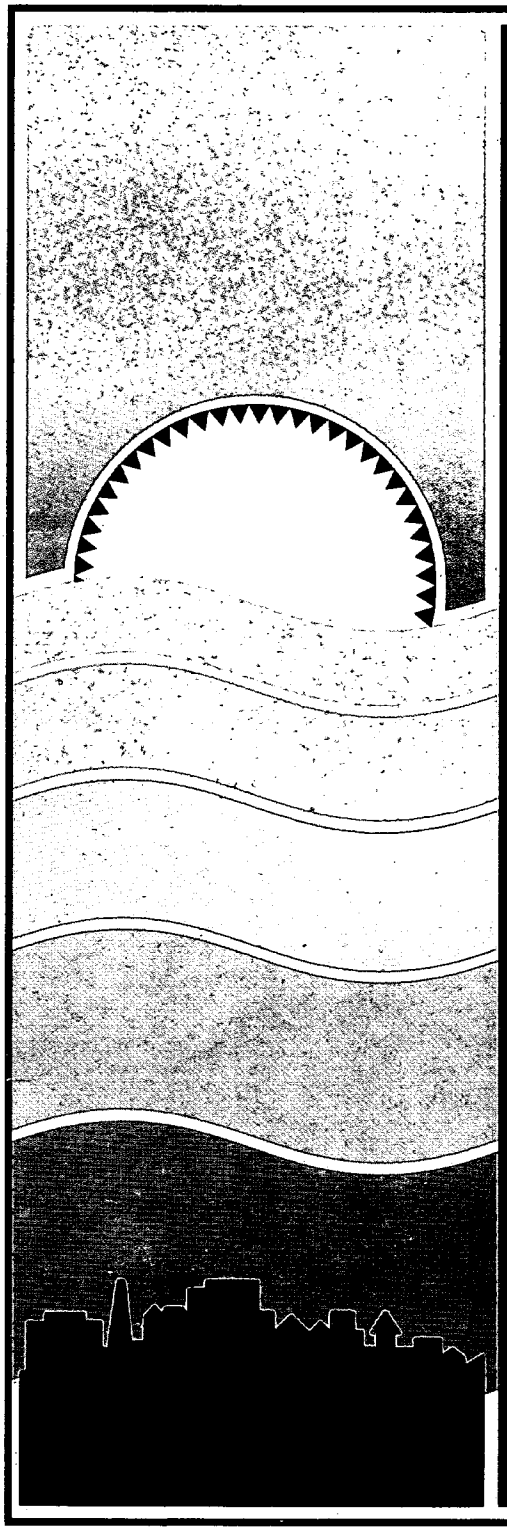
CCME

Canadian Council of Ministers of the Environment

Le Conseil canadien des ministres de l'environnement



MANAGEMENT PLAN

FOR

Nitrogen Oxides (NO_x)

AND

Volatile Organic Compounds (VOCs)

Phase I

SUMMARY REPORT

November 1990

CCME-EPC/TRE-32E

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Phase I

Summary Report

November 1990

CCME

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The Canadian Council of Ministers of the Environment (CCME) is the major intergovernmental forum in Canada for discussion and joint action on environmental issues of national, international and global concern. Environment ministers from each of the ten provinces, the federal government, and the two territories participate in council meetings at least twice a year. They discuss environmental issues, exchange information, make decisions and establish policy for work to be carried out under the auspices of CCME.

The presidency of CCME and other official posts are rotated annually among member governments.

In 1990, CCME began a major restructuring in order to more effectively address the large number of important environmental issues facing the country. A new, streamlined organization enables member governments to respond quickly to emerging issues, set national environmental strategies and develop long-term plans.

Between meetings of the Council of Ministers, the work of CCME is managed by a Deputy Ministers Committee and a full-time Secretariat. The Secretariat, in Winnipeg, Manitoba, provides administrative, technical and policy support to the Council of Ministers and various CCME committees. Two permanent intergovernmental steering committees provide ongoing advice to the Deputy Ministers Committee and coordinate specific CCME projects assigned to intergovernmental task groups.

Executive Summary

Ground-level ozone, a major component of urban smog, is one of the more serious air quality problems in Canada today. In summer, more than half of all Canadians are routinely exposed to ozone levels that are known to have adverse effects on health. Ozone is also known to cause significant damage to agricultural crops and other forms of vegetation in parts of Canada.

Ground-level ozone is caused by two precursor pollutants, nitrogen oxides (NO_x) and volatile organic compounds (VOCs), reacting in the atmosphere in the presence of sunlight. Exposure to elevated ozone levels is most severe in the Lower Fraser Valley of British Columbia, the Windsor-Quebec Corridor in Ontario and Quebec, and the Southern Atlantic region. While ozone problems are for the most part locally generated in the Lower Fraser Valley, imported pollutants from the United States are the dominant factor in ozone episodes in border regions of the Windsor-Quebec Corridor and throughout the Southern Atlantic Region.

In recognition of the seriousness of the ground-level ozone problem, the Canadian Council of Ministers of the Environment (CCME) decided, in October 1988, to develop a management plan for the control of NO_x and VOCs. A "Phase I" management plan was subsequently prepared, under the direction of the Federal-Provincial Long Range Transport of Air Pollutants (LRTAP) Steering Committee. In preparing the Phase I Plan, the Committee obtained the views and assistance of a wide range of interested parties through a comprehensive multistakeholder consultation process. This Summary Report outlines the main features of the Phase I Plan, which is described in detail in the main Management Plan document.

The Phase I Plan is the first phase of a three-phase NO_x and VOC control program aimed at fully resolving ground-level ozone problems in Canada by the year 2005. Phase I consists of three primary components:

1. A national prevention program based on application of the best available control technology economically achievable (BACTEA) to new mobile and new stationary sources of NO_x and VOCs (or equivalent measures), on new measures to reduce emissions from products containing solvents, on measures to improve energy conservation and efficiency, and on better public education.

2. Interim (1995 and 2000) NO_x and VOC emission reduction targets for three designated ozone non-attainment areas: the Lower Fraser Valley, the Windsor-Quebec Corridor and the Saint John Area. These will be negotiated between the federal government and the jurisdictions having authority in these areas and will be contained in federal/provincial agreements. Jurisdictions responsible in these areas will develop and implement remedial control programs to achieve emission reductions which, when combined with the national prevention program reductions, ensure that the interim targets are met.

3. A program of studies and investigations aimed at providing the information needed to set final NO_x and VOC emission targets for ozone non-attainment areas for the years 2000 and 2005.

The NO_x/VOC Management Plan provides the framework for removing the threat of ground-level ozone (smog) to Canadians.

Implementation of the Phase I Plan will result in major air quality improvements in ozone problem areas.

The Phase I Plan contains a "base" set of 31 specific emission reduction initiatives for the national prevention program, and an "illustrative" set of 27 regional emission reduction initiatives that responsible jurisdictions may wish to draw upon in designing remedial programs for the non-attainment areas. It also provides for substitution of "environmentally equivalent" alternatives to the base prevention program initiatives at any time throughout the five year Phase I implementation period.

The prevention and remedial emission reduction programs of the Phase I Plan will affect numerous mobile and stationary source sectors that emit NO_x and VOCs. These range from automobiles through power plants and refineries to solvent use categories such as paints and coatings. The programs will also affect lifestyles to some degree by influencing product choice, consumer habits and transportation modes. Combined, the preventive and remedial programs will ensure that new ozone problems will not be created where none now exist, and that, in existing problem areas, air quality with respect to ozone will be significantly improved. It is estimated that, within the non-attainment areas, peak ozone concentrations can be reduced by 15 to 35 percent from current levels by 2005 by the combined application of the Phase I Plan and planned NO_x and VOC reductions in the United States. The duration of exposure of humans and vegetation to unacceptable ozone levels can be reduced by 40 to 100 percent.

The Phase I Plan will result in significant costs to governments and industry. The cost to governments to develop and implement the measures in the base prevention program and the illustrative remedial program is estimated at $100 million over the 5-year period 1991-95. The cost to emitters of reducing NO_x and VOCs is estimated at $855 million per year by 2005. More than 80 percent of this cost will be incurred by three sectors: automobiles, power plants and paints and coatings.

The final 2000 and 2005 emission targets for non-attainment areas, and the additional measures needed to achieve those targets, will be contained in Phase II of the Plan, which is scheduled for 1994. The 2005 targets will be selected to ensure consistent attainment of the Canadian maximum acceptable air quality objective for ozone of 82 ppb in all areas of Canada by 2005. They may include the designation of areas additional to the three currently designated as ozone non-attainment areas. An opportunity will be afforded for final adjustments to the 2005 targets and control programs with a third and final phase of the Plan scheduled for 1997.

CHAPTER 1

Ground-Level Ozone: The Air Quality Problem

Ozone is formed in the lower atmosphere (i.e., near ground-level) by photochemical reactions in the presence of sunlight between two precursor pollutants, nitrogen oxides (NO_x) and volatile organic compounds (VOCs).

