



**TRANSPORTATION MASTER PLAN**

Policy Paper No. 4

**AIR QUALITY  
&  
THE ENVIRONMENT**

For Discussion Purposes Only

October 2000



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## 1.0 INTRODUCTION & BACKGROUND

The quality of our air has a direct relationship with the transportation sector, and particularly with private automobile usage. Gasoline and diesel engines emit greenhouse gases and particulate matter into the environment, contributing considerably to air pollution in cities and global climate change (other sources include industry, the evaporation of liquid fuels and the use of solvents and other volatile products such as oil-based paints). The impacts of these emissions are further compounded when they react with heat and sunlight to cause smog (the hazy air that causes difficult breathing conditions), the most harmful components of which are ground-level ozone and fine airborne particles.

As the urban trend continues for the demand for single occupancy vehicle use, more and more private automobiles enter the road network every year, creating increasingly more trips per day, and greater traffic congestion. York Region is no exception. With residents of the Region commuting across municipal boundaries and crossing over other Regional boundaries, trip lengths in the Greater Toronto Area (GTA) have increased as residents relocate to suburban areas, a trend which is likely to continue. In 1996, the average trip length by York Region residents (auto drivers) was 11.4 kilometres (down from 12.2 km in 1986), as compared to only 9.7 kilometres throughout the GTA (up from 9.4 km in 1986). As such, innovative and comprehensive solutions are needed to reduce the dependence on the private automobile for commuting purposes and increase the proportion of travel completed by “cleaner” methods of transportation that have less harmful effects on the sustainability of the natural environment. As defined in the York Region Official Plan (1999, p.5), a sustainable natural environment is one that is “capable of meeting the needs of the present without compromising the ability of future generations to meet their own needs.”

## 2.0 CURRENT ISSUES

Air quality is an issue that affects urban areas worldwide. Human-induced activities (particularly the operation of motor vehicles, industrial combustion processes and the evaporation of gasoline, oil-based paint and cleaning solvents) have led to adverse impacts on global warming, acid rain and the ozone layer, which in turn adversely affect the air quality and pollution levels in the atmosphere. For example, the operation of gasoline powered vehicles emit heat-trapping greenhouse gases, including carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>) and nitrous oxide (N<sub>2</sub>O), which cause the Earth's temperature to increase, contributing to climate change in the upper atmosphere and possible threats to the stability of global food sources (Our Environment Our Home, 2000, p.4-3). In the lower atmosphere, the resulting pollution levels can affect vegetation, the state of buildings and most importantly human health. Poor air quality affects those with heart or lung disease and respiratory problems, such as asthma, emphysema and chronic bronchitis. Elderly people and children are particularly at risk for experiencing respiratory problems due to poor air quality. The impacts of air pollution typically worsen during the summer months given the heat and humidity levels. This can cause an increase in mortality and the number of patients admitted to hospitals for respiratory problems, particularly in southern and eastern Ontario.

The heavily populated Windsor-Quebec City Corridor (which includes the GTA and York Region) experiences high levels of air pollution more frequently and for longer periods of time than any other part of Canada. This is also true for “smog”, a distinct form of poor air quality. Smog, a mixture of smoke and fog in the air, describes a noxious mix of air pollutants largely arising from automobile exhaust that can often be seen as a brownish haze in the air. A combination of sunlight, heat and exhaust from automobiles, trucks and power plants causes smog to form. Smog is comprised of two components: airborne particles and ground-level ozone. Airborne particles are minute droplets of liquid small enough to remain suspended in the air for days and even weeks. These particles can aggravate respiratory problems in humans and may have an impact on the environment by reducing visibility. Ground-level ozone is a gas that naturally forms when sunlight reacts with air pollutants, specifically nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOC), typically found over urban areas. Ground-level ozone can have a number of health impacts on humans including inflamed breathing passages, eye and nose irritation, interference with the body's ability to fight infection increasing susceptibility to illness – it is especially harmful for seniors, children, asthmatics and people with heart and lung conditions (City of Toronto Public Health Department - [www.city.toronto.on.ca/health/smogalert.htm](http://www.city.toronto.on.ca/health/smogalert.htm)).

Smog alerts in Ontario are usually a result of the migration of pollutants from the United States combining with unfavourable weather patterns; the Ministry of the Environment estimates that more than half of Ontario's smog problem can be attributed to trans-boundary pollution. There are, however, local sources of pollution that contribute to the severity of smog events and as such, "spare the air" actions must be considered locally.

The Kyoto Protocol that brought together the world's industrialized nations in 1997 was an initiative to reduce the emission of greenhouse gases into the atmosphere. Participating nations signed an agreement to reduce emissions of six greenhouse gases by 5.2% below 1990 levels by 2012. Canada has agreed to a reduction target of greenhouse gas emissions by 6% below 1990 levels by 2008-2012 (Our Environment Our Home, 2000, p.4-9; Environment Canada, [www.ec.gc.ca](http://www.ec.gc.ca)). The next world summit on the issue of climate change and the environment is scheduled for November 2000.

