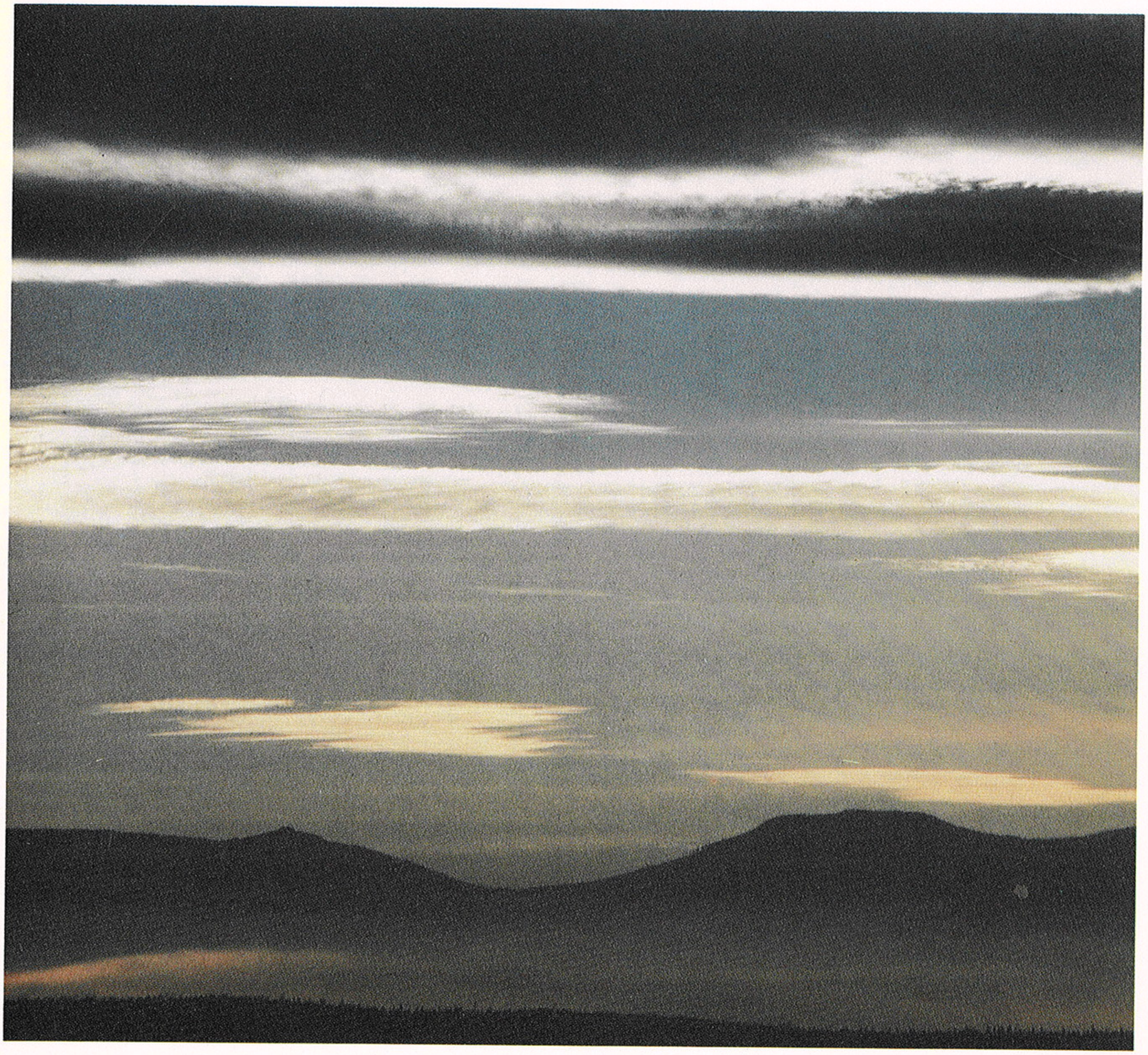
The Clean Air Act Report 1984-1985



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THE CLEAN AIR ACT REPORT
1984-1985

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1 INTRODUCTION

The quality of the air in Canada is improving and should continue to do so.

In 1984-85, landmark decisions important to air quality on three fronts - acidic precipitation, motor vehicle emissions and the lead content of gasoline - were reached. A newly-forged constructive partnership between the federal government and the provinces on the acid rain issue and a spirit of open dialogue between industry, environmental organizations and the public made it possible to tackle these problems with greater determination than ever before.

Air is essential to the well-being of the planet: it must be suitable for breathing, but it is also a dynamic medium that protects the earth from the sun's excess ultraviolet radiation. It is the site of myriad natural, self-purifying chemical reactions; a vehicle for mixing, transporting and redistributing gases and solid particles that arise from the earth. Aesthetically, it is prized for its clarity.

The products of combustion that arise in the human quest for energy, and air contaminants from industrial processes, are the greatest threats to air quality. In an industrialized nation such as Canada, where almost 90 per cent of the population of nearly 25 000 000 people live and work within a few hundred kilometres of the United States border, the quality of the air is particularly vulnerable. Moreover, Canadians have lived through a worldwide switch from coal to oil-based energy, the oil supply crises of 1973 and 1978, a reversal to greater coal dependency in 1980 and a worldwide recession from which industrialized nations are only now emerging. In this context, reaching agreement about what to do on three key environmental fronts is significant.

Significant progress has been made, but there are challenges ahead.

Canada continued to encourage the United States administration to control pollution in a way that is compatible with the Canadian emission reductions announced in 1985, in order to prevent damage from acidic precipitation in both countries. Canada also explored avenues of co-operation on other aspects of air pollution common to both countries through the International Joint Commission and continued her leadership role in the international community through the Organization for Economic Co-operation and Development and the Economic Commission for Europe.

Other challenges to air quality were confronted in 1984-85. Contaminants that result from the incineration of waste and the use of consumer products were of particular concern. Environment Canada scientists investigated how contaminants enter and move through the atmosphere; how contaminant levels are affected by current efforts to bring them under control; how new knowledge influences present air quality objectives; and how significant concerns such as ozone and carbon dioxide buildup, though still not fully understood, may affect Canada. These investigations are the basis on which Environment Canada will build programs that will give Canadians better air quality.

2 ENVIRONMENT CANADA AND THE CLEAN AIR ACT

The Clean Air Act deals with the quality of the atmosphere and the control of contaminants that cause air pollution which may significantly endanger humans, plants, animals or property. Under the Act, the Department of the Environment has regulatory programs in two areas:

Regulatory programs are a shared federal and provincial responsibility.

a) the composition of fuels produced in or imported into Canada; and
b) national emission standards for specific classes of stationary sources of contaminants that constitute a significant danger to human health.

In Canada, however, the responsibility for regulating stationary sources of air pollution rests primarily with provincial governments.