Ground-level ozone is a major component of urban smog. While the problems associated with ozone are usually most severe in urban areas, ozone is not just an urban problem. Large rural areas beyond the boundaries of urban centers are affected as ozone, NO_x and VOCs are transported downwind from sources.

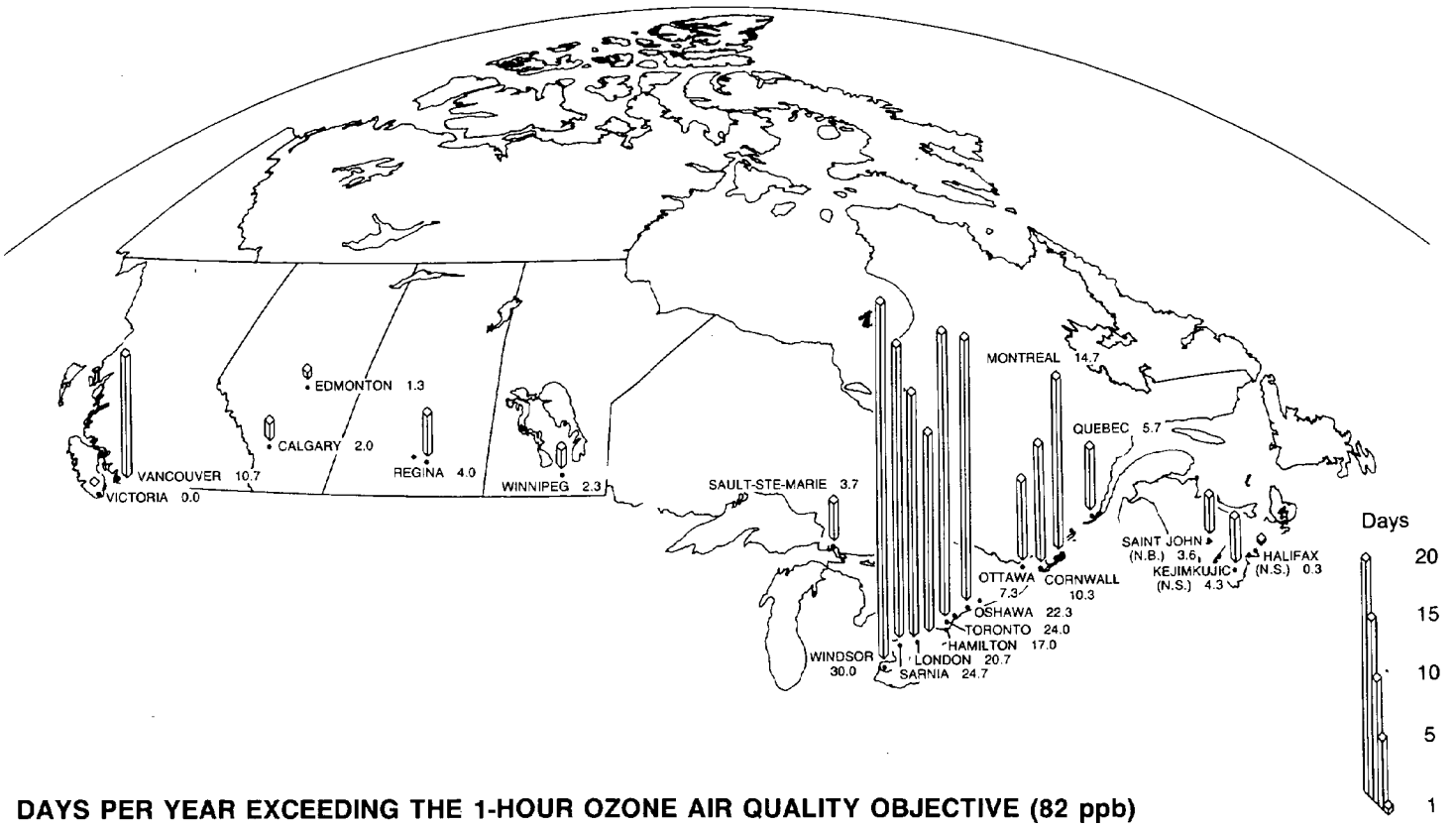
Elevated ozone concentrations are known to have adverse effects on human health, vegetation and materials. Human health effects occur in the form of decreased lung function, coughing and discomfort, and as chronic effects such as premature aging of the lungs. Vegetation damage usually occurs in the form of foliar damage which affects plant growth and productivity. Materials damage from ozone includes the hardening of materials such as rubber, and the bleaching of painted and colored artifacts.

The Canadian "maximum acceptable" 1-hour air quality objective for ozone is 82 parts per billion (ppb) in ambient air at ground-level. The duration and magnitude of exposure to concentrations greater than 82 ppb is a gauge of the severity of health and environmental affects from ozone.

In summer months, more than half of all Canadians are exposed regularly to ambient air ozone concentrations above 82 ppb. These levels are often more than twice the maximum acceptable level. During severe ozone episodes, such as those that occurred in 1988, people in some major Canadian cities have been advised to limit outdoor physical activity or stay indoors. Crop damage in Ontario alone from elevated ozone levels throughout the summer growing season is estimated at up to $70,000,000 per year. Ozone is known to damage the foliage of forest species, but there is no firm evidence on loss of production or changes in forest ecosystems in Canada due to ozone damage.

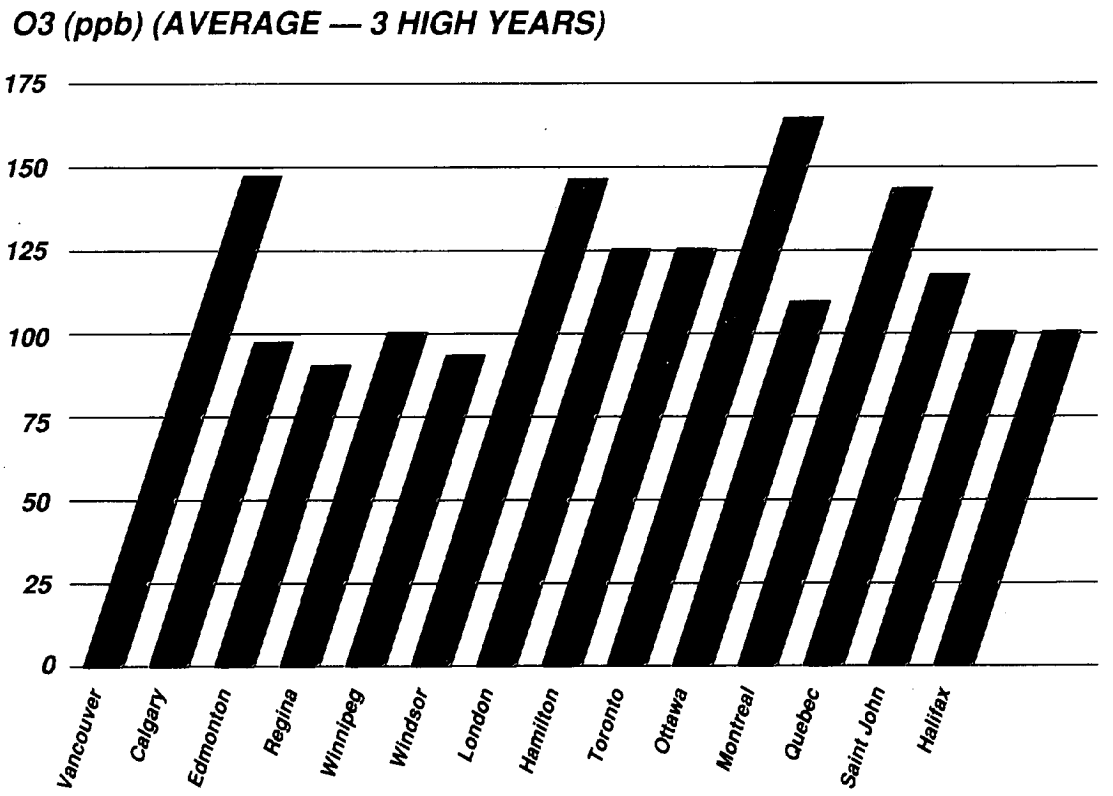
Although they often extend beyond immediate urban areas, ozone problems in Canada are nevertheless highly regionalized. Except where imported pollutants from upwind regions are a dominant factor, such problems are normally most severe in fairly limited corridors or airsheds where major urban centers are located. Almost all major urban centers in Canada have experienced some exposures to ozone concentrations above the 82 ppb objective. The highest recorded ozone levels have been in the Lower Fraser Valley of British Columbia, in the Windsor-Quebec Corridor of Ontario and Quebec, and in the southern Atlantic Region. The ozone episodes in the Lower Fraser Valley originate primarily from local NO_x and VOC emission sources. In sections of the Windsor-Quebec Corridor near the United States border, imported pollutants from the United states dominate; farther along the corridor Canadian sources of NO_x and VOCs become progressively more important. The high recorded ozone levels in southern New Brunswick and western Nova Scotia are caused primarily by pollutants transported from the New England States.

Ozone levels in parts of Canada frequently exceed the maximum acceptable concentration.