## **2.1 AIR QUALITY IN THE GTA**

The airshed or “atmospheric region of influence” for the GTA is estimated to stretch from Hudson's Bay in the north, central Georgia in the south, the Dakotas in the west and New Brunswick in the east (Our Environment Our Home, 2000, p.4-2). Although non-local pollutants are found in the atmosphere surrounding the GTA, much of the pollution leading to poor air quality is derived from local sources. Emissions from transportation sources in the GTA have contributed to greater than 80% of the presence of nitrogen oxides, and greater than 50% of the presence of other such greenhouse gases as VOCs, particulates and carbon monoxide in the air. Although pollutants are no longer emitted from industrial sources in the same frequency as in the past, the levels of particulate matter and ground level ozone have still remained high due to an increasing number of automobiles and increased automobile use in the GTA (Our Environment Our Home, 2000, p.4-12).

Current trends regarding transportation and travel behaviour in the GTA are heading in the wrong direction with respect to sustainability of the natural environment. Such trends include:

- increasing automobile ownership levels, particularly in the suburban GTA;
- increasing individual trip rates, occurring largely as auto-driver trips;
- increasing suburbanization of the population and employment into areas lacking comprehensive public transit;
- reduction in the use of public transit as an alternative to the automobile, despite increases in the overall trip rates (Miller and Shalaby, 2000, 99-100).

More specifically, between 1986 and 1996, daily passenger travel in the GTA increased by 24%. Morning peak traffic volumes increased by 19% and afternoon peak traffic volumes increased by 22%. It is forecast that over the next 25 years morning and afternoon peak traffic volumes will increase by 49% and 51% respectively (Removing Roadblocks, 2000, pp.10-11). Such stark auto dependency in the Region has resulted in increased traffic congestion, vehicle emissions and increased environmental degradation.

The Official Plan for the City of Toronto (November 1994) specifies policies regarding improving air quality. In accordance with the City's transportation policies, the Official Plan promotes measures to reduce private automobile usage within the City and encourage alternative means of transportation, including public transit, cycling and walking. More specific policies aim to reduce carbon dioxide (CO<sub>2</sub>), carbon monoxide (CO), hydrocarbon (HC) and nitrogen oxide (NO<sub>x</sub>) emissions from all sources within the City by 20 percent of 1991 levels by 2006. The Official Plan aims to reduce sulphur dioxide (SO<sub>2</sub>) and nitrogen dioxide (NO<sub>2</sub>) emissions by 25 percent of 1991 levels by 2006 (City of Toronto Official Plan, November 1994, §2.3).

The Toronto Atmospheric Fund (TAF) was established in 1992 to help the City of Toronto meet its goal in reducing greenhouse gas emissions. Other Toronto-based associations include the Better Building Partnership (BBP) and the International Council for Local Initiatives (ICLEI) which both work to improve air quality in the Toronto area. The City of Toronto promotes an Anti-Smog Strategy that goes into effect when smog levels in the City are high. The use of public transit over the private automobile and carpooling (if one must drive) are suggested for smog-alert days (City of Toronto, [www.city.toronto.on.ca](http://www.city.toronto.on.ca)). In June 2000 the first ever Smog Summit was held in Toronto. Three levels of government agreed on a six-point plan to improve air quality in the City, including establishing a clean air partnership with the TAF for financial support, and initiation of an employee trip reduction program to encourage carpooling within the City.

## **2.2 AIR QUALITY IN YORK REGION**

Current trends in transportation in York Region point to the private automobile as the primary method of travel. The number of vehicles and the number of trips made in York Region is ever-increasing. One of the fastest increases in travel demand has been seen in school trips – parents driving their children to and from school, or students driving themselves. The old adage “when I was a kid, I walked 2 miles to school – up hill both ways” is no longer true. Overall, these trends have resulted in increases in traffic volumes that exceed the rate of increase in population and employment growth. In response to low density land development patterns characteristic of the Region, travel by public transit is often not the most convenient choice for the Region's residents and employees. To compound the impacts of increased automobile use, the share of light duty trucks or sport utility vehicles (SUV) on the road has also been increasing in recent

years. These vehicles operate at a lower level of fuel efficiency and thus produce higher levels of greenhouse gas emissions per kilometre driven.

In comparison to the average Ontario resident, the residents of York Region commute longer distances to work, drive their cars to work more often, and use public transit, bicycle and walk less (Our Environment Our Home, 2000, p.2-17). The average number of vehicle trips per day in York Region was slightly above the GTA average of 2.52 vehicle trips per person. Between 1986 and 1996, as the population of the Region increased by 68%, the number of vehicle trips per day increased by 79% while public transit use only increased by 40% (Our Environment Our Home, 2000, p.2-23). Between 1990 and 1997 the number of active registered vehicles in the Region increased 24% (Our Environment Our Home, 2000, p.2-19). As such, transit trips in the Region do not have a significant share of the total travel market.

These consistent increases in the number of households, the number of vehicles on the road and the number of trips per day has led to increased stress on the Region's road network in the form of traffic congestion. Increased traffic congestion and vehicle emissions have served to further degrade the Region's environment, particularly its air quality.

### **2.2.1 Air Quality Index**

An Air Quality Index (AQI) measures how breathable the air is on a given day. One air monitoring station is located in York Region in Stouffville on Highway 47 east of Highway 48. This station however does not monitor all pollutants required to measure the AQI. York Region and the Ministry of the Environment are working to locate an AQI monitoring station in Newmarket that may be in use in the year 2000 (Our Environment Our Home, 2000, p.4-12). The 5 closest monitoring stations in the Toronto area measured the AQI to be greater than 31 (considered as a moderate level of air pollution) on 30-100 days of the year between 1989 and 1995. These levels are largely due to ground level ozone and particulates (Our Environment Our Home, 2000, p.4-13).

