



Ontario's Smog Plan

A Partnership for Collective Action

Steering
Committee
Report
January 1998



Ontario

Ministry of the Environment

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Note: In October, 1997 the Ministry of Environment (MOE) replaced the Ministry of Environment and Energy (MOEE), and at the same time the Ministry of Energy, Science and Technology was created. References to both the MOE and the MOEE will be found in this report.

Letter from the Minister

Dear Ontarians:

Smog is one of the most persistent air quality problems in Ontario. It is a factor in the premature deaths of as many as 1800 Ontarians every year. Reducing this threat to our air quality is one of the most important environmental challenges facing Ontario. The Government of Ontario is committed to meeting this challenge.

Progress is being made. In August 1997, I introduced the Drive Clean vehicle emissions testing program to reduce smog-causing emissions from cars, trucks and buses. This program will commence in 1998 and will reduce emissions by 62 kilotonnes. The Drive Clean announcement was complemented by a three month Smog Rover (Roadside Optical Vehicle Emission Reporter) program to monitor the emissions of cars and trucks and increase public awareness of the need to keep vehicles well tuned. Through the Partners in Air pilot project, an air quality initiative to involve our young people, Ontario students are learning more in their science classes about smog and other air quality issues. Earlier last year, I also promulgated a regulation to reduce summer gasoline volatility and emissions. Clearly, we need to continue to move in a comprehensive way if we are to reduce smog.

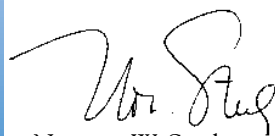
In this regard, the Ontario's Smog Plan is a broad-based partnership of government, business, academia, environmental and community groups who have come together to develop and implement voluntary actions to reduce emissions. My ministry is a key participant, facilitator and strong supporter of the plan. I commend those who have signed the smog accord. For those stakeholders that have not yet signed on, I urge these companies, industry associations and environmental groups to get on board. We need everyone's participation to achieve our goals.

The first year of the plan focused on identifying the challenge, agreeing on the principles and organizing the necessary actions in an achievable plan. This first year report is a good start. Voluntary actions that will achieve about one half of the targeted emission reduction objective of 45 per cent were identified. A good beginning, but we need to close the gap between the emission reductions to date and the 45 percent target, while backstopping these and future actions with rigorous reduction agreements, time lines and performance standards.

In the second year, as outlined in the Next Steps section of the report, we must strengthen and extend our monitoring and annual reporting activities. Over the next nine months, I will be monitoring the progress of the plan and considering other non-regulatory and regulatory approaches, including incentives and rewards, that could be included in the plan to ensure Ontario's air quality continues to improve.

I encourage all Ontarians to play a part in the partnership plan.

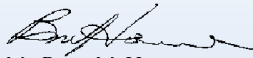
Sincerely,



Norman W. Sterling
Minister of the Environment



Mr. Steven Edward
President
Adhesive and Sealant Manufacturers'
Association of Canada



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Canadian Farm & Industrial
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Mr. Tim Clutterbuck
Vice President & General Manager
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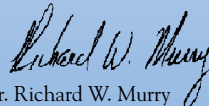
Mr. David M. Halton
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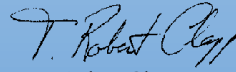
Mr. Richard W. Murry
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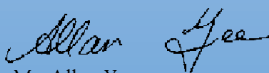
Mr. Peter Corbyn
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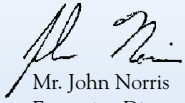
Mr. Roger A. Hayward
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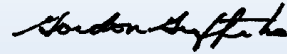
Mr. P. Kelley
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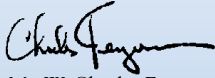
Mr. John Norris
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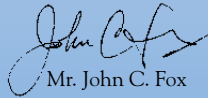
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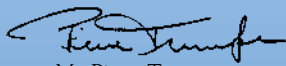
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Mr. Volker Leyerzapf
Secretary/Treasurer
Lambton Industrial Society*



Mr. Bruce J. Richards
President
Private Motor Truck Council of Canada



Mr. David Crombie
Chair
Waterfront Regeneration Trust

Those organizations which appear with an asterisk (*) support the Ontario Smog Accord with exceptions or clarifications, or have expressed the need to review supporting documents.



Ontario's Smog Accord

The Partnership

Ontario's Smog Accord has been developed and is supported by a broad coalition of government, business and community representatives. This large and growing partnership was brought together by the Ministry of Environment and Energy (MOEE) and is voluntarily working together to improve Ontario's air quality. This accord represents our commitment to Ontario's Smog Plan and cleaner air.

The Challenge

As partners of Ontario's Smog Plan we believe that:

- Smog is a serious and continuing problem that can affect health, property and the environment of Ontario.
- Major improvements to Ontario's air quality have been made over the past two decades, but more must be done to reduce smog and the pollutants that cause it.
- While there are some gaps in our understanding, we have the knowledge, resources and expertise to take decisive and effective action to address the smog problem.

We recognize that:

- Nitrogen oxides (NO_x), volatile organic compounds (VOCs) and inhalable and respirable particulates (IP/RP) are significant contributors to smog.
- These pollutants originate from both human and natural processes, with sources in both Ontario and the United States.
- The smog problem in Ontario is most serious in southern Ontario.
- Reducing smog can improve human health, reduce health care costs and improve the quality of the environment.
- To achieve success, everyone — individuals, businesses, governments and non-governmental organizations — must be part of the smog reduction effort.

Principles

In our partnership, the following principles will be applied:

- **Balanced approach** We will pursue activities that are environmentally sustainable, cost effective and technologically feasible.
- **Sound science** We will apply scientific principles and use the best available technical information.
- **Harmonization** We will coordinate our activities with other jurisdictions and sectors, wherever possible.
- **Fairness** We will recognize past and ongoing reduction efforts and strive to create a level playing field in which everyone is engaged in smog reduction activities.
- **Flexibility** We will aim for the effective use of human, financial and scientific resources and build into our activities the ability to respond to future innovations and improvements in understanding of the smog problem.