DAYS PER YEAR EXCEEDING THE 1-HOUR OZONE AIR QUALITY OBJECTIVE (82 ppb) — AVERAGE OF 3 HIGHEST YEARS 1983–1989

Reductions of 40 to 50 percent in peak ozone concentrations from current levels are needed to achieve consistent attainment of the 82 ppb ozone objective in the primary problem areas. To attain this decrease, even greater percentage reductions (50 to 75 percent) of the precursor pollutants, NO_x and VOCs, are required.



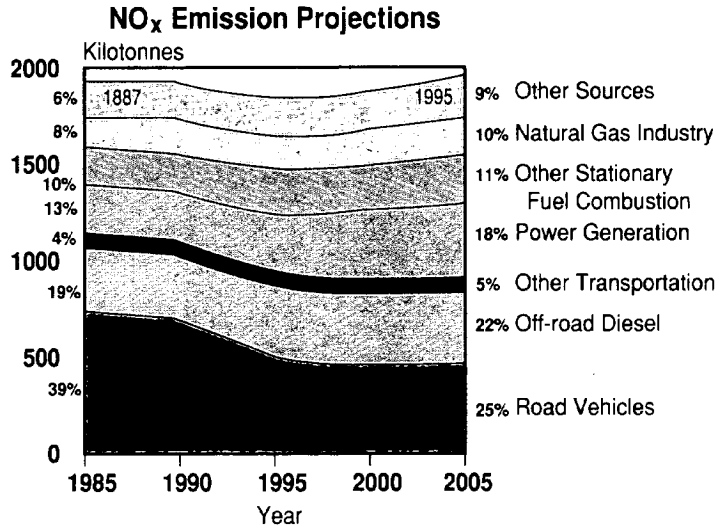
Sources of the Air Quality Problem

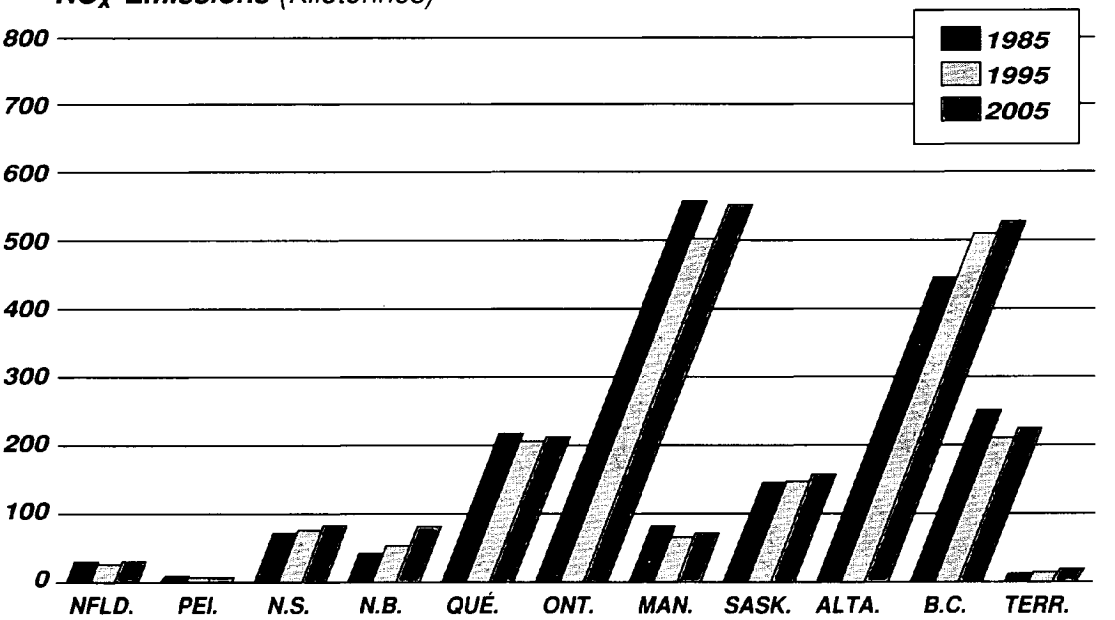
NO_x and VOCs, the precursor pollutants that cause ozone, derive from many different sources. NO_x is released primarily (95%) during the combustion of fossil fuels such as gasoline, diesel fuel, heavy fuel oil, natural gas and coal. This combustion takes place in automobiles, trucks, construction engines, combustion turbines, industrial boilers, power plants and other facilities that use fossil fuel as an energy source.

VOCs are released during the combustion of gasoline, from various industrial processes, and from the evaporation of liquid fuels, solvents and organic chemicals. Sources of VOC emissions include the automobile, gasoline distribution systems, refineries, chemical plants, the application of paints and coatings, a variety of solvent uses, and other source categories.

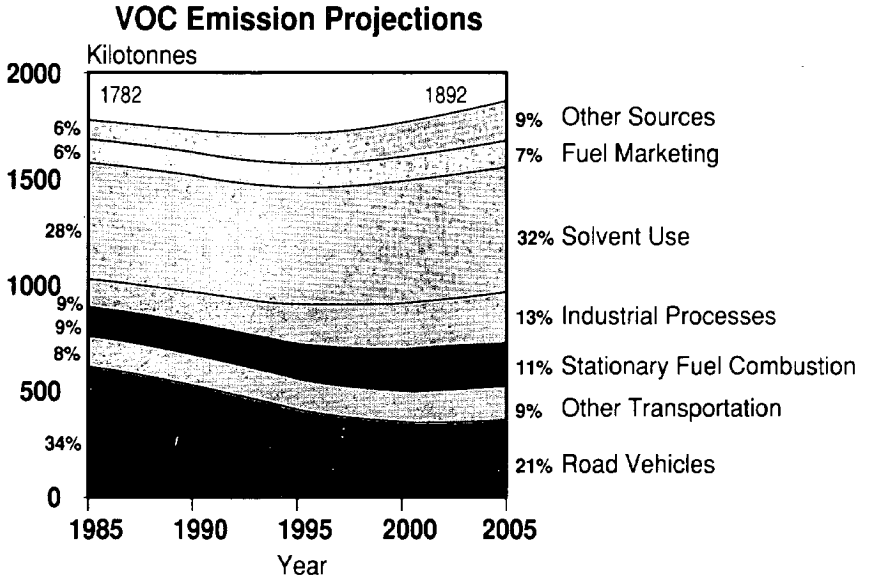
Fossil fuel combustion is the primary source of NO_x.