### **2.2.2 Air Quality Advisories**

Air Quality Advisories (AQAs) are issued in Ontario and the GTA on days when the Air Quality Index is expected to exceed a reading of 50 at a significant number of monitoring sites throughout Ontario due to ground-level ozone. Warnings are issued by the Ministry of the Environment to the local Medical Officer of Health and the media the day before elevated pollution is expected to occur. These advisories serve the purpose to warn the public that sensitive individuals with heart or lung disease may experience a worsening of their condition. The number and length of AQAs is largely affected by weather conditions, where sunny and hot weather with little wind cause sustained production of ground-level ozone. AQAs have been issued on 5 days in the Toronto area in 1998 and 1997, 3 days in 1996 and 8 days in 1995 (Our Environment, Our Home, 2000, p.4-13).

## **3.0 YORK REGION OFFICIAL PLAN POLICIES**

### **3.1 AIR QUALITY**

The York Region Official Plan sets out a goal for the maintenance of a sustainable natural environment as: "to conserve and improve the natural environment for this and future generations so that it will sustain life, maintain health and provide an improved

quality of life.” The policies contained in the Regional Official Plan serve to identify, protect and help restore definable natural areas and functions in order to uphold the goals for a sustainable natural environment (York Region Official Plan, 1999, p.5). The Regional Official Plan recognizes that air quality is a part of the worldwide environmental system that is affected by the current trends mentioned above, such as global warming and climate change. Policies, programs and practices initiated in York Region can affect air quality locally, and may have small but important effects on the global environment as a whole.

A set of objectives in achieving environmental sustainability, specifically aimed at improving the air quality found in the Region are stated in the Regional Official Plan:

1. To promote compact urban form, transit use and trip reduction as a means of reducing energy consumption and improving air quality.
2. To promote protection of natural areas and systems and urban and rural forestry initiatives as a means of improving air quality and reducing energy use through shading, sheltering and cleansing (York Region Official Plan, 1999, p.18).

Practices in preserving a sustainable natural environment point to strategies emphasizing the use of public transit and trip reduction. Coupled with a decrease in private automobile use, this can serve to help reduce greenhouse gas emissions, specifically carbon dioxide and carbon monoxide. Regional policies promote the increase of regional forest cover, careful consideration of the environment, and the development of compact and efficient communities, which can control pollution and increase the capacity of natural systems to filter and clean the environment, particularly the air (York Region Official Plan, 1999, p.18).

Trees and woodlands are valued for many environmental, social and aesthetic purposes. The Regional Official Plan upholds the value of trees and woodlands to aid in climate control through regulating temperatures and counteracting the effect of greenhouse gases emitted into the atmosphere. Further, trees enhance air quality as they effectively serve to improve oxygen levels in the air and reduce chemical pollutants, odours and absorb noise pollution.

### **3.2 TRANSPORTATION NETWORK**

The York Region Official Plan coordinates the provision of regional infrastructure services with growth management policies to substantiate the goals of a sustainable natural environment, economic vitality and healthy communities. It coordinates transportation planning and operates a road network to provide high-capacity inter-municipal service; the strong correlation between transportation and urban form is recognized. As such, the inclusion of compact, mixed-use urban form in new communities is encouraged to support a variety of travel modes, including walking, bicycling and transit use. Compact development also serves to help reduce the overall average trip length required for work, school, shopping and other purposes (York Region Official Plan, 1999, p.63). An expanded and well-integrated public transit system is a necessary component of the transportation network required to reduce vehicular traffic by providing alternative access to jobs and services for all people. A comprehensive and convenient public transit system is an important tool for environmental and energy conservation strategies (York Regional Official Plan, 1999, p.68).

As such, the objectives set out in the Regional Official Plan promote improving the level of service of the existing and future transportation network:

- to plan and protect road and street corridors so that they can be developed in a manner that is supportive of the future urban and rural structure of York Region and that can accommodate future transportation demands;
- to ensure that roads are improved in a manner that is supportive of all modes of transportation including walking, cycling, automobile, transit and truck and that minimizes conflicts between these different modes;
- to increase the total person-carrying and goods-carrying capability of the regional street and road network in a manner that is consistent with the overall goals and objectives of this plan; and
- to provide transit service that is convenient, accessible and equitable to all residents of York (York Region Official Plan, 1999, p.64 and p.68).

The objectives of the Regional Council regarding the transportation network identify the need for:

- high-occupancy vehicle (HOV) lanes on regional and other municipal roads, integrated with existing and planned networks in the GTA ;
- road improvements and new regional roads including bypasses will address all the policies of this Plan including the Sustainable Natural Environment policies and the Regional Greenland System and will be based on an Environmental Assessment;
- the development of a fully coordinated public transit system linking major residential, employment and community activity areas within the Region and making suitable connections with other GTA transit systems;
- planning communities based on a significant increase in public transit usage, to support the 30-year target for 33% of peak period trips to be taken by transit in urban areas;
- co-operation between area municipalities, GO Transit, the TTC, the Ministry of Transportation and adjacent municipalities in the planning and integration of expanded transit services and to increase transit use for travel across the Region's boundaries; and
- preferential treatment for transit vehicles on Regional roads, E.g.: HOV lanes, reserved bus lanes, bus priorities at traffic signals (York Region Official Plan, 1999, pp.67-70).

