

# **AIR: BACKGROUND REPORT**

**City of Toronto's Environmental Plan  
"Clean, Green and Healthy"**



**City of Toronto**

**FEBRUARY 2000**

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## **1.0 Background**

"Air: Background Report for the City of Toronto's Environmental Plan" and "Air: Strategic Directions" are part of a series of background and strategic documents on Water, Land and Air. These reports were prepared by the Environmental Impact Assessment & Policy Development Unit of Works & Emergency Services in collaboration with Environmental Task Force members and staff, Toronto Public Health, Urban Planning & Development Services, the Healthy City Office and Corporate Services. Participants involved in this process are listed in Appendix A.

These reports were developed to provide background information and analysis for the Environmental Plan and reflect the results of a review of environmental initiatives current as of November/December 1999. The Environmental Plan was endorsed by the Environmental Task Force in February, 2000 and the reports have been revised to consider comments received during this process. These reports also serve to provide part of the foundation for an integrated environmental policy framework that is currently being developed by the Environment Impact Assessment & Policy Development Unit.

## **2.0 Introduction**

Air quality (smog, acid rain and air toxics) and atmospheric change (climate change and stratospheric ozone depletion) are two environmental and health issues that have substantially increased in urgency and importance. According to a 1998 study conducted by Environics International entitled "Public Opinion and the Environment: A Summary of Major Trends in the Toronto Region", nine out of every ten citizens in Toronto say that they are concerned about environmental problems. This study also determined that air quality is the number one environmental concern for the people of Toronto. These individuals also viewed respiratory problems as their greatest health concern, rating it higher than cancer.

Effective public and private sector initiatives are both needed to address air quality issues, as atmospheric emissions per capita are continuing to increase. Environmental and community groups also play a key leadership role in ensuring that our decision-makers and community are well informed and that the conditions of our air environment improve.

## **3.0 Current State of the Environment**

### **3.1 Outdoor Air Quality**

#### **3.1.1 Smog**

A term originally coined from the combining of smoke and fog in the atmosphere, smog is the air issue that currently has the greatest visibility and public awareness. The Ontario Medical Association has recently issued a warning that air pollution is a public health crisis. According to the Government of Ontario, approximately 1,800 people die prematurely and 1,400 people are admitted to hospitals for cardiac and respiratory problems each year in Ontario from the effects of smog (MOE, Business Plan, 1999). By addressing the sources and components of smog, significant improvements in air quality could be realized.

Smog is largely composed of low-level ozone and fine particulate matter. Low-level ozone is created when nitrogen oxides and volatile organic compounds combine in the presence of sunlight. The Ministry of the Environment (MOE) regularly monitors smog-forming chemicals, as well as other criteria pollutants. This list includes low-level ozone (O<sub>3</sub>), nitrogen oxides (NO<sub>x</sub>), sulphur dioxide (SO<sub>2</sub>), carbon monoxide (CO), inhalable particulates (PM<sub>10</sub>), respirable particulates (PM<sub>2.5</sub>) and sulphates. Any of these pollutants can be transported downwind and affect rural and other urban areas more than one thousand kilometres away (MOE, 1999).

The chemicals that make up poor air quality come from many sources. The main sources of NO<sub>x</sub> in Ontario are gasoline-powered vehicles, coal-fired generation of electricity, and industrial combustion processes.

VOCs come from the evaporation of gasoline, oil-based paint and cleaning solvents. CO is also a major pollutant and comes mainly from motor vehicles. Suspended particulates are emitted from vehicle emissions and residential heating. SO<sub>2</sub> emissions come from smelters, oil, coal-fired power plants, industrial combustion processes, and the processing of sulphur-rich ores.

Each summer, the Greater Toronto Area experiences “smog episodes” where air quality falls below acceptable provincial standards. Over the past decade the situation has worsened and during the summer of 1999, five separate Air Quality Advisories were called by the Ministry of Environment, lasting nine days (Franca Ursitti, Toronto Public Health Division, pers. comm., Oct. 20, 1999). In response to these provincial advisories, the City of Toronto’s Medical Officer of Health issues a Smog Alert.

Part of the challenge in developing effective strategies to improve Toronto’s air quality lies in the fact that poor air quality does not respect political or geographical boundaries. In certain weather conditions, up to 50% of Ontario’s smog is imported from the mid-western United States (MOE, Smog Plan, 1998). Air pollution from Ontario also blows downwind to Quebec and Eastern Canada and to parts of the United States. Effective intergovernmental action at all three levels is required to deal with this trans-boundary issue and improve Toronto local air quality.

### **3.1.2 Acid Rain**

Acid rain is caused by emissions of sulphur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>), and is mainly a result of human activities. In the atmosphere, these pollutants are transformed into diluted acids and then fall to Earth in the form of rain, snow, fog, and mist, as well as acidic dust and particles.

In Ontario, sulphur compounds account for approximately two-thirds of acid deposition while nitrogen compounds account for the remaining portion (Environment Canada, 1995). Emissions of these compounds can be transported long distances and adversely affect virtually anything that they contact, such as water, soil, plants and structural material. Key emissions sources are the same as for smog.