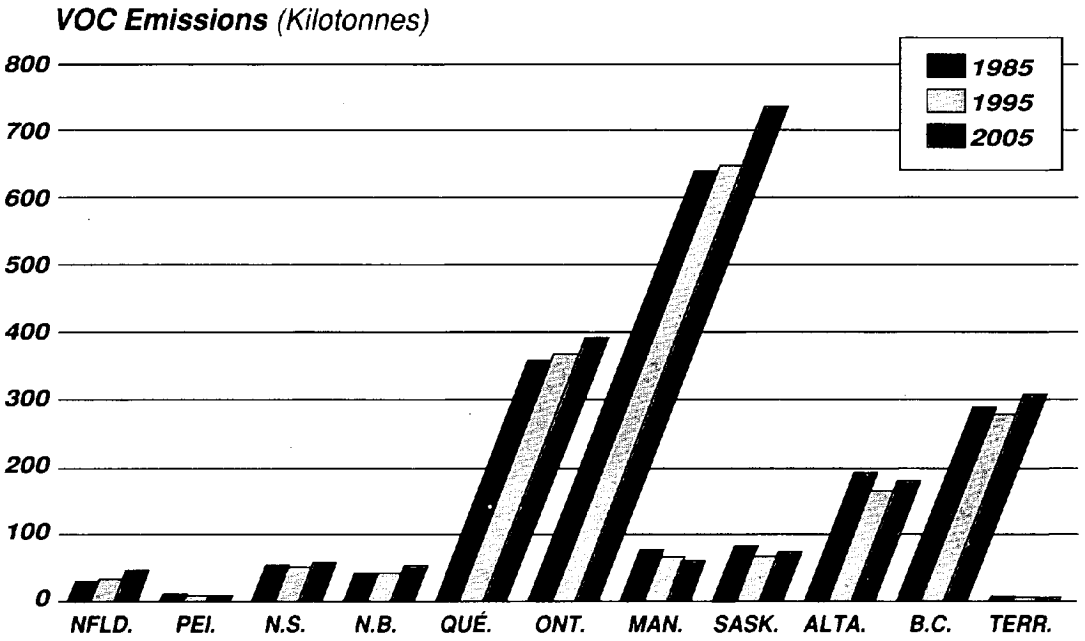
NO_x Emissions



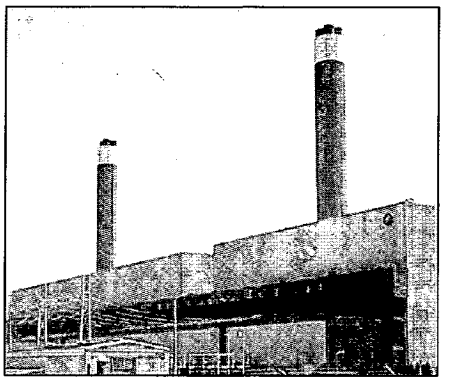


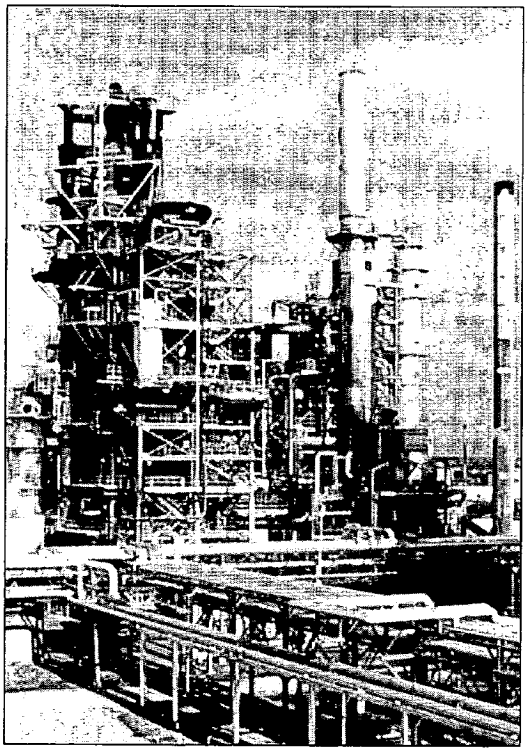
VOC emissions derive from the gasoline fuel cycle, from solvents, and other industrial activities.

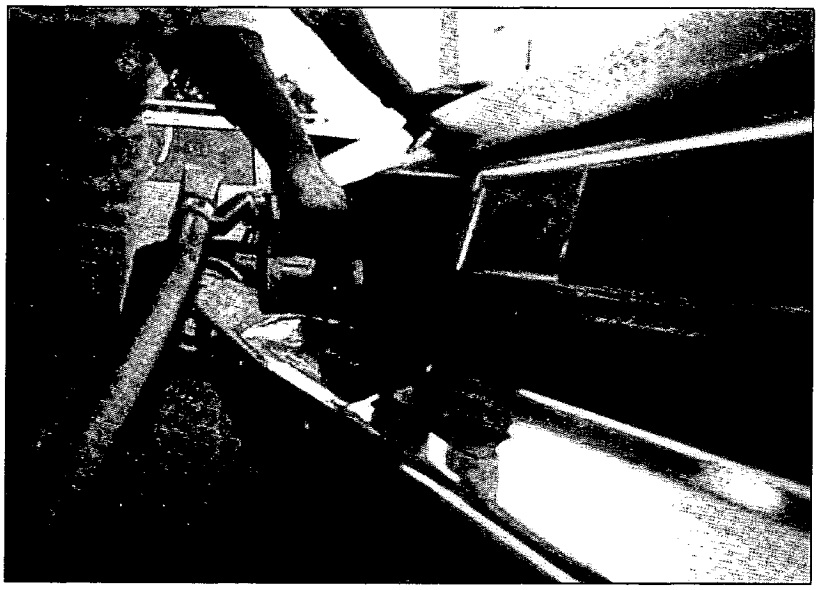


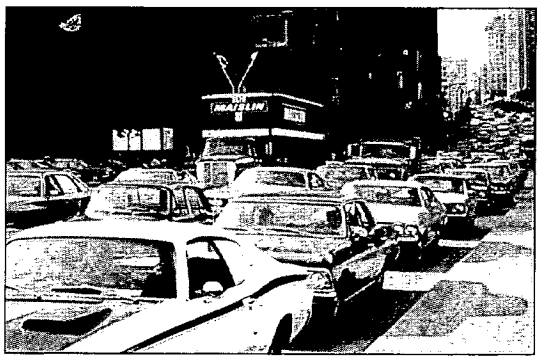


Nationally, both NO_x and VOC emissions are projected to grow by about 6 percent between 1985 and 2005, if no new controls are put in place. This will increase ozone levels in key problem areas, and contribute to the creation of new problems in areas that are now marginal with respect to attainment of the 82 ppb ozone objective. There will be some variations in the trend in ozone levels between provinces and between regions within provinces which will require that each region be examined separately in developing an ozone control strategy. Another factor in determining which source sectors to control is the variation between regions in the contribution of NO_x or VOC emissions from given sectors to the ozone problem.









CHAPTER 3

Solving the Ozone Problem

The focus of the CCME plan for management of NO_x and VOCs is the elimination of harmful effects of ground-level ozone.

Introduction

Recongizing the seriousness of the ground-level ozone problem in Canada, the Canadian Council of Ministers of the Environment (CCME) directed, in October 1988, that a management plan be developed for the control of NO_x and VOCs. The Plan was to be developed in consultation with interested stakeholders and delivered to CCME within 2 years. It was to have two primary objectives:

1. to solve Canada's NO_x and VOC related environmental problems, and
2. to meet Canada's international obligations with regard to these pollutants.

Although there are other potential environmental problems in Canada associated with NO_x and VOCs, it was decided that the focus of the Plan would be on the contribution of these pollutants to ground-level ozone. Other concerns with NO_x and VOCs, such as acid deposition and direct toxic effects of some VOC compounds, are secondary considerations in the Plan. These concerns are being addressed under other programs. Direct toxic effects, for example, are being dealt with through the Priority Substance List of the Canadian Environmental Protection Act, and various provincial programs for control of toxic air pollutants.

Meeting Canada's international obligations was interpreted to mean that (i) there be no increase in the transboundary flow of NO_x, VOCs or ozone into areas of the United States where NO_x and VOC related problems are known to exist and (ii) the conditions of Canada's international agreements are met. One such agreement is the NO_x Protocol of the United Nations Economic Commission for Europe, which calls for a freeze in NO_x emissions at the 1987 level by 1995.

The Plan was also to be developed with due consideration for other related air pollution control programs, including the Canadian acid rain control program and anticipated future programs for the control of greenhouse gas emissions. It was recognized at the outset that in addition to emission source control measures, energy conservation and lifestyle change initiatives, which are likely to be a primary thrust of any greenhouse gas control program, would also be necessary elements of a NO_x and VOC management plan if that plan was to fully resolve ground-level ozone problems.

The Process

In developing the Management Plan, a comprehensive stakeholder consultation process was undertaken over the period August 1989 to June 1990. The process included the review of a draft version of the Management Plan, which was publicly released on March 1, 1990. The Plan was subsequently finalized, taking into consideration the views of stakeholders, and submitted to CCME at its annual fall meeting in November 1990.

Preparation of the Plan has been guided by principles for allocating emission reductions which were developed through the stakeholder consultation process. These principles include the need for equity and fairness, the need to prevent future air quality problems as well as to resolve existing ones, the avoidance of undue restriction on technology innovation and choice of emission reduction options, and the ability of measures to solve more than one environmental problem.

A Phased Approach

The NO_x/VOC Management Plan Phase I is the first phase of a three phase program aimed at fully resolving ground-level ozone problems in Canada by 2005. The primary components of each of the three phases are as follows:

PHASE I

1. The establishment of a strong prevention program nationally.

2. Interim (1995 and 2000) NO_x and VOC emission reduction targets in designated ozone non-attainment areas, to be negotiated between the federal government and the appropriate jurisdictions, and regional remedial programs to reach those targets.

3. Studies and investigations to provide the base for establishing final emission caps for ozone non-attainment areas for the years 2000 and 2005.

PHASE II (1994)

1. Establishment of final emission caps for designated ozone non-attainment areas for the years 2000 and 2005, with the 2005 targets selected to meet the 82 ppb objective for ozone.

2. Identification of additional remedial measures for ozone non-attainment areas and, if appropriate, extension or tightening of the prevention program, to achieve the 2000 and 2005 caps.

PHASE III (1997)

1. Final adjustments to the ozone non-attainment area caps and emission reduction programs.

Description of the Phase I Plan

Each of the three primary components of the Phase I Plan are described below.

1. *National Prevention Program*

The national prevention program consists of a combination of new source performance standards based on best available technology economically achievable, measures for the control of products containing solvents, energy conservation and efficiency measures, and public education.

A starting menu of 31 specific initiatives is defined for the Phase I prevention program, including schedules and identification of jurisdictions responsible for developing and implementing each initiative. A listing of these initiatives is contained in Appendix A. The initiatives are of two types:

(i) those that would be developed and implemented by the federal government, such as emission limits for mobile sources, energy efficiency standards for equipment and appliances, and product formulation; and

(ii) those that would be developed nationally through federal-provincial cooperative programs but implemented by the provinces. These would include initatives such as new source performance standards for stationary sources of NO_x and VOCs.

The Phase I Plan is the first of three phases of the Plan that will be required to meet the ozone objective of 82 ppb.