The Federal Department of the Environment, therefore, has an important role as advocate of clean air for Canada and, under the authority of the Clean Air Act, encourages programs in several important non-regulatory areas:

Initiatives in non-regulatory program areas promote the attainment of clean air.

a) establishment of air quality objectives;
b) air pollution monitoring and research;
c) national emission guidelines for all sources of contaminants;
d) consideration of federal-provincial and international concerns;
e) information and data collection and distribution; and
f) promotion, development and demonstration of improved pollution control techniques.

The regulation of motor vehicle emissions is a co-operative federal/provincial endeavour.

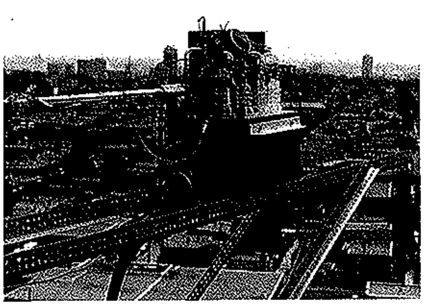
Under the Motor Vehicle Safety Act, administered by Transport Canada, emission standards are set for motor vehicles at the manufacturing stage. Provincial governments regulate and inspect motor vehicles after sale.

3 THE AIR WE BREATHE

Emissions

Emissions of contaminants to the atmosphere threaten air quality.

Contaminants emitted to the atmosphere adversely affect air quality. Collecting information and analysing materials such as smokestack gases enable scientists to determine the quantities of contaminants emitted. These activities were undertaken by Environment Canada under the mandate of the Clean Air Act. Emission measurements in 1984-85 were made for two purposes. The first was to verify compliance with federal emission standards established under the Clean Air Act (see Section 4 of this report). The second was to support evolving programs aimed at problem chemicals such as lead (from all sources including automobiles); dioxins and furans (organic compounds that are toxic at low doses and that contaminate some chemical products or may arise from combustion processes); oxides of sulphur and nitrogen (precursors of acidic precipitation); and volatile organic compounds (the collective term for organic chemicals emitted principally from motor vehicles, solvents, incinerators, and petrochemical and refinery sites).



Estimates or inventories of emissions from specific sources give an indication of the relative importance of each source. Some of the major inventory initiatives are discussed in this section.

Estimates of emissions of sulphur dioxide and nitrogen oxides (the two main contributors to acid precipitation) in Eastern Canada* are shown in Figures 1 and 2. Between 1970 and 1983, emissions of sulphur dioxide from all sources decreased by about 47

* Manitoba, Ontario, Quebec and the Atlantic Provinces

The trend for sulphur dioxide emissions is downward.

per cent. Emissions from primary copper and nickel smelters, the major sources of sulphur dioxide in Canada, decreased by about 57 per cent. This trend is expected to continue due to improved pollution controls.

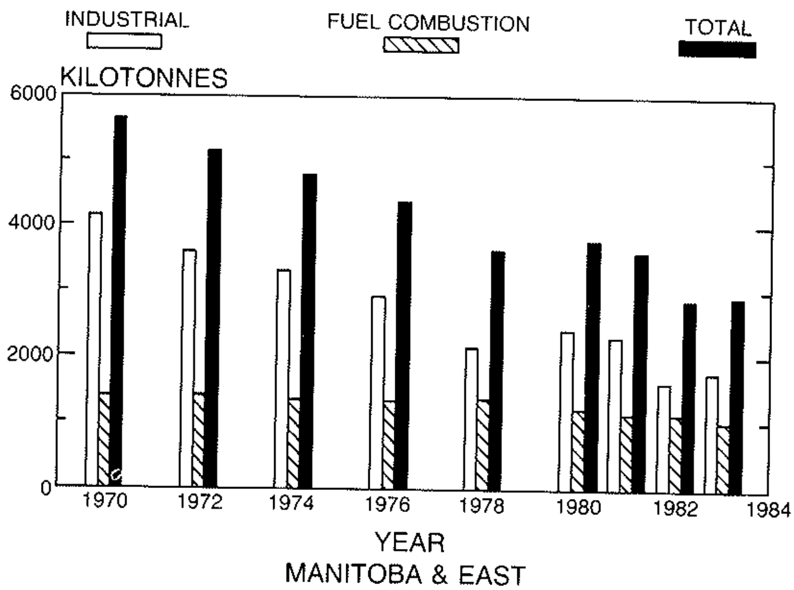


Figure 1 ***Estimated Sulphur Dioxide Emissions in Eastern Canada***

Nitrogen oxide emissions are increasing, mainly from heavy-duty trucks, other diesel-powered mobile equipment and fuel burning.

Emissions of nitrogen oxides in Eastern Canada have increased by about 20 per cent since 1970. The sources contributing to this rise are transportation vehicles, including passenger cars and light- and heavy-duty trucks, trains, airplanes and ships; mobile equipment used in forestry, agriculture, construction and mining; and the combustion of fuels used in industry and commerce, the generation of electricity and the heating of our homes.

Due to the enactment in the mid-seventies of regulations affecting cars and light-duty trucks, emissions of nitrogen oxides from this source have remained essentially constant despite a significant increase in the number of these vehicles on the road.

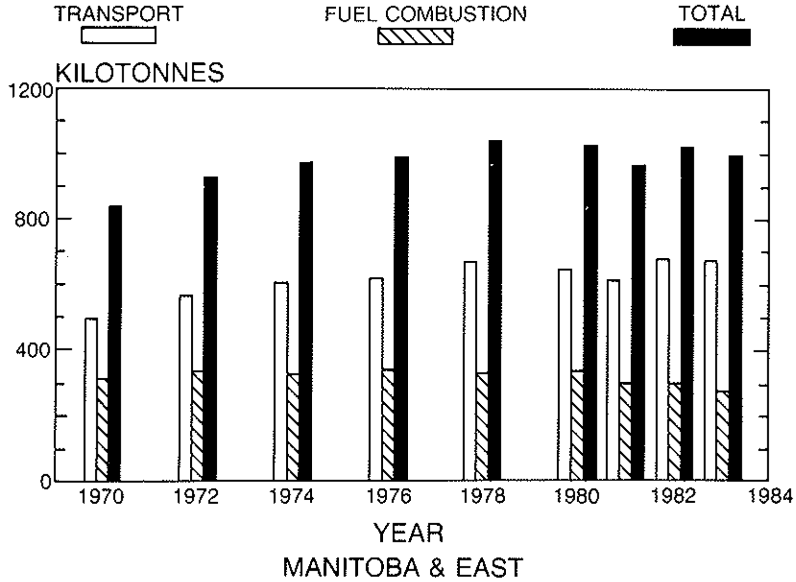


Figure 2 ***Estimated Nitrogen Oxides Emissions in Eastern Canada***

Since that time, the overall rise in emissions from transportation vehicles has occurred largely as a result of increases in emissions from heavy-duty trucks and other mobile equipment used in forestry, agriculture, construction and mining. The increase in emissions from the combustion of fuels is largely due to the increased use of fuels by utilities for the generation of electricity. Emissions from residential and commercial applications have declined, reflecting the change in fuel use to natural gas and electricity.

Emissions information and mathematical models may be used to predict acidic deposition.