The Eastern Canada Acid Rain program (which formed the basis of the Canada/U.S. Air Quality Agreement) and international protocols have helped to cut our sulphur dioxide emissions significantly from the 1980 level (54% in Eastern Canada and 44% nationally) (Environment Canada, 1997). Even though SO<sub>2</sub> emissions have dropped substantially in the past 20 years, and NO<sub>x</sub> emissions have decreased by 25% over the past decade, acid rain continues to be a concern. Some reasons include:

- Most NO<sub>x</sub> emissions were reduced in the early half of the 1990s, but the decrease has slowed down in the past few years
- The acidity of precipitation has not decreased despite decreases in sulphate concentration
- Many of Canada’s lakes, watersheds, soils, and forests have a natural tendency to be highly acid-sensitive and are not adequately protected by reductions alone
- Fogs at high elevations are much more acidic than rain or snow, and more damaging to spruce trees and birches in these areas
- More than 50% of acid deposition in Canada comes from imported sources (mostly coal-fired plants)
- Emissions now reach higher altitudes, remain longer in the air, are spread more widely and are deposited much further from their source
- Higher levels of emissions are now occurring in summer when increased electric power generation combined with more intense sunlight substantially increase the production of acid aerosols
- Deregulation of the electric industry leading to increased reliance on low-priced coal-fired power plants will cause increases in SO<sub>2</sub> and NO<sub>x</sub> emissions (Tilman, 1999)

The environment and effects on human health respond to total pollutant loading. A large area of Ontario, including Toronto, receives acidic depositions exceeding the critical load. Tens of thousands of lakes within the province remain damaged and acid rain remains a significant problem. It is unknown at this time what the impact acid rain has on Toronto’s terrestrial and aquatic ecosystems.

### **3.1.3 Air Toxics**

#### **3.1.3.1 Outdoor Environment**

Air-borne toxic contaminants are also present in the atmosphere, and include inorganic (lead, copper, iron, mercury, arsenic and manganese) and organic chemicals such as polynuclear aromatic hydrocarbons (PAHs), polychlorinated dibenzodioxins (dioxins), polychlorinated dibenzofuran (furans) and volatile organic compounds (VOCs). Many of these hazardous pollutants are persistent in the air and are a hazard to human and ecosystem health.

Upward of 160 different toxic chemical compounds have been detected in Toronto's air, including 24 inorganic and 136 organic compounds (City of Toronto, Toronto Public Health Division, 1999). Coal plants emit inorganic compounds such as mercury and arsenic. Lead was mainly the result of the combustion of gasoline in cars until Federal regulation has generally prohibited leaded gasoline. The switch to unleaded gasoline caused manganese levels to increase as the fuel additive, methylcyclopentadienyl manganese tricarbonyl (MMT), is added to gasoline to replace tetraethyl lead as an octane enhancer. Lead is now mainly found as an emission from industrial processes.

The sources of organic toxics vary. VOCs, such as benzene (a known carcinogen) is the by-product of the incomplete combustion of vehicles. Primary sources of dioxins and furans in Ontario are from the incineration of municipal waste. Dioxins and furans also come from the incomplete combustion of wood treatment agents, some herbicides, effluents from pulp and paper processes and tobacco smoke.

#### **3.1.3.2 Indoor Environment**

There is increasing recognition that indoor air quality can have a significant impact on human health. This is particularly true in northern climates where people spend most of their time indoors. Chemicals released from construction materials, furnishings, and human activities in indoor environments, can accumulate to levels which exceed those in outdoor environments and can produce both chronic and acute health effects for occupants. Biological agents such as bacteria, mould, and dust mites that can be associated with humidifiers, damp construction materials, and mattresses, as well as insects and pets, have been linked to health effects including respiratory infections such as pneumonia, allergies, and aggravation of asthma. Toronto Public Health received more than 500 indoor air quality complaints in 1998 (Toronto Public Health Division, 1999).

## **3.2 Global Atmospheric Change**

### **3.2.1 Climate Change**

The concentration of greenhouse gases in our atmosphere is rising at a clearly measurable rate. Current concentrations of carbon dioxide are 30% above pre-industrial levels, one-half of this growth has happened in the past 30 years (IPCC, 1995; Canada's SOER, 1996). In Ontario, an estimated 166 million tonnes of carbon dioxide were emitted to the atmosphere in 1990, and in Toronto, 1988 CO<sub>2</sub> emissions were estimated at over 27 million tonnes (MOE, Smog Plan, 1998; City of Toronto, UP&DS, 1999).

Scientific evidence is gathering that increased emissions of greenhouse gases, mainly due to human activities such as the burning of fossil fuels, will lead to increased global average temperatures and produce climate change. In the past 50 years, most parts of Canada have experienced warmer temperatures and increased precipitation (Environment Canada, Canada Country Study, 1998). In Toronto, five of the warmest years on record occurred in the 1990s (Environment Canada's website, 1999).

Results from Environment Canada's Global Circulation Model (GCM) simulations of climate suggest an average annual warming of 2° to 5°C for Ontario by 2100 (Environment, Canada Country Study, 1998). These projections are based on an atmosphere that contains twice the current amount of greenhouse gases. Even if greenhouse gas amounts stabilize at that point, temperatures would continue to increase

thereafter, with overall warming of 3° to 8°C possible (Environment Canada, Canada Country Study, 1998). Toronto itself will be more affected by local climate controls such as the Lake Ontario but is predicted to have increased amounts of precipitation (both snow and rain) and more frequent and severe weather events, in addition to higher temperatures (Harvey Shear, Environment Canada, pers. comm., Oct. 21, 1999). These predictions are uncertain, and are based on many assumptions. However, it is certain that climate change is an environmental risk that must be managed.

Canada will likely be greatly affected by the changing climate. It is difficult to predict how climate will change, or how these changes will affect us, especially at a regional or local level. The *1997 Canada Country Study* projects what life could be like if climate change continues unchecked:

- more health problems from heat stress, pollution and the spread of new infectious diseases;
- changes in our ability to grow food and potentially costly changes to the methods we use to do it;
- longer and more frequent droughts in some areas, severe flooding in others;
- risks to fish, waterfowl and animal populations; and
- more severe and frequent weather events such as thunder, hail, wind and icestorms and tornadoes.