### **3.3 FUTURE TRENDS IN POPULATION, EMPLOYMENT AND TRAVEL**

York Region is forecast to grow very substantially over the next two to three decades. The Region's population currently sits at over 730,000. The population is forecast to increase to over 1 million by 2011 and close to 1.3 million by 2026. Also, employment is expected to almost double from its current figure of approximately 370,000 to 700,000 in 2026 (York Region Population, Households and Employment Forecasts, 1996-2026, 2000, p.4). As a result of such forecasts, trip generation and travel demand on Regional roads will in turn increase. With a rise in the resident population, greater household formation is also expected. The 1991 Transportation Tomorrow Survey identified that of the 1,032,000 daily trips taken in York Region, greater than 80% were by private automobile. Trips by public transit and school bus modes accounted for approximately 8% of total trips and walking and bicycling accounted for approximately 5% of total trips (York Region Official Plan, 1999, p.66).

The current trend experienced and expected to continue in the GTA is the incidence of a greater number of households with a lower average number of members per household. With an increase in the number of households, the number of private automobiles owned and operated per household is also forecast to rise. An increase in travel demand by private automobile use incurs a stress on the Region's air quality as sheer traffic volume creates further congestion, leading to greater levels of greenhouse gas emissions and ground-level ozone.

A Growth Management Strategy is an initiative in the works as a partnership between York Region and area municipalities. This is a necessary implement to ensure controlled and defined areas for growth. As such, components of this system include:

- a requirement through the Regional Official Plan for comprehensive planning of new communities, typically on a concession block basis;
- a recommendation for the use of phasing policies for all new urban secondary plans tied to specific infrastructure capacities;
- coordination by the Region and area municipalities regarding land use decisions and capital plans for infrastructure and financial planning;
- a long term transportation network plan;
- a 10 year capital works program for orderly delivery of new and improvements to existing infrastructure;
- the establishment of a York Region Transit System to coordinate and improve transit services in the Region; and
- a new "Green York Region" initiative to be considered by Council, in attempt to coordinate natural environment programs in the Region (Refining the Region's Growth Management Strategy, 1999, p.4 and p.8).

## **4.0 RELEVANT EXPERIENCE IN AIR QUALITY & THE ENVIRONMENT**

Initiatives undertaken by other governmental jurisdictions regarding the protection of the environment and air quality serve as examples for York Region to follow. Favourable experience in other places of the world indicates ways in which improving the current state of our air is possible.

### **4.1 CITY OF TORONTO – SMOG ALERT RESPONSE PLAN**

The City of Toronto (City of Toronto, [www.city.toronto.on.ca/health/smogalert.htm](http://www.city.toronto.on.ca/health/smogalert.htm)) has adopted a Smog Alert Response Plan, the objectives of which are to:

1. implement divisional smog alert response plans that will see short term reduction or suspension of activities that contribute to poor air quality on smog alert days;
2. provide information to City staff serving at risk groups such as children and seniors to support informed programming and service delivery decisions on smog alert days; and
3. provide education materials for distribution by City staff serving at risk population such as children and seniors so that these client groups can learn about smog, its effects on health and the precautions they should take on smog alert days.

The Smog Alert Response Plan outlines special actions that the City of Toronto will take on the smog alert days, which include:

- reducing the use of non-essential gasoline and diesel powered vehicles;
- minimizing vehicle idling ;
- reducing the use of oil-based paints, solvents and cleaners;
- postponing the use of gasoline powered equipment;
- suspending the use of pesticides;
- postponing refuelling of vehicles until dark; and
- advising staff in general to take public transit or walk to work (casual clothes are permitted on these days).

#### **4.2 CITY OF TORONTO – CORPORATE SMOG CONTRACTS**

The Corporate Smog Contracts is a Toronto Environmental Alliance (TEA) program that targets altering corporate practices and employee behaviour in effect to reduce greenhouse gas emissions leading to smog in the City of Toronto. This program encourages the senior management of industries to sign a contract committing them to undertake a program that includes at least two of the following elements:

- an emergency smog plan for days when the AQI is predicted to reach a level of 50;
- a “Green Fleets Program” designed to reduced emissions of the company fleet;
- an employee trip reduction program with at least two sustainable transportation options to alter commuter behaviour (carpool matching with TEA’s ride Together program, commuter bicycle facilities or transit pass subsidies); and
- a corporate practices emissions reduction program to reduce in house pollution (Smog: Make It or Break It, 1998, 8).

#### **4.3 TULSA, OKLAHOMA – “OZONE ALERT” DAYS**

On days where ground-level ozone levels are high in Tulsa, Oklahoma, free public transit is provided by the local government to discourage private automobile trips further aggravating air pollution. The local government and industry have come together to promote transit use or higher occupancy vehicle use on a regular basis. Examples of such include offering discounted bus passes, draws for free bus passes, promoting car pooling, free emission testing for employees and encouraging flexible work hours (Smog: Make It or Break It, 1998, p.8).