The 31 specific initatives represent the "base" prevention program. It is recognized that there may be other sequencing of control measure development and implementation, other combinations of initiatives, or other methodologies for implementation that would achieve equivalent or better ozone control, and perhaps offer advantages in terms of cost effectiveness or preference by implementing jurisdictions. The Phase I Plan provides for the substitution of "environmentally equivalent" measures for those specified in the base prevention program. The criteria for determining environmental equivalency are provided in the main Phase I Plan document.

The prevention component of the Phase I Plan requires best available control technology on new sources of NO_x and VOCs.

2. *Interim (1995 and 2000) NO_x and VOC Emission Reduction Targets for Ozone Non-Attainment Areas*

The information currently available on emissions, cause and effect relationships, effectiveness of U.S. control programs, and means available to further reduce emissions beyond the levels identified in Phase I is inadequate for setting final emission caps at this time. Consequently, only interim emission reduction targets will be negotiated as part of the Phase I Plan.

Jurisdictions may substitute "environmentally equivalent" alternatives for the prescribed prevention program initiatives.

Three regions are designated ozone non-attainment areas for the purpose of establishing interim emission reduction targets. These areas, are as follows:

Designated Non-Attainment Area

- Lower Fraser Valley
- Windsor-Quebec Corridor
  - Ontario Portion
  - Quebec Portion
- Southern Atlantic Region
  - Saint John Area

Interim (1995 and 2000) NO_x and VOC emission reduction targets will be set for ozone non-attainment areas.

The interim emission reduction targets will be negotiated between the federal government and the jurisdiction having authority for each designated non-attainment area, and contained in joint federal/provincial agreements. They will be achieved by a combination of the reductions in ozone non-attainment areas that will result from the national prevention program, and the reductions from additional remedial programs to be applied in the non-attainment areas. These remedial programs will be determined by the jurisdictions responsible for the designated non-attainment areas. However, to assist in identifying potential emission reduction options and to provide a basis for estimating emission reduction potential and costs, an illustrative Phase I NO_x and VOC control program for ozone non-attainment areas was developed and is presented in Appendix 1. This illustrative regional reduction program consists of 27 initiatives for reducing NO_x and VOC emissions, ranging from emission control retrofits on existing emission sources to improved urban transportation management and ozone episode management programs. The jurisdictions responsible may wish to draw upon this illustrative program in establishing the remedial programs that they will be implementing to reach the 1995 and 2000 target reductions. Once the jurisdictions responsible have identified their starting or "base" remedial programs, these base programs, like the base prevention programs, may also be modified throughout the Phase I implementation period to account for new information and changing circumstances, so long as the interim emission reduction targets are met.

The interim reduction targets are the criteria that provinces will use to design remedial programs for non-attainment areas.

Because of emission inventory data deficiencies, it is anticipated that the interim targets will have to be in the form of annual percentage reductions from a base year. These annual percentage reduction targets will provide adequate guidance for this first round of emission reductions, provided some fundamental characteristics of ozone episodes and of emission variability are taken into account in selecting the measures that will be taken to meet the targets. Particular emphasis should be placed on measures that will reduce summer daytime emissions as well as annual emissions.

It is recommended that the final emission caps for non-attainment areas for 2000 and 2005, to be set in the Phase II of the Plan in 1994, be in the form of total kilotonnes of NO_x and VOC emissions, and have more focussed spatial and temporal dimensions from those used for the interim reduction targets. Other areas, such as airsheds around the other large urban centres across the country, may also be designated ozone non-attainment areas in the Phase II Plan. This will depend on an evaluation of the effectiveness of the Phase I prevention program in reducing ozone peaks in areas now considered marginal with respect to ozone attainment (i.e., areas where a limited number of exceedances of the 82 ppb objective now occur regularly each year).

3. *Studies and Investigations*

Additional information must be developed before final NO_x and VOC emission caps can be set for ozone non-attainment areas. The spatial and temporal distribution of emissions

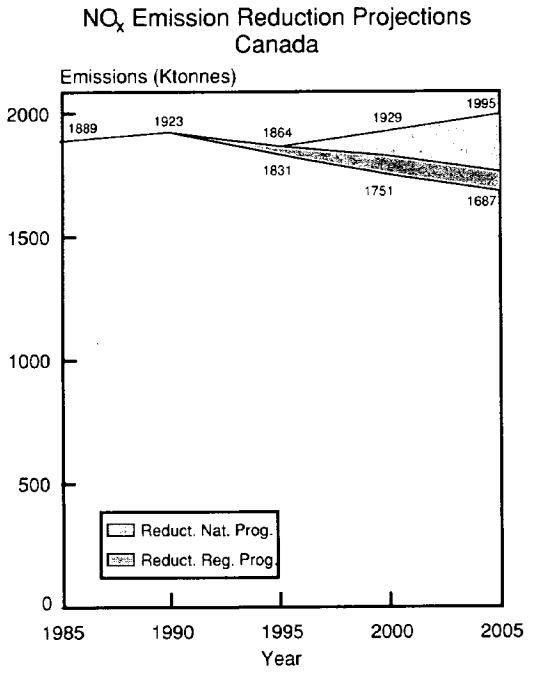
from some mobile source categories is not adequately defined. Among these categories are off-road diesel engines, heavy duty vehicles, marine and aircraft. Emission estimates for some mobile and stationary source categories are expected to require adjustments over the next year or two as better information is gathered. For example, VOC emissions from motor vehicles are thought to be underestimated by a factor of 2 or 3, and VOC emissions from solvent use sectors may require substantial adjustment when more information on the current level of emission control in these sectors is obtained. Also required is improved knowledge regarding cause and effect relationships, the effectiveness of U.S. control programs in reducing the transboundary flow of pollutants, and the effectiveness of other related federal and provincial programs in reducing NO_x and VOC emissions.

Twenty four (24) study initiatives are outlined as part of the Phase I Plan. These will generate the additional information needed to set final emission caps, design additional emission control programs, and track progress towards the interim targets. These initiatives are listed in Appendix 1.

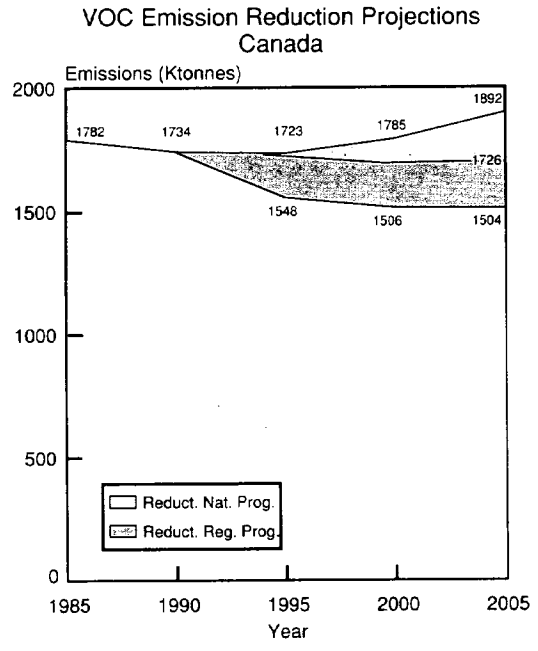
Effectiveness of the Phase I Plan

Assuming that regional remedial programs comparable to the illustrative regional program outlined in Appendix 1 are implemented, the Phase I Plan, when fully implemented, would achieve the following:

- By the year 2005, national NO_x and VOC emissions that are 11 and 16%, respectively, below current (1985) emission levels, with emission reductions of about 25 to 40% in the more serious ozone non-attainment areas.



Final (years 2000 and 2005) NO_x and VOC emission caps for non-attainment areas will be set in Phase II of the Plan in 1994.

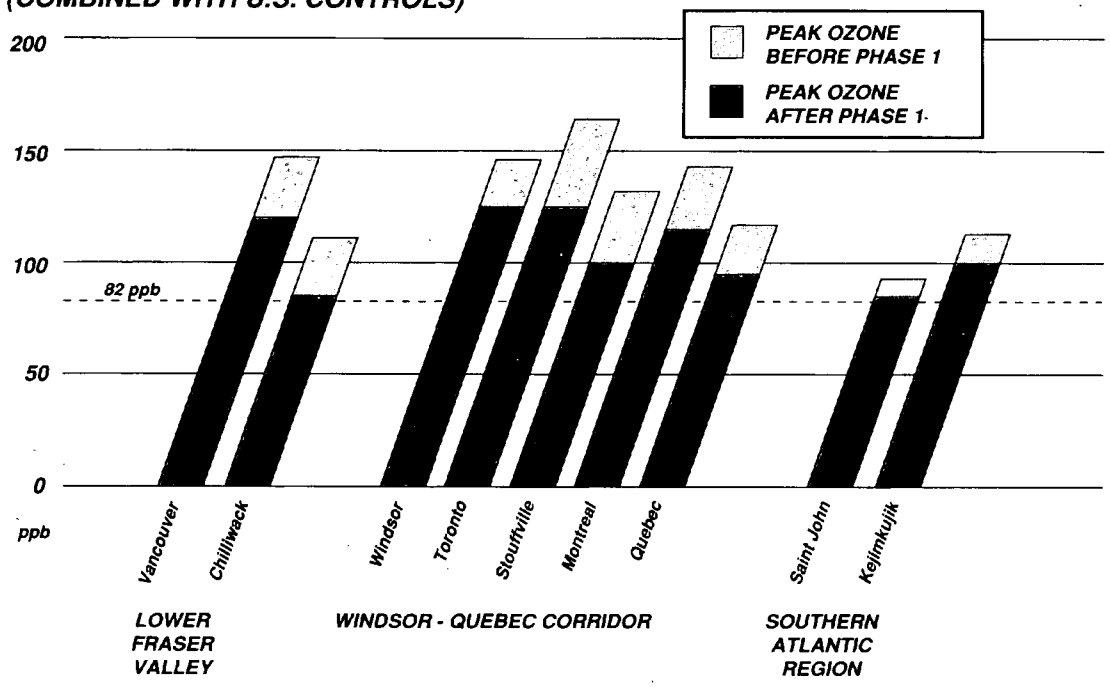


A comprehensive study program will provide the information needed to set final emission caps for 2000 and 2005.