Emissions inventories of contaminants that give rise to acidic deposition and oxidants are required for long range atmospheric transport and deposition mathematical models being developed by Environment Canada to predict the impact of air contaminants downwind of emitting sources. To test these models, emissions data were compiled for sulphur dioxide, nitrogen oxides, volatile organic compounds, particulate matter and other contaminants, and resolved spatially on a 127 km^2 grid covering all of Canada. Typical seasonal, day of the week and hour of the day variations of these emissions were also established.

Volatile organic compound emissions are classified according to their potential to promote oxidant formation.

In order to understand how photochemical oxidants are formed, scientists must compile estimates of emissions of volatile organic compounds by compound or by class of compounds, as these react differently in the formation of oxidants. In a study undertaken jointly with the Ministry of the Environment of Ontario, emissions of volatile organic compounds were classified into different reactivity classes for the sources of these contaminants in Ontario. The methodologies developed in this study will be applicable to the study of similar emissions across the country.

Lead emissions have decreased by over 21 per cent since the last inventory survey in 1978.

National emissions of lead to the atmosphere in 1982 were estimated at 11 466 tonnes. The sources of lead emissions are depicted in Figure 3. More than 60 per cent of atmospheric lead is generated by gasoline combustion. The impact of environmental regulations on the lead content of gasolines has significantly reduced the amount of lead entering the atmosphere from this source. Progress under the lead phase-down program is described in Section 4 of this report.

Two classes of chemicals, PCDDs and PCDFs, were the subject of a new emission inventory in 1984-85.

Environment Canada made a preliminary review of the sources and releases of polychlorinated dibenzo-ρ-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) in the Canadian environment. The scientific information available for making accurate estimates of the releases from major sources was very limited, and caution should therefore be exercised in interpreting the estimates shown in Table 1. One of the priority areas identified by the Minister's Advisory Committee on Dioxins is the incineration of municipal garbage. This is being addressed by the national incinerator testing program discussed in Section 4.

Table 1 ***Identified Major Sources and the Respective Potential Releases of PCDD and PCDF to the Canadian Environment***

Sources	Releases (g/annum)* PCDD	PCDF
Combustion Sources		
Municipal Incineration		
- Fly ash	2900-7100	4900-15600
- Air emissions	250-13700	550-21700
Sewage Sludge Incineration Emissions	1400-3300	1500-6500
Wigwam Burner/ Wood Waste Boiler Emissions	(0-30200, PCDD and PCDF)	
Forest Fire Emissions	58700	**
Chemical Sources		
Pentachlorophenol	1.4×10^6***	0.8×10^6***
Polychlorinated Biphenyls (PCBs)	-	75000***

* PCDD - polychlorinated dibenzo-ρ-dioxins
PCDF - polychlorinated dibenzofurans

** Not available

*** Presence in these products represents only a potential for release, not actual quantities lost to the environment. The likelihood that these quantities would be released in one year is remote.

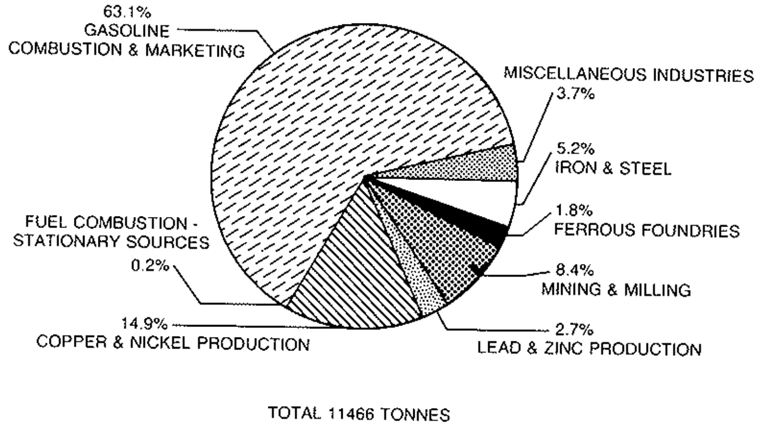


Figure 3 ***Lead Emissions to the Atmosphere in 1982***

Air quality objectives represent a federal-provincial consensus on benchmarks for air quality.

National Ambient Air Quality Objectives

Scientific investigation can establish what levels of contaminants in air are harmful. On the basis of such research, the Federal-Provincial Advisory Committee on Air Quality formulates ambient air quality objectives to protect human health and the environment. These objectives may then be prescribed across the country. There are now national ambient air quality objectives for sulphur dioxide, nitrogen dioxide, ozone, carbon monoxide and total suspended particulates, and the levels of these contaminants are routinely monitored in urban areas by the National Air Pollution Surveillance (NAPS) Network. Monitoring not only provides information on trends in contaminant levels but can also be used to evaluate control programs. Three levels of air quality objectives have been defined.

1) The maximum tolerable level. Concentrations of air contaminants exceeding this level could threaten the health of the general population.

2) The maximum acceptable level. This concentration is intended to provide adequate protection against adverse effects on the most sensitive receptors in the environment.

3) The maximum desirable level. This level of air quality is a long-term goal: it forms the basis for a policy governing the protection of pristine areas of the country, and inspires continuing improvement in control technology.

Air Quality Monitoring

The National Air Pollution Surveillance Network is operated jointly by the federal and provincial governments to monitor urban air quality.

Operated jointly by the federal and provincial governments, the NAPS Network consists of 450 instruments at 148 stations in 52 cities. Monitoring stations are located in most Canadian cities with populations over 50 000. Each monitoring station measures the quality of the air in the vicinity of the station only, and measurements may not necessarily represent the air quality in the entire community.

Air quality trends show that the levels of many contaminants are declining in urban centres.

Air quality trends are established using data generated by the NAPS Network. One meaningful way of looking at the trends data is to compare them to the National Ambient Air Quality Objectives (NAAQOs) maximum acceptable level (see Figure 4 and Table 2). It should be noted that there is no national air quality objective for lead. The annual mean, generally considered a good indicator of pollutant trends, correlates well with changes in emissions resulting from control actions or economic pressures such as the cost of energy or materials.

For ozone, however, a more meaningful indicator than the annual mean is the composite average of the measured hourly values that are exceeded by only two per cent of the total hourly readings recorded at any given NAPS station. When the composite average is

Composite NAPS Network annual means for particulate, sulphur dioxide and nitrogen dioxide are compared to the annual national ambient air quality objective. Carbon monoxide is compared to the 8-h national ambient air quality objective.

