler (2004) argues that "the Lower Fraser Valley ecosystem epitomizes one where protecting nature may save society hundreds of millions, if not billions of dollars every year."

Olewiler (2004) also presents estimates for the net value of protecting natural areas within the Grand River Watershed in Southern Ontario. High, medium and low estimates of the value of benefits that are derived from conservation practices, erosion control, water quality improvements and other practices along the Grand River. Benefit categories include phosphorus reduction, decreased sedimentation, decreased flooding, improved recreational fishing, carbon sequestration, increased wildlife hunting and viewing. The value of gross benefits, per hectare per year, range form $344.12 to $197.97 to $83.99. After subtracting program administration costs and wildlife depredation compensation payments, the value of net benefits amount to a high of $342.76 to $79.91 per hectare per year. To provide a perspective, these net benefits of conserving natural areas can be compared to the market value of the land in the watershed. Average rental rates for agricultural land in the Grand River watershed range from approximately $74/ha to $247.10/ha. Consequently, estimates of the net benefits from conserving natural

capital fall into the same range with the high estimate exceeding the high market value. To the extent that these estimates are accurate, it would be in society's interest to implement policies to help conserve the natural environments and ecosystem services on those agricultural lands that generate the highest net benefits to conservation.

Much work has also been carried out by academics in the U.S. on the amenity benefits and their values that are associated with farmland. Studies of this nature have shown that non-farming citizens are willing to pay to preserve farmlands for a variety of reasons. Indeed, the purpose of many of the investigations were intended to determine which factors and variables are most important to respondents' WTP values. Furthermore, much effort is expended to determine which of the various empirical methods noted in Table 39 yield the most accurate and statistically defensible estimates. Bergstrom and Ready (2008) found that preferences and values are positively related to acreage, regional farmland scarcity, public accessibility, and productivity or soil quality. However, for many urban people, proximity to a farmstead is viewed as a disamenity due to odours and noise. Empirical estimates reported by Bergstrom and Ready (2008) in terms of WTP per household for farmland amenities (which are often defined in a variety of different ways) vary so widely as to seem to be unhelpful for policy purposes.[50]

McConnell and Walls (2005) summarize estimated values for open spaces based on the application Stated Preference Methods (eg. Contingent Valuation Surveys) in Table 41. McConnell and Walls note that income appears to have a fairly consistent and positive effect on WTP for different types of open space amenities. Being closer to urban parks and greenways is, in general, positively related to WTP, but evidence is not clear for wetlands and farmland preservation. WTP for farmland is actually higher at greater distances in some studies. McConnell and Walls complain that, in most of the studies reviewed, open space amenities were not explicitly described, so it is not clear which services or sets of services respondents are valuing. For example, in the farmland preservation studies, one does not know whether the values estimated include only the prevention of development, or whether households are valuing other services from undeveloped farmland as well. Thus, even where CV methods are applied, which are able to include non-use values as part of total value, it is not clear how much can be attributed to non-use values and how much to use values.

The values cited in Table 41 are not trivial and, when aggregated over all affected parties, can amount to relatively substantial amounts. These examples, the valuations presented by Olewiler (2004) and other estimates contained in the references cited by Olewiler and by McConnell and Walls (2005) are representative of a growing, but often disparate and difficult to access, literature on valuations of ecosystem products and services. Unfortunately, these estimates continue to be characterized by researchers and authors having to spend much effort to explain caveats and uncertainties about the estimates and by users to understand and interpret these estimates for policy applications.

7.5 Summary Comments

It is clear from the above that there is no dearth of estimates of the monetary values for ecosystem and open spaces and their various, respective products and services. Indeed, academics and government agencies in both Canada and the U. S. have devoted substantial resources and effort to the development of methods and procedures, which can be applied to generate valuation estimates that are defensible and widely accepted by all stakeholders for decision-making (Taylor *et al*, 2007).

Moreover, methods and studies by John Crompton and others show how parks and other types of open and green spaces can generate sufficient incremental tax income for municipalities to fund their development and maintenance. Crompton has also shown that farm land, wood lands, undeveloped open

spaces and industrial lands require far fewer municipal services than do residential properties. According to Crompton (Fall 2001), for every million$ received in tax revenues, municipalities in the U.S. had to spend about $1.15 million on services for residential properties. By contrast, the costs to municipalities for non-residential properties are on the order of 35% of the tax revenues collected from these properties.

Given the foregoing findings, it is important to realize that the following challenges persist:

a) the work to date has been case-study specific so that estimates of unit values cannot be widely applied to the same resources or services in different locations,
b) few estimates of non-marketed benefits or services of open spaces are used by government and industry because the economic values implied by these estimates are not appropriated by anyone who can use it in favour of preservation and protection of open spaces,
c) many regulated industries, including developers, are attempting to create a green image for themselves. However, when the costs of environmental compliance are high or the rules threaten to delay or terminate projects, there is little hesitation to use their considerable economic and political muscle to get their way.[51]

If there exists a Holy Grail for practitioners with respect to the generation and availability of values of open and green spaces and ecosystem products and services, it would consist of:

a) relevant biological and physical time series data concerning the products and services of open spaces and ecosystems are available,
b) relevant methods to observe preferences and values from behaviour and/or to elicit preference and value information from samples of relevant populations have advanced to the point where uncertainties, caveats and complexities surrounding value estimates are reduced to a minimum, and
c) "reference" estimates of values for at least some key products and services are of such rigor and wide acceptance that they can be transferred among jurisdictions with similar socio-economic characteristics with little debate.

Much work remains to achieve a Nirvana in this field of study. However, it should be remembered that many of the economic indicators and values that are used without question in millions of transactions and decisions daily, such as the Consumer Price Index and the Gross National or Provincial Product figures, are no less uncertain, complex and vulnerable to critical appraisal. These indicators are used not because they are inherently accurate or correct, but because there has evolved a wide-spread acceptance of, and agreement for, their use in decision-making by all relevant stakeholders.

8 FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The key issues and topics addressed in this exposition include:

a) defining and explaining the economic drivers, underpinnings and implications for urban development and growth patterns that have dominated North American over the past 55 years and which is known as urban sprawl,
b) reviewing urbanization, population growth trends and the economic and social consequences of urban sprawl patterns,
c) enumerating the economic costs (and benefits) associated with sprawl development patterns as compared with new alternative urban development designs and models,
d) parsing the motivations and the economic incentive structures associated with key participants and stakeholders involved in urban planning and decision making,
e) evaluating the degree to which builders and owners of rapidly growing suburban municipalities pay the full cost of incremental infrastructure expansions and additional municipal services required by new residential and commercial developments,
f) showing how distortions in economic incentive structures arising from government (ie. federal, provincial and municipal) fiscal policies and programs can influence urban growth patterns,
g) identifying, quantifying and valuing, in monetary terms where possible, the economic and the non-marketed products and attributes associated with managed and undisturbed open spaces and natural environments.

"Findings" consist of facts, data and analytical results while "conclusions" contain greater degrees of interpretation, opinion and judgement. There is overlap between the two in some cases. However, in the paragraphs below, topics for which "findings" are presented do not always yield associated "conclusions."

These findings and conclusions are selected from each chapter based on the author's judgement as to relevance to the topics listed above, the potential depth of insight revealed and the ease of exposition. Key Findings are presented under relevant chapter headings while Conclusions are listed in rough order of the topics discussed throughout the report.

Recommendations regarding issues and activities that are within the purview of the Environmental Commissioner of Ontario are presented in Section 8.3.