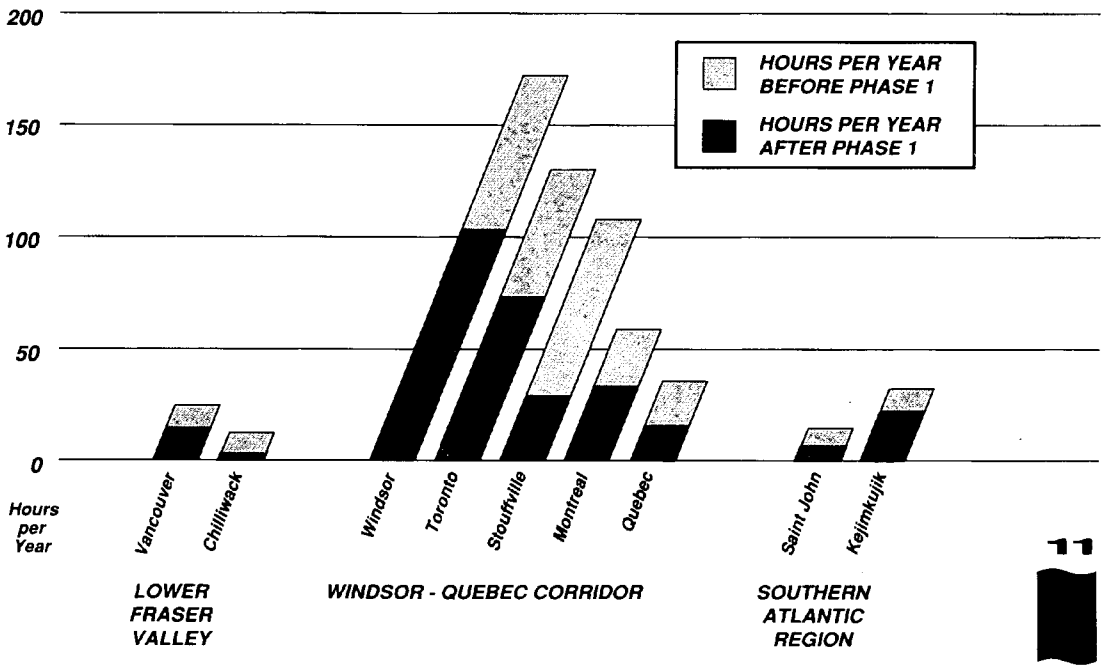
- A reduction in summertime peak ozone concentrations of 15 to 35% in most areas of concern, by the year 2005. (When combined with NO_x and VOC control measures in the United States).

- A reduction in the number of hours above the "maximum acceptable" ozone concentration (82 ppb) of from 40 to 100% in most non-attainment areas. (When combined with NO_x and VOC control measures in the United States.)

REDUCTION IN PEAK OZONE FROM PHASE 1 CONTROLS (YEAR 2005) (COMBINED WITH U.S. CONTROLS)



REDUCTION IN OZONE HOURS PER YEAR ▶ 82 ppb (YEAR 2005)



- Significant reductions in damage to vegetation as a result of the reduced duration of exposure to ozone concentrations above 82 ppb.

- Major reductions (20 to 60%) in some sources of VOCs which are of concern because of their toxicity as well as their ozone forming potential.

- A reduction in emissions of carbon dioxide (CO_2), the gas contributing most to the greenhouse effect, of approximately 6% from the level otherwise projected for 2005.

- Conformity with Canada's international obligations under the United Nations Economic Commission for Europe (ECE) NO_x Protocol, signed by Canada on October 31, 1988.

  - NO_x emissions under the Plan will be about 5% below the 1987 level by December 31, 1994, the date specified for a freeze at the 1987 level.

  - The Plan calls for national emission standards for major new mobile and major new stationary source categories as specified in the Protocol.

- Conformity with Canada's commitment not to increase the transboundary flow of NO_x and VOCs into areas of the United States already experiencing ozone or acid rain problems.

  - In areas of potentially significant transboundary flow (the Windsor-Quebec Corridor, Lower B.C. Mainland), the Plan will result in decreases in transboundary flows of NO_x and VOCs to the United States of 25 to 40%.

Cost of the Plan

The Plan will result in significant costs to governments and industry. It may also result in some additional costs to consumers resulting from their adaptation to the lifestyle changes needed to improve and conserve the quality of the environment.

The Phase I Plan will have other environmental benefits.

Two kinds of costs will be incurred. The first is the cost of conducting investigations, consulting with stakeholders and developing the regulatory instruments that will put the Plan in place. If the base prevention and illustrative remedial program and study initiatives outlined in Appendix 1 are implemented, the cost to governments over the next five years, is estimated at $100 million. This is exclusive of industry "participation" costs in the consultation processes for control measure development. Some of this cost may be absorbed within other government air pollution control programs such as federal and provincial programs for control of greenhouse gases.

The second form of costs that will be incurred under the Plan is the cost to emitters of implementing the measures that will be taken to reduce NO_x and VOC emissions. These "emission reduction costs", based on the initiatives identified in Appendix 1, are estimated to be $855 million per year by 2005. They are split as follows:

- $415 million/year for NO_x control, and

- $440 million/year for VOC control.

More than 80% of the cost will be incurred in 3 source categories.

Costs will begin to be incurred by NO_x and VOC source sectors in the early 1990s, and increase gradually as the Plan is implemented. These costs will be either incurred directly by consumers, or incurred by the various source sectors and subsequently passed on to consumers. It is estimated that 48% of the total emission reduction cost will be associated with motor vehicles, 21% with power generation and 12% with paints and coatings. The remaining 19% will be split among numerous NO_x and VOC source categories. Geographically, almost 90% of the control costs will be borne by 3 provinces: British Columbia (11%), Ontario (62%) and Quebec (16%). On a per capita basis, the $855 million per year translates into 9 cents per person per day.

The costs of control may be overestimated. The costs of NO_x and VOC reductions due to energy conservation and product substitution measures are estimated to be zero. Most analyses conclude that energy conservation measures actually result in net economic benefits offsetting some of the emission reduction costs. In addition, actual emission control costs tend to be less than first estimates, due to technological innovations and other factors.

No estimate has been made of either the administrative costs to governments or the emission control costs to emitters of NO_x and VOCs, of implementing alternative control methods, such as emission trading schemes in ozone non-attainment areas.

Recommendations to Ministers

The Federal/Provincial LRTAP Steering Committee made nine specific recommendations to Ministers for their consideration. These are that:

1. consistent attainment of the ambient ozone objective of 82 ppb in all areas of the country by the year 2005 be re-affirmed as the overall objective of the Plan.

2. the Phase I Plan, consisting of a national prevention program and interim emission reduction targets for designated ozone non-attainment areas, be endorsed in principle as a major first step towards meeting the 82 ppb objective.

3. there be agreement to seek the necessary resourcing within respective governments to ensure that the Phase I Plan is fully implemented over the 5 year period from 1991 to 1995.

4. there be agreement to seek the necessary cooperation of municipal and regional governments, as well as of other federal and provincial government departments such as Energy, Transport, Industry and Health, to implement the Plan.

5. there be agreement on the establishment and maintenance of an implementation tracking system with continuous public access to information on the status of all initiatives and programs undertaken under the Plan.

6. approval be given for the establishment of a NO_x/VOC Consultations Office to operate on a one year interim bases and to report to the Environmental Protection Committee of the CCME. During the one year interim period, the EPC should examine and make recommendations on how implementation of the Phase I Plan should be coordinated over the full 5 year implementation period, and how its coordination should be integrated with the management of other atmospheric issues. The purpose of the office would be to coordinate implementation of the Phase I Plan, inform stakeholders, manage an implementation tracking system, develop public education programs, and organize the development of Phase II of the Plan.

7. there be commitment to develop Phase II of the Plan in 1994. Phase II will contain those further measures needed to provide consistent attainment of the 82 ppb ozone objective in all areas of Canada by 2005, taking into consideration the effectiveness of U.S. controls, related programs for the control of greenhouse gases, acid rain and toxics in Canada, and other new information.