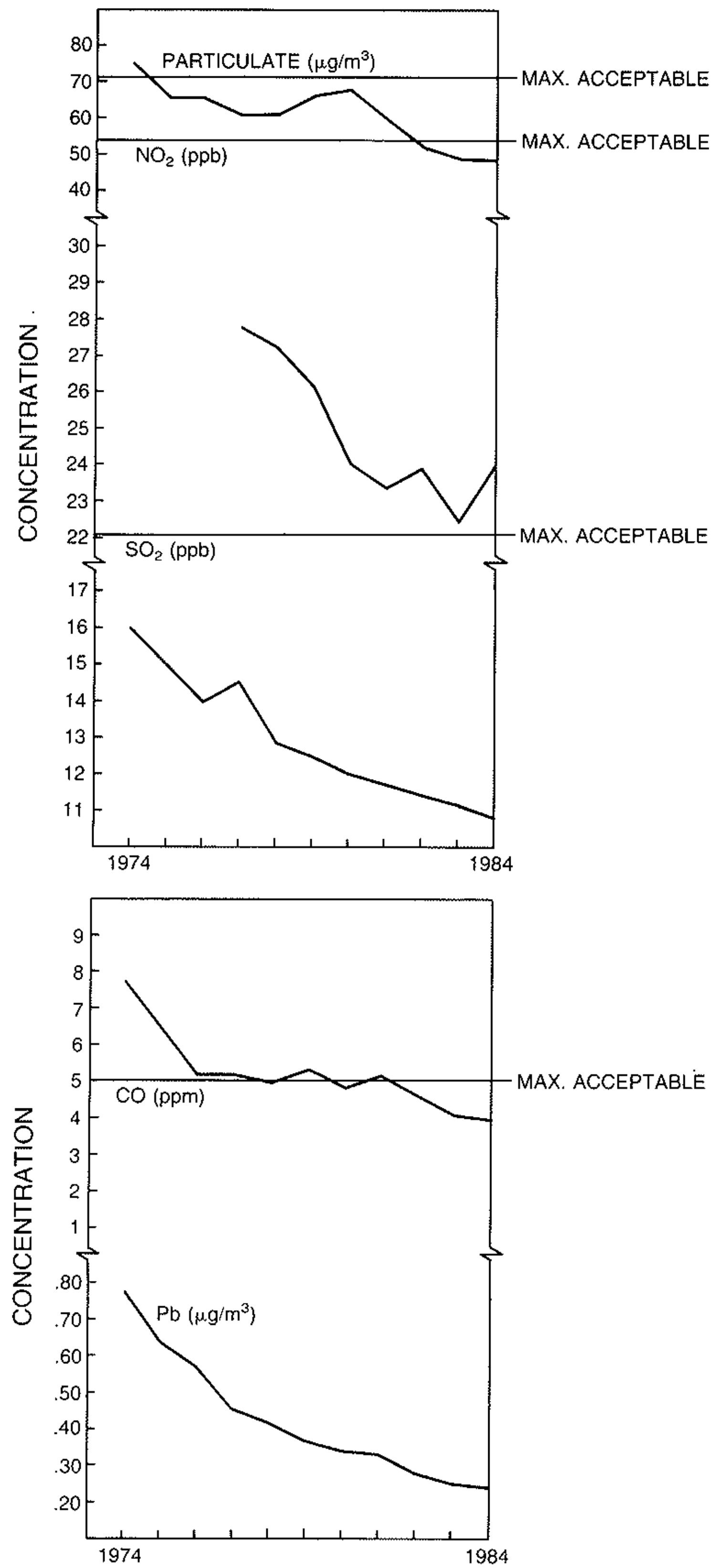


Figure 4 ***Air Quality Trends***

Ozone is compared to the 1-hour national ambient air quality objective.

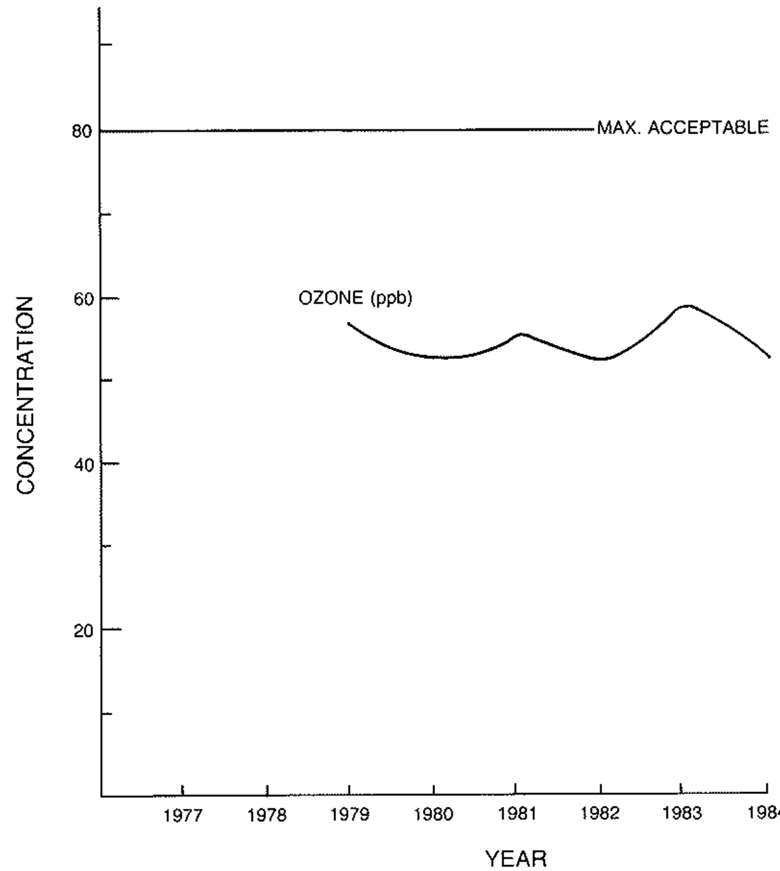


Figure 5 ***Trends in Ozone Levels***

Table 2 ***Trends in Air Pollution***

Pollutant	Decrease (%) in Annual Average Level from 1974 to 1984
sulphur dioxide	31
nitrogen dioxide	23
suspended particulates	41
carbon monoxide	54
lead	66

Note: Ozone has only been monitored since 1979; nitrogen dioxide since 1977; all other pollutants since the early 1970s.

compared to the maximum acceptable one-hour air quality objective (see Figure 5), no general trend in ozone levels is apparent.

Air quality index values indicate the general condition of the air in urban centres.

Environment Canada summarizes complex monitoring data for all contaminants except lead in a single number called the air quality index (see Table 3). As an index of air quality, this number allows comparisons to be made among cities and among areas of the same city, and reveals trends in overall levels of air pollution. The index is calculated using methods recommended by the World Health Organization as adopted by the Federal-Provincial Advisory Committee on Air Quality.

Apart from the above monitoring program for contaminants for which there are air quality objectives, other contaminants - inhalable particulate matter, lead, sulphates and volatile and particulate-bound organic compounds - are of concern and have been monitored at selected sites in Canada. As a result of these measurements we now know that more than 50 per cent of the total suspended particulate in Canadian urban atmospheres is in the inhalable size range and hence can be deposited in the respiratory tract. We also know that most of the airborne man-made carbon, lead, sulphur and nitrogen-containing compounds are found in the fine fraction of inhalable particulate matter. Because of their small size these particles may be transported great distances and affect areas far from the original point of discharge. Inhalable particulate levels have not been monitored long enough to establish trends. Vehicular transportation, road dust, sulphate formed in the atmosphere, wood burning and oil refining appear to be the major sources of fine particulate. Sulphate is of particular concern, and concentrations of it are reported routinely by NAPS.

