



## Project Summary

# Anthropogenic Emissions Data for the 1985 NAPAP Inventory

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**This report documents development of the anthropogenic emissions estimates to be used in the 1985 National Acid Precipitation Assessment Program (NAPAP) Emissions Inventory. Point and area source data, spanning the contiguous U.S., focus on the NAPAP high priority pollutants SO<sub>2</sub>, NO<sub>x</sub>, and VOC. Detailed point source data, provided by the states, were obtained for over 9000 plants, and area source data were obtained for more than 100 area source categories. Quality control was conducted at all levels of inventory development. This effort was the first national emissions inventory in which the data were actually returned to the responsible agencies for their comments and corrections. As a result, the quality of this annual inventory is better than that of any previously developed national inventory. Data are summarized at various levels of aggregation including nation, state, and source category. Emissions data are also analyzed by plant size, stack height, and general source type.**

***This Project Summary was developed by EPA's Air and Energy Engineering Research Laboratory, Research 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).***

### Background

The National Acid Precipitation Assessment Program (NAPAP) was established by Congress in 1980 (Title VII of P.L. 96-294) to coordinate and expand research on problems posed by acid deposition in and around the U.S. A fundamental objective of the NAPAP research program is the investigation of emissions sources that may contribute to acid deposition in order to: assess the impact of various source types and characteristics on the emissions of these precursors; investigate and verify atmosphere process models that simulate source/receptor relationships; and assess historic trends in emissions. Among contributors to acid deposition, anthropogenic emissions sources are believed to be of primary importance.

This report covers U.S. anthropogenic emissions of acid deposition precursors for calendar year 1985 as contained in the 1985 NAPAP Emissions Inventory. This inventory is divided into two major categories, point and area sources. Points are stationary sources with precise location data and typically emit at least 100 tons per year (TPY) of a criteria pollutant (SO<sub>2</sub>, NO<sub>x</sub>, VOC, PM, or CO). Area sources consist of both mobile sources and stationary sources too small (less than 100 TPY) and too numerous to inventory individually. The 1985 NAPAP Emissions Inventory has focused attention on the three criteria pollutants of most concern to the NAPAP research community: SO<sub>2</sub>, NO<sub>x</sub>, and VOC. The

report discusses the methodology and implementation of the inventory effort, and summarizes the emissions data.

### Methodology

Point source data were supplied to EPA through the National Emissions Data System (NEDS) by state agencies in an essentially bottom-up collection strategy. The area source emissions estimates were calculated by EPA using a series of computer programs. This is primarily a top-down strategy which allocates emissions estimates to state and county levels.

The data collection efforts for 1985 point source data were prioritized to reflect the needs of the NAPAP research and assessment programs. Estimates of SO<sub>2</sub>, NO<sub>x</sub>, and VOC emissions were given highest priority. In addition, the effort concentrated on facilities emitting at least 1000 TPY of the three priority pollutants because they represent 97, 90, and 61% of the point source SO<sub>2</sub>, NO<sub>x</sub>, and VOC emissions, respectively. Of the 50 data elements in a NEDS record, the data collection effort focused on the 14 that are most important for the NAPAP community. These priority items include: the annual emissions estimates for SO<sub>2</sub>, NO<sub>x</sub>, and VOC; the maximum design and annual operating rates; the Source and Standard Industrial Classification codes (SCC and SIC); emissions control equipment and efficiencies; fuel characteristics, stack parameters; location data; and operating schedules.

Quality control procedures consisting of manual and computerized checking were specifically designed for the 1985 NAPAP Emissions Inventory and involved State and EPA personnel at all levels of inventory development. These procedures were designed to ensure that the quality of the data met the requirements of the NAPAP community as closely as possible, given the resource constraints of the inventory effort. As a result, the quality of this annual inventory is better than that of any previously developed national inventory.

### Summaries and Analyses of Data

Results of the 1985 NAPAP Emissions Inventory are based on more than 9300 plants in the point source inventory with over 111,000 individual stationary points reporting 1985 emissions and operating data in the contiguous U.S., as well as emissions data for about 100 area source categories for each U.S. county. These

results for the three pollutants of most concern (SO<sub>2</sub>, NO<sub>x</sub>, and VOC) show three distinct patterns (Figure 1). About 90% of the SO<sub>2</sub> emissions are from point sources, while NO<sub>x</sub> emissions are almost equally split between point and area sources, and area sources contribute about 90% of the total anthropogenic VOC emissions. Breakdowns by major category are presented in Figure 2 (point sources) and Figure 3 (area sources).