Our Intent

We are taking action to improve Ontario's air quality, thereby reducing the effects of smog on human health, property and the environment. The Ontario Ministry of Environment and Energy (MOEE) has set an Air Quality Target for Smog to reduce the amount of time that our air quality fails to meet provincial guidelines. This target is to achieve, by 2015, a 75 per cent reduction in the number of times the 80 ppb one hour ozone criterion is exceeded. The base for calculating the reductions is the average number of exceedences in the years 1990 to 1994. We are working towards that target in the smog plan. The plan's components include:

- **Emission reductions** by 2015 of 45 per cent of the total NO_x and VOCs emitted in the province in 1990. The MOE has estimated that these reductions (along with a corresponding reduction in transboundary pollution) are needed to achieve the MOE's Air Quality Target for Smog. These reductions will be achieved by:
 - quick-start activities — implementing existing technologies, pilot projects or other measures that are ready now or that can be put in place very soon;
 - development and implementation of sectoral and regional reduction plans that will contribute to meeting the target;
 - enhancement of plans as they undergo review and continual improvement.
- **Broad involvement** of the public, business and government in smog reduction actions.
- **Reduction of transboundary pollution** through co-operative activities with the United States that mutually benefit our countries.
- **Reduction of particulate emissions** through developing a better understanding of the nature of particulate pollution, its sources and actions to reduce it.
- **Implementing a disciplined management policy** that includes performance measurement and annual reporting to ensure that progress is being made towards improving air quality in Ontario and to permit adjustments of sectoral or regional targets as technology advances and our understanding of the smog problem improves.

A goal of Ontario's Smog Plan is to reduce emissions of nitrogen oxides (NO_x) and volatile organic compounds (VOCs) by 45 per cent from 1990 levels by the year 2015. Reductions of between 190,000 and 215,000 tonnes of NO_x and 190,000 and 216,000 tonnes of VOCs have been identified in work group reports and partner plans and commitments. For NO_x, this represents emission reductions of 29 to 32 per cent of 1990 baseline levels; for VOCs, 21 to 24 per cent of 1990 baseline levels. Highlights are presented below.

Reductions achieved

- From 1990 to 1995, Ontario members of the Canadian Chemical Producers' Association reduced their emissions of NO_x by 3,900 tonnes and of VOCs by 6,800 tonnes.
- Canadian Petroleum Products Institute member companies have implemented gasoline vapour recovery systems (Stage I) in the distribution system in Southern Ontario. Reduction of 19,000 tonnes has been achieved.
- Through improved combustion control and efficiency, Ontario's steel plants reduced NO_x emissions by 2,300 tonnes from 1990 to 1995.
- Ontario VOC emissions from consumer paint products have been reduced by 3,800 tonnes (22 per cent) from 1991 to 1995, largely due to a shift from solvent-based to water-based paint.
- Between 1990 and 1995, members of the Adhesive and Sealant Manufacturers' Association reduced solvent use by 57%; this represents a reduction of 1,600 tonnes for Ontario.
- Through a mix of efficiency measures and changes in solvent use, Ontario rubber manufacturers have reduced VOC emissions by 1,200 tonnes since 1990; this represents a reduction of 85 per cent from the 1990 level.
- By 1993, the automobile manufacturing sector reduced VOC emissions from surface coating by 12,100 tonnes through improvements in efficiency, quality control and solvent management practices.
- By 1995, the estimated annual emissions reductions due to motor vehicle design improvements and fleet turnover totalled 61,000 tonnes of VOCs and 49,000 tonnes of NO_x compared to 1990 emissions.
- Canadian Petroleum Products Institute member companies reduced the summer volatility of gasoline from 79 KPa (Kilopascal-unit of pressure) to 72 KPa earlier in the decade. A second reduction to 62 KPa was accomplished by the spring of 1997. The combined total reductions amounting to 18,000 tonnes of VOCs.

Projected future reductions

- In August 1997, the Minister of Environment and Energy, Norman Sterling, introduced Drive Clean, a vehicle emissions testing program for trucks, buses and cars. The program will reduce NO_x emissions by 15,000 tonnes, VOC emissions by 47,000 tonnes, particulate emissions by 220 tonnes and CO₂ emissions by 900,000 tonnes annually when it is in full effect. The program will be phased in geographically over the period 1998 to 2002.

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- The vehicle manufacturers (the Canadian Vehicle Manufacturers' Association and the Association of International Automobile Manufacturers of Canada) work group report identified the vehicle manufacturers intent to offer for sale new vehicles which meet the U.S. National Low Emission Vehicle requirements beginning with the 2001 model year vehicles, contingent upon the program being approved and broadly implemented in the U.S. and the appropriate fuels with low sulphur levels that ensure the maximum emission reductions being commercially available in Canada.
 - The vehicle manufacturers and petroleum companies are participating in a Canadian study to identify appropriate fuel sulphur levels which address: requirements of new vehicle emission control systems, atmospheric impacts, health effects, and the economic viability of refineries.
 - The automotive refinishing subsector estimates VOC reductions of 500 tonnes from a new Greater Toronto Area (GTA) body shop accreditation program. The program requires proof of pollution control and emission reduction in order to access the car repair marketplace.
 - The Canadian Chemical Producers' Association predicts that by 2000, VOC emissions from its Ontario members will be reduced by a further 5,000 tonnes, totalling a 58 per cent reduction from 1990 levels.
 - Future reductions of 1,500 tonnes of VOCs are forecast by 2001 for Ontario's steel plants. This represents an estimated 18 per cent reduction from 1990 levels.
 - By 2015, stationary industrial sources represented by the NOx Emissions Work Group will reduce NOx emissions by 97,000 tonnes. This represents a 46 per cent reduction from 1990 levels.
 - Conservative estimates are that the increased use of natural gas in light and heavy-duty vehicles will lead to emission reductions in the order of 900 tonnes of NOx and 800 tonnes of VOCs by 2015.
 - Propane has a number of desirable properties, when it is used as automotive fuel, that make it possible to achieve lower vehicle emissions than with today's conventional fuels. With projected growth in fleet markets, estimated reductions are 5,100 tonnes of NOx and 2,400 tonnes of VOCs by the year 2015.
 - The Transportation Demand Management (TDM) Work Group identified 11 sets of TDM initiatives, each with the potential to reduce emissions of NOx and VOCs by 300 to 10,000 tonnes.
 - The lead associations representing the majority of the consumer products industry have agreed in principle to harmonize VOC restrictions with those proposed in the U.S. This would reduce VOC emissions by 5,000 tonnes (or 20 per cent of 1990 levels).

Letters of co-operation

- A Memorandum of Understanding has been signed with the Ontario Federation of Anglers and Hunters to encourage its members to minimize the effect of boating on the environment by such measures as tuning up engines and avoiding fuel spillage.
- A Letter of Co-operation has been signed with the Automotive Parts Manufacturers' Association outlining the association's and member companies' intention to develop sector targets and action plans to reduce emissions of NOx, VOCs and particulates.