Table 3 ***Annual Air Quality Index Values For Some Canadian Cities From 1975 to 1984***

Index	Category
0-25 -------	Good
26-50 -------	Fair
51-100 ------	Poor
100+ ------	Very Poor

City	Station Location	'75	'77	'79	'81	'83	'84
Halifax	Barrington & Duke (C)	33	22	26	27	21	15
Montreal	Jardin Botanique (R)	45	39	34	26	22	24
Montreal	Duncan & Decarie (C)	50	43	51	47	46	37
Ottawa	88 Slater Street (C)	41	42	38	24	33	34
Toronto	Breadalbane (C)	39	40	44	41	40	42
Toronto	Bathurst & Wilson (R)	X	44	45	39	29	38
Toronto	Evans & Arnold (I)	38	40	40	40	38	35
Hamilton	Barton & Sanford (C)	52	51	48	43	45	42
Winnipeg	Jefferson & Scotia (R)	X	34	44	35	28	26
Regina	1620 Albert Street (C)	X	X	40	52	33	43
Edmonton	10255-104th Street (C)	X	48	53	43	34	24
Edmonton	127th St. & 133rd Ave. (R)	36	39	45	39	33	25
Edmonton	17th Street (I)	26	30	30	26	26	20
Calgary	39th St. & 29th Ave. N.W. (R)	34	36	37	36	33	32
Vancouver	Robson & Hornby (C)	35	36	37	42	18	24
Vancouver	Rocky Point Park (I)	X	X	32	43	25	22

Notes:
1. X = insufficient data to calculate an index.
2. Each station is categorized by the dominant activity at the site: (C) Commercial (R) Residential (I) Industrial.
3. The air quality measured at a monitoring station represents the condition of the air in the 0.5 to 4 km range of the site and may not necessarily represent community-wide air quality.

Smog is a problem in many cities.

In the fall of 1984 a monitoring program for volatile organic compounds was established in Toronto and Montreal. Levels of organic compounds in Canadian cities appear to be similar to levels reported for American cities. Organic compounds are monitored because some may pose a health risk or may promote ozone and acid formation in the atmosphere.

Research

Air quality research leads to a better understanding of air pollution and how it can be controlled.

The new knowledge that results from air quality research will enable the Canadian Government to respond effectively to regional, national and international air quality issues. Several air quality concerns - acidic precipitation, airborne toxic chemicals, depletion of the ozone layer, carbon dioxide and the greenhouse effect, and arctic haze - were investigated and in some cases, research findings are suggesting new and better ways to address the concerns.

Acidic precipitation research has recently revealed several important facts. Nitrogen oxides, which are usually associated with local emission sources, contribute more significantly to atmospheric acidity and to acidic deposition, especially in winter, than was previously thought. More than 20 per cent of the total annual deposition of sulphates and nitrates occurs in the absence of rain and snow, while fog and low cloud contribute significantly to wet acidic deposition on vegetation at high elevations. More than half of wet acidic deposition occurs in less than 20 per cent of precipitation events. Investigations of snow melt, snowpack and meltwater chemistry indicate that rapid runoff of meltwater into streams or lakes could result in acidification which in turn could cause the aluminum ion concentration to rise to potentially lethal levels for certain fish species. Approximately 60 per cent of this acidity is due to nitrates in the snowpack. Mathematical models were developed to identify where emissions should be reduced in order to achieve proposed target loadings. The models were partially validated using tracer experiments and will be further tested in future.

Toxic chemicals research focused on trace elements, airborne pesticides and other classes of organic chemicals.

Trace elements were measured in air, precipitation and lichens at sites in Eastern Canada. Lead, nickel, copper, vanadium and chromium were found in the snowpack of the Eastern Canadian Shield at concentrations slightly above those of the bedrock, indicating an industrial or automotive origin. Similarly, concentrations of lead and sulphur in lichens were found to be higher in Eastern Canada than elsewhere.

Research provides clues to the movement of chemicals of concern through the atmosphere over both short and long distances.

Both the short- and long-range transport of pesticides were investigated. A model for predicting the movement of pesticides applied by aircraft over forests was selected for use by regulatory agencies to determine the conditions under which pesticides may be applied. Studies are in progress to estimate the amounts of toxic and other chemicals that are being deposited to the Great Lakes from the atmosphere. Trajectory models indicate that sources in the United States contribute the bulk of the deposition of both lead and nitrogen oxides to the Great Lakes. However, the deposition of lead from Canadian sources into Lake Ontario is as large as that from United States sources, and Canadian sources contributed about one-quarter of the lead deposited to Lake Huron. Organic pollutants, including PCBs, from industrial and combustion sources have been detected in the air in the vicinity of the Niagara River, but the actual quantities of these pollutants have yet to be determined.

The Department has developed air pollution models that can be used to predict the movement and concentration of toxic chemicals released during environmental emergencies. These models employ actual weather information and can be activated at all regional weather centres 24 hours a day, 7 days a week in the event of an emergency.

Protecting the stratospheric ozone layer has become an international priority.

The stratospheric ozone layer shields the earth from excess ultraviolet radiation from the sun. Research on the depletion of the stratospheric ozone layer has culminated in the adoption and signing in Vienna on March 22, 1985, of the "Vienna Convention for the Protection of the Ozone Layer". Canada played a leading role in developing this Convention, which commits participating nations to protecting human health and the environment against the adverse effects of depletion of the ozone layer. To achieve this, Canada and other nations are working, through the United Nations Environment Program, to develop a protocol for equitable control measures for chlorofluorocarbons, chemicals which our research indicates are threatening the ozone layer.

Carbon dioxide buildup in the atmosphere could alter the earth's climate.

An increase in atmospheric carbon dioxide could lead to a change in the earth's climate. Like greenhouse glass, the atmosphere is transparent to incoming short-wave radiation from the sun, but carbon dioxide, like glass, impedes the outgoing long-wave radiation and this causes a warming of the atmosphere. Environment Canada measures carbon dioxide at Sable Island, Nova Scotia and Alert, Northwest Territories as part of a global monitoring program sponsored by the World Meteorological Organization. The Department also collaborates with the United States' National Oceanographic and Atmospheric Administration in taking measurements at Mould Bay, NWT. Since 1975, when measurements began, carbon dioxide concentrations have increased at the rate of 1.4 parts per million and 1.7 parts per million per year at Sable Island and Alert respectively. The average global concentration in 1984 was 344 parts per million.

A number of other gases that behave like carbon dioxide are also known to be increasing in the atmosphere, and a program has been initiated to measure them. This information is being used to anticipate the effect of possible climatic changes in Canada.

The Arctic is being affected by air pollution from the south.