#### **4.4 PARIS, FRANCE – VEHICLE RESTRICTIONS**

National legislation passed in 1996 allowed the City of Paris to effectively respond to severe smog plaguing the city. On October 1, 1997 a local government policy permitted cars with licence plates ending in an odd number only and cars holding three or more occupants to enter or drive in the city. Other vehicles were stopped en route into the City. Commuters were encouraged to take public transit, which was free during that day. Vehicles allowed into the city centre were not permitted to exceed 60 km/hour on highways to control emissions. Due to poor air quality in the Paris area, it is expected that such vehicle restrictions may become a permanent situation (Smog: Make It or Break It, 1998, p.8).

#### **4.5 PORTLAND, OREGON – URBAN GROWTH BOUNDARY**

The City of Portland, Oregon established an urban growth boundary (UGB) in 1979, an invisible line encompassing a number of cities and counties within the Portland

metropolitan area, outside of which urban growth is discouraged or prohibited. Efficient urban development, also referred to as “smart growth” is the prime motivation for the UGB concept. With the prevention of urban sprawl, new development is directed to higher densities and closer to the city centre. As such, transportation demand in effect would be lessened than if development were permitted beyond the boundary. With residential districts located in closer proximity to the Central Business District (CBD) efficient public transit is possible and the demand for private automobile commuting is lower. Even with the implementation of the UGB, air pollution and smog is an issue affecting the Portland area. The Oregon Department of Environmental Quality has issued state rules to reduce toxic air pollutants through a Vehicle Inspection Program to ensure that emission control systems in vehicles are operating properly. The program identifies vehicles that are producing more air pollution than may be permitted and are in need of maintenance. Another policy initiated by the state of Oregon is the “ECO Rule” initiative, adopted for the Portland metro area in 1996. This policy requires that area employers with greater than 50 employees at a work site reduce employee single occupancy vehicle use for commute trips by 10% over a three year period. This program can in effect shift travel demand towards higher occupancy vehicle modes, such as transit, carpooling, and alternative forms of travel such as pedestrian and bicycle transportation (City of Portland, [www.city.portland.or.us](http://www.city.portland.or.us)).

The above examples of how municipalities have reacted to air pollution in their jurisdictions illustrate the importance of reducing harmful emissions arising from automobile use. Policies and programs targeted at reducing private automobile use have attempted to redirect travel demand to higher occupancy modes of transportation. Influencing travel demand behaviour can in effect improve traffic congestion found on the road network and create a more sustainable natural environment.

## **5.0 POLICY DIRECTIONS FOR IMPROVED AIR QUALITY IN YORK REGION**

Environmental protection and the maintenance of good air quality are reflected in policies aimed to alter the current state of the transportation system in York Region. Several recent transportation reports have been prepared to assess the existing York Region transportation system and recommend policies to influence a future transportation system that is less reliant on the use of the private automobile. Relevant reports include:

- Crossing Boundaries – Coordinating Transit in the Greater Toronto Area;
- GTA Cross Boundary Study Overview;
- GTA HOV Network Strategy Study;
- Highway 407 Transitway System Plan and Station Site Plan Study;
- Highway 7/407 Transit Planning Strategy Study;
- Highway 7 Corridor Land Use & Transit Strategy;
- Inter-Municipal Highway No. 7 Corridor Study, Highway 404 to West of Leslie;
- North Metro Boundary Transportation Review;
- Removing Roadblocks – A Strategic Transportation Plan for the GTA and H-W;
- Transit Corridor Protection Study Highway 407/Parkway Belt West Corridor from Highway 403 to Markham Road;
- York Region HOV/Rapid Transit Study; and
- York Region Transit Study.

Similar themes are found in the body of these reports. Emphasis is placed on the need for an integrated public transit system to play a much greater role in the Region's transportation system. This is deemed essential to sustain the growth in population and employment forecast for York Region and maintain an attractive quality of life. Policies related to modal priority are necessary, where emphasis must be given to transit over road improvements to encourage a high transit modal split early into the 30 year planning horizon. In order to achieve a transit modal split of one out of every three trips, transportation system expansion needs to be directed towards public transit initiatives. As such, the design of road improvements to accommodate transit use, including the addition of bus bays, should be the essence of road improvements in the interim (York Region HOV/Rapid Transit Study, 1995, pp.2-8).

## **5.1 IMPROVED PUBLIC TRANSIT**

To reduce the dependence on the private automobile (particularly single occupancy vehicles) and hence increase the viability of rapid transit services, a series of major transportation network improvements would be required. Public transit service must be offered at a regional scale to capture a significant market share. Improvements to public transit making the system more comprehensive, integrated and convenient, can serve to bring about a decrease in automobile dependency and the associated environmental side effects – traffic congestion and air pollution. A York Region public transit system should be planned as a fully integrated component of a comprehensive GTA-wide transit network. Coordination between GO Transit services and the transit systems run by the area municipalities and adjacent regions will make transit travel more accessible and convenient. The system should be capable of being built incrementally in response to future congestion and land development opportunities.