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- A Memorandum of Understanding has been signed by the Toronto Environmental Alliance (TEA) and MOE to promote carpooling by major employers through TEA's RideTOgether Program.
 - A Letter of Co-operation has been signed with the Canadian Vehicle Manufacturers' Association (CVMA) outlining the Association's and member companies' commitment to implement plans to reduce new car emissions by providing second generation on-board diagnostic systems (OBD-II), enhanced evaporative emissions control systems and on-board refuelling vapour recovery systems and smog related emissions on new light duty trucks, on a harmonized basis with the U.S., beginning with the 1998 model year. CVMA has stated their commitment is contingent upon "appropriate fuels are widely available commercially".
 - A partnership led by the Lung Association has launched a pilot school program, The Air We Breathe, that focuses on indoor and outdoor air quality. Goals of the project are to mobilize communities to take action on air quality; progress is measured by participation rates and behavior change.

Other initiatives

- A Memorandum of Understanding has been signed by McMaster University, the Regional Municipality of Hamilton-Wentworth and MOE to use McMaster's mathematical modelling capability to estimate the relative effect on passenger vehicle emissions of various land use and transportation scenarios over the next 25 years in the region. The report will be available later this year.
- Through the use of alternative fuels, reduction of fleet size and emissions testing, the federal government is reducing the emissions of smog-related pollutants from its fleet of vehicles.
- Activities like Greater Toronto Area's Clean Air Committee (June 1996) of the "Blue Ribbon Taskforce", has raised awareness of air quality issues. It led to the formation of a Clean Air Committee, consisting of the mayors and chairs in the Greater Toronto Area, to address air quality issues in the GTA. Other examples of municipal activities include North York's innovative fleet management system, Etobicoke's Clean Bus Policy, the Toronto Atmospheric Fund, the City of Toronto and Metropolitan Toronto green purchasing policies, and Metropolitan Toronto's smog alert strategy for ozone exceedance days.
- The MOE recently introduced an interim ambient air quality criterion for inhalable particulates (particles less than 10 microns in diameter) of 50 micrograms per cubic metre of air averaged over a 24-hour period.
- Partners in Air project was initiated by the MOEE to promote a better understanding of smog and other air quality issues among high school students.
- A three month Smog Rover (Roadside Optical Vehicle Emissions Report) program was started by the MOEE in July 1997 to raise awareness of poorly tuned vehicles and their contribution to smog.
- The Hamilton-Wentworth Air Quality initiative is a cooperative effort between Regional Municipality of Hamilton-Wentworth, McMaster University, MOE, Environment Canada and community organizations to assess air quality and human health impacts. A summary report was released in 1997, identifying priority air pollutants and recommendations to address air quality problems.

1.0 Introduction

Often, especially in the summertime, Ontario's cities, villages and countryside are covered by the low-lying haze known as smog. This mix of ground-level ozone, gases and particulates can cause damage to human health, crops and property. The pollutants that form smog come from thousands of sources and sometimes from hundreds of kilometers away. Reducing smog is a tough environmental challenge facing Ontario.

To meet this challenge — to improve Ontario's air quality — a broad coalition of organizations and individuals is participating in a unique, collaborative process to develop and implement a smog reduction plan for the province. Ontario's Smog Plan sets regional and sectoral targets for emission reductions, involves the public in emission reduction activities, addresses transboundary sources of pollution and monitors progress. It recognizes and builds upon existing efforts to address the smog problem. Ontario's Smog Plan will be incorporated into the National Smog Strategy for Canada that is being developed by the Canadian Council of Ministers of the Environment.

To address Ontario's smog problem effectively requires involvement and commitment from all sectors of society. With this commitment, we can reduce smog, improve human health, lower health care costs and lessen the environmental effects of pollution.

Leadership

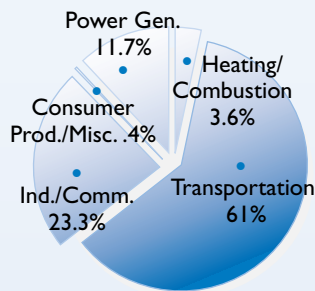
Governments, community groups, citizens and industries have taken, and continue to take, leadership roles to improve Ontario's air quality. Ontario's Smog Plan is a partnership for collective action in which all sectors share common intent for improving air quality.

Governments have developed many regulatory initiatives to address smog, such as Ontario's 1997 regulation to reduce the volatility of gasoline that was developed in partnership with industry. Federal, provincial and municipal governments have also implemented voluntary initiatives, such as pollution prevention agreements dealing with transboundary issues, vehicle fleet management programs and energy efficiency programs for buildings. Individuals and communities are actively engaging the public in a variety of cleaner air initiatives, including education, carpooling programs and encouraging people to take action in and around their homes. Pollution Probe's Clean Air Commute is one example that demonstrates how progress can be made in making clean air choices. The province's industries have taken significant steps to improve air quality through capital investment and process improvements, new technology development and voluntary pollution prevention.

What causes smog?

The major components of smog are ground-level ozone and inhalable particulates. Ground-level ozone is formed when two groups of pollutants — nitrogen oxides (NO_x) and volatile organic compounds (VOCs) — react in the atmosphere in the presence of sunlight. Smog levels are strongly influenced by the weather. In the summer, when it is sunny, hot and dry, ozone levels are often high. In the winter, inhalable particulates, not ozone, form the main component of smog. Smog can come from local or distant sources: on hot summer days, more than 50 per cent of the ozone affecting Ontario is generated by pollutants that are carried in the atmosphere from the United States. (See Figure 1).

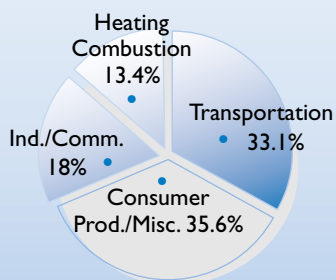
NO_x



Nitrogen oxides Nitrogen oxides are emitted from many sources including motor vehicles, power plants, incinerators and a wide range of industries. The sources of these emissions are well understood.

Volatile organic compounds Known as VOCs, they come from a variety of sources including the production and use of solvents and paints, motor vehicles and combustion of wood. The sources of VOCs are well understood.

VOCs



Particulates Two kinds of particulates are involved in smog. **Inhalable particulates** (IP) are smaller than 10 microns in size and are easily inhaled. These tiny particles are made up of sulphates, nitrates, organic compounds, metals and soil dust. They generally originate as wind-blown dust from roads, construction sites and agricultural areas, as ash from forest fires, and as emissions from vehicles and industry. A limited amount is known about the sources of inhalable particulates and the amounts emitted.