Our concept of the Arctic as an unpolluted environment has been drastically altered in the past five years as a result of a co-operative international air monitoring and research program. Levels of suspended particulates, comprising mainly sulphates, soot and hydrocarbons transported from mid-latitudes, were found to be 20 to 40 times higher in winter than in summer. This form of air pollution may lead to climate modification, acidification of land and water ecosystems, and degradation of visibility.

4 PROTECTING OUR AIR

The Acid Rain Abatement Program

The federal government has moved ahead in the fight against acid precipitation. Acid precipitation - rain, snow, gases and dust - is caused mainly by two common by-products of our modern industrialized society: sulphur oxides and nitrogen oxides. The main sources of sulphur oxide emissions in North America are coal-fired power generating stations and smelters; the main sources of nitrogen oxides emissions are automobiles and other vehicles. Acid precipitation can endanger the lives of aquatic organisms and cause corrosion of materials. Acidic deposition to soil, alone or in combination with other factors such as ozone, is suspected of harming plants, especially trees.

Canada has an exemplary acid rain abatement program.

In March 1984, federal and provincial governments made a commitment to reduce sulphur dioxide emissions in Eastern Canada by 50 per cent of the 1980 base level (i.e., by 2.3 million tonnes per year) by 1994. This emission reduction was tied to a specific objective for acid deposition of no more than 20 kg/ha•a*, a quantity considered low enough to protect moderately sensitive lakes and streams. An agreement announced by federal and provincial environment ministers in February 1985 specified reductions in sulphur dioxide emissions in each province east of the Saskatchewan-Manitoba border. Table 4 shows the agreed reductions. Federal and provincial ministers will be discussing further reductions to reach the 2.3 million tonne target.

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* kg/ha•a = kilograms per hectare per year (annum)

Table 4 *Sulphur Dioxide Reductions and Emission Objectives for 1994*

Province	1980 Base Case (tonnes)	Reductions (tonnes)	Emission Objectives (tonnes)
Manitoba	738 000	188 000	550 000
Ontario	2 194 000	1 164 000	1 030 000
Quebec	1 085 000	485 000	600 000
New Brunswick	215 000	30 000	185 000
P.E.I.	6 000	1 000	5 000
Nova Scotia	219 000	15 000	204 000
Newfoundland	59 000	14 000	45 000
Totals	4 516 000	1 897 000	2 619 000

On March 6, 1985, a comprehensive federal acid rain program - including a funding package - was announced. Some of the major components of this program are:

a) tougher new motor vehicle emission standards (equivalent to those in effect in the United States) for cars and light trucks;

b) guaranteed funding to assist in the acceleration of a domestic emissions clean-up program ($150 million for controlling emissions at smelters, $25 million for developing technology and $70 million for studying cleaner, more efficient use of coal);

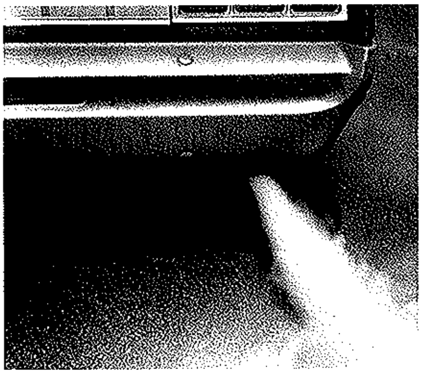
c) continuation of a world-class scientific research and monitoring program ($18 million per year to 1989/90).

In 1979, members of governments of the United Nations Economic Commission for Europe, including Canada and the United States, signed the Long Range Transboundary Air Pollution Convention. Under this Convention, 20 countries (the "30% Club") signed a sulphur dioxide abatement protocol in July 1985, endorsing a proposal to reduce sulphur dioxide emissions by 30 per cent by 1993. Canada is a member of the Executive Body for the Convention and was a leader in the negotiations which led to the protocol.

New Motor Vehicle Emission Standards

Canadian motor vehicle emission standards will be more stringent in 1987.

Nitrogen oxides, hydrocarbons and carbon monoxide are three principal motor vehicle emissions of concern as contributors to the acid rain problem and to air pollution in cities. On March 6, 1985, Canada announced the setting of tighter light duty vehicle emissions standards which will apply to 1988 and all subsequent automobile models. By the year 2000, these standards are projected to reduce automotive pollutants by more than 45 per cent from the emission levels that would have existed without the new standards. They are shown in Table 5.



With the new standards in place, the struggle against the threat posed by emissions from motor vehicles is much closer to being won. Nitrogen oxides, hydrocarbons and carbon monoxide, each in its own right potentially harmful, will be present in much lower concentrations in future. Lower motor vehicle emissions are predicted to result in lower urban levels of ozone and other oxidants, which are products of the chemical interaction of automotive hydrocarbon and nitrogen oxides emissions. Ozone can harm plants, animals and materials. Motor vehicle emissions also contribute to acid precipitation. A cutback in all acid-forming emissions is essential to the successful resolution of this problem.

Table 5 ***Canadian Emission Standards for Light Duty Vehicles***

	Current		Effective Sept. 1/87	
	(g/km)	(g/mile)	(g/km)	(g/mile)
Cars				
Hydrocarbons	1.24	2.00	0.25	0.41
Carbon Monoxide	15.50	25.00	2.11	3.40
Nitrogen Oxides	1.92	3.10	0.62	1.00
Evaporative Emissions (grams/test)	24.00	24.00	2.00	2.00
Diesel Particulate Emissions	-	-	0.12	0.20
Light Trucks				
Hydrocarbons	1.24	2.00	0.50	0.80
Carbon Monoxide	15.50	25.00	6.21	10.00
Nitrogen Oxides	1.92	3.10	1.43	2.30
Evaporative Emissions (grams/test)	24.00	24.00	2.00	2.00
Diesel Particulate Emissions	-	-	0.16	0.26

Lead in Gasoline - Progress Toward the Phase-Down

Gasoline sold in Canada will contain very little lead after 1986.

The lead content of leaded gasoline has been regulated since 1976. Lead is added to gasoline as an anti-knock compound in order to improve its combustion characteristics. As the gasoline is consumed, the lead is released to the environment, and this constitutes the major source of atmospheric lead emissions in Canada. While some aspects of the poisonous character of lead were still being debated, there was, in 1984, convincing evidence and strong public support for a tighter lead content regulation. As announced in the *Canada Gazette* on May 16, 1984, beginning January 1, 1987, the maximum allowable lead content in leaded gasoline will be 0.29 grams per litre. This translates into an expected 80 per cent reduction in annual motor vehicle lead emissions in 1987 from the 1973 unregulated peak levels. Continued regulation may lead to even more dramatic results by the year 2000 (see Figures 6 and 7).

Furthermore, the Commission on Lead in the Environment, sponsored by the Royal Society of Canada, is studying the unresolved aspects of the lead issue. The Commission will make its final report to the Minister of the Environment in September 1986.