8.1 Key Findings

Urbanization, Growth Trends and the Consequences of Urban Sprawl

The key characteristics of the predominant urban development pattern, known as urban sprawl, include unlimited growth and outward expansion of urban developments, low density residential subdivisions and commercial plazas, "leap-frogging" private developments (usually into farmlands or open spaces) which forced publically financed infrastructure to follow, excessive dependence on the automobile for transport and spatially segregated land uses (eg. residential, commercial, shopping, schools, public buildings).

Some of the key adverse effects of this development pattern include:

a) irreversible losses of forests, green space, wetlands, wildlife habitat, natural environments, open space and scenery,
b) loss of agricultural lands and their production,
c) increased traffic congestion and political pressures to build more roads, rather than expanding public transit,
d) increases in air pollution (mainly due to automobile emissions) and water pollution (mainly due to increases in sewage generation),
e) inefficiencies due to high costs of providing utilities, roads, highways and infrastructure to scattered, low density subdivisions and bedroom communities,
f) generation of "fiscal deficits" and rapidly increasing taxes for jurisdictions where infrastructure capital and servicing operating costs exceed the development charges paid by developers and additional tax revenues paid by property owners,
g) increased conflicts associated with rural businesses and land uses that are incompatible with residential areas, eg. rendering plants, livestock farming operations, abattoirs, stone and gravel quarries.

No matter how critical of sprawl development patterns one may be, authorities are unanimous in the realization that these low density, large lot residential developments have been widely popular and preferred by millions of home-buying families across the U.S. and Canada. Indeed, one of the selling points of such developments has been living in or near the natural environments that these same developments have too often destroyed. Perceived beneficial qualities of sprawl developments which attract home buyers include:

a) less congestion,
b) enhanced personal and public open space,
c) quiet,
d) lower crime rates,
e) fosters localized land use decisions,
f) enhanced municipal diversity and choice.

It is also argued that some of the municipal service and infrastructure cost issues will be offset and resolved by infill development of open spaces that had been "leapfrogged" by earlier developments and subdivisions.

The automobile and low cost fuel have been prime enabling factors for urban sprawl developments over the past 50 years. The automobile has been the most efficient (in terms of private costs and benefits, travel time and convenience) travel mode for the individual but not for society as a whole due to uncompensated public costs such as air pollution, public expenditures on roads and traffic congestion, to name but a few.

As the result of enjoying the bulk of Canada's economic and population growth between 1945 and 1999, Ontario now contains the highest concentration of urban land in Canada which is also the largest total urban land area of any province, which, in 2001, amounted to 9,800 km^2. In 2001, approximately one in every three square kilometres of urban land in Canada was found in Ontario. This area is nearly as large as the urban land found in all three Prairie Provinces and British Columbia combined. However, total urban land amounts to less than 2% of the total 917,741 km^2 of land that make up Ontario.

Despite these trends toward urbanization, the total area of land planted to crops in Ontario has increased by about 6% between 1986 and 2006. At the same time, however, the number of farms has declined by

21.3%, the total area of land owned by the farmers who work these lands has fallen by 14.9% and the average area of farms have increased by 20.5% since 1986. Ontario farms are getting larger land-wise and farmers seem to be leasing more land rather than buying and owning it. The following factors are contributing to these trends:

a) demand for land for residential and commercial developments has been pushing prices on urban periphery lands beyond the affordability of farmers who must therefore rent land rather than buy it in order to make their farming operations large enough to be profitable,
b) developers may be offsetting their carrying costs of land inventories by leasing them to farmers. Governments have done this as well.

While the area of total cultivated land in Canada has increased from nearly 380,000 km^2 to 455,000 km^2 between 1951 and 2001, urbanization and other non-agricultural uses have expanded to cover 40,400 km^2 of dependable farmland in Canada as of 2001. The provinces of Ontario, Manitoba, Saskatchewan and Alberta are home to 99 percent of Canada's Class 1 (which is a subclass of "dependable" farmland) agricultural land, which totals 492,727 km^2. More than 76,500 km^2, or 15.5%, of this land is concentrated in southern Ontario. As of 2001, over 11% of the province's best agricultural land had been converted to urban and other non-agricultural uses.

Key Participants and Stakeholders and Economic Incentive Structures Facing Them

Before the first decade of the 21st Century has been reached, efforts by NGOs, municipalities, academics and Provincial Government agencies and institutions such as the Environmental Commissioner have documented many current and potential problems and costs associated with prevailing urban forms and growth patterns. The Provincial Government was also motivated to develop new land use planning goals and objectives and the regional plans, legislative tools and institutions to implement them. These new directions, plans and legal tools are intended to alter the economic incentive structures facing the various key participants and stakeholders involved in urban development. These new tools are particularly intended to motivate developers, municipalities and individuals, as consumers of housing and municipal services, to build, buy and live in denser and more efficient urban designs that are more pedestrian and transit friendly and less dependant on the automobile. The speed and the extent to which these tools and policies will induce the desired changes in preferences, behaviour and investment and behavioural remains to be seen.

Economic Drivers Associated with Urban Sprawl

Key supply factors that helped to drive urban sprawl are low cost rural lands and, until recently, low cost gasoline. Moreover, the development industry has become extremely adept and efficient at assembling land, negotiating the labyrinth of government approvals, organizing suppliers of materials and labour to build housing and commercial developments quickly and then marketing their finished products as they begin the next project.

Demand factors include preferences for the types of homes, neighborhoods and certain design features of sprawl development such as the cull-de-sac that have lured millions of Canadians, native borne and newly immigrated, to the suburbs.

Except for Kitchener, Windsor and Sudbury, housing prices in the largest metropolitan areas of Southern Ontario have exhibited annual increases above the 3.8% average rate of increase that have prevailed up to the present. St. Catharines/Niagara Falls, Hamilton and London hare recorded the highest rates of price

increases, between 2.6% and 3.7% above the average rate of consumer inflation, which has hovered around 2% or less throughout 2006. These high rates of increase are consistent with the pattern of steady immigration and internal migration into Southern Ontario over the past three decades. Moreover, average house prices across Toronto have risen from about $200,000 in 1980 to over $380,000 by 2007, with a spike up to $400,000 in 1989. Given this steady and growing demand, it is little wonder that urban sprawl has overwhelmed the GTA and the Golden Horseshoe regions.

Costs (and Benefits) Associated with Urban Development Designs

A multitude of studies of the costs (and some benefits) of urban sprawl have been produced in the U.S. Far fewer studies are available from Canada. These costs-of-sprawl estimates are often derived in terms of the differences in costs between current development patterns (sprawl) and alternative forms variously called "smart growth," "smart development," "planned growth," etc. The characteristics of sprawl versus "smart growth" are compared in Table 15. Costs that are compared include capital investments, operating costs and various environmental measures including land area and pollution releases. In both U.S. and Canadian studies, estimates of costs are always lower for the alternative development patterns than for sprawl, as would be expected. However, the cost differences are generally not large, between 5% and 15%, with few estimates above 25%.

A financial feasibility analysis of "smart development" projects for residential and commercial developments by the Royal LePage Advisors in four suburban GTA locations (Vaughan, Whitby, Mississauga, St. Catharines) where smart development has, so far, failed to materialize, revealed that:

a) land costs are still to low too justify extra costs for land-saving "densification" components of smart developments such as indoor parking structures,
b) because of these extra costs, such developments might not find ready customers in these areas. At the time of the study, grade-level detached homes and townhouses were still available in the case study areas at comparable or lower unit prices than would have to be charged for the smart development units. "Townhouses are a tough sell when a detached house can be had for $199,999."
c) Office space was also in particularly high supply during the period of study (2002-03) so that rents were very competitive.
d) Consequently, the marketability of the smart development housing or commercial properties were dependant more on consumer preferences than on price advantage.