Respirable particulates (RP) are smaller still — less than 2.5 microns in size — and can travel to the deepest part of the respiratory tract when inhaled. Respirable particulates are emitted directly into the air by diesel and gasoline engines, fuel combustion, power plants and many industries. They can also be formed in the atmosphere by the chemical reaction of gaseous pollutants, such as sulphates from sulphur dioxide, nitrates from nitrogen oxides and organic particulates from volatile organic compounds. Little is known about the sources that directly contribute respirable particulates, the reactions that generate them in the atmosphere and the subsequent ambient levels.

Figure 1: Sources of emissions from human activities.



How do we measure smog?

As with other air pollutants, the severity of smog is measured by the concentration of pollutants in the air. One component of smog is measured as either micrograms of ozone per cubic metre of air or parts per billion (ppb) of ozone. Ontario's Air Quality Criterion is 80 ppb for ozone averaged over one hour.

Levels of ozone (and other pollutants) are routinely measured by a network of monitoring stations across the province. When ozone concentrations exceed 80 ppb, air quality is considered to be poor. The 80 ppb criterion is exceeded most often in southern Ontario (see Map 1).

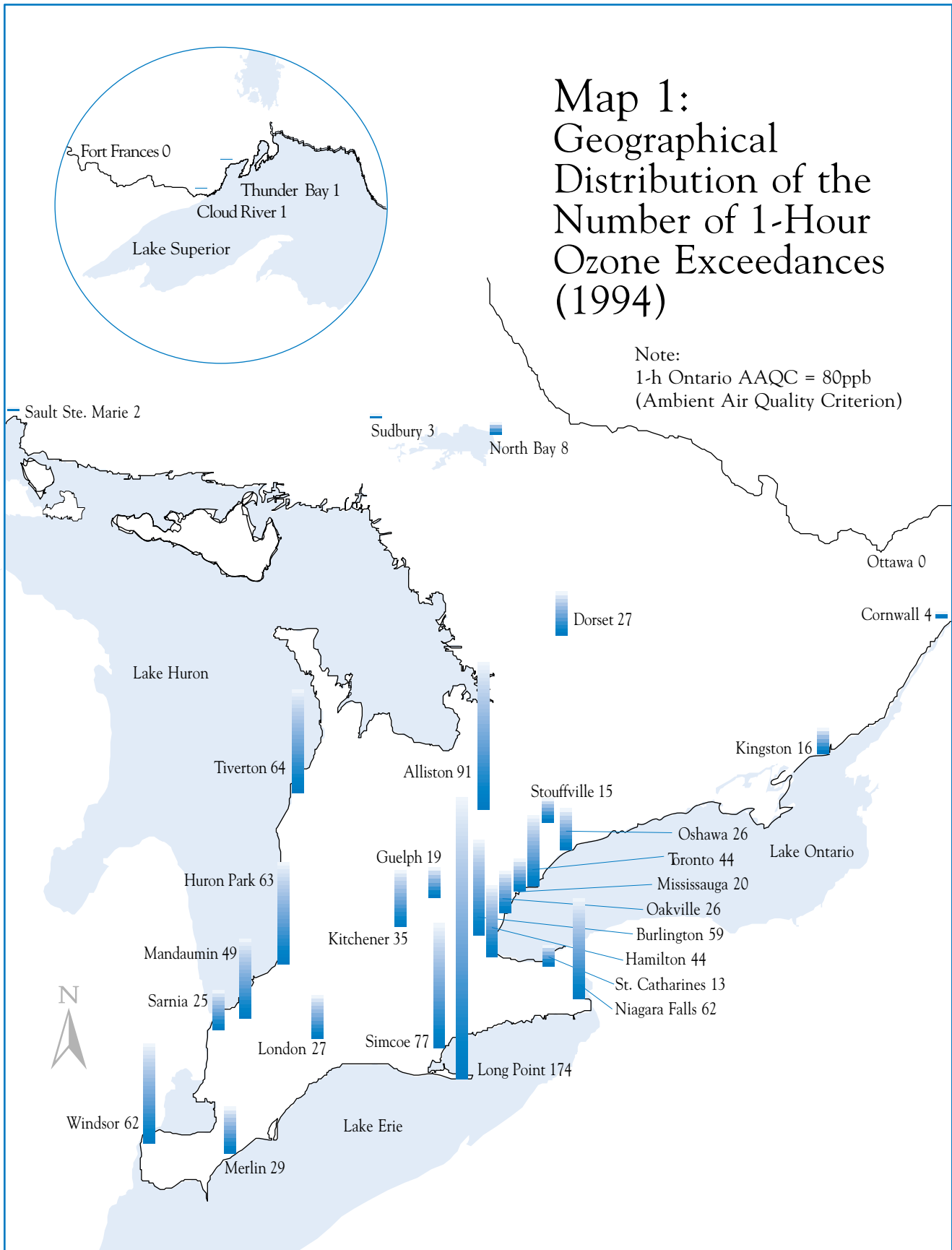
Information about emissions is derived from a number of sources. For sources such as industrial processes and stationary fuel combustion, the best method of obtaining estimates is for generators to complete surveys or emission inventories. For other sources, such as the manufacture and use of consumer products, production and market information are used to calculate emissions.

The sources of directly emitted IP/RP are uncertain, but the sources of some precursors, such as the sulphur dioxide that can form sulphate particles, are better known. While emissions from point sources such as industries and combustion can be estimated reliably, emissions from non-point sources — road dust, construction, surface erosion, transportation and agricultural activities — are more difficult to quantify. More accurate estimates and measurements of the relative contribution of RP from non-point sources and a better understanding of the secondary formation of IP/RP are needed to develop an overall strategy and effectively target reduction activities. The introduction of an interim ambient air quality criterion for IP of 50 micrograms per cubic metre of air by the Ministry of Environment is a first step towards the overall strategy.

Over the past year the MOEE has been restructuring and upgrading its air quality monitoring network by improving the environmental information system to better manage the flow of data from its monitoring sites, and installing state-of-the-art continuous IP/RP monitoring instruments at twenty-two monitoring stations.

Map 1: Geographical Distribution of the Number of 1-Hour Ozone Exceedances (1994)

Note:
1-h Ontario AAQC = 80ppb
(Ambient Air Quality Criterion)





Why should we reduce smog?

Reducing smog will improve health and reduce health care costs

It is now well understood that exposure to high levels of smog can aggravate a wide range of serious health problems, such as asthma, bronchitis and other respiratory diseases. Some studies show increases in hospital admissions for respiratory problems during periods when there are elevated levels of ground-level ozone. Furthermore, there is a growing body of evidence that healthy people — particularly children — are also affected by relatively low levels of ozone. There is now compelling evidence that people with asthma, respiratory and cardiac disease are more sensitive to inhalable and respirable particulates. This sensitivity occurs at the particulate levels typically found in urban metropolitan areas such as Toronto, Detroit and Los Angeles. Most recently, some studies have linked exposure to inhalable particulates to an increase in death rates. Using data from recent reviews, it is estimated that current levels of inhalable particulates are associated with 1,800 premature deaths and 1,400 cardiac and respiratory hospital admissions in Ontario every year.