Environment Canada has monitored compliance with current regulations: of 100 refinery and retail outlet checks across the country in 1984, none revealed leaded gasoline with more than the legal lead limit. "Lead-free" gasoline - an alternative to leaded gasoline that can be used in most new automobiles - was also tested. At retail outlets, only 3 per cent of more than 1500 tests revealed "lead-free" gasoline with more than the regulated lead content of 0.013 grams per litre; of 62 refinery tests, none revealed contravention of the regulation. Misfuelling - the intentional or inadvertent use of leaded gasoline where lead-free gasoline should

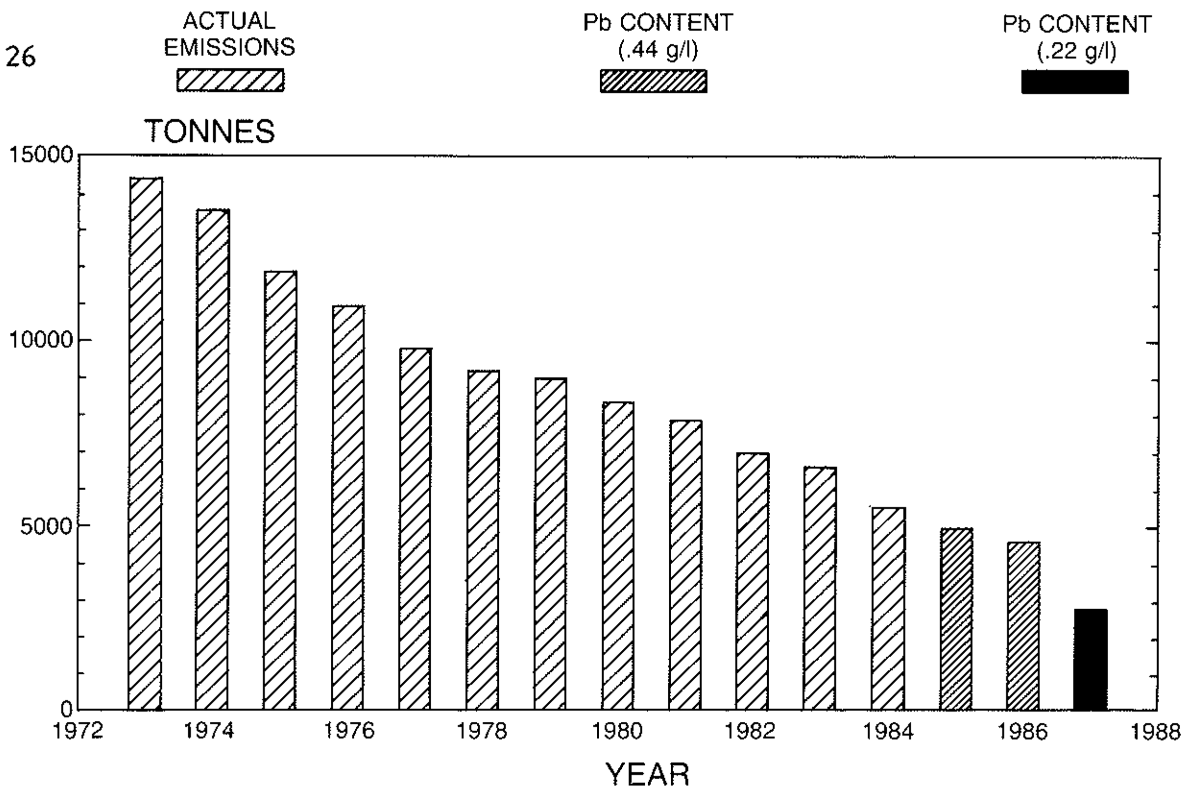


Figure 6 *Automotive Lead Emissions, 1973-1987*

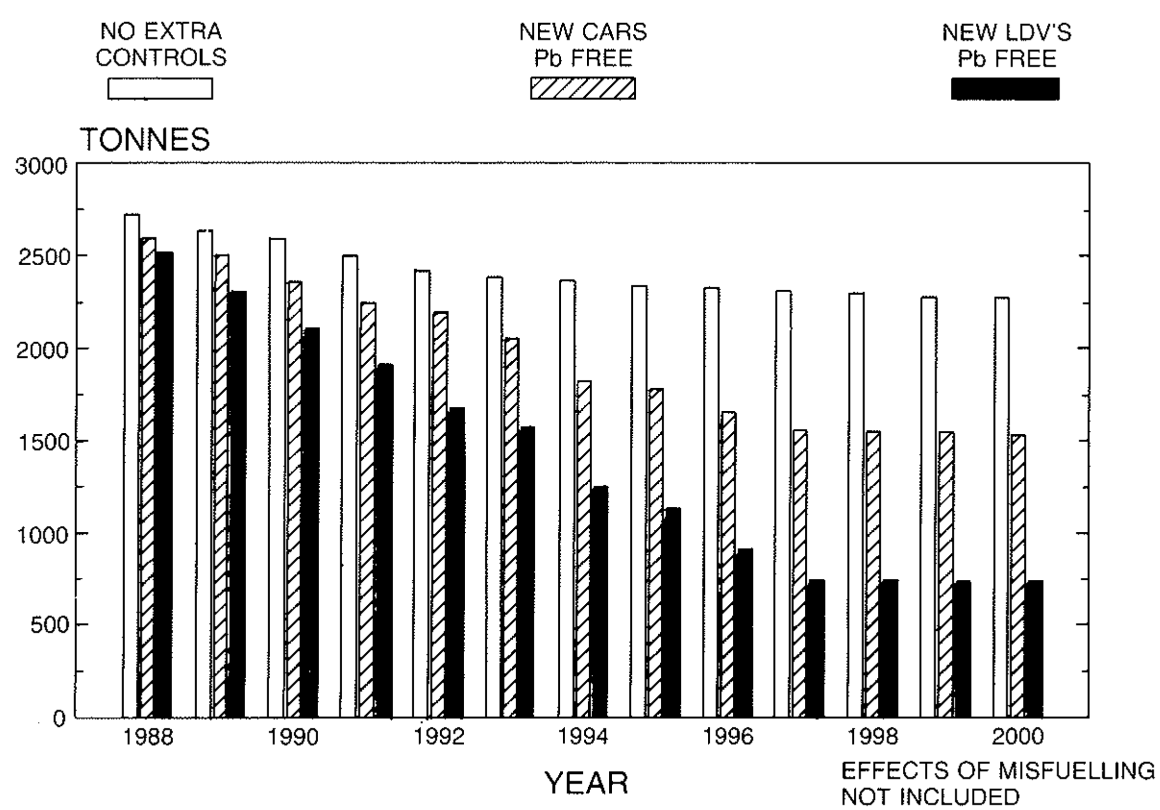


Figure 7 *Automotive Lead Emission Projections, 1988-2000*

be used - was estimated to be 13 per cent in 1984. The effects of misfuelling are serious. It damages catalytic converters, increases lead emissions, perpetuates leaded gasoline use and undermines the intent of federal motor vehicle emission standards. The provinces have the authority to regulate misfuelling, and some have taken action to reduce it.