Health effects that are thought to be associated with urban sprawl characteristics and indicators include:

a) mortalities and morbidities (including cancers) due to air pollution,
b) diabetes, obesity and hypertension due to lack of physical activity which are due, in part, to dependence on automobiles,
c) mortalities and injuries due to increased incidence of vehicular and pedestrian accidents in low density suburban areas.

The automobile stands at the crux of key public policy issues and conflicting objectives in Ontario as well as in other jurisdictions. On the one hand, its manufacture, use, maintenance and disposal are the cause of many millions of dollars of external or public environmental damages and social costs. On the other hand, the automobile yields highly valued private benefits to owners, most of which are intangible although they can be measured in terms of time savings (over public transit), convenience, enjoyment and willingness to pay for alternative forms of transportation; and, on yet another hand, the manufacture of

vehicles and parts and the maintenance, repair and other industries complementary to the automobile generate employment and economic activity that are of such a magnitude as to be considered essential to the economic prosperity of this province. The automobile assembly and parts industries generated $23.7 billion in production value in 2007, or 4.8% of the total value of production in the Province for that year, which amounted to $494.3 billion in 2002 dollars.

However, at this writing (Fall 2008), the North American automotive industry is in a decline which appears to be is accelerating. The gross business production value of the automobile assembly and parts sectors in Ontario has declined steadily from $25.3 billion (2002$) in 2004, when it accounted for 5.5% of the total Provincial production value of $460.4 billion, to $23.7 billion in 2007, a 2.4% decline over the 3 year period. The automotive assembly, parts and two additional transportation equipment manufacturing sectors recorded a total production value of $50.4 billion (2002$) in 2007, which comprises 10.2% of the total value of industrial output in that year. However, total business production values of these three sectors and their share of the total provincial business production values have also declined each year since 2004.

With gasoline prices surpassing US$4.00 per U.S. gallon (CDN$1.30 per liter), a sea change in demand for vehicles is now under way. By the end of 2008, sales of North American made vehicles by some firms had declined by as much a 35%. Production at U.S. and Canadian automobile assembly plants has been sharply curtailed, plant closures have been announced and thousands are facing lay-offs and job losses. Executives of the "Big Three" North American firms (GM, Ford and Chrysler) have, with the support of their unions, gone hat in hand to the U.S. and Canadian governments for billions in loan subsidies and "bailouts" which will, undoubtedly, be intensely debated. What ever happens, the economic pain will be felt widely by the industry's suppliers and supporting sectors: petroleum, steel, chemicals, repairs and services, highway and road construction, insurance and banks.

In any event, gasoline prices are now rising high enough for suburban commuters to seriously search for lower cost transportation alternatives (even at the sacrifice of their much valued convenience) and for pressing the provincial and local government to enable or to increase the supply and availability of lower cost transportation alternatives. Also, rising fuel prices will provide a strong incentive for home buyers to begin to consider smaller and denser residential options as well as purchasing more fuel efficient heating equipment as existing furnaces wear out.

Financing municipal infrastructure and service costs associated with urbanization and implications of financing tools

It is widely alleged that the costs of new infrastructure and increased municipal services for new sprawl type residential developments are not fully paid for by the builders and residents of these subdivisions. There is some evidence that this allegation (or hypothesis) may be true:

a) the costs of infrastructure and services to new subdivisions on the periphery of a municipalities tend to be higher than the average over the entire municipality. However, property taxes and the development costs paid by developers are derived from average costs for the various services across the whole municipality. For various reasons, municipalities do not normally disaggregate services and utility costs and rates by geographical areas, nor do they differentiate development charges or other fees on the basis of geographical areas.

b) in the case of development charges, the municipal service costs, which are used to derive development charges, are averaged over 10 years thus further depressing the final average values

on which development charges are based.

c) property taxes in Ontario are a function of market value assessments of the properties, not the actual costs of supplying municipal services. If property values in outlying areas are lower than prices for comparable properties closer to the city centres, the taxes for properties in the rural areas at the edge of the municipal boundaries will be lower than taxes for city central properties, even though the costs of services are lower for the older properties in the city centre.

However, it was not possible to assemble sufficient data with which to test the hypothesis that development charges do not pay the full costs of infrastructure or services. Data from financial statements of municipalities are incomplete and it was not possible to interview enough municipal finance officers to obtain data and results that would be statistically meaningful. For example, the published municipal financial data on revenues from development charges could not be compared meaningfully with relevant capital expenditures. However, municipal finance officials who were interviewed were of the opinion that, in their municipalities, development charges covered most, if not all, of the eligible costs that had to be incurred for new developments. This question will require further research to answer definitively.

The influence of municipal financial powers and instruments on urban form is significant. If a municipality is interested in pursuing more compact urban forms, it must design its revenue-raising tools so that, at the very least, they do not discourage the desired form of development. For example, area-specific development charges would reduce somewhat the prevailing incentives for developers build low density subdivisions and commercial structures on the urban fringe that result from the current practice of applying the same rate of DCs equally across a given municipality. Moreover, property taxes should, at the very least, be neutral with respect to land-use decisions. Neutrality can generally be achieved by relating tax collections more closely to the benefits received from municipal services by type of property and by location. Economists, in particular, argue that municipalities should obtain a greater proportion of their financing from user fees, which can be based on the marginal costs of the services and utilities that are being consumed. However, even though mechanisms for levying development charges that vary by location already exist in some cities, and many municipalities are implementing more and higher user charges, the extent to which user fees being imposed actually reflect costs of services continues to be a topic of intense debate among municipal authorities and their constituents.

Various distortions exist in current property tax systems, such as the over-taxation of apartments and commercial and industrial properties relative to single-family homes. Moreover, uniform user charges and development charges across the entire city tend to under-charge subdivisions and properties at the low density edges of the city as well as over-charge residential and non-residential properties in the city centers. While it may be difficult for municipalities to optimize these taxes and charges, the design of fiscal tools should, at least, not work against planning objectives and mechanisms.

Three relatively new fiscal revenue generation tools were reviewed. Two of these taxation methods, site-value taxation and land-value capture taxation, are intended to capture more tax income from properties whose value increases as the result of public investments (eg. new transit lines, establishment of new parks). A third taxation approach, tax increment financing districts (TIFs), is intended to generate funding for neighborhood regeneration. At this point in time, there seems to be more interest and experimentation with these tools in U.S. jurisdictions than in Canada.

Values Associated with Agricultural Lands, Forests, Wetlands, Parks and Open Spaces

The widespread and rapid conversion of natural lands to subdivisions and shopping malls is due in part to the erroneous conventional wisdom by most principals within the development industry and their allies among municipal and provincial politicians and their respective staffs, that green spaces and natural environments have little or no "hard" economic value, particularly if compared with residential subdivisions and commercial or industrial parks.

It was found that there is no dearth of estimates of the values for ecosystem and open spaces and their various, respective products and services. Indeed, some government agencies in Canada and the U. S. have devoted significant resources and effort in order to develop methods and procedures to generate valuation estimates that are defensible and are acceptable to all stakeholders for decision-making

Moreover, methods and studies by academics primarily in the US, and most notably by Prof. John Crompton at Texas A&M University, have demonstrated how parks and other types of open and green spaces can generate sufficient incremental tax income from adjacent privately owned properties for municipalities to fund their development and maintenance. Crompton has also shown that farm land, wood lands, undeveloped open spaces and industrial lands require far fewer municipal services than do residential properties. According to Crompton, for every US$1 million received in tax revenues, municipalities in the U.S. had to spend about US$1.15 million on services for residential properties. By contrast, the costs to municipalities for non-residential properties are on the order of 35% of the tax revenues collected from these properties.