Studies also show that lowering smog levels can reduce smog-related health effects. For example, a study by MOEE estimated what the relative reductions in health effects would be if the 1990 emissions of NO_x and VOCs were reduced by 45 per cent by 2015 (as compared to a base case scenario in which no reductions were made from 1990 on). It estimated that the 45 per cent reduction in NO_x and VOCs would result in approximately 180 fewer mortalities a year, 190 fewer cardiac and respiratory hospital admissions, 6,200 fewer emergency room visits for asthma, and between three and four million fewer episodes of acute respiratory symptoms than in the base case scenario.¹ As well, reductions in health effects due to lower smog levels will lead to reductions in health care costs in Ontario.

Reducing smog will benefit the environment

Of all atmospheric pollutants affecting crops, forests, ornamental plants and terrestrial ecosystems, ozone is one of the most damaging. Ontario's air pollution criterion of 80 ppb has been set to protect the most sensitive crops from visible leaf damage caused by ozone. However, even at lower concentrations — where visible leaf damage does not take place — ozone reduces yields of some crops. Cumulative exposure to ozone levels in excess of 40 to 60 ppb over a three-month growing season has been found to have damaging effects on crop and tree growth.

Strategies to reduce the frequency of smog episodes (instances of exceeding the 80 ppb ozone criterion) will also reduce average ozone levels in ambient air. These lower average levels will have a beneficial effect on crops, forests and other vegetation and can lead to increased plant yields for farmers and nurseries. Actions to reduce smog will also have a beneficial effect on related air quality issues, including climate change (the greenhouse effect), airborne toxics and acid rain.

¹Tables C-5 and C-6, *Towards a Smog Plan for Ontario, Supporting Document*, pp C-19 and C-20, June, 1996.

2.0 Smog Plan Management and Organization

The Ontario's Smog Plan is a partnership effort involving many people: 14 representatives from non-governmental organizations, 52 association representatives, 79 representatives of companies and 58 participants from the government sector. This partnership has been brought together by the Ministry of the Environment and Energy to address Ontario's smog problem. The voluntary approach used to develop Ontario's Smog Plan is cost effective, flexible and applicable to a broad range of individuals and interest groups.

Development of Ontario's Smog Plan is being managed by a multi-sectoral steering committee composed of 50 business, government and organizational leaders. The steering committee has responsibility for initiating the Ontario Smog Plan process, assembling work group plans, monitoring progress and reporting annually over the 20-year planning and emission reduction process. The MOE is providing co-ordination and secretariat support to this initiative, as well as co-ordination of provincial government emission reduction plans. In addition, the MOE is carrying out its traditional roles to combat air quality problems, including regulating air emissions from new stationary sources, ensuring compliance with current legislation, monitoring air quality, updating ambient air standards and developing new regulatory programs.

Through the steering committee, sectoral work groups have been formed for the transportation, industry and manufacturing and government sectors. These have been further divided into appropriate subsector work groups as shown in Table 1. (Some work groups also have sub subsector or company-level planning processes in progress.) Work groups are collecting emission inventories and data for NO_x, VOCs and inhalable and respirable particulates. The MOEE has provided participants with baseline data from 1990, which is being updated with information from partners. Each subsector work group is preparing an emission reduction plan and implementing programs to achieve reduction targets. Combined, these emission reduction plans form Ontario's Smog Plan. The work group reports are under separate cover as Ontario's Smog Plan Work Group Reports 1997.

Sectoral work groups will report annually to Ontario's Smog Plan steering committee on progress and performance. Over the 20-year planning and implementation period, flexibility will be needed: partners will review their plans and adapt or amend them as understanding of the smog problem improves, as technology changes, and as overall progress is measured. A highly disciplined management system will be implemented to ensure progress is being made towards improving air quality.

In addition to the sectoral work groups, as shown in Table 1, four issue-based work groups and two support work groups have been established. The IP/RP work group is developing a strategy to address inhalable and respirable particulates, and the public acceptance work group is developing a strategy for broad public involvement in smog reduction activities. The level playing field/incentive work group is developing an approach to address the level playing field issue and identifying a system of incentives for participation in Ontario's Smog Plan.

**Table 1:
Work Group
Organization**

Sector	Sub-Sector
Transportation	<ul style="list-style-type: none"> • Cleaner vehicles • Cleaner fuels • Demand management tools • Off-road vehicles
Industry and manufacturing	<ul style="list-style-type: none"> • NOx emissions • NOx/VOCs emissions <ul style="list-style-type: none"> • Iron and steel • Chemicals • Petroleum • Surface coating emissions <ul style="list-style-type: none"> • Automobile manufacturing • Automobile refinishing • Automotive parts • Wood products • Consumer coatings • Architectural and industrial maintenance coatings • Cans/metal packaging • Metal finishing • Heavy equipment • General solvent use emissions <ul style="list-style-type: none"> • Printing and graphics • Adhesives and sealants • Plastics processing • Degreasing • Asphalt cutback and emulsions • Pesticide formulation • Natural oil extraction • Wood treatment • Rubber production • Consumer products emissions
Government	<ul style="list-style-type: none"> • Federal • Ontario • Municipal
Issue	Focus
Public acceptance	Develop strategy to involve the public in lifestyle change
Transboundary	Develop strategy for bilateral coordination and action on smog
IP/RP strategy	Develop by 1998 a strategy to identify sources, emission inventories and control options and reduce emissions of IP/RP
Level playing field/incentives	Develop approaches to address level playing field and identify a system of incentives for participation
Support	Focus
Data management	Develop a framework to collect and manage the input, storage and reporting of data; centralize baseline information; and analyze new data and trends
Technical support and liaison	Provide scientific and economic support; develop performance criteria and track performance

3.0 Ontario's Smog Plan

The pollutants that form smog come from thousands of diffuse and point sources. The complexity of the problem and the number of generators pose a great challenge. Accordingly, Ontario's Smog Plan is multi-faceted, phased and inclusive of all sectors of society. Actions are based on the five principles listed below.

Use a balanced approach

The actions undertaken as part of Ontario's Smog Plan will be those that are environmentally sustainable, cost effective and technologically achievable.

Base actions on sound science

Scientific principles will be applied in the development of Ontario's Smog Plan and the best available technical information will be used to develop strategies to reduce smog. Where there are scientific questions, such as the contribution of sources of respirable particulates, information gaps will be addressed.