Examination of the distribution of emissions among categories indicates the major sources of each of the three pollutants (Figure 4). SO<sub>2</sub> emissions are predominantly from electric utilities; utilities contribute about 70% of total SO<sub>2</sub> emissions and represent 76% of point source SO<sub>2</sub>. The utilities also emit about 30% of the total NO<sub>x</sub> or 70% of the point source NO<sub>x</sub>, while mobile sources

account for 43% of the total NO<sub>x</sub> or 80% of the area source NO<sub>x</sub>. VOC emissions are principally contributed by area source categories, with mobile source representing 33% of the total and 37% of the area source VOC emissions.

The analysis of point source emission categories was extended to include plant size (emissions) and the relationship between emissions magnitude and stack height. The distribution of point source emissions by plant size reveals that 81% of emissions are from facilities emitting at least 10,000 tons per year. These facilities are primarily utilities and smelters. For NO<sub>x</sub>, only 60% of emissions are from facilities emitting at least 10,000 tons per year. Again, these facilities are primarily utilities and large industrial sources. For VOCs, the distribution according to source size is

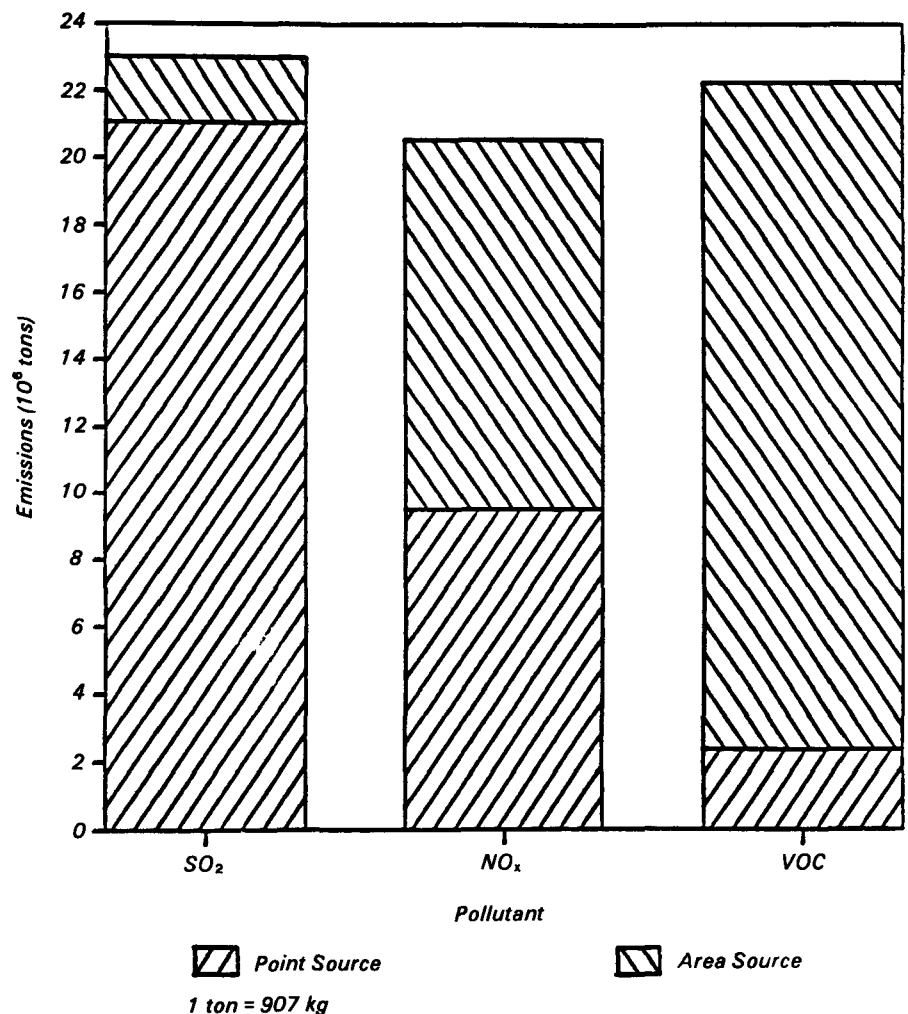


Figure 1. Comparison of point and area source SO<sub>2</sub>, NO<sub>x</sub>, and VOC emissions.

more uniform: VOC point source emissions originate in a wide variety of industrial processes and locations.

Regarding the relationship between point source emissions and stack height, utility emissions of SO<sub>2</sub> and NO<sub>x</sub> predominate the point source category; these boilers are typically associated with tall stacks. Most point source VOC emissions, however, are contributed by industrial processes which typically vent emissions near ground level.

The total anthropogenic emissions of SO<sub>2</sub>, NO<sub>x</sub>, and VOC as well as point and area source emissions of these pollutants are included in the report for each state. The 1985 NAPAP Emissions Inventory also includes emissions of PM, CO, and four non-criteria pollutants deemed important to acid deposition research (hydrogen chloride, hydrogen fluoride, primary sulfate, and ammonia).