### **3.2.2 Stratospheric Ozone Depletion**

Our planet's only natural sunscreen, the ozone layer located in the Earth's stratosphere, absorbs ultraviolet radiation and protects the Earth from most of the damaging rays from the sun. Ninety per cent of all ozone is concentrated in the stratosphere, between 15 and 35 km above the surface of the earth (CCME, 1998). The ozone molecules in the upper atmosphere are spread so thinly that if they were compressed to pure ozone at ground level, they would create a band only 3 mm thick (CCME, 1998). At the beginning of the 1980s, scientists identified some disturbing and unnatural changes happening in the ozone layer. This ozone depletion has been confirmed through the Antarctic "Ozone Hole" discovered in 1985 and since then observations of ozone depletion in the middle and higher latitudes.

Ozone depletion is largely the result of human activity. The leading cause of ozone depletion has proven to be chlorofluorocarbons (CFCs) previously used in air conditioners, refrigerators, foams, solvents and other products. CFCs are stable chemicals in the lower atmosphere. However, when released, CFCs drift into the stratosphere and are broken down by ultraviolet radiation releasing chlorine that destroys ozone. Other ozone-depleting substances include carbon tetrachloride, methyl chloroform, hydrochlorofluorocarbons (HCFCs), halons, methyl bromide, and hydrobromofluorocarbons (HBFCs). There is a large concentration ozone-destroying chemicals in the atmosphere, and some of them have life spans of 25 to 400 years. Almost all substances released still exist in the atmosphere and will continue to destroy ozone for many years. Concentrations of chlorine and bromine in the stratosphere will reach a peak in 2000, then slowly diminish as a result of the phase-outs called for in the Montreal Protocol on substances that deplete the ozone layer (CCME, 1998).

## **4.0 Getting to Clean, Green & Healthy**

### **4.1 Framework for Action - Jurisdictional Responsibilities**

#### **4.1.1 Federal**

The responsibilities regarding the air environment are divided between the federal and provincial governments. Federal jurisdiction is mandated under the Canadian Environmental Protection Act that specifies the role of the federal government in protecting the air. The federal government sets maximum acceptable levels for certain stationary pollution sources and has established the National Ambient Air Quality Objectives (NAAQOs) for the common air pollutants, such as SO<sub>2</sub>, NO<sub>x</sub>, CO, and ground-level O<sub>3</sub>. These standards are not enforceable, but encourage uniformity in provincial air quality regulations. The federal government regulates motor vehicle emissions and has developed regulated standards for the sulphur content in gasoline.

## **4.1.2 Provincial**

The Ministry of Environment has established emission standards under its Environmental Protection Act (EPA) for stationary pollutant sources such as industries, power plants and incinerators, motor vehicle pollution control equipment. It has regulated standards for the release of ozone-depleting substances. Under the EPA, provincial approval is required before facilities that release air pollutants can be constructed or modified. The Ministry of Environment maintains a province-wide monitoring network that measures ambient air. Provincial Ambient Air Quality Criteria (PAAQC) have been established for the common air pollutants described in the national quality objectives.

## **4.1.3 City of Toronto**

Municipalities affect the air environment mainly through land use, energy use and transportation policy and programs. The 1994 Official Plan of the former Metro Toronto stated that its main objectives and actions would be to improve air quality by reducing fossil fuel consumption and reducing pollutant emissions. Most of the actions that have been completed since this time have been aimed at the gases that lead to smog, that are thinning the ozone layer, and that are contributing to global warming.

This Official Plan also set targets for reductions in non-renewable resource use and supported innovative and best available technology projects such as energy conserving and emission reducing district heating and cooling projects. Furthermore, this document called for policies and programs that improve air quality by encouraging alternatives to automobile travel, such as the use of public transit, cycling and walking.

Since the current state of the air environment is closely tied to the way we work, live and travel in Toronto, the Environmental Task Force and the City of Toronto have recently focussed on improving local environmental conditions. Much of the work completed to date has focussed on stationary sources of air emissions (e.g. residential, industrial, commercial and institutional buildings). Numerous policies, plans and programs have been proposed by various levels of government, including the City, and by non-governmental organizations and are in their early stages of implementation.

To make headway into improving our air environment, the Environmental Task Force established four Work Groups to focus in on particular environmental themes. The Sustainable Transportation and Sustainable Energy Use Work Groups, looked specifically at Toronto's demand for non-renewable energy, and developed strategies to reduce our dependence on fossil fuels and associated air emissions. The Green Economic Development and Education & Awareness Work Group discussed ways that Toronto could better prepare for the necessary societal/economic changes needed to move toward sustainability.

## **4.2 Current Strategies/Actions**

### **4.2.1 Outdoor Air Quality**

#### **4.2.1.1 Smog**

##### **4.2.1.1.1 Federal/Provincial Initiatives**

The Phase One NO<sub>x</sub>/VOC Management Plan endorsed by the Canadian Council of Ministers of the Environment (CCME) in 1990 prescribed initial federal and provincial programs to combat smog across Canada. This phase is mostly complete, and provides a strong base of NO<sub>x</sub> and VOC control measures and supplies new scientific information to guide the development of additional measures.

The Phase Two Federal Smog Management Plan, prepared by Environment Canada, Natural Resources Canada and Transport Canada, completes a 1995 commitment made CCME. It contains a summary of current federal actions on smog, identifies new federal initiatives, and summarizes the current state of scientific understanding on the issues and points to the next steps to be taken by the three departments.