8.2 Conclusions

The following conclusions roughly follow the sequence of the chapters in the report although not every section in the report has yielded a conclusion.

a) The automobile and low cost fuel have enabled urban sprawl developments over the past 50 years. High prices on gasoline will impose increasing pressures on suburban and exurban residents to make adjustments in transportation equipment, in employment locations and even in residential locations.

b) Selected data from the MMAH Municipal Performance Measures Program (MPMP) were obtained and analyzed. However, these data could not be used to test any hypotheses about the relationships between these indicators and costs of services for the following reasons:

- the MPMP does not provide data on the indicators of urban sprawl, eg. population densities, density data on populations of private passenger and utility vehicles, ratios of land uses in given areas, ratios of public parklands and other open spaces to total areas, etc., that can be used to monitor this phenomenon.
- compiling and submitting MPMP forms is costly and currently not mandated by statute. Therefore, data were found to be missing for some key municipalities, eg., Toronto in 2006.
- a proper study of the correlations among indicators of sprawl and various service costs would require discussions with MPMP staff to formulate data requests and, perhaps, development of new indicators to be collected from municipalities in their annual MMAH financial data submissions.
- for many indicators, there are no clearly defined baseline data on which to discern trends

or to judge whether conditions are improving or deteriorating.

c) Although losses of agricultural land to urban uses in Ontario and elsewhere appear to be relatively small, in some regions such as the lands around Toronto and the Niagara peninsula, urbanization of agricultural land reduces the supply of land for specialty crops such as grapes and soft fruits and of truck gardens. Loss of agricultural lands around major cities has contributed to the need to import fresh food from much longer distances resulting in added transport costs, increased vehicular pollution and lower quality produce. Moreover, the establishment of year-round, low cost supply chains of fresh produce from the subtropics (ie. Mexico, Central America and the US South) by grocery chains and mass marketers such as Walmart has reduced demand and incomes of local Canadian farmers. As a result, returns from farming in Ontario and elsewhere in Canada have fallen and agricultural land became available to be optioned or purchased by developers.

d) Where annual population growth is *lower* than the provincial average, which was 6.6% over the 5-year period between 2001 and 2006, house price increases are likely to be a function of scarcity of land supply and/or higher than average cost increases for other supply/cost factors such as construction trades labour or municipal development charges. Where annual population growth is *higher* than the provincial average, demand factors are likely to provide much of the impetus for housing price increases. Of 8 Ontario municipalities listed in Table 11, population growth between 2001 and 2006 exceeded 6.6% only in Kitchener. Population growth in Kitchener was 7.5% but house prices increased by an average of 3.8% per year between 2003 and 2007, which is also about provincial average rate. Highest population growth municipalities in Southern Ontario are in the GTA region surrounding Toronto. Further analyses would be needed to thoroughly assess the relationships between sprawl characteristics and housing price trends.

e) Economic incentive structures must be properly aligned with various land use planning goals and objectives if the new provincial and municipal land use plans and other planning tools and policies are to divert growth and development patterns away from the prevailing sprawl to more efficient, less energy-intensive urban forms,

f) Economic losses that are associated with the health effects of urban development patterns and sprawl designs in Canada have not been estimated systematically. Moreover, there seems to be little interest in doing so. However, where mortalities, various illnesses and health risks, health care costs and productivity losses can be linked directly to urban sprawl patterns, this evidence could be mobilized to garner support for intensification and densification policies and programs that comprise the alternative development patterns and styles discussed in Section 5.1.

g) The automotive industry is a mainstay of the Ontario economy and has been, at various times, the recipient of substantial government funding. However, this industry is currently in decline in the face of $1.30+ per litre gasoline and competitive pressures from off-shore vehicle manufacturers. The high fuel prices are, in turn, placing financial pressures on the residents of urban sprawl areas who only have their vehicles for transportation. Thus, consumers are beginning to shun gas guzzling trucks and SUVs in droves. In the face of these major economic cost shocks, several major shifts and adjustments must occur.

- in order to survive, the automotive industry will have to begin to produce new products that are vastly more fuel efficient or can operate on less costly power sources or

alternative fuels,
- other businesses, perhaps with government assistance, will have to convert or be created to support and service these new types of vehicles,
- local governments or even private firms will have to design and implement new and expanded public transit systems that provide substantially better service convenience and comfort than existing systems,
- formerly 2 and 3-car families will have to experiment with new public transit options and with new systems for achieving personal transportation, especially for short distances. These latter would include vehicle co-op memberships, bicycling, motor bikes and powered scooters, and other devices and power sources perhaps as yet undreamed.

h) It is unlikely that Canadians (or for that matter, people everywhere who can afford them) will give up their personal automobiles. Under pressure from governments, regulatory officials and customers, North American vehicle manufacturers are eschewing their signature North American SUVs and pickup trucks for smaller, more fuel efficient and, purportedly, more eco-friendly vehicles. While further declines in automobile sales, production and use will be extremely painful for automotive industry employees, shareholders and host communities, resources thus freed up may be redirected to fulfill the continuing demand for transportation services by other products and systems, thus creating new opportunities for inventive and risk-taking entrepreneurs and/or responsive and innovative public agencies.

I) A combination of user fees based on marginal cost pricing and development charges levied on a development-by-development basis would better encourage efficient land and infrastructure use and would help induce developments to locate closer to existing services. On the other hand, the cost of achieving greater degrees of differentiation among user fees and development charges could be high given the likely amount of investigation and monitoring that would be required to implement and enforce such a system. Moreover, user charges should be based on the marginal cost of additional units of service from the infrastructure, and development charges on the marginal cost of extending infrastructure to new developments.

j) The influence of municipal financial powers and instruments on urban form can be significant. If a municipality is interested in pursuing more compact urban forms, it must design its revenue-raising tools so that, at the very least, they do not discourage the desired form of development.

k) Regarding the generation of empirical estimates of the monetary values of open spaces, natural environments and their various attributes, the following challenges persist:

- work to date has been case-study specific so that estimates of unit values cannot be widely applied to the same resources or services in different locations,
- few estimates of non-marketed benefits or services of open spaces are used by government and industry, in part because the economic values implied by these estimates are not appropriated by anyone who could use the funds to help preserve and protection of open spaces,
- many regulated industries, including developers, are attempting to create green images for themselves. However, when the costs of environmental compliance are high or rules that are intended to preserve natural resources and environments threaten to delay or terminate projects, there is frequently little hesitation by developers and their allies to use their considerable economic and political muscle to get their way.

