



Project Summary

Assessment of National and Regional Acid Deposition Precursor Emission Trends

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The report that this summary describes was prepared as part of the U.S. Environmental Protection Agency's (EPA's) effort to summarize current knowledge on acid trends in emissions of pollutants considered to be acid deposition precursors, primarily sulfur oxides (SO_x), nitrogen oxides (NO_x), and volatile organic compounds (VOCs). Special emphasis was placed on recent trends (1980-1985) and on new information learned by researchers since 1983, although comparisons were made with emission trends from 1940 to 1980 for perspective.

From 1980 to 1985, SO_x emissions showed a net decrease of almost 11%, VOC emissions decreased 7%, and the change in NO_x emissions was insignificant compared to potential uncertainties in the analysis methods. Historically, emissions increased from 1940 to the mid-1970s as fuel use and Gross National Product (GNP) grew. The late 1970s and early 1980s was the "emissions control era" when programs enacted under the Clean Air Act produced a downward emission trend for SO_x and VOC while the economy was still growing. Since 1980, the relationships between emissions and the economy, fuel use, and regulations have become more complex so that predictions of how economic growth and control regulations will combine to affect emissions in future years are difficult.

This Project Summary was developed by EPA's Air and Energy Engineering Research Laboratory, Re-

search Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

The purpose of this report is to examine trends in acid deposition precursor emissions from 1980 through 1985. Emission trends in the 1980s have important implications for future EPA policy as potential control efforts need to take into account how emissions are changing by source emitting sector and region.

Emission trends data have been published for the 1940-1980 time period by the National Acid Precipitation Assessment Program (NAPAP). More recent emission trends data are necessary in order to assess the impact of emission controls, the economy, and regulations on emissions. Additionally, data on Canadian emission trends are important since acid deposition is an international issue and U.S. source emissions may impact Canadian receptors and vice versa.

EPA's emissions estimation method uses national level fuel combustion or production data, emission factors, and average levels of pollution control. This "top-down" method is used to estimate national emissions in this report. Regional emissions are estimated using state or regional activity data.

Scope of Analysis

Annual emissions of SO_x , NO_x , and VOC are estimated for the years 1980-1985. The emissions estimates are com-

pared to trends in GNP, emissions release height, and population. Emissions are estimated by source category (electric utilities, industrial activities, transportation, and other), and by Federal administrative region. Canadian emissions from 1970 to 1984 are presented at the national and source category (fuel combustion/stationary sources, industrial processes, transportation, and other) levels. U.S. emissions data from 1940 to 1980 are presented to provide an historical perspective. Emphasis is placed on new information made available since 1983 by acid deposition researchers.

Results

U.S. Emissions Trends from 1940 to 1985

Emissions trends since 1940 break down into three periods. The 1940 to mid-1970s period was one of emissions growth during which, generally, emissions increased proportionately with fuel use and GNP. The latter half of the 1970s and the early 1980s was the "emissions control era" when programs enacted under the Clean Air Act produced a downward trend for all pollutants except NO_x while the economy and fuel consumption continued to grow. After 1983, the relationships between emissions and the economy, fuel use, and regulations became more complex.

The main reason for this added complexity is that many emission reductions were achieved in the 1970s and early 1980s, and few new programs have been instituted since then to go beyond those control levels. The operation and control of emissions sources which are not regulated by New Source Performance Standards have a significant effect on emission trends. Economic factors such as declining commodity prices and foreign competition have reduced emissions from a number of mineral production and heavy manufacturing sectors, most notably copper smelters and iron and steel mills.

U.S. Regional Emission Trends from 1980 to 1985

Regional emission patterns often follow national trends. Eastern regions generally reduced their SO_x emissions at the same

rate as the nation, while western regions, especially one in which a copper smelter shut down, experienced larger SO_x reductions.

Regional NO_x emission trends were generally downward in the eastern U.S. and either flat or upward in the west. Control regulations for NO_x are not as prevalent as they are for other pollutants, so, except for mobile sources, NO_x emissions track almost directly with fuel use. Regional highway vehicle emission trends were similar to those observed nationally: regions with the highest VMT growth showed the least decline in emissions.

Regional VOC trends tracked national trends; this lack of regional variation results from both the absence of dominant source types and the uncertainty in estimating VOC emissions.

Canadian Emission Trends from 1970 to 1984

Eastern Canadian SO_x emissions decreased 44% between 1970 and 1984; U.S. emissions decreased 24% during this time period. Eastern Canadian emissions of NO_x , which were 8% of U.S. levels in 1980, increased by 29% between 1970 and 1984, with most of this increase occurring by 1974. U.S. NO_x emissions increased by 9% from 1970 to 1984. This information provides a useful historical perspective between trends of U.S. and Canadian emissions which could contribute to transboundary transport of acidic air pollution.

U.S. Utility SO_x Emission Trends

Emissions from coal-fired utility boilers decreased by 4% from 1980 to 1985. Much of this reduction was achieved between 1980 and 1982. Although utility SO_x emissions have declined, an increase in the use of higher sulfur coal or uncontrolled utility boilers could rapidly reverse this trend.

The Influence of Stack Height on the Transport of Emissions

Although emission trends analysis indicates an historic decrease in SO_x emissions, this decrease may be counterbalanced by an increase in the amount of SO_x emitted through tall stacks at higher elevations and thus more directly

available for long-range transport. Stack height, velocity, and temperature increases in recent years have been made largely to reduce peak concentrations near major emission sources to meet ambient air quality standards without controlling the quantity of SO_x emitted.

U.S. NO_x Emission Trends from 1980 to 1985

There is no demonstrable trend in national NO_x emissions between 1980 and 1985. However, recent estimates of highway vehicle NO_x emissions indicate a possible increase in these emissions during 1986 and 1987. This is a change from pre-1983 projections that national NO_x emissions would decrease as highway vehicle emissions decreased. It was thought that transportation sector decreases, the result of increasingly stringent NO_x emission standards, would more than offset any NO_x emission increases from utility and industrial sector fuel combustion.

U.S. VOC Emission Trends from 1980 to 1985

VOC emissions declined only about half as much as earlier projections for the time period indicated. The U.S. EPA estimates of VOC emissions prior to 1980 appear to have overestimated the reduction in emissions that would be achieved in response to control programs. This is due to more rapid than expected vehicle miles traveled (VMT) growth, increase in popularity of less well controlled new vehicles, and slower than expected vehicle turnover. VOC estimates are more uncertain than those for SO_x or NO_x .

Emissions in the Near Future

Preliminary fuel consumption data for 1986 and the current relationship between coal, oil, and gas prices indicate that emissions of SO_x , NO_x , and VOC are not expected to vary significantly from 1985 levels during 1986 and 1987, although SO_x emissions may decrease slightly. The flat trajectory of emission trends indicates that, without additional control initiatives, future (1990) emissions of all three pollutants will be higher than they are now if fuel use and VMT increase.



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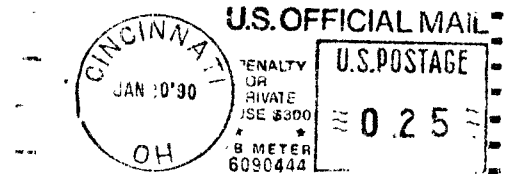
The complete report, entitled "Assessment of National and Regional Acid Deposition Precursor Emission Trends," (Order No. PB 89-180 483/AS; Cost: \$21.95, subject to change) will be available only from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
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