The Phase Two Plan is the federal component of an overall national strategy, with provincial plans currently in various stages of completion. The objectives of the Phase Two Federal Plan are to:

- continue moving toward a more stringent Canadian air quality objective for low-level ozone;
- adopt a comprehensive approach to resolving air pollution issues, incorporating work on smog (ground level ozone and particulates) with acid rain and climate change, energy efficiency and transportation;
- implement a strong domestic national smog reduction program that includes actions on industrial processes, vehicle emissions, fuels and consumer products, and makes Canada's position on trans-boundary flows of smog-forming pollutants more effective; and
- assist the provinces in resolving regional smog problems.

Environment Canada, with its partners, is now preparing a Phase Three Federal Smog Management Plan. The Phase Three Plan is the third element of a program and will be the initial federal implementation response to the new Canada-Wide Standards (CWS) on particulate matter and ozone. The Phase Three Plan will contain initiatives led by the federal government in transportation and petroleum fuels, stationary sources, public education, international advocacy, research, monitoring and modelling. The Plan will also present an update on the science of smog, air quality in Canada and the status of previous initiatives.

As of November 1999, the CCME have accepted CWS for ozone and particulate matter and expect these standards to be endorsed by May 2000. These CWS have been established pursuant to the 1998 Canada-Wide Accord on Environmental Harmonization of the CCME and its Canada-Wide Environmental Standards Sub-Agreement (CCME website). According to their 1999-2000 business plan, the CCME is also supporting negotiations for an Ozone Annex to the Canada/U.S. Air Quality agreement for subsequent implementation by individual jurisdictions (CCME website).

The Ministry of Environment (MOE) produced Ontario's Smog Plan in 1998 (re-named the Anti-Smog Action Plan in October 1999) with its chief goal of reducing emissions of nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOCs) by 45 per cent from 1990 levels by the year 2015. Important proposed provincial air quality initiatives that are presented in the Plan include:

- Implementing the Drive Clean program that will reduce emissions from the number one domestic source of the emissions that cause smog: cars, trucks and buses (as of January 10, 2000, one million cars have been tested in Ontario, leading to an estimated 6.7 % reduction in smog-causing pollutants);
- Increasing public awareness through campaigns such as Smog Rover and Partners in Air;
- Establishing a three-year plan to upgrade environmental standards for numerous chemicals, including more than 70 contaminants affecting provincial air quality;
- Imposing a regulation requiring less polluting gasoline formulas to be used in the summer months;
- Spending \$4 million on its ambient air emissions monitoring network; and
- Negotiating with the United States on trans-boundary pollutant emissions.

This Plan is a voluntary agreement and has been designed with no clear incentives to support voluntary action. Other advocates for "cleaner" air assert that the reduction targets are too low, and the time frame is too long in view of the documented human health consequences. Other shortcomings of the Plan that have been identified by advocacy groups include:

- No commitments from other Provincial ministries;
- Not having the financial commitment from the MOE and/or the Province;
- Insufficient programs and policy initiatives to reach the 45% reduction goals of NO<sub>x</sub> and VOCs;
- Not accounting for U.S. based smog-causing emissions in the setting of targets;
- Not setting interim targets during the 17 years that the Plan will be implemented;
- Not creating mechanisms for monitoring progress and engaging the public; and
- Not currently negotiating with the United States on trans-boundary pollutant emissions.

However, according to the MOE, much work has been done since the Smog Plan was originally developed in 1998. The Smog plan process has focused on the organization of workgroups and the identification and documentation of work in progress, quick starts, actual emissions reductions, and long-term plans. Some

workgroups are in the early stages of formation while other groups are in more advanced stages of action affecting smog reductions. There has been no effort to date to quantify total emissions reduction. Largely the progress made relates to strengthening the foundation for smog reduction plan implementation.

#### 4.2.1.1.2 City Initiatives

The negative impacts of poor air quality in Toronto upon the health of citizens, the environment, and the economy have been documented in a number of City reports over the past few years by both the Healthy City Office and Toronto Public Health Division. Both offices also have a long history of involvement in the development and implementation of Corporate programs related to air quality and in the development and review of air quality standards.

A Corporate Smog Alert Response Plan was implemented by Public Health during the 1998 smog season and is currently being evaluated. Following from the Environmental Task Force's quick starts, electronic signs have been used on some roads in the City to notify residents of smog alerts.

In March 1999, the Smog Reduction Work Group, a sub-committee of the City's Toronto Interdepartmental Environment (TIE) Team, was established to assist in the preparation of a co-ordinated response to Council's adopted anti-smog recommendations, and to oversee Corporate policy and planning activities. This Work Group is improving the municipal smog alert response plan for the 2000 season and is developing a comprehensive public education and awareness campaign. Educational materials should not be limited to the outcome of smog, but should also focus on regional air quality issues such as sulphur in fuel and coal-fired plants. TIE will also develop a program which ensures the compliance of the Corporate fleet to the emission standards of the Provincial Drive Clean Program and promote anti-smog initiatives through Urban Planning and Development Services Transportation Management Association (TMA) pilot project.

A Corporate Green Fleets Strategy Status Report provided the steps that are being taken to develop a corporate green fleet strategy directed at reducing emissions from City vehicles and equipment. The Corporate Green Fleets Committee has reconvened and is currently discussing the replacement of motorized vehicles with non-motorized alternatives, substituting currently used fuels with less polluting alternative fuels, and prepare a report on the feasibility and cost of implementing a green fleet strategy. In addition, the City fleets will be assessed for the feasibility of setting a 50% target for reducing emissions and report to Council on the Green Fleet strategy.