I) There continues to be substantial debate, and sometimes dispute, regarding the generation and uses of estimates of the values associated with the intangible, non-marketed benefits and attributes of open spaces and natural environments. However, many of the economic indicators and values that are used without question in millions of transactions and decisions daily, such as the Consumer Price Index and the Gross National Product (GNP), are complex and vulnerable to critical appraisal. Furthermore, businesses frequently value intangible attributes such as brand names or the Good Will of some firms. Moreover, these indicators are not used and relied upon because they are inherently accurate or correct. They are applied because there has evolved a wide-spread acceptance and agreement among contractual parties and stakeholders that these indicators are dependable for decision making.[52]

8.3 Recommendations

The topics and issues discussed in the foregoing pages are wide-ranging and constantly evolving. Many short-comings and problems were identified which have need of improvement or resolution. During a meeting regarding the first draft of this report, Commissioner asked for recommendations. Therefore, the following suggestions are offered with the Environmental Commissioner's interests and mandate in mind.

a) Urge/work with the Ministry of Municipal Affairs and Housing to revise the MPMP land-use data being collected in order to monitor land use trends more usefully and transparently. In particular, define and collect data that document more clearly progressions of changes in land use and ecological types from natural environments to agriculture to suburban/urban uses.
b) Promote more explicit and systematic documentation/monitoring of some of the key indicators of urban sprawl noted in Tables 1 and 2. Generate estimates of both quantities and associated monetary values where possible.
c) Sponsor/promote investigations and documentation of the effects that provincial and municipal taxation and revenue generation policies (including the Ontario Development Charges Act) have on key urban sprawl indicators in Ontario.
d) Population growth and immigration is a fundamental driver of urbanization and growth in urban sprawl. The Environmental Commissioner might, therefore, investigate the pros and cons of federal and provincial policies that allow other nations to enable, or even promote, unrestrained population growth which ultimately contributes to environmental destruction, resource depletion and social and economic impoverishment.
d) Given the overwhelming priority of growth as the primary, if not the only, means for increasing economic and social well-being in Ontario and the rest of Canada, and, given the on-going destruction of species and natural environments in Ontario and throughout Canada that results from this growth, the Environmental Commissioner could begin to examine the barriers to, and implications of, policies for "managing without growth" that have been suggested by Victor (2008) and others in recent years.

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ENDNOTES

1. Burchell and Mukherji (2003) provide two technical criteria that can be used to identify "sprawling" locations: 1) "a county's growth rate is in the upper quartile of the economic area's annual county household and employment growth rates, the county's growth rate exceeds the national average annual absolute growth rate and the county's absolute level of growth exceeds 40% of the national average annual absolute growth; or 2) the county's absolute level of growth exceeds 160% of the national average annual absolute growth.

2. Miron (2003) classifies the contemporary social science and planning literature on urban sprawl in to three distinct discourses: a) as a problem experiences by residents; b) as a problem to be solved by planners and advocates of various stripes and c) as a problem to be explained and effects predicted by means of a particular theoretical framework developed by academic economists, sociologists or political scientists.

3. During 1999, the author provided economic advice and direction to Ministry of the Environment Officers who were responding to an appeal of a Ministerial order issued to a rendering plant near Dundas, Ontario. The Ministry had ordered the plant to stop operations during the weekends because odours were adversely affecting residents of a neighboring subdivision. The rendering plant had been built in the area more than a decade before, having been moved from a site in Hamilton to the then unpopulated rural location near Dundas because of complaints about odours. With municipal zoning approvals, developers and individuals built homes on lands surrounding the facility in subsequent years. Until recent years, the plant, which is owned by Maple Leaf Foods, operated on a 5-day per week schedule. However, a number older rendering plants in other parts of the province had been closed, due largely to complaints by residents of newly built subdivisions and by subsequent re-zoning of the plant sites. Therefore, greater quantities of dead stock and wastes from abattoirs and meat packing plants were being redirected to the newer and larger plant in Dundas. The Dundas plant had to go on a 7-day per week schedule in order process the extra feed stock. During the summer, odours from weekend operations began to adversely affect neighbors who complained that they could not use their outdoor BBQs, pools or decks while the plant operated. The Ministry issued an order for the company to stop operating on Saturdays and Sundays. However, after hearing the opinion of an agricultural economist in evidence that pork and beef producers and processors would suffer economic harm, the Environmental Review Tribunal over-turned the order but Maple Leaf was obliged to design and implement extensive (and costly) odour control systems at the plant.

4. Gross Domestic Product (Gross Provincial Product) is the measure of the value of goods and services produced in Canada (a province) in a given period of time, normally a year. GDP (GPP) is equal to the sum of remuneration for labour (eg. wages, salaries) and for capital (eg. profits, interest, depreciation). GDP is also equal to the value of final sales less imports. To avoid double counting, sales (costs) of products used in the production of other products are excluded. GDP of an industry is the value of output (sales) less the value of inputs or goods and services used in the production process. GDP (GPP) is sometimes cited as an indicator of social or economic well-being. However, GDP (GPP) is not an appropriate measure of these concepts for several reasons including, the fact that unpaid work (by housewives or husbands, volunteers) are not included or that no adjustments are made for environmental losses and damages or for the depletion of natural capital (Statistics Canada, June 2000).

5. "Urban Land" is estimated by Statistics Canada from Census Enumeration Area digital boundary files and Census Enumeration Area (EA) representative points. EA digital boundary files are digital maps outlining the EA boundaries and are available beginning in 1991. "Urban" population refers to the population in census urban areas (i.e., centres of 1,000 or more with a population density of 400 or more inhabitants per square kilometer). To estimate the portion of urban land that occupies dependable agricultural land in each year, the digital maps representing urban land are overlaid with digital maps from the Canada Land Inventory showing the extent of dependable agricultural land in Canada. The intersection of the two represents the area of urban built-up land that has consumed dependable agricultural land. In addition, the

area for small rural settlements with populations of less than 1,000 was derived from Statistic Canada census block data and historical Census of Population statistics. Digital maps from the National Topographic Database (NTDB) combined with auxiliary historical data from a variety of sources were used to estimate land area covered by airports, dumps, auto wreckers, cemeteries, roadways, railroads, pits, quarries, waste management sites, lumber yards, golf courses, and utility transmission sites. The area of parks and other protected areas are obtained from the World Wildlife Fund Canada protected areas database.

6. According to Hoffmann *et al.* (2005), total cultivated land consists of croplands (land planted to various harvestable crops), summerfallow (land that is not cropped for a year in order to store moisture and/or control weeds), and tame or seeded pasture (grazeable land that has been improved from its natural state by seeding, draining, irrigating, fertilizing or weed control. Dependable agricultural land is agricultural land that is class 1 through 3, which are lands that are not hampered by constraints such as frost, slopes, drought or lack of fertility.

7. It should be noted that the importation of fresh fruits, vegetables and flowers over thousands of kilometers from warmer climates is also a consequence of Canadian demand for these commodities during winter months when they are not available from local producers. However, the apparent preference of major grocery chains and mass marketers such as Walmart for imported, lower cost (even with the added transportation) produce has reduced prices and demand for competing locally grown produce throughout the growing seasons as well as during the winters.

8. Total Urban Land Use for Ontario cited in Table 8 during 1996 is 9,017 km^2. However, the total land area shown in Table 12 for just 4 Ontario Census Metropolitan Areas (CMAs) (Toronto, London, Ottawa-Hull and Hamilton) is 29,963 km^2. This discrepancy is apparently due to differences in definitions of the urban areas presented in Table 8 and CMA definitions.