In order to attract commuters in York Region, the single largest group of peak period travellers, the transit system must be convenient enough to serve a substantial proportion of work trips. The concept of a hub and spoke system would make the transit network more comprehensive – the “hubs” would serve as the transit stations in the downtowns, regional centres and designated urban areas, with “spoke” routes serving as transit routes between the hubs (York Region HOV/Rapid Transit Study, 1995, pp.2-9). The establishment of transit gateways at transit hubs to include passenger parking lots will provide a convenient opportunity for connection points for local buses, feeder GO buses, and for SOV commuters to transfer between automobile and transit trips (Removing Roadblocks, 2000, p.5).

Other transit network improvements point to expanding the three commuter rail lines which run through York Region to increase train frequency, add or relocate stations, and add extensions to rail services. Extension of both the Yonge and Spadina subway lines into York Region to reach Highway 7 can further improve sustainable travel options for York Region commuters. Upon the completion of the Sheppard subway line and the relocation of the Oriole GO Station on the Richmond Hill line, a connection between the two services will be established. Exclusive bus service operating on separate right-of-ways or on reserved bus lanes within key areas of the Region can provide an alternative for inter-municipal commuting, including a possible east-west transitway along the Highway 7/407 corridor from the York/Peel boundary to the York/Durham boundary and a north-south transitway along the Yonge Street corridor from the proposed subway station at Highway 7 northward into Newmarket

Additional measures, targeted specifically at high automobile trip generators, should also be considered (such measures are further discussed in Section 5.3 TDM Strategies). In particular, in response to the increase in student drop-offs and student trips, schools within York Region should be targeted to reduce overall automobile use and encourage walking shorter distances. Current efforts to promote alternatives to the automobile should be reinforced.

## 5.2 HOV USE

HOV lanes should be an integral component of the transportation system in York Region. The 1995 *York Region HOV/Rapid Transit Study* prepared by McCormick Rankin and Delcan details a series of policies and initiatives required for HOV usage within the Region. Incentives may be required to shift SOV use to HOV use, mainly in the form of car or vanpools. Car/vanpooling often occurs as existing road capacity does not effectively support SOV trips (York Region HOV/Rapid Transit Study, 1995, pp.3-18). The primary objective of HOV lanes is to attract SOV commuters. A transfer of transit users to HOV use does not decrease the number of cars on the road. Therefore the target market for the expansion of HOV use is SOV users who would not ordinarily take transit for commuting purposes (York Region HOV/Rapid Transit Study, 1995, p.8-2). As such there is the potential for a reduction of private automobiles on the road. An integrated HOV network on Regional roads can accommodate car/vanpooling needs in the interim period and a more comprehensive transit network in the future. The primary purpose of the implementation of an extensive HOV network is threefold:

- to encourage car/vanpool use for trips that cannot be reasonably made by public transit;
- as a precursor for an ultimate comprehensive rapid transit network; and
- to provide priority to transit vehicles feeding rapid transit and commuter rail networks (York Region HOV/Rapid Transit Study, 1995, p.8-2).

HOV and reserved bus lanes are useful in reducing energy consumption and air pollution as increased vehicle occupancies allow a fewer number of vehicles to carry the same or greater number of people. This reduces the total number of vehicles on the road and serves to decrease traffic congestion and increase the efficient operation of surface transit routes.

## 5.3 TDM STRATEGIES

Transportation Demand Management (TDM) strategies are pivotal to sustaining the natural environment and improving air quality in the Region. In controlling transportation demand, TDM in effect serves to reduce the number of trips taken in a given area. A reduction in travel and in trip length can aid in cutting down on the level of vehicle emissions produced in the Region. TDM strategies can serve to alter the demand for journey-to-work trips, the number and length of private automobile trips and increase the demand for HOV trips. A number of measures can be initiated as part of a TDM strategy (several are currently in place in parts of Toronto and the GTA). Expansion of some of these initiatives across the boundaries of York Region can aid in altering travel demand in the Region and provide links to the City of Toronto's existing comprehensive transportation system.

Flexible or alternative work schedules and telecommuting provides an opportunity for a reduction in the number of automobiles using the road network on a daily basis. Telecommuting allows employees to work from home via remote access and therefore

decreases the need for SOV journey-to-work trips. Flexible or compressed work weeks provides employees with the opportunity to work fewer days per week due to longer work days, where a 40 hour work week can be compressed into four days rather than five. This concept can ease peak hour traffic volumes by moving journey-to-work trips out of the weekday peak periods.

Trip chaining is another strategy for trip reduction. Trip chaining points to compressing a number of household trips into a chain of trip destinations taken in one trip. As a result, automobile use, travel length per person and the number of trips taken per person will decline. Short automobile trips are the most polluting as engines do not heat up enough to be efficient (Smog: Make It or Break It, 1998, p.26). As such, chaining trips into larger single trips will reduce the occasion of greenhouse gas emissions polluting the air.

TDM is further explored in Policy Paper No. 3: *Transportation Demand Management and Telecommuting*. Other TDM measures to be considered by the Region of York, outlined in above noted paper include:

- HOV lanes;
- ridesharing programs – car/vanpooling;
- building and expanding commuter parking lots at key locations throughout the Region such as transit facilities or expressway interchanges;
- road pricing/tolls;
- flexible work hours (or compressed work weeks) and telecommuting; and
- expansion of bicycle networks to encourage alternative travel.