City Council also supported Environment Canada's initiative that establishes new standards and regulations that reduce sulphur in gasoline. Sulphur content has become an important decision-making criterion for City Council for the purchase of fuels for the corporate fleet.

A City Employee Trip Reduction Program (ETRP) is being developed to concentrate on the design and implementation of incentives encouraging City employees to use public transit. This report recommends that City Council approve the use of payroll deduction for payment of TTC Metropasses for City employees to create a convenience incentive to employees interested in public transit. The report also asks the Federal Finance Minister to make employer-provided transit passes, an income-tax exempt benefit. In September 1999, a comprehensive survey of employee travel was launched and subsequent phases will address parking allowance for City employees, ridesharing, and telecommuting.

A May 1999 report adopted by City Council, entitled "Smog Prevention and Reduction: Status Report and Work Plan", requested the Toronto Transit Commission (TTC) and the City of Toronto adopt specific emission reduction targets, the City purchase green power, and the City monitor the economic benefits of implementing anti-smog action.

The Air Quality Improvement Office of Works & Emergency Services, has a baselining project underway to collect, analyze and report on CO<sub>2</sub> emissions from corporate operations and the community at large. This project uses software developed for the Partners for Climate Change Program and is co-ordinated by the

International Local Council on Environmental Initiatives and the Federation of Canadian Municipalities. This project will help to measure the City's progress in reducing CO<sub>2</sub> and determine the effectiveness of initiatives aimed at reaching CO<sub>2</sub> and other Air Quality targets.

The Council of the former City of Toronto concluded that due to constitutional restrictions on the ability of the City to participate directly in international negotiations, the most effective way for the City to participate in trans-boundary air pollution negotiations is in partnership with the Province. However, progress on this issue is limited to date and is further complicated by deregulation in the electricity market, which may result in coal-fired plants producing greater air pollution in the generation of electricity. The City and the Province should work in partnership to explore alternative methods to deal with transboundary air pollution within our airshed.

#### 4.2.1.2 Acid Rain

##### 4.2.1.2.1 Federal/Provincial Initiatives

The Acidifying Emissions Task Group released a report entitled, "Towards a National Acid Rain Strategy" in October, 1997. This multi-stakeholder task group, initiated by the National Air Issues Co-ordinating Committee (NAICC) in 1994, consisted of representatives from provincial and federal governments, industry, health and environmental groups across Canada. The Task Group came to agreement on principles such as ensuring that clean areas remain clean, pollution prevention, and the need to develop a strategy to reduce nitrogen deposition, but failed to reach consensus on recommendations for targets and schedules.

Smog plans, both in Canada and the United States, predict that the reduction of NO<sub>x</sub> emissions by 45% would ameliorate acidification. However, quantification of any NO<sub>x</sub> reductions achieved since the 1998 Ontario Smog Plan target was initiated have not been released. Also, the benefits arising from reduction in nitrate deposition cannot be quantified, and critical loads have not yet been established. At present, only an interim target load of 10 kilograms per hectare per year exists.

To date, there has been little action taken on the findings and conclusions of this report. However, in October 1998, the Environment and Energy Ministers signed a Canada-Wide Acid Rain Strategy for Post-2000. Currently there is an on-going planning and consultative process regarding this strategy. The Strategy is intended to lay the framework for how Canada will manage acid rain in the future. A primary long-term goal of the Strategy is to achieve critical loads (or the threshold level) for acid deposition across Canada. The key elements of the Strategy are:

- the need to seek further SO<sub>2</sub> emission reductions in the U.S.;
- the need for new SO<sub>2</sub> emission reduction targets in eastern Canada (Ontario, Quebec, New Brunswick and Nova Scotia);
- the on-going need for acid rain science and monitoring;
- pollution prevention;
- ensuring that clean areas remain clean; and
- annual reporting.

The Strategy builds on the work of the multi-stakeholder "Acidifying Emissions Task Group." The Task Group released its report, *Towards a National Acid Rain Strategy*, in October 1997.

The US Clean Air Act (CAA) implemented by the Environment Protection Agency (EPA), was amended in 1990 to cut SO<sub>2</sub> emissions by 40% from 1980 levels by the year 2010 and NO<sub>x</sub> emissions by 10% by 2000. The intention was to protect moderately sensitive ecosystems in the eastern United States. It introduced a SO<sub>2</sub> allowance trading system and called for regional control strategies, such as a NO<sub>x</sub> trading programme and low-emissions vehicle programme.

The Canada - US Air Quality Agreement, 1991 was designed to control trans-boundary air pollution with an initial focus on acid rain. The United Nations Economic Commission for Europe signed a protocol to address emissions caps for SO<sub>2</sub> and NO<sub>x</sub>. The 1994 sulphur protocol set a cap on SO<sub>2</sub> emissions in

sensitive regions of eastern Canada to reduce the production of acid rain. The NO<sub>x</sub> Protocol committed to stabilize NO<sub>x</sub> emissions that also have a significant effect on acid rain generation.

While these commitments represent an initial step in addressing air pollution issues and policies, they are relatively conservative when one considers the severity of the problem, the level of commitment and the relative ease of achieving compliance. The Province could enact measures to limit SO<sub>2</sub> emissions from exceeding current levels (now 25% below the cap) and establish more protective targets and schedules resulting in a 75% reduction in SO<sub>2</sub> emissions below the current cap by 2015. The Province needs to ensure that critical loads of nitrogen deposition are established and a reduction strategy is put into place by 2000.