8. there be agreement to pursue bilateral negotiations with the United States to reduce ozone levels in border states towards the Canadian 82 ppb ozone objective, so that transboundary flow into Canada of ozone or its precursor pollutants do not cause harm to the health or environment of Canadians.

9. bilateral federal-provincial agreements be negotiated within 12 months defining interim reduction targets and details of the prevention, remedial and study programs and the responsibilities and commitments of each jurisdiction in implementing the Phase I Plan.

Ministerial Decision

The Canadian Council of Ministers of the Environment endorsed the above recommendations at its annual fall meeting on November 29, 1990.

APPENDIX 1

NO_x/VOC Management Plan: Phase I Initiatives

TABLE 1A

NO_x/VOC Management Plan – Phase I: NO_x Reduction Initiatives

Initiative		Control Instrument: Type	Control Instrument: Delivery Date	Control Instrument: Effective Date	Reference Pages in Plan
(a) NATIONAL PREVENTION PROGRAM					
Energy Conservation and Product Control					
N101	Power utility DSM	DSM Plans	31 Dec. '92	1993-2005	68, 82
N102	Energy efficiency in equipment, appliances	Performance Stds.	31 Dec. '94	1994	68, 84
N103	Energy efficiency in industry	Performance Stds.	92/93/93/95	1993-1996	68, 85
N104	Energy audits by industry	Audit Plans	31 Dec. '91	1992	68, 86
N105	Energy efficiency in buildings	CSA Standards	31 Dec. '93	1994	68, 86
Consumer Choice and Lifestyle					
N201	Public Education – Driving/Alt. Transport	Public Ed. Campaign	91-99	1991-1999	68, 87
N202	Public Education – Energy Conservation	Public Ed. Campaign	91-99	1991-1999	69, 87
Source Control					
N301	Light Duty Veh./Light Duty Truck NO_x limit	Federal Regulation	91-92	1994-1996	69, 87
N302	Heavy duty vehicle NO_x limits	Voluntary/Fed. Reg.	91/93	1991/1994	69, 88
N303	Const. diesel engine NO_x limits	Federal Regulation	31 Dec. '95	1998	69, 89
N304	Cap on rail transport NO_x	Reporting Schedule	31 Dec. '91	1992	69, 91
N305	NSPS – Power plants	CEPA Guideline	91-94	1995/2000	69, 92
N306	NSPS – Industrial Boilers	CCME Guideline	31 Dec. '91	1994	69, 93
N307	NSPS – Gas Turbines	CCME Guideline	30 June '92	1994	69, 94
N308	NSPS – Compressor Engines	CCME Guideline	31 Dec. '91	1993	70, 95
(b) ILLUSTRATIVE REGIONAL REMEDIAL PROGRAM (See Plan for Regional Application)					
Energy Conservation and Product Control					
N401	Urban Transportation Management	Management Plans	92-94		70, 96
Consumer Choice and Lifestyle					
N501	Ozone Episode Management	Mun. Plans/Criteria	31 Mar. '93	1993	70, 97
N502	Highway speed reduction	Provincial Programs	31 Dec. '92	1993	70, 98
N503	Public Education-Highway speeds	Prov. Pub. Ed. Campaign	92-99	1993-1999	70, 99
Source Control					
N601	Motor Vehicle Inspection & Maintenance (I&M)	Provincial Programs	31 Dec. '93	1994	71, 99
N602	New and Existing Power Plants	Prov. Limits/Schedules	31 Dec. '92	1994/1997	71, 100
N603	Retrofit – Existing Industrial Boilers	Prov. Limits/Schedules	31 Dec. '93	1997	71, 102
N604	New and Existing Iron & Steel Mills	Prov. Limits/Schedules	31 Dec. '93	1995/1997	71, 103
N605	Retrofit – Existing Refinery Processes	CCME Guideline	31 Dec. '93	1997	71, 104

TABLE 1B

NO_x/VOC Management Plan – Phase I: VOC Reduction Initiatives

Initiative		Control Instrument: Type	Control Instrument: Delivery Date	Control Instrument: Effective Date	Reference Pages in Plan
(a) NATIONAL PREVENTION PROGRAM					
Energy Conservation and Product Control					
V101	Emission Reduction – Surface Coating	CCME Reduction Plan	31 Dec. '93	1997	72, 105
V102	Emission Reduction – Adhesives & Sealants	CCME Guideline	31 Dec. '93	1997	72, 106
V103	Emission Reduction – Consumer Products	CCME Reduction Plan	30 June '94	1997	72, 106
V104	Emission Reduction – General Solvent Use	CCME Reduction Plan	31 Dec. '94	2000	72, 107
Consumer Choice and Lifestyle					
V201	Public Education – Driving/Alt. Transport	Public Ed. Campaign	91-99	1991-1999	72, 108
V202	Public Education – Solvent Use/Recycle	Public Ed. Campaign	91-99	1991-1999	72, 108
Source Control					
V301	Light Duty Veh./Light Duty Truck VOC Limit	Federal Regulation	91/92	1994-1996	73, 109
V302	NSPS – Volatile Liquid Storage Tanks	CCME Guideline	31 Dec. '91	1993	73, 110
V303	NSPS – Chemical Plant Processes	CCME Guideline	31 Dec. '92	1994	73, 110
V304	NSPS – Chemical Plant Fugitive Emissions	CCME Code	31 Dec. '91	1993	73, 111
V305	NSPS – Plastics Processing	CCME Guideline	30 June '93	1995	73, 112
V306	NSPS – Pulp & Paper Sulphate Process	CCME Guideline	31 Dec. '92	1994	73, 113
V307	NSPS – Comm/Ind. Coating Application	CCME Code/Guideline	31 Dec. '92	1994	73, 113
V308	NSPS – Comm/Ind. Printing	CCME Code	30 June '93	1994	73, 114
V309	NSPS – Comm/Ind. Degreasing	CCME Code	30 June '94	1995	73, 115
V310	NSPS – Dry Cleaning	CCME Code	31 Dec. '93	1995	74, 116
(b) ILLUSTRATIVE REGIONAL REMEDIAL PROGRAM (See Plan for Regional Application)					
Energy Conservation and Product Control					
V401	Urban Transportation Management	Management Plans	92/94		74, 117
Consumer Choice and Lifestyle					
V501	Ozone Episode Management	Mun. Plans/Criteria	31 Mar. '93	1993	74, 117
Source Control					
V601	Motor Vehicle Inspection and Maintenance (I&M)	Provincial Programs	31 Dec. '93	1994	74, 117
V602	Gasoline Volatility Limit-62 KPa	Provincial Regulation	31 Dec. '91	1992	74, 117
V603	Vapour Bal. – New & Exist. Gas. Depots	CCME Code	31 Dec. '90	1992/1993	75, 118
V604	Vapour Bal. – New & Exist. Serv. Stations	CCME Code	31 Dec. '90	1992/1993	75, 119
V605	Vehicle Refuel – Vapour Balance (Stage II)	CCME Code	31 Dec. '91	1993/1995	75, 120
V606	Retrofit – Volatile Liquid Storage Tanks	CCME Guideline	31 Dec. '91	1994	75, 121
V607	Fugitive Emission Control - Refineries	CCME Code/Prov. Sch.	31 Dec. '91	1993	75, 122
V608	Retrofit – Chemical Plant Processes	Prov. Limits/Schedule	31 Dec. '92	1996	75, 123
V609	Fugitive Emission Control - Chemical Plants	CCME Code/Prov. Sch.	31 Dec. '91	1993	76, 123
V610	Retrofit – Existing Plastics Processing	Prov. Limits/Schedule	30 June '93	1996	76, 124
V611	Retrofit – Existing Pulp & Paper Sulphate Proc.	Prov. Limits/Schedule	31 Dec. '93	1997	76, 125
V612	Retrofit – Surface Coating Facilities	Prov. Limits/Schedule	31 Dec. '92	1996	76, 125
V613	Retrofit – Existing Comm/Ind. Printing	Prov. Limits/Schedule	30 June '93	1996	76, 126
V614	Retrofit – Existing Comm/Ind. Degreasing	Prov. Limits/Schedule	30 June '94	1997	76, 127
V615	Retrofit – Existing Dry Cleaning	Prov. Limits/Schedule	31 Dec. '93	1997	76, 127
V616	Retrofit – Existing Wood Waste Burning	Prov. Limits/Schedule	31 Dec. '92	1995	76, 128

TABLE 1C

NO_x/VOC Management Plan – Phase I Studies and Investigations for Preparation of Phase II