Oxidants

Ozone, the major oxidant of concern in the atmosphere, has been linked to respiratory problems, smog and plant damage. Although no clear trend can be observed, ozone levels frequently exceed national ambient air quality objectives during the summer months. Emissions of oxides of nitrogen and hydrocarbons from motor vehicles, among other sources, cause ozone formation through atmospheric reactions. Periodic influxes of natural stratospheric ozone can also raise levels in the lower atmosphere.

Motor vehicle emission controls are expected to reduce the potential for atmospheric oxidant formation.

Oxidant control is tied to motor vehicle emission control. As the acid rain abatement program is implemented and motor vehicle emissions begin to decline after 1987, oxidant levels should likewise decline. Authorities in the British Columbia Lower Mainland, however, plan to do even more to reduce ozone levels. Both the geographical and meteorological conditions of the Vancouver area support high ozone production. In addition, unlike high ozone regions in Eastern Canada, the British Columbia Lower Mainland does not receive significant ozone influx through long-range transport. An assessment of these conditions in 1984 has led to the formulation of a co-operative federal-provincial-municipal plan for an all-Canadian solution to this ozone problem.

The National Incinerator Testing and Evaluation Program

Environment Canada's technical and financial support fosters better incineration technology and cleaner emissions.

Incineration is an attractive alternative to landfilling for the disposal of Canada's annual 16 million tonnes of solid municipal waste. One major stumbling block to gaining acceptance for incineration facilities is the public's concerns about the environmental and health effects of emissions from incinerators. The National Incinerator Testing and Evaluation Program (NITEP) is a four-year co-operative federal-provincial-municipal-industrial research program designed to address these concerns. Under NITEP, different conventional incinerator technologies will be evaluated at three Canadian sites. No regulatory control of incinerator emissions is planned at this time, although the issue will be reviewed upon completion of the test program.

In 1984, phase I of the NITEP program was completed at an energy-from-waste incinerator facility at Parkdale, Prince Edward Island. Phase I has demonstrated that existing technology can meet the strictest environmental standards for incinerators in Canada. Emissions of concern can be kept to a minimum, with substantial benefits in energy recovery and reduced use of valuable land for landfill sites. A film and a report on the Parkdale test will be released in 1985. Phase II will involve testing an incinerator at Quebec City in 1986.

Intergovernmental Programs

The Federal-Provincial Advisory Committee on Air Quality, established in 1969, has been effective in promoting co-operation, sharing knowledge and co-ordinating, at the operational level, air pollution assessment and control programs. In the past the

Intergovernmental co-operation is the key to successful resolution of some major concerns.

Committee has been concerned principally with contaminants, such as sulphur dioxide, that are uniquely air quality problems. Many air contaminants, however, are not unique to the air but may be found in food, for example, or water. The Committee has concluded that it should address emerging issues such as the overall management of these multi-media problems. It is concerned with other issues, including long-range transport of air pollutants; automotive, woodstove and waste-oil burning emissions; and monitoring programs. The Committee will continue its work in setting air quality objectives.

The Federal-Provincial Ministerial Management Board, supported by the Federal-Provincial Long Range Transport of Air Pollutants Steering Committee, deals only with acidic deposition. This Board agreed, in February 1985, that sulphur dioxide emissions should be reduced to the levels described on page 21 of this report.

At the request of the International Joint Commission (IJC), the major activity of the IJC's Air Pollution Advisory Board during the review period was an assessment of environmental monitoring within 400 kilometres of the Canada-United States border. The Board is now examining the extent of environmental monitoring within this area.

Environment Canada's involvement with the Air Management Policy Group of the Organization for Economic Co-operation and Development continued in work relating to asbestos, benzene, the long-range transport of air pollution, emission inventories and oxidants.

Other Programs

The co-operative efforts of the chlor-alkali industry and governments in response to federal regulations have realized an impressive 95 per cent reduction in mercury emissions to the atmosphere and a marked decline in mercury consumption by the industry since the early 1970s. The present monitoring and inspection program has shown that further emission reductions are possible.

National control programs have markedly reduced emissions of mercury, vinyl chloride and lead.

There have been substantial reductions in vinyl chloride emissions from polyvinyl chloride plants since regulations were established in 1979. A report on the co-operative federal-provincial-industry program to monitor compliance with regulations will be available in 1986.

Secondary lead smelter emission regulations for particulate matter and its lead content applied to 51 facilities across Canada in 1984. The inspection program has shown that emissions meet federal and provincial requirements in all but two facilities.

During 1984 an extensive study of the levels of asbestos in ambient air was carried out in three asbestos mining towns in Quebec. The Department of National Health and Welfare is evaluating the results of this study. The asbestos facilities tested in Quebec in 1984-85 were all in compliance with the asbestos mining and milling national emission standards regulations.

5 FURTHER READING

Certain accomplishments under the Clean Air Act in 1984-85 that are outlined in this report are presented and explained in more detail in formal departmental publications. These publications are:

1. Environment Canada. Air Pollution Emissions and Controls: Light Duty Vehicles. Report EPS 2/TS/4. August 1984.
2. Environment Canada. The Atmospheric Pathway of Oxides of Nitrogen. Report EPS 2/TS/2. May 1984.
3. Environment Canada. Light Duty Vehicle Emissions and the Oxidants Issue in Canada. Report EPS 2/TS/3. May 1984.
4. Environment Canada. Measurement of Emissions of Polychlorinated Dibenzo-p-Dioxin (PCDD) and of Polychlorinated Dibenzofuran (PCDF) from the Des Carrières Incinerator in Montreal. Report EPS 5/UP/RQ 1. December 1984.
5. Environment Canada. National Urban Air Quality Trends 1974-1981. December 1984.
6. Environment Canada. The Phase-down of Lead in Gasoline. Report EPS 2/CC/1. August 1984.
7. Environment Canada. River Road Environmental Technology Centre Annual Report 1983-4. n.d.
8. Environment Canada. Status Report on Compliance with Secondary Lead Smelter Regulations - 1984. Report EPS 1/MM/1.
9. Environment Canada. Status Report on Compliance with the Chlor-Alkali Mercury Regulations 1982-83. Report EPS 1/HA/1. March 1985.

10. Environment Canada. Summaries of Studies Related to the Review of New Motor Vehicle Emission Standards. Report EPS 2/TS/5. November 1984.

11. Environment Canada. Atmospheric Environment Service. Air Quality and Inter-Environmental Research Branch Annual Report 1984-85. April 1985.

12. Environment Canada. Atmospheric Environment Service. Federal LRTAP Liaison Office. LRTAP Newsletter. June 1985.

13. Environment Canada. Report EPS 7/AP/13. National Air Pollution Surveillance. Annual Summary for 1983. September 1984.

14. Environment Canada, British Columbia Ministry of Environment and Greater Vancouver Regional District. A Report on the Assessment of Photochemical Oxidants in the Lower Mainland. August 1984.