#### 4.2.1.3 Air Toxics

##### 4.2.1.3.1 Federal and Provincial Initiatives

The Canada-Ontario Agreement respecting the Great Lakes Basin Ecosystem (COA) was signed in 1994, and provides the framework for co-ordination of shared federal and provincial responsibilities for ecosystem management in the Great Lakes. The COA plan sets priorities, target and schedules for environmental concerns in the basin. The pollutants under the COA are categorized into two groups, Tier I and Tier II. Canada has pledged to seek a 90% reduction in the use, generation or release of Tier I substances including mercury, dioxins/furans, aldrin/dieldrin, PCBs, hexachlorobenzene, lead, and chlordane by 2000. Voluntary programs reducing the use, release or generation of Tier II substances, including cadmium and PAHs, moving towards their virtual elimination.

A related initiative is the Great Lakes Binational Strategy (BNS) which is jointly undertaken by Canada and the United States. This is a voluntary initiative that works toward virtual elimination of certain persistent substances, especially those that bioaccumulate. Voluntary reduction challenges have been established for 12 substances for the period 1997-2006 (CCME's website). The voluntary initiative builds on existing Canadian/American regulatory programs that address these substances. The COA agreement (noted above) sets the framework (e.g. substances and reduction targets) within which all Canadian work related to the BNS takes place.

Environment Canada has established the National Pollutant Release Inventory which is a database containing quantitative information on numerous substances manufactured, used or processed in large volumes in Canada that are potentially harmful to human health and the environment. In this reporting system, which started in June 1994, all major point source facilities and activities are required to report their emission types and quantities.

As stated earlier, the CWS process is one of the CCME initiatives under the Canada-wide Accord on Environmental Harmonization. The process involves the participation of 12 Ministries of the Environment at the federal, provincial and territorial level (Quebec is not a participant). CCME has developed a framework to address key environmental protection and health risk reduction issues that require common standards, practices and legislation across the country. CCME has established a process for developing CWS for a number of substances of national interest. CWS are intended to be achievable targets. CWS include a numerical limit (e.g. ambient, discharge and/or product standard) a commitment and timetable for attainment, a list of preliminary actions to attain the standard, and a framework for reporting to the public. Public input in the form of stakeholder consultation is a key component of the development process. The environmental standards have been developed for ozone and particulate matter, but it should be noted that other CWS have been developed for benzene and mercury. These standards have been accepted by the CCME and are expected to be endorsed in May 2000.

In Canada, there are currently no legal standards regulating the levels of indoor air pollutants for non-industrial workplaces or in residential and institutional buildings. The American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) has developed guidelines for ventilation requirements for residential, office and institutional buildings. The guidelines referred to as the ASHRAE

Standards are considered to be a reasonable protection by the Ontario Ministry of Labour and the Ministry of Housing (City of Toronto, Toronto Public Health Division, 1999).

#### 4.2.1.3.2 City Initiatives

Toronto Public Health Division participated in the consultation process for developing CWS for particulate matter and ground-level ozone. Toronto Public Health Division participated in the stakeholder consultation workshop in May 1999 and submitted recommendations directly to the Development Committee respecting the numerical limits, the implementation timeframe and a list of actions for achieving reductions in ambient air levels. The Board of Health has considered the Public Health position and endorsed the specific recommendations for more health protective air standards and actions.

### 4.2.2 Global Atmospheric Change

#### 4.2.2.1 Climate Change

##### 4.2.2.1.1 Federal/Provincial Initiatives

The Third Conference of the Parties to the United Nations *Framework Convention on Climate Change* in December 1997 in Kyoto, Japan agreed to limit greenhouse gas emissions relative to 1990 levels by the period 2008 to 2012. Canada pledged a 6% reduction.

Natural Resources Canada (NRCan) has many energy efficiency initiatives that target all consumers and emphasize partnerships and economic investments. Their objective is to overcome the market barriers of inadequate information and knowledge, institutional deterrents in the energy market, and financial and economic constraints on energy users. NRCan's energy efficiency initiatives have contributed to reducing energy use across Canada. NRCan has recently established the Office of Energy Efficiency. The Federal Climate Change Action Fund has been created to allocate \$150 million for climate change initiatives in the following areas: technology early action measures, public outreach, foundation analysis and science, impacts and adaptation (Environment Canada's Website).

The Ministry of Environment's 1999 business plan outlined its key strategies that include:

- building environmental protection measures into the design of a competitive electricity market for Ontario;
- developing regulations to cap atmospheric emissions for all Ontario electricity generators;
- ensuring Ontario Hydro's voluntary emission commitments are met;
- assisting in the development of a sustainable national plan to reduce greenhouse gases; and
- setting emission performance standards for all generators wishing to sell electricity in the Ontario market.

The MOE, have developed initiatives such as Drive Clean, municipal landfill regulations, smog and other pollution prevention programs, that have greenhouse gas benefits as well. The Province also has regulations under the Energy Efficiency Act, the Ontario Building Code which are some of the more progressive in Canada and lead to lower greenhouse gas emissions. According to the May 1999 Ontario Budget, \$10 million has been set aside to conduct a critical analysis on climate change. This examination would have a dual focus of investigating the impacts of the Kyoto Protocol on Ontario and on policy and program planning for the next wave of provincial action.