Harmonize activities with other jurisdictions

Actions under Ontario's Smog Plan will be co-ordinated with other sectors and other international, federal, provincial and regional jurisdictions.

Strive for fairness

In the development of Ontario's Smog Plan, participants will strive for fairness. We will recognize past and ongoing reduction efforts, attempt to involve everyone in smog reduction activities, and strive for equity among competitors, within sectors, and among sectors.

Build in flexibility

In developing Ontario's Smog Plan, participants will aim for the effective use of resources and will build in the ability to respond to future innovations and improvements in scientific understanding.

3.1 Components of the Smog Plan

The Ontario Ministry of the Environment and Energy had set an Air Quality Target for Smog. This target is to achieve, by 2015, a 75 per cent reduction in the number of times the 80 ppb one hour ozone criterion is exceeded. The base for calculating the reductions is the average number of exceedences in the years 1990 to 1994². The Ontario Smog Plan works toward that target. It will:

1. Set sectoral targets for emission reduction of smog-related pollutants;
2. Use a phased, iterative approach;
3. Involve the public, business and government in smog-reduction actions;
4. Address transboundary issues;
5. Develop a strategy to address inhalable and respirable particulates;
6. Implement a disciplined management process.

1. Set sectoral targets for emission reduction of smog-related pollutants

To achieve the government's Air Quality Target for Smog, the MOEE has estimated that emission reductions totalling 45 per cent of the total NO_x and VOCs emitted in the province in 1990 are needed by 2015. These will need to be complemented by corresponding reductions in transboundary smog, achieved through bilateral efforts. To work towards that target, tangible and specific actions are being identified and implemented by each partner and participating sector.

The approach to developing emission reduction plans on a sectoral basis includes:

- identifying and verifying 1990 baseline emissions of smog-related pollutants from each sector;
- identifying quick-start actions from which reductions can be achieved in the short term;
- developing short-term targets for emission reductions by the year 2000;
- updating reduction plans on a five-year cycle;
- developing longer-term emission reduction plans to the year 2015.

NO_x and VOCs

The smog reduction planning process recognizes and builds on existing and planned efforts by smog partners to reduce emissions. For example:

- Those partners that have implemented actions in the existing Canadian Council of Ministers of the Environment (CCME) Phase 1 process (including codes of practice, new source performance standards and adoption of CCME national standards and guidelines) will report those kilotonne reductions in their first round of contributions.

² Rationale for 75% reduction is found in Table F.1, page F-9 of *Supporting Document for Towards a Smog Plan for Ontario, June 1996*; rationale for five-year average is presented on page F-8 of same document.

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- Partners that have developed plans, and are starting implementation, will use their proposed reduction targets to the year 2000.
 - Those partners that have just entered the process will develop plans in accordance with an approach agreed upon through the Ontario's Smog Plan work group process.

Particulates

In consultation with all partners, the IP/RP work group is developing a strategy to be completed by 1998. The strategy will establish a schedule to set targets and reductions of particulate emissions and its precursors. To assist in benchmarking reductions, MOE recently introduced an interim ambient air criterion for inhalable particulates of 50 micrograms per cubic metre of air averaged over 24 hours.

2. Use a phased, iterative, approach

Under Ontario's Smog Plan, strategies are being developed for a 20-year planning horizon (1995 - 2015). Work group activity plans have short- and long-term components. Short-term strategic components include quick starts to ensure immediate reductions. Long-term components are more flexible and are expected to be adjusted over time as new technologies are developed, knowledge of atmospheric chemistry improves and success is measured.

Steps:

The following steps and milestones describe the steering committee's approach to completing Ontario's Smog Plan. Second-year steps are outlined in more detail in Section 4.0.

- | | |
|-----------|---|
| 1996-97 | <ul style="list-style-type: none"> • Present initial proposals on targets and process. • Establish work groups. • Identify quick start initiatives and quantification of reductions (where possible) • Develop short- and long-term plans and quantification of reductions. • Develop Smog Accord and first year Ontario's Smog Plan. • Develop framework for monitoring performance and progress. • Develop approaches to address level playing field and incentives. |
| 1997-2000 | <ul style="list-style-type: none"> • Finalize IP/RP strategy. • Implement short-term strategies. • Initiate performance evaluation and annual reporting. • Refine long-term proposals. |
| 2000-2014 | <ul style="list-style-type: none"> • Iterations of implementation, performance evaluation and annual reporting, and refinement of long-term reduction initiatives. |
| 2015 | <ul style="list-style-type: none"> • Final reporting. |

3. Involve the public, business and government in smog reduction actions

Ontario's smog reduction planning process has attracted the participation of leaders from industry, commerce, utilities, public interest groups and government agencies. The challenge now is to engage the participation of countless other generators.

It is estimated that almost two-thirds of NO_x and one third of VOC emissions come from transportation sources (marine vessels, aircraft, trains, cars, heavy-duty diesel trucks and off-road diesel vehicles). Emissions from these sources can be dramatically reduced through demand management strategies, preventative maintenance of vehicles, promotion of alternative transportation options, better traffic management and use of cleaner or alternative fuels. An example of these reductions include the recently introduced Drive Clean vehicle emission testing program for trucks, buses and cars, and the lowering of the summertime volatility of gasoline in Ontario. Residential, industrial and commercial emissions are also significant human sources.

To achieve significant smog reductions, educational and lifestyle change programs will be developed to obtain the support and action of the public at large, other government bodies and commercial and industrial enterprises. The public acceptance work group is developing a strategy to reduce smog through broad lifestyle changes.

More than any other initiative, transportation demand management depends on effective education and lifestyle change programs in order to deliver emission reductions. In addition to the implementation of an ongoing, proactive public education and social marketing campaign, the transportation demand management work group recommends three steps for 1997:

- preparing an implementation plan for the GTA;
- consulting with municipalities outside the GTA;
- exploring the potential for more efficient and safer movement of goods.

While lifestyle change is a long-term proposition, transportation demand initiatives need to begin now to develop the land use, transportation and economic structures needed to meet public expectations.

4. Address transboundary issues

A large proportion of the pollutants associated with smog originate in the United States. Ontario's current transboundary strategy includes:

- encouraging U.S. jurisdictions to adopt more stringent air quality standards for ozone, inhalable and respirable particulates and other smog related pollutants;
- participation in processes involving interest groups, which are steering current U.S. regional airshed modelling studies, to promote consideration of the effects in Ontario of U.S. emissions;
- consideration of and preparation for potential international negotiations on transboundary air pollution.

Under Ontario's Smog Plan the transboundary work group is charged with the development of a strategy to reduce the transboundary flow of smog-related pollutants.