9. In his recent book, *Predictably Irrational - the Hidden Forces That Shape Our Decisions* (Harper/HarperCollins Publishers. 280 pp. US$25.95), MIT economist, Dan Ariely, offers fascinating insights into the seemingly irrational, but nevertheless predictable, behaviour that people exhibit. At the heart of neoclassical economic theory of markets, the following assumptions regarding predicting human behaviour prevail. First, an individual is a coherent and unitary self, unaffected by the groups, culture and activities of society around him/her. Second, people possess certainty about what they want and need and these wants and needs can predicted by inductive reasoning. Third, people get information about themselves and their basic corporeal needs such as hunger, thirst, pain and pleasure, that help guide their decisions to predictable ends. Ariely argues that neoclassical economic theory assumes that people fundamentally "know all the pertinent information about (their) decisions" and they "... can calculate the value of the different options (they) face." People are, for important decisions, rational and this is what makes markets so effective at finding value and allocating work. However, Ariely argues that the past two decades of experimental work in psychology, sociology and economics have shown that all three of these assumptions are fallible, if not entirely false. A more accurate interpretation of the evidence is that there are more than one version of an individual's persona who come to the fore under different conditions to make decisions and choices. People are not always cool calculators of self-interest who sometimes make irrational choices because they are misinformed or they face random uncertainties or they are crazy. People, or at least some aspects of their personas, exhibit seemingly irrational needs and wants and will indulge themselves when given the chance and the wherewithal. Decisions that are based on rational benefit-cost considerations and assessments are made under special circumstances, which are less common that most economists realize or hope for. Ariely and his fellow experimental social scientists want to replace the "rational economic man" model with one that more accurately describes the psychological processes and principles that drive human choices.

10. For example, in 1953, then premier Leslie Frost brought Toronto and its suburban boroughs together in the Metropolitan Toronto Council, which built and administered the infrastructure that allowed Toronto to grow

(Stein, 2008). The Davis Conservatives initiated the “Toronto Centered Plan” in 1970 and subsequently created the upper tier Regional Municipalities in Southern Ontario. In 1988, a Liberal government created the “Gateways” Transportation Plan and, in 2001, a Plan to save the Oak Ridges Moraine was tabled. New Democrat Premier Bob Rae created a Greater Toronto Area Task Force, which recommended a Greater Toronto Council. However, the New Democrats lost the 1995 election and Premier Mike Harris amalgamated the Metro Toronto municipalities into one City of Toronto. Harris also created a Greater Toronto Services Board, which was intended to induce the new City of Toronto to work with its surrounding municipalities but the Board was later disbanded. The McGuinty government has since initiated Smart Growth Panels throughout the province as well as creating another Greenbelt Plan and a land use plan for the Greater Golden Horseshoe Region. The authority of the 100 municipalities in the Greater Golden Horseshoe is being eroded as these plans and institutions grow to maturity.

11. According to Lorinc (May 2001), OMB officials are charged with a narrow mandate that leaves little room for environmental, heritage and social goals and considerations. Moreover, “When the (Conservative government of Mike) Harris.....rewrote the (Ontario) Planning Act in 1996, they made two crucial changes that effectively neutered the ability of municipalities to enforce their own land use decisions. First, ... to streamline the process of approving development, (the government) established a rule saying that if a local council doesn't make a decision within 90 days of receiving an application, the developer can appeal directly to the OMB. (While there is) merit to... limiting a council's inclination to dither, this rule has shifted the balance of power sharply (toward) ... developers (who) now have ... no incentive to negotiate with local planners (and) ... the OMB (soon became) ...swamped with appeals.”

“The other crucial change was a three-word amendment to the Planning Act that transformed the OMB--a century-old body with a mandate to judge whether municipal land use decisions conform to provincial planning law--into a star chamber. The act used to require that development applications "be consistent with" Ontario's provincial policy statement, which lays out the core principles of urban planning. Now they need only "have regard to" it. One is clear, the other utterly ambiguous. The almost Talmudic dilemma of interpretation has landed, by default, on the doorstep of the OMB, which is made up of 31 government-appointed panellists who are mandated to find in favour of development projects that represent ‘the highest and best use’ of the land in question. Its problems mirror those of any judiciary put in the uncomfortable position of having to interpret vague laws. Invariably, the judges end up taking the heat for the ineptitude (or laziness, or cynicism) of the lawmakers.”

12. Exactions usually refer to formal or informal non-financial concessions (that become costs to developer) that are required by the subdivision approval process. Exactions include, land that is set aside for roadways, other public works, school sites, or for environmental reasons. A dedication of parkland may be required from the land intended for development or a cash payment in lieu of parkland may be made. In some instances a developer may be granted higher densities than permitted in the Official Plan in return for providing a day care facility or for preserving an historic building.

13. The Development Charges Act, 1997, S.O. 1997, CHAPTER 27. Apparently, Ontario is the only province to enact a unique statute that specifies what the charges can be based on and how the charges are to be derived. The statute is also unusual in that it specifies in detail how charges are to be computed, instructions which are normally relegated to a regulation.

14. These municipalities include the Regional Municipalities of Peel, York, Halton, Durham that surround Toronto as well as the Regional Municipality of Waterloo and the urbanizing counties of Frontenac, Peterborough, Haliburton and Lanark in the central and eastern parts of the province, all of which experienced population growth well above the provincial average of 6.6% between 2001 and 2006. However, it was remarkable to this writer to find that the highest population growth municipalities in the province are Indian reserves (Statistics Canada terminology) and settlements in Northern Ontario which recorded 2 and 3 digit growth figures between 2001 and 2006 (Statistics Canada, 2008).

15. An economic area in the US is a metropolitan area plus its rural counties. Geographically, an economic area can be as much as twice as large as a metropolitan area but, in terms of population, they are only about 20% greater. A metropolitan area contains only metropolitan counties (urban and suburban) that often have political and economic affiliations with the core cities. An economic area includes rural counties that are adjacent to metropolitan areas and are undergoing exurban migration and growth.

16. New Urbanism is yet another name for the compact, mixed use, higher density, public transit served and pedestrian friendly development patterns variously called smart-, planned- and managed-growth by other authors.

17. Neptis is an independent Canadian foundation that conducts and publishes nonpartisan research on the past, present and futures of urban regions. Neptis seeks to inform and catalyze debate and decision-making on regional urban development. Neptis Foundation is located at 50 Park Road, Toronto, Ontario M4W 2N5 and can be accessed at www.neptis.org.

18. A growing number of environmental and ecological economists argue that continuous growth is neither sustainable nor smart (Daly, 1991, 1996; Costanza, 1993). They contend that, in addition to more compact, efficient and less resource intensive urban settlements, governments and international organizations should also be working toward curtailment of global population growth that would ultimately ensure a sustainable, high quality life style for all humans into the future without destroying the ecological integrity of the planet. See

19. Since 2003, the collection, management and reporting of air pollutant emission data (including GHG emissions) from all provinces, including Ontario, are carried out by Environment Canada. Emissions data for Ontario can now be obtained from an Environment Canada website, http://www.ec.gc.ca/default.asp?lang=En&n=499D6B13-1 . GHG emissions can be obtained from http://www.ec.gc.ca/pdb/ghg/onlineData/docs/t4n5_all_b.xls. The most recent emissions data for Ontario, disaggregated by sector, are available for 2005 and 2006. Emissions data by sector and over time for earlier years are available only for Canada for years between 1985 and 2006 at the above noted web site.

20. Total Ontario emission of SO2, NOx, VOC, CO and total PM in 1999 = 4,391.3 kilotonnes.
The proportion of each of these emissions are: SO2 = 13.2%, NOx = 12.5%, VOC = 15.7%, PM = 4.7%
The total % contribution of the three source sectors to each pollutant is SO2 = 2.8%, NOx = 5.1%, VOC = 32.3%, PM = 16.4%.
Multiply each of these percentages and add the products together to get 6.83% times $4 bil. = $273 mil. = an estimate of the value of health effects related to emissions from the three source sectors associated with urban sprawl.