So far however, neither the Ministry of Environment or the Ministry of Energy, Science and Technology implemented a province-wide strategy to reduce greenhouse gases beyond the reduction targets in the Kyoto agreement. These strategies could include actions such as:

- Establishing mandatory greenhouse gas reduction targets/timelines on a local/regional basis;
- Instituting an Ontario Atmospheric Fund, much like Toronto's Atmospheric Fund;
- Developing its own Transportation Plan detailing a strategy directed towards the reduction of automobile use along with fiscal commitments to public transit and other alternatives to the car;

- Supporting and promoting research, through internal programs and external funding, activities that lead to increased energy efficiency, such as alternative fuel technologies, fuel-efficient vehicles and new building designs and retrofitting devices;
- Strengthening the Ontario Building Code as to ensure greater energy efficiency and greenhouse gas reductions in the construction of new buildings; and
- Developing, while partnering with other levels of government, a public education program that supports and addresses the role of communities and individuals in addressing the causes of climate change.

#### 4.2.2.1.2 City Initiatives

The Energy Efficiency Office (EEO), within Works & Emergency Services has a mandate to develop and implement a comprehensive energy efficiency and conservation strategy for the City. The EEO's five major program areas include the Better Buildings Partnership, City-owned Building Retrofit, Energy Efficiency and Conservation Standards for New and Existing Buildings, District Energy Systems and Land/Use Transportation. City Council has reaffirmed its commitment to greenhouse gas reduction, by aligning its CO<sub>2</sub> target with the Kyoto Protocol, calling for a 20% reduction of 1990 levels by the year 2005.

The Better Buildings Partnership is an innovative program that assists building owners to improve and modernize buildings through energy and water-efficient retrofits. To date, there are 155 participating BBP buildings (Angelo Poto, W&ES, pers. comm., Oct. 21, 1999). The full-scale program, launched on May 4, 1999, could potentially achieve a substantial portion of City Council's 20% reduction goal.

The Facilities and Real Estate Division of Corporate Services is currently investigating the potential for further energy and water efficiency retrofits in all municipally-owned facilities of the City of Toronto. According to the Toronto Transition Team's final report, energy costs like heat, air conditioning and lighting in City of Toronto's buildings and facilities will be about \$83 million a year (Toronto Transition Team, 1997). Cutting energy costs and improving efficiencies by 25 per cent would save the city about \$21 million annually while also reducing emissions associated with energy consumption.

In 1991, the former Toronto City Council adopted the policy that developers in the City of Toronto submit an energy efficiency and conservation plan for new developments. As a result this policy and the City's advocacy for higher standards, the provincial government amended the Ontario Building Code in 1995. The implemented policy and eventual standard change was estimated to reduce CO<sub>2</sub> for new buildings by 100,000 tonnes per year. The 1997 version of the Ontario Building Code (OBC) lowering energy efficiency standards for new construction. This change in policy has resulted in increased energy use, and consequently more greenhouse gas emissions. The new City Council should continue to support the advocacy of improved standards and review the impact of OBC-1997 to once again increase energy efficiency standards through its development approvals.

District energy systems (DES) use central energy plants to meet space heating, domestic hot water, and cooling needs of residential, institutional, commercial, and industrial buildings and other energy users. The central plants replace individual, building-based furnaces, air conditioning units, boilers, and chillers. DES, powered by co-generation and tri-generation plants, could supply electricity, heating and cooling efficiently, economically and with significantly reduced environmental impact as the energy efficiency of co-generation exceeds that of conventional power plants. The Toronto District Heating Corporation (TDHC) operates one of the largest district energy systems in North America and has approximately a 14% share of downtown Toronto's heating supply (Greg Allen, pers. comm., Oct. 28, 1999).

The TDHC, in conjunction with the City of Toronto, is also pursuing the development of "deep lake water cooling" (DLWC) which uses cold water from Lake Ontario to cool buildings. This innovative system would utilize a layer of lake water that is permanently just above freezing temperature as a chilled water source for air conditioning. The process would use less energy than conventional chillers and eliminates the need to use CFC, HFC and HCFC based refrigerants, which are potent greenhouse gases, as well as being ozone depleting substances. Expansion of the DLWC concept in conjunction with further application of co-

generation, would facilitate the evolution of environmentally sustainable energy management options in our City, which could accelerate the retirement of conventional fossil fuelled electricity generation.

Many of the former municipalities implemented policies and programs related to land use and transportation in order to reduce energy consumption and their associated atmospheric emissions. These initiatives attempted to reduce automobile use, encourage recycling, persuade transit use, promote cycling, and raise awareness around lifestyle choices that have a negative impact on the environment. These program initiatives are being harmonized in the City and include street lighting conversion, transportation priority and bicycling initiatives, transportation demand management plans for new developments, curbside management of loading activities, traffic calming measures, idling control by-law, tree planting, water conservation, and blue box recovery.

Land-use and transportation still contribute greatly to greenhouse gases and represent significant potential for CO<sub>2</sub> reduction. The amalgamated City will address issues relating to a more sustainable urban form and more efficient and effective transportation networks in its first Official Plan. Also, Section 6.1, Sustainable Transportation calls for the first ever City Transportation Plan, to provide guidance and direct our City to a better, more effective transportation system that needs far less resources to sustain itself.

Recent City initiatives also include the investigation into the potential trading of greenhouse gas emission reduction credits (ERCs). The City's specific interest includes selling ERCs that it has earned through previous and current reduction programs and investing the proceeds into further initiatives that reduce more greenhouse gases. The City is also a member of the Pilot Emission Reduction Trading (PERT) project. PERT is an industry-led, multi-stakeholder initiative formed to evaluate the potential environmental and economic benefits of open-market emissions reduction trading in Ontario and is the forum in which Ontario's protocols and rules for trading are being developed. Leading from this initiative, the Ministry of Environment is expected to release a framework for carbon emission reduction trading in March 2000 (Drew Shintani, W&ES, pers. comm., Oct. 21, 1999). To date, there have been some successful trades in Ontario and the market is expected to develop in the next few years.