Study Initiative		Reference Agencies	Date	Reference Pages in Plan
EMISSION INVENTORIES AND FORECASTS (S100 SERIES)				
S101	Streamline Emission Inventories with Maximum 1 Year Lag Time.	Env. Canada All provinces	1993	77, 128
S102	Update National Emission Forecast Annually, Extending to 2010.	Env. Canada All provinces	Annual	77, 129
S103	Emission Surveys for the Pulp and Paper, Plastics processing and Wood Transformation Sectors.	Env. Canada, BC	31 Dec. '91	77, 129
S104	More Accurate Data Base on Emissions From Products Containing Solvents	Env. Canada All provinces	31 Dec. '92	77, 130
S105	Number and Usage Rates of Off-road Vehicles.	Env. Canada	31 Dec. '92	77, 130
S106	Inventory Data for the WQC to Facilitate Oxidants Modelling.	Env. Canada Que, Ont	31 Dec. '91	77, 131
AMBIENT AIR QUALITY AND MODELLING (S200 SERIES)				
S201	Analysis of Available Ambient Air Monitoring Data.	Env. Canada NB, Ont, Que, BC	1991	77, 131
S202	Expand the Ambient Air Monitoring Network for NO_x, VOC and Ozone.	Env. Canada All provinces	31 Dec. '93	77, 132
S203	Better Information on the Transboundary Flow of NO_x, VOCs and Ozone.	Env. Canada NB, Ont, Que, BC	31 Dec. '91	77, 132
S204	Refined Meteorological Data Sets to Facilitate Oxidants Modelling.	Env. Canada	30 June '91	77, 133
S205	Set Up and Run Appropriate Scale Oxidants Models for the LFV and WQC.	Env. Canada Ont, Que, BC	1991/1993	77, 133
S206	Evaluate Health Effects Information and Develop Position on 6-8 hour Ozone Standard	H&W Canada All provinces	31 Dec. '92	78, 134
S207	Evaluate Vegetation Effects and Develop Position on Appropriate Ozone Standard	Agric. Canada All provinces	31 Dec. '92	78, 134
TECHNOLOGIES, CONTROL OPTIONS AND COSTS (S300 SERIES)				
S301	Refine Cost Estimates for VOC Emissions From Major Sources	Env. Canada	31 Dec. '91	78, 135
S302	Current VOC Emission Controls in Plastics, Pulp and Paper and Wood Transformation.	Env. Canada	31 Dec. '91	78, 135
S303	R&D on Advanced Combustion and NO_x Emission Control Technologies.	Env. Canada EMR	1991-1995	78, 135
S304	Current Control and Product Substitution in All Major Solvent Use Categories	Env. Canada All provinces	31 Dec.'91	78, 136
S305	Control and Product Substitution Options for Major Solvent Use Categories.	Env. Canada All provinces	31 Dec. '91	78, 136

TABLE 1C

NO_x/VOC Management Plan – Phase I Studies and Investigations for Preparation of Phase II (cont'd.)

Study Initiative		Reference Agencies	Date	Reference Pages in Plan
TECHNOLOGIES, CONTROL OPTIONS AND COSTS (S300 SERIES) (cont'd.)				
S306	Implications of Greenhouse Gas Control Program for NO_x and VOC Emissions.	Env. Canada EMR, All provinces	Link to GHG Program	78, 137
S307	Analyze Canadian Transportation Network to Determine Potential to Reduce NO_x, VOC and CO_2 Emissions by Intermodal Shifts.	Transp. Canada EMR	31 Dec. '91	78, 137
S308	Evaluate Energy Conservation Merits of Labelling and a Retrofit Building Code for Existing Buildings	EMR All provinces	31 Dec. '92	78, 138
S309	Evaluate the Merits and Develop a Framework for NO_x/VOC Emission Trading	Env. Canada All provinces	31 Dec. '92	78, 138
U.S. EMISSION CONTROL (S400 SERIES)				
S401	Analyze New U.S. NO_x Control Program for NO_x Reductions in Selected Regions.	Env. Canada Ont, Que, BC	1991/1993	79, 139
S402	Analyze U.S. State Implementation Plans (SIPs) in Selected Ozone Non-attainment Areas.	Env. Canada Ont, Que, BC	31 Dec. '92	79, 139

APPENDIX 2

NO_x/VOC Management Plan – Phase I Emission Reductions by Province, Region and Sector

TABLE 2A

Provincial NO_x Emission Reductions (KT/YR 2005)

		Reductions in 2005[1]											
Province/Territory	**1985**	**LDVs**	**HDVs**	**Off Rd. Diesel**	**Elect. Power**	**Nat. Gas**	**C/Ind. Fuel Comb.**	**Ind. Proc.**	**Res. Fuel Comb.**	**Total**	**2005 Pre-Plan**	**2005 Post-Plan**	**% Diff. From 1985**
British Columbia	252.6	9.1	3.1	0.7	1.0	1.1	9.3	1.0	0.3	25.6	225.4	199.8	- 20.9 (LFV -40.7)
Alberta	440.3	6.6	2.0	1.4	35.8	0	8.5	0	0.7	55.0	528.3	473.3	+7.5
Saskatchewan	155.6	3.1	1.8	0.5	9.5	1.8	3.3	0	0.2	20.2	165.5	145.3	- 6.6
Manitoba	81.9	3.0	1.7	0.4	0.1	0	2.2	0	0.1	7.5	77.0	69.5	-15.1
Ontario	557.5	29.3	9.8	3.5	57.2	0.1	27.6	9.1	1.5	138.1	553.6	415.5	- 25.5 (WQC -27.1)
Quebec	222.8	13.1	4.5	0.9	0.5	0	10.4	0.3	0.4	30.1	218.3	188.2	- 15.5
New Brunswick	46.4	1.5	0.9	0.1	11.6	0	1.9	0	0.1	16.1	80.7	64.6	+ 39.2 (SJA +79.3)[2]
Nova Scotia	74.3	1.9	1.3	0.1	4.0	0	1.4	0	0.2	8.9	82.9	74.0	0.0
Prince Edward Island	5.6	0.3	0.2	<0.1	<0.1	0	<0.1	0	<0.1	0.5	5.4	4.9	-12.5
Newfoundland	33.7	1.0	0.6	0.1	0.9	0	1.3	0	0.1	4.0	36.2	32.2	- 4.5
Yukon/N.W.T.	16.0	0.2	0.1	0.2	1.3	0	0.1	0	<0.1	2.0	22.1	20.1	+ 25.6
CANADA	1886.9	69.1	26.0	7.9	121.9	3.0	66.0	10.4	3.7	308.0	1995.4	1687.4	- 10.6
INITIATIVES		N301 N601	N302 N502	N303	N101 N305 N603	N308	N102 N306 N307 N603	N604 N605	N104				

1 The distribution of emission reductions by sector and province is based on the implementation of all emission control initiatives outlined in the base national prevention program and the illustrative remedial program for ozone non-attainment areas.

2 1985 was an abnormally low NO_x emissions year in the Saint John Area with NO_x from power generation (the largest source) only about 30% of the level in 1988. Referencing the 1988 level would give a small reduction rather than the high percentage increase obtained by referencing 1985.

TABLE 2B

Provincial VOC Emission Reductions (KT/YR 2005)

		Reductions in 2005[1]									
Province/Territory	**1985**	**LDVs**	**Gas Distⁿ**	**Vol. Liq. Storage**	**Ind. Process /Comb.**	**Paints/ Coatings**	**Other Solvent Use**	**Total**	**2005 Pre-Plan**	**2005 Post-Plan**	**% Diff. From 1985**
British Columbia	294.4	11.9	5.4	2.1	8.6	9.0	7.7	44.7	304.5	259.8	- 11.8 (LFV -39.4)
Alberta	195.8	1.5	0	1.7	4.0	2.8	5.2	15.1	180.1	165.0	- 15.7
Saskatchewan	82.9	0.8	0	0.3	0	1.2	2.4	4.7	73.7	69.0	- 16.8
Manitoba	71.0	0.8	0	0	0.1	1.5	2.3	4.7	59.8	55.1	- 22.4
Ontario	631.3	52.0	37.1	9.2	28.5	52.9	34.6	214.3	713.2	498.9	- 21.0 (WQC -25.8)
Quebec	355.8	16.6	14.3	3.3	10.4	26.0	17.1	87.6	392.6	305.0	- 14.3
New Brunswick	45.4	1.9	0.4	0.5	1.1	1.2	1.6	6.7	47.9	41.2	- 9.3 (SJA - 23.2)
Nova Scotia	52.2	2.4	0.4	0.6	0	1.2	1.9	6.5	51.3	44.8	- 14.3
Prince Edward Island	11.0	0.1	0	0	0	0.3	0.3	0.7	11.2	10.5	- 4.2
Newfoundland	35.6	0.2	0	0	0	0.8	1.4	2.4	49.3	46.9	+ 31.8
Yukon/N.W.T.	7.0	<0.1	0	0	0	0.1	0.2	0.3	8.3	8.0	+ 14.4
CANADA	1782.4	88.2	57.6	17.7	52.6	97.1	74.6	387.8	1891.9	1504.1	- 15.6
Initiatives		V301 V601 V602	V602 V603 V604 V605	V302 V606	V303 V304 V305 V306 V607 V608 V609 V610 V611 V616	V101 V307 V612	V102 V103 V104 V308 V309 V310 V613 V614 V615				

1 The distribution of emission reductions by sector and province is based on the implementation of all emission control initiatives outlined in the base national prevention program and the illustrative remedial program for ozone non-attainment areas.