21. Public costs and benefits refer to unintended external (to the source) losses and gains incurred or enjoyed by individuals, firms or the community as the result of activities by other individuals, enterprises or government agencies. People or firms who buy products and services from other companies or government agencies pay the costs of these goods and services and, in turn, obtain a benefit from their purchase. Involuntary recipients of external public costs and benefits seldom receive any compensation for losses (costs) or pay for any gains (benefits). Pollution is a key example of public costs imposed on third parties. Closely related to public costs and benefits is the economic principle of *public goods*. Public goods is a technical name for products or services with attributes that, once made available to one person, are available to everyone. This happens because organizing markets and arranging to prohibit or exclude those users who do not pay are too costly or technically difficult to implement. Furthermore, the consumption or use of a public good by one person does not diminish the availability of the good or service to others. Two prime examples of public goods are radio and television broadcasts and the provision of national defense. Reduced health risks and environmental damages that result from industrial air and water pollution control have public goods attributes insofar as polluters cannot exclude anyone from enjoying these benefits and

they normally cannot command any revenues from the beneficiaries (irrespective of the distributional and equity issues associated with this approach).

22. If the Commissioner has not already examined and commented on the utility and desirability of adopting a system of expanded Provincial Economic Accounts that explicitly incorporate and display the quantities and values of natural capital depreciation and additions as well as environmental damages and non-compensated employment (eg. home-makers, volunteers, etc.) and other intangible benefits and costs that are currently ignored by current standard provincial income accounting, it should do so in the future.

23. The question of providing subsidies and "bailouts" to the major players in the automotive industry is likely to arise due to the perceived importance of this sector in providing employment, incomes and tax revenues to the Ontario and the national economies. Decisions to provide such subsidies will no doubt be highly contentious. On the one hand, it is likely that the automobile industry could achieve substantial efficiency gains by reducing capacity in terms of dealerships and production facilities, which would not happen if subsidies allowed these facilities to continue to operate. On the other hand, the perceived economic and employment losses that would occur during such a transition would be, to many, politically and socially unacceptable.

24. Rising gasoline prices are not the result of a government policy although some would argue that Canadian drivers could have been shielded from at least part of these price spikes by the application of appropriate government policies as was done in the 1970's by the Trudeau National Energy Plan (NEP). This policy was bitterly opposed by the oil industry and the government of Alberta who faced restrictions on the amounts of petroleum they could export and the prices they could charge for products within Canada. World oil prices had spiked in the wake of the formation of the Organization of Petroleum Exporting Countries (OPEC) cartel in 1973. Among the many features that were odious to Canadian oil producers and Alberta, the NEP established a schedule for the delayed increase of domestic petroleum and products prices toward free market world price levels. This schedule spread price increases over several years. By the time that the NEP schedule allowed producers to charge world prices within Canada, these prices had fallen partially due to the development and proliferation of more fuel efficient transportation equipment that were induced by the higher fuel prices and to new supplies of oil that came into the market from new producers in the North Sea, Nigeria and Russia. Current (2008) record high, and rising, gasoline and fuel oil prices are "fueled" by steady growth in domestic demand for petroleum fuels, contraction in refinery capacity (under the guise of maintenance and upgrading), record prices for crude oil and rapid growth in demand by China, India and other nations with rapidly expanding economies. Indeed, both India and China are beginning to build automobiles that will sell for between CDN$3,000 and $6,000 each. Fuel efficiency and pollution performance of these vehicles are unknown.

25. London's toll or congestion charge to drive in the City core on week days is one of the best known and, initially, one of the most controversial toll systems to be implemented. Known as an area-based pricing scheme, vehicles are photographed by mounted cameras at boundary roads and bills are sent to the owners. According to Lu (2008), the zone of payment was widened in 2007 and large cars and trucks will a face a surcharge. Currently, drivers pay £8 (pounds sterling) per day if they pay by phone, at kiosks, shops or gas stations the same day. The fee jumps to £10 if paid on the next day. Thereafter, late fees and penalties apply. Data are available from the City of London (Transport for London) to show that traffic quickly fell by 21% in the fee zone, that collisions and smog declined and cycling increased. The £250 million in toll revenues that was made in 2007 were earmarked for buses, road and bridge repair, safety-related projects and amenities and facilities for walking and cycling.

Other types of road pricing models from around the world that are being studied by Metrolinx include:

a) Distance-based pricing - where drivers are charged according to distance and fees can also vary by emissions and/or vehicle weight.
b) High-occupancy toll (HOT) lanes and managed lanes - HOT lanes allow a limited number of

single-occupant cars to pay a toll to use the faster lane. This toll system can be designed to reduce tolls with vehicles carrying multiple passengers to induce car-pooling.

c) This concept would divide a road in to fast and regular lanes separated by barriers. Fast lanes would have tolls that vary with traffic flow, more traffic, higher tolls. Regular lanes would be free but probably busier.

d) Peak hour pricing would make drivers who use the fast lanes pay more.

26. According to Kalinowski and Girard (2008), Metrolinx recently released two reports which evaluated several "car-reduction scenarios" in terms of capital costs and greenhouse gas emissions that would improve transportation services for an estimated influx of 2.6 million people by 2031. The most ambitious scenario would cost $419 billion to build and $3.8 billion annually to operate. However, even under this program, greenhouse gas emissions could still increase by 18% or decline by just 4% (Kalinowski and Girard, 2008).

27. Electric LSVs are evolving from golf carts and small electric utility vehicles used in parks, air ports and industrial plants. Vehicles made by ZENN and its competitors (eg. Vancouver-based Dynasty Electric Car and Electrovaya of Mississauga) are entirely enclosed, heated, air-conditioned and equipped with stereos, sun roofs and other features common to cars and vans. With top speeds of 40 km/hr, the charged lead-acid batteries provide a range of about 60 km before needed recharge. According to Hamilton (2008), while the vehicles are apparently approved for street use in many U.S. and European jurisdictions, Transport Canada is "worried about the ability of LSVs to keep pace with ... SUVs and trucks." Also, because LSVs are not required to install front and side airbags or comply with any crash-test standards, there is a concern that drivers of these vehicles are at greater risk if they collide with a larger vehicle. To this argument, Ian Clifford, the frustrated CEO of ZENN is quoted as pointing out that "nobody is banning bicycles, motorcycles or motorscooters from the streets."

28. A copy of this statute may be found at www.elaws.ca. The specific reasons why the Development Charges statute was enacted are unknown to this writer. However, it is an archetypal example of the degree to which a provincial government can, and does, limit and micro-manage the fiscal powers of municipalities.

29. Reserves are discretionary funds established by a municipal council to fund special purpose expenditures and future contingent liabilities designated by council, to minimize tax rate fluctuations due to shortfalls in revenues or unexpected expenditures and to fund multiple year projects and programs (eg. employee benefits, snow plowing). Reserve Funds are non-discretionary, segregated and restricted to be used for specific purposes such as capital expenditures. Trust Funds are also special purpose accounts which are recorded separately from the municipalities statements of financial position or activities. Examples are funds to pay for cemetery maintenance and surplus election proceeds that must be returned to candidates.

30. See, for example, "Vaughan paves way for new subdivision - Re-zoning could alter Hwy 427 extension plans, cost taxpayers millions," by Phinjo Gombu, **Toronto Star**, Sat. Jan. 31, 2009, pp GTA 1, 4.

31. TD Economics (2004) defines the infrastructure gap as representing the back-log of deferred maintenance, rehabilitation and replacement of public assets (which are built and maintained by governments) or, alternatively, the accumulated annual deficit between the amount of capital expenditure needed to properly maintain or replace existing infrastructure as well as to support growth with the amount actually spent.