#### 4.2.2.1.3 Other Important Local Initiatives

The Toronto Atmospheric Fund (TAF) was established in 1992 to assist Toronto in meeting its greenhouse gas reduction goal. TAF is managed by a board of directors consisting of City councillors, City staff and citizens and have helped finance projects/programs such as the Better Buildings Partnership, GreenSaver, Toronto Bike Trails, Walking School Bus, Renewable Energy in Toronto Parks, Landfill Methane, and Co-op Green House Renewal Fund. TAF works in partnership with community and environmental groups, schools, utilities, businesses, trade associations, and all levels of government to reduce the impact of air pollution and climate change and increase public understanding of these issues. Funding priorities in 1999 include energy efficiency, including fuel switching, and improved transportation.

Toronto Hydro is currently developing and promoting a Green Energy program that considers: solar, wind and water technologies, recovery technologies (methane from sewage treatment plants or landfills); biomass (such as wood waste or food waste); and other issues (hydrogen fuel cells). Toronto Hydro recently announced a proposal to install two waterfront wind turbines in partnership with the Toronto Renewable Energy Co-operative (TREC). This announcement included a promise to sell green power directly to Toronto customers for the first time in Toronto Hydro's 88-year history and will be the first wind turbines to be built in a downtown area in North America.

### 4.2.2.2 *Stratospheric Ozone Depletion*

#### 4.2.2.2.1 Federal/Provincial Initiatives

The United Nations Environment Programme (UNEP) has been addressing this issue of stratospheric ozone depletion since 1977. Under the auspices of UNEP, the Governments have met and committed themselves to protecting the ozone layer and to co-operating with each other to conduct scientific research that

improves further understanding. The Montreal Protocol on Substances that Deplete the Ozone Layer was agreed to by Governments in 1987 aims to reduce and eventually eliminate the emissions of man-made ozone depleting substances. The Montreal Protocol is threatened by the continued and excess production of ozone depleting substances.

Current initiatives include an update in 1998 of CCME's National Action Plan for the Environmental Control of Ozone Depleting Substances and their Halocarbon Alternatives. This report updates the National Action Plan for Recovery, Recycling, and Reclamation of Chlorofluorocarbons (CFCs), published in 1992.

In Canada, the federal and provincial governments are responsible for ozone-depleting substances. Federal and provincial regulatory programs are complementary, and form an integral part of Canada's Ozone Layer Protection Program. The federal government is responsible for implementing the provisions of the Montreal Protocol, including controls on the manufacture, import, and export of ODSs under the Canadian Environmental Protection Act.

Provincial governments are responsible for the regulation of emissions and discharges to the environment, and govern the implementation of ODS recovery and recycling programs, and emission controls under provincial regulations. The province used the City's by-law as a template for the provincial regulation on ozone-depleting substances.

#### 4.2.2.2 City Initiatives

The City of Toronto passed a by-law (i.e. #230-89) in 1989 that prohibited and regulated the manufacture, sale, distribution, use and disposal of certain products, material, and equipment containing or manufactured with chlorofluorocarbons and halons. This by-law was repealed and replaced first in 1990 and then in 1993 (i.e. by-law #279-93) as to include all ozone-depleting substances. Works & Emergency Services, provides large appliance/white good collection and recycling programs including CFC extraction in accordance with provincial legislation prior to disposal.

### 4.3 Air Environment Strategy and Planning

The amalgamation redesign of the City of Toronto included administrative strategies such as the establishment of key offices to work together to improve the conditions of the air environment. The development of an effective overall air quality strategy for the City that integrates and communicates all of the separate and joint air initiatives will require contributions and expertise from many departments. These groups will include Works and Emergency Services (Technical Services Division), Community & Neighbourhood Services (Toronto Public Health Division), Urban Planning & Development (City Planning Division), and the Chief Administrative Office (Healthy City Office), and will reflect the mandates and activities of these departments. The City is well positioned to collaborate with other governmental agencies and with the public to develop a comprehensive air quality strategy for the City.

## 5.0 Conclusions

The consumption of fossil fuels in Toronto is contributing many pollutants and greenhouse gases to the atmosphere. The automobile is a significant source of Toronto's total pollution emissions. The residential, commercial and industrial sources are also contributing contaminants. These stresses are contributing to climate change, ozone depletion, acid rain, air toxic loading and smog.

Demographic trends and land use will have implications for the air environment. Increasing populations in the City as well as in the Greater Toronto Area will raise the demand for the supply of energy and increases the associated emissions of fossil fuels. This added stress must be offset by increased energy use efficiencies and for effective "at source" controls for air emissions.

Improving the conditions of Toronto's air will require strong commitments from all levels of government, the community as well as every citizen. Efforts to date could benefit from a more integrated and coordinated

strategic approach, grounded at the municipal level. In order to achieve this, contributions and expertise will be required from the policy, technical and operational units created in all of the new City departments through amalgamation, other government levels, the private sector, community and environmental groups, and the broader public.

A comprehensive air quality strategy that would minimize impacts on the environment and health should be based on an airshed approach. It should include a focus on cumulative emissions, impacts and pollution prevention. It should integrate and communicate all of the current separate and joint air quality initiatives into one framework, identify where the City is currently involved, and identify new areas where the City should be involved and how it can best apply its resources to maximum effect.

Public education and awareness is a key strategy to building a healthier urban ecosystem. Increasing awareness on air issues will raise individual commitment to purchasing products and services that have a reduced impact on the atmosphere, increasing energy conservation and efficiency, and making transportation choices that are more sustainable.

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## **Appendix A: Acknowledgements**

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