5. Develop a strategy to address inhalable and respirable particulates

The IP/RP work group is developing a strategy that considers emission reduction targets, emission inventories, standards development, air monitoring, computer modelling, cost-benefit analysis, control technologies, implementation methods and communications. This strategy will complement efforts at the national level and will be completed by 1998 for review by the steering committee. Work groups will then develop reduction plans. Important considerations will include emission inventories, ambient levels, modelling and source apportionment.

6. Implement a disciplined management process

To co-ordinate activities, enhance communications and track progress, a management system will be put in place for Ontario's Smog Plan. It will include a framework for monitoring performance and measuring progress. This is being developed by the technical support and liaison work group. The framework will identify the ways in which performance and progress can be measured (measures of health, ambient air quality, emission reductions, process targets, etc.) and the level of detail needed. Subsequently, each work group will develop and track appropriate performance indicators as a part of their reduction plan development and implementation. Evaluation of the overall Ontario's Smog Plan will be measured by progress towards the government's target of 75 per cent reduction in the incidences of ozone criterion being exceeded and by progress towards IP/RP reduction targets, when those are set. The steering committee will review progress and prepare annual reports.

3.2 Smog Plan Implementation Tools

Discussion of level playing field issues was stimulated by the generation of a definition provided in early 1997 by members of the steering committee. *“A level playing field ensures participation across all sectors and is open and inclusive at all levels. [It] is created in a voluntary initiative by differentiating between participants and non-participants. Differentiation shall be provided through rewards and recognition. Access to rewards and recognition shall be available to all competitors.”*

Subsequently, the level playing field/incentives work group was convened and identified categories of incentives and rewards that could be used to address the level playing field issue. These include:

- financial incentives such as grants or reduced fees;
- financial rewards such as tax credits or accelerated depreciation of equipment;
- process incentives such as use of a performance-based approach that would allow use of tools such as emissions reduction trading;
- regulatory relief incentives such as flexibility in implementation schedules;
- rewards through recognition such as editorial coverage or special designation;
- benefits from shared information and learning;
- use of Ontario’s Smog Plan logo and recognition process for environmental stewardship.

Ontario’s Smog Plan partners are committed to developing a strategy to address these issues.

3.3 Related Initiatives

Canadian Council of Ministers of the Environment smog-related activities

Although independent from it, Ontario's Smog Plan builds on the work done to date by the Canadian Council of Ministers of the Environment (CCME). In 1990 the CCME launched the development of a management plan for NO_x and VOCs — a collaborative process that involved generators, governments and non-governmental organizations. After reviewing the plan in 1994, the CCME requested a next steps smog management strategy. This will consist of a national smog management plan and four regional plans, one of which will be Ontario's Smog Plan. Particulates (IP/RP) are also under consideration at the national level.

Other activities

Many Ontario companies and institutions have registered their commitments to reduce energy consumption and/or greenhouse gas emissions through involvement in programs such as the Voluntary Challenge Program and Registry for greenhouse gases and the Canadian Industry Program for Energy Conservation. Many of these commitments will help achieve both climate change and smog reduction goals. Other programs, such as Countdown Acid Rain, have reduced sulphur dioxide emissions, which will help reduce ambient levels of IP/RP.

4.0 Implementation

Ontario's Smog Plan is the product of hundreds of partners carrying out varied initiatives and tackling unique reduction plans. Partnership instruments are needed to co-ordinate efforts, allow progress to be monitored, define terms and conditions, ensure accountability and build partnership commitment. Such instruments need to be rigid enough to allow expected emission reductions to be totalled, yet flexible enough to be appropriate for the type of partner and kind of reduction activity proposed.

For reducing transboundary pollution, an appropriate mechanism could be an intergovernmental agreement. For a non-governmental organization working to achieve smog reductions through lifestyle change, an appropriate mechanism could be an informal agreement signed with the MOE.

For the transportation and industry and manufacturing sectors, formal partnership agreements will be used. These will include, but are not limited to, the Smog Accord, Letters of Co-operation, Letters of Intent and Memorandums of Understanding. These instruments are bilateral tools: in addition to targets and timelines for the signing partner, they might contain incentives or rewards from the province. Because Ontario's Smog Plan partners are at different stages in the development of their emission reduction plans, they are also at different stages with respect to partnership agreements (i.e., some are ready now to sign a Memorandum of Understanding).

- **Smog Accord** The accord (found on page iv of this document) describes in a general way Ontario's Smog Plan, the reasons for the plan, and its targets, principles and intent. Those signing the accord are Ontario's Smog Plan partners. In signing it, partners affirm their commitment to Ontario's Smog Plan process and their intention to develop and implement a smog reduction plan.
- **Letter of Co-operation** This is a letter signed between a partner and the MOE. It provides the terms of participation between both parties. It recognizes the voluntary nature of the process, describes the cooperative nature of the partner's approach to emissions reduction planning, and provides the opportunity for the partner to use Ontario's Smog Plan logo in promoting its activities.
- **Letter of Intent** This letter is signed by a senior partner official and the MOE, and indicates the intent to produce an emission reduction plan.
- **Memorandum of Understanding** This instrument, signed by a senior partner official and the MOE, is binding on both parties. It will contain the partner's emission reduction plan, performance measures and conditions of participation.

Next Steps

The first year of Ontario's Smog Plan process has focused on the organization of work groups and the identification and documentation of work in progress, quick starts and long-term plans. Some work groups are in early stages of formation, some have yet to begin, and efforts are needed to recruit new partners to the process.

For the second year of this 20-year process, the steering committee has established an agenda to ensure that progress continues to be made. This agenda includes:

- continued formation of work groups and development of emission reduction plans;
- continued identification of quick starts and long-term proposals from established work groups, sectors and subsectors;
- continued development of the level playing field/incentive rewards strategy for review and discussion by the steering committee and partners;
- development and initiation of a performance evaluation, monitoring and reporting process;
- continued development and implementation of various aspects of the public acceptance strategy;
- continued development of the transportation demand initiatives identified by the TDM work group as next step priorities;
- completion of the IP/RP strategy for review by the steering committee and consideration by work groups;
- continued development and implementation of the transboundary strategy;
- annual reporting on progress.

During year two, new partners are expected to commit to Ontario's Smog Plan process. This commitment will be indicated by their becoming signatories to the Smog Accord, entering into Letters of Co-operation with the Ministry of the Environment, developing individual company Letters of Intent, and/or entering into specific Memorandums of Understanding.

Upon release of this document, the general public and interested individuals or groups will be invited to review and provide comments. Copies of Ontario's Smog Plan will be made available to the public through partners, the MOE's Public Information Centre and the MOE's Internet site.