32. Generating estimates of the infrastructure investment gap is fraught with difficulties and caveats. Estimates are often made by means of fairly simplistic models, such as extrapolating from historical spending data or through surveys of best guesses and opinions of a sample of relevant experts, but without incorporating issues such as technological innovation or changing government regulations. Moreover, estimates of so-called infrastructure investment "needs" seldom factor in price elasticities, taxes or alternative uses of funds. Some authorities generate estimates of future needs while others calculate past shortfalls and deferred expenditures. Estimates also vary in the categories of infrastructure and other public assets that are

included. Consequently, estimates vary widely and are seldom comparable.

33. Reasons why cutting capital expenditures was often became the first choice of government finance ministers to balance their books include the following. First, the consequences of reduced capital spending were much less noticeable than reduced operating expenditures in the short run. Second, because capital projects tended to be big ticket items, reductions and deferrals would yield large budgetary savings from one year to the next. Finally, new capital assets such as roads, water and sewage treatment capacity, schools, libraries, etc. also require higher overall recurring operating. Therefore, cuts in capital spending also helped to contain growth in operating expenditures.

34. Early in the author's career with the Ontario Ministry of the Environment, preferences for add-on capital-intensive abatement solutions to achieve compliance with regulatory requirements were often expressed by Ministry staff engineers in permit conditions and Ministerial orders. Abatement officers tended to specify specific end-of-pipe or stack treatment technologies to be applied as well as (and sometimes instead of) performance objectives in terms of contaminant release loadings or concentrations. When the regulated parties did install the requisite systems, Ministry abatement staff and the compliant industrial facilities were then able to demonstrate their shared regulatory effectiveness with highly visible machinery and structures. Indeed, the presence of the machinery and structures sometimes became the end rather than the means of regulatory compliance. However, after these systems were installed, the Ministry too often found that the abatement performance (eg. % of pollutants removed) began to deteriorate for lack of maintenance and repair or because the firm failed to hire qualified staff to operate the equipment properly. In subsequent years, Ministry regulatory and enforcement strategies began to stress setting performance criteria and allowing regulated parties more flexibility to choose more cost-effective technologies that would achieve the desired performance objectives.

35. Federal and Provincial subsidies to municipalities, and in some cases, to private enterprises in the 1970's and 80's tended to target capital items, leaving the operation and maintenance (O&M) costs to the recipients. During the author's tenure with the Ontario Ministry of the Environment, he witnessed several financial assistance programs that helped municipalities and, in rare cases, private firms, build waste water and solid waste processing and recovery facilities but did not provide assistance for O&M costs. During subsequent years, recipient municipalities and industrial firms whose operating costs were particularly high or who suffered cyclic revenue downturns, would spend less and less on annual maintenance and repairs. As a result, productivity of the equipment in question, as measured in pollutants removed or materials recovered for recycling, would decline until the Ministry initiated a new round of enforcement activities.

36. The original legislation on development charges in Ontario permitted standards to be the highest achieved over the past ten years, rather than the average. The change was made in response to developers, who complained that they should not have to pay for gold-plated services that existing residents did not enjoy. Furthermore, the highest level of service in any given year often reflected excess capacity.

37. Robert Rossini, Director of Finance, City of Mississauga, 905-615-3200 ex 5003.

38. Beaujot *et al.* (2007) offer the following caveat: "The continued globalization, along with the strong economic and demographic differentials across countries, would imply a continuation of high immigration. Canada is particularly well placed with policies for the admission and integration of various types of immigrants. However, the difficulties (in terms of jobs, ethnic-based street gangs, etc.) faced by recent immigrants might be indications that the numbers are in excess of the country's absorptive capacity."

39. Not all municipalities experienced the same degree of property value increases that are found in Toronto. Many smaller urban areas in Northern and Eastern Ontario have experienced declines in downtown commercial and industrial property values due to growth in shopping malls and population emigration to larger urban centres.

40. These differentials developed historically. Assessments in Toronto were frozen from 1954 to 1998. Over this period, residential properties increased in value more rapidly than nonresidential properties, but the freeze meant that these changes were not reflected in the assessment used for taxation. The result is that residential properties have been under-taxed in Toronto for several years. Assessments in other municipalities were less out of date. Recent property tax reform in Ontario means that all properties are assessed at market value, and municipalities are permitted to reduce the tax burden on nonresidential property classes relative to the residential class (Slack, 2002).

41. A notable exception is Calgary where all residential properties (single-family homes, apartments, and condominiums) are taxed at the same rate (Slack, 2006).

42. In Ontario, municipalities can now set the tax rate for new multi-residential properties equal to the tax rate on single-family residential properties for a period of eight years. Some developers argue that the eight year provision is not long enough, given the exigencies of long-term financing. As of 2002, the Ontario government was contemplating increasing the period to as much as 30 years..

43. For further elaboration of the advantages of user charges, see Kitchen (2000), Bird and Tsiopoulos (1997) and Dewees (2003).

44. First proposed by Henry George in 1879, this approach gave rise to the single-tax movement in the United States during the 1890s (Slack, 2002).

45. Brownfields tend to be closed commercial or industrial sites that are often vacant, dilapidated, sometimes contaminated and generally located in central city areas. Because of their central locations, brownfields often hold substantial potential for redevelopment. However, realization of this potential is often hindered by remediation and cleanup costs of contaminated lands, the costs of upgrading or replacing older infrastructure and the potential for liability. Banks and other sources of private financing are apprehensive about investing in brownfield sites because of the potential for future liability so that these lands often remain vacant and unused with little or no tax revenue to the municipality. Their presence can also deter investment on other nearby properties that are not contaminated. Reviews of the extensive literature on TIFs in the United States can be found in Wassmer (1994), Anderson (1990), and Chapman (1998) and at the web site of the Lincoln Institute for Land Policy (http://www.lincolninst.edu/).

46. Another economic criterion for estimating the value of non-priced, non-marketed goods and services would be the minimum amount people would be willing to accept in compensation to incur specific losses or damages and still perceive themselves to be no worse off. While theoretically sound and widely agreed to by economists, this approach to valuing environmental damages and benefits continues to be difficult for non-economists to comprehend or accept (Freeman, 1979, 2003).

47. Crompton (2001) states that his own studies and others in the literature found that capitalization benefits dropped to zero from 500 feet to 3,000 feet away from a park in an urban context.

48. An active park contains sports fields, playgrounds, picnic areas and other facilities. A passive park consists primarily of natural vegetation and habitats with some developments to support natural resource based recreation such as hiking, wildlife viewing, boating, camping, etc. May also include areas managed for habitat protection with no public access or improvements.

49. When this study was carried out (1996), market value assessment had not yet been implemented in Ontario so that there was no easy municipal tax mechanism available to capture this additional tax revenue.

50. Academic papers can be a bit frustrating. For example, the key conclusion of Bergstrom and Ready's paper, which is entitled, "What have we learned from over 20 years of Farmland Amenity Valuation Research in North America?," is "....although much has been learned about farmland amenity values since the first farmland protection and amenity valuation studies in the 1980s, much more qualitative and quantitative research is needed to better understand the effects of specific farmland attributes on references and values for farmland protection and amenities."

51. See Lorinc (2001) for an insightful and well written account of the views and attitudes of some developers regarding the intrusion of environmental and land protection rules on their businesses.

52. Issues associated with the collection, manipulation and interpretation of economic data and statistics are reviewed, analyzed and discussed by Morgenstern (1963) in his seminal work, *On the Accuracy of Economic Observations*.

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