#### **5.4 IMPROVED LAND USE PLANNING**

Land use decisions in York Region have traditionally been made with the private automobile at the forefront. The urban design patterns and low density developments which characterize the suburban landscape in the Region have made necessary the use of the private automobile, and have relegated the use of public transit to a more minor role (York Region HOV/Rapid Transit Study, 1995, p.2-9). In order for transit to have a more predominant influence on travel patterns, land use planning requires rethinking. New communities must be planned with the following in mind:

- higher density development levels with mixed uses;
- a comprehensive pedestrian network;
- a more extensive and continuous grid of arterial and collector roads to make transit services more accessible; and
- improved building siting.

Higher density developments are more likely to support walking and transit and thus lessen the dependence on the automobile, which in turn will reduce air pollution. The benefits of such can be further increased with the introduction of mixed land uses which is key in reducing the number of trips taken per household and reducing overall trip lengths in the Region. Mixed use developments offer communities composed of integrated residential, employment and institutional uses. In addition to the opportunity for pedestrian travel, this type of development also promotes the ability for residents to live and work within the same neighbourhood or community. As such, improved live/work relations in the Region's municipalities can decrease travel length for journey-to-work purposes, a stark alternative to the bedroom community notion found in older areas of development in the Region's municipalities.

Policies included in the York Region Official Plan and the Official Plans of area municipalities require that walkways and more direct road patterns be included in new subdivision plans to provide safe and convenient access between residential dwellings and other facilities within the community (eg. schools, places of work, commercial areas, transit services, etc.). In urban areas the walking distance to a transit stop should be no more than 500 metres for 90% of all residents, and no more than 200 metres for 50% of all residents (York Region Official Plan, 1999, p.68).

Within the development, the layout of the road system is critical from the transit perspective. Transit vehicles can usually only be accommodated by the geometry of collector and arterial roads, and consequently the layout of these roads determines the array of potential bus routing options. In addition, interconnecting roadways must also be implemented to ensure ready access between adjacent communities, thus minimizing the amount of unnecessary travel (this is particularly important for transit routes that serve adjacent developments). Many widely-used street design principles intended to discourage through traffic also inhibit efficient bus routing, especially when adjacent subdivisions built by different developers are designed so that each creates an atmosphere of seclusion. Municipal and Regional plans must contain policies encouraging collector road continuity.

With respect to site design, current practices do not often adequately provide for the safe and convenient passage of pedestrians between buildings and adjacent walkways and transit services. This is again due to the fact that the needs and desires of automobile uses are often the primary consideration in site design. Rather, to discourage the use of the automobile (and hence encourage walking and transit use), buildings should be appropriately located on the development site to reduce walking distances and increase on-site pedestrian safety and comfort. Zoning by-laws that require large setbacks, and thus encourage the placement of parking between streets and buildings, should be adapted to reduce such requirements.

Neo-traditional communities that embrace many, if not all, of the development elements discussed above can be found in a number of municipalities in York Region and thus can serve as models for upcoming developments.

## **5.5 ALTERNATIVE FUEL USE**

Alternative fuel use is an innovative option for the reduction of vehicle emissions into the environment. Current innovations towards the electric car and fuel cell technology can alter the demand for gasoline- and diesel-powered engines. Natural gas and other alternative fuel powered engines, as well as hybrid vehicles, can provide cleaner vehicle emissions and reduce the amount of greenhouse gas production. Fuel cell technology is an electrochemical process producing electricity silently and without combustion. The by-product of this process is water vapour. Fuel cells using liquid fuels (methanol or gasoline) to produce hydrogen have some emissions; vehicles that carry hydrogen directly are true zero emission vehicles. Buses that run on a fuel cell (liquid hydrogen and oxygen) are currently being tested in Vancouver, California and Europe, and may be ready for mass production within a few years (Smog: Make It or Break It, 1998, p.26). Electric vehicles do not create fossil fuel combustion and therefore are significantly cleaner than gasoline-powered automobiles, especially if they are charged by electricity derived from natural gas, solar energy or hydrogen. Traditional diesel buses emit 2462g of CO<sub>2</sub> and 17g of ozone per kilometre; in contrast, buses which use hydrogen produced

by steam reformed natural gas emit 701g of CO<sub>2</sub> and 2g of ozone per kilometre (Howard, 1999).

The California Clean Air Act of 1990 mandated that at least 2% of the cars sold in the state by 1998 must have zero tailpipe emission technology, 10% of cars sold must meet this target in 2003 (Stutz, 1995, p.388). In Canada, the Federal government may be the most appropriate agency to promote and direct technological changes toward alternative fuels. Innovation in vehicles that produce clean emissions is largely an initiative by the private sector, but needs public sector support. Policies to encourage and support alternative fuels and cleaner vehicle emissions regarding both private automobiles and public transit fleets should be reflected in the York Region Official Plan.

## **6.0 MOST PROMISING DIRECTIONS FOR CHANGE**

Air quality is an issue that affects everyone in York Region. Trends in private automobile use, including an increase in single occupancy vehicles, larger vehicles and more vehicles on the road have not only congested the regional road network (and the overall GTA road network) to the point of inefficiency, but has served to degrade the environment. For the future of York Region and the GTA as a whole, a shift towards alternative modes of transportation, including HOVs and public transit, will be compulsory to sustain the natural environment given the projections for population and employment increase; higher occupancy vehicles are the most effective means to protect the natural environment from harm and counteract increasing vehicle emissions. A comprehensive and integrated regional transit network is sorely needed, including fare coordination, to encourage commuters to take public transit and make transit trips more attractive over the private automobile. For York Region to achieve a transit usage target of 33%, transit system improvements need to be initiated as soon as possible. The following sections below outline the most promising directions for change regarding air quality in York Region.

### **6.1 ALTERNATIVE MODES OF TRANSPORTATION**

Policies to encourage alternative modes of transportation need to be initiated by the Region and area municipalities in the Official Plan process. A coordinated Regional transit system will become the responsibility of York Region on January 1, 2001 to integrate the individual public transit systems presently found within the Region's area municipalities. The Regional Official Plan must emphasize the need for a seamless public transit system, not only to include York Region's area municipalities, but also the other GTA Regions. Policy Paper No. 1: *Public Transit*, outlines in detail recommendations for improved public transit within the Region.

For transit, higher occupancy vehicle and bicycle trips to be viable, public programs and policies must be in place to support expansion of the transit network and implementation of transit priority measures to ensure travel time savings and convenience. A variety of corridors delineated for transit expansion within York Region include the following:

- Highway 7/407 transitway corridor;
- York University corridor linking the Vaughan Corporate Centre to the Spadina subway line at the Downsview station;
- Yonge Street Transitway running between Newmarket and the Yonge subway line at Finch station; and

- Highway 48 corridor from Markham to an extended Scarborough Rapid Transit line in the City of Toronto.

The existing GO Rail lines that bring commuters from the suburbs into downtown Toronto need to be enhanced and extended to meet the demand of increasing populations in York Region and the other suburban regions. GO Rail lines within York Region requiring improvements include:

- Bradford line – two-way all-day service between Vaughan and Union Station with extended rush hour service to Newmarket;
- Richmond Hill line – two-way all-day service between Richmond Hill and Union Station; and
- Stouffville line – two-way all-day service between Markham and Union Station with extended rush hour service to Stouffville.

Given these improvements, the GO Rail network can be considered the “spine” of higher order transit service within York Region. As such, additional improvements to the ancillary transit services (eg. surface buses) should be made in this context and thus provide the necessary connections between the higher order transit services and the various communities throughout the Region. As such, enhanced GO bus services on GTA roads are necessary to connect smaller urban centres to the GTA transit network.

## **6.2 STRONGER LAND USE PLANNING METHODS**

Land use planning must be integrated into plans for the regional transportation system. Higher density mixed-used development is key to support higher occupancy vehicle travel (eg. public transit and carpooling). As such, urban form and development trends towards mixed land uses must be promoted through public and private partnerships, with a mutual understanding of the importance of encouraging a shift to alternative modes of travel. The Regional Official Plan outlines numerous parameters to implement stronger land use planning in relation to transportation planning.

Improved live-work relations are the main thrust in reducing travel demand in the Region and need to be reinforced by Regional Official Plan policies toward community development. Mixed use and higher density residential and commercial developments can promote alternatives to automobile travel, as journey-to-work as well as non-work trips can be completed via public transit and other higher-occupancy vehicle means of travel. Mixed land uses can serve to decrease trips per household and trip length per person as greater services may be provided for within a given community.

Residential communities planned on a basic grid road network, for instance, the neo-traditional community plan, can improve accessibility and accommodate more convenient transit routes. As such, the development of neo-traditional subdivisions should be promoted within the Regional and area municipalities’ Official Plans. The Regional Official Plan must reinforce the need for continuous collector roads within neighbourhoods and to connect with adjacent neighbourhoods to render transit use, walking and cycling more efficient and accessible. Through the provision of adjacent residential and non-residential uses within communities, improved live-work relations can result and may decrease the need for commute trips via private automobile and in turn reduce harmful vehicle emissions leading to air pollution.

### **6.3 TRIP REDUCTION**

Trip reduction and TDM strategies are important means of reducing traffic congestion on the Region's road network and decreasing greenhouse gas emissions. Programs or policies aimed to control travel demand need to be implemented by public-private partnerships or by higher levels of government. The Region can take on a role in influencing travel demand through coordination with area municipalities as well as large private firms located within the Region to implement TDM strategies, such as ridesharing, parking controls, flexible work hours and telecommuting. The Regional Official Plan needs to reinforce the importance of TDM measures in its policies towards transportation planning. These strategies can serve to reduce trip generation and trip lengths and as such decrease air pollution produced within the Region. This strategy can have profound effects on reducing automobile travel and improving air quality if partnerships are reached between York Region, the area municipalities and private enterprise, and as such can prove to be the most promising direction for change.

## **7.0 CONCLUSION**

As traffic volumes and ensuing traffic congestion increases every year in York Region, air quality becomes more and more of a concern. Methods to decrease traffic generation, trip length and single occupancy automobile trips need support by the Region to be realized. Innovative land use planning, the use of transportation demand management measures and alternative fuels can change the pattern of polluting vehicle emissions within York Region. Options to promote HOV use can further serve to reduce harmful emissions released into the air. Public-private partnerships and direction from the Region for initiatives in part by area municipalities are needed to improve air quality with the Region and support a sustainable transportation system and a sustainable natural environment.

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