Appendix 1

Progress Table: Work Group Proposed Reductions for NO_x and VOCs: First Year Progress (1997)

Sector	Subsector	Measure	NO _x Reductions		VOCs Reductions		Type of Commitment/ Actions Needed
			kt	by year	kt	by year	
Transportation	Cleaner fuels	Vehicle technology and fuel improvements	65.0 - 80.0	2000	80.0 - 97.0	2000	Forecasted reductions since 1990, dependent on vapor pressure control, federal benzene actions and availability of sulphur-reduced fuel
		Increased propane usage in cars, buses and heavy-duty trucks	5.1	2015	2.4	2015	Forecasted penetration by propane
		Increased natural gas usage in light and heavy-duty vehicles	0.9	2015	0.8	2015	Projected penetration by natural gas vehicles (on a conservative basis)
Transportation	Cleaner vehicles	Vehicle inspection and maintenance programs	15.0	2005	47.0	2005	MOEE introduced the Drive Clean Program in 1997
Transportation	Demand management	Range of land use, transit and user-pay pricing actions ³	0.3 - 10.0 ³	2015	0.3 - 10.0 ³	2015	Action needed by federal, provincial and municipal governments, transit groups, and others
Industry and manufacturing	NO _x emissions (stationary combustion sources)	Copper and nickel production	43.0	1995			Achieved
		Ontario Hydro	19.0	2000			In 1991, Hydro committed to reduce 1985 NO _x emission levels by 40% by 2000
		Combustion turbine guideline	29.0	2015			Combustion turbines are part of a MOE guideline (1994)
		Combustion system Performance standard	4.0	2015			Work group will pursue development and implementation
		Voluntary boiler system review, inspection and maintenance	2.0	2000			Work group will pursue development and implementation
Industry and manufacturing	NO _x and VOCs: Iron and steel	Combustion control and improvements	2.0	1996			Achieved
		Combustion control and improvements	1.5	2001			Forecasted
		ARET ² program			0.3	1996	Achieved
		ARET ² program			0.6	2001	Forecasted

Sector	Subsector	Measure	NOx Reductions		VOCs Reductions		Type of Commitment/ Actions Needed
			kt	by year	kt	by year	
Industry and manufacturing	NOx and VOCs: Chemicals	Range of process changes, leak detection and repair, tank controls, boiler and energy measures	3.7	2000	11.8	2000	Projected reductions based on voluntary measures
Industry and manufacturing	NOx and VOCs: Petroleum	Stage 1 vapor recovery			19.0	1998	MOEE regulation was introduced in 1994
Industry and manufacturing	VOCs: Coatings automobile manufacturing	Improved efficiency, quality control and solvent management practices			12.1	1993	Achieved
Industry and manufacturing	VOCs: Coatings automotive refinishing	Greater Toronto Area body shop accreditation program			0.5	1999	Projected
		Use of high-efficiency spray guns and low-solvent coatings			2.6	NS ¹	Requires provincial approval for industry self-management plan
Industry and manufacturing	VOCs: Coatings consumer coatings	Product reformulation			3.8	1995	Achieved
Industry and manufacturing	VOCs: Solvent use adhesives/ sealants	Reductions in solvent use; switch to water-based product			1.6	1995	Achieved
Industry and manufacturing	VOCs: Solvent use wood treatment	Declining use of oil-borne preservatives			0.6	2015	Projected
Industry and manufacturing	VOCs: Solvent use rubber products	Various efficiency measures, changes in solvent use, etc.			1.2	1995	Achieved
Industry and manufacturing	VOCs: Consumer products	Adoption of U.S. rules for solvent content			5.0	NS ¹	Letter of Intent provided (to be signed). Reduction numbers derived by MOE
Total reductions identified to date			190.5 to 215.2		189.6 to 216.3		
1990 baseline emissions			659		868		

1 NS - Not specified

2 Accelerated Reduction and Elimination of Toxics

3 The range of potential emissions reductions from the 11 Transportation Demand Management initiatives are shown. Each initiative has the potential to reduce emissions by 0.3 to 10 kilotonnes.

Appendix 2

Steering Committee Members

Alan Abelsohn	Ontario College of Family Physicians
Jim Armstrong	Crown Cork and Seal Canada Inc.
Gail Bebee	Automotive Industries Association of Canada
Beth Benson	Waterfront Regeneration Trust
Ed Berry	Canadian Institute for Research in Atmospheric Chemistry
Esther Bobet	Environment Canada
Gary Browne	Consumers' Association of Canada
Michael Burke	Ontario Trucking Association
D.G. Campbell	Rubber Association of Canada
Carl Carter	Canadian Cosmetic, Toiletry and Fragrance Association
Bob Clapp	Canadian Petroleum Products Institute
Brian Collinson	Alliance of Manufacturers and Exporters Canada
Lois Corbett	Toronto Environmental Alliance
Peter Corbyn	Automotive Parts Manufacturers' Association
Peter Dunn	Regional Municipality of Hamilton-Wentworth
Jim Farmer	Ontario Printing & Imaging Association
Walter Fraiss	Bayer Rubber Inc.
Terry Gates	Adhesive and Sealant Manufacturers' Association of Canada
David Halton	Canadian Manufacturers of Chemical Specialties Association
Ted Hamill	CanAmera Foods
Dale Henry	Ministry of the Environment
Tom Hewitt	Canadian Petroleum Products Institute
Paul Hiramatsu	Ontario Furniture Manufacturers' Association
Norm Huebel	Canadian Chemical Producers' Association

Anda Kalvins	Ontario Hydro
Al Labatt	John Deere
Kevin Loughborough	Metropolitan Toronto
Keith Madill	Canadian Vehicle Manufacturers' Association
Rob Milne	Consumers Gas
Pauline Mitchell	Canadian Automobile Association
Ian Morton	Ontario Lung Association
Richard Murry	Canadian Paint and Coatings Association
Mark Nantais	Canadian Vehicle Manufacturers' Association
John Norris	Hamilton District Autobody Repair Association
Ken Ogilvie	Pollution Probe
David Pengelly	McMaster University
Paul Plotz	Canadian General Tower
Betty Rozendaal	CENTRA/Union Gas
Judy Shaw	Crop Protection Institute, Ciba-Geigy Canada
Dave Shortt	Dow Chemical Canada Inc.
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Lorne Smith	Canadian Boiler Society
Hugh Sprague	Stelco Inc., Canadian Steel Producers Association
Jim Sutherland	Canadian Association of Metal Finishers
Yasmin Tarmohamed	Canadian Vehicle Manufacturer's Association
Helle Tosine/Chuck Pautler (Chair)	Ministry of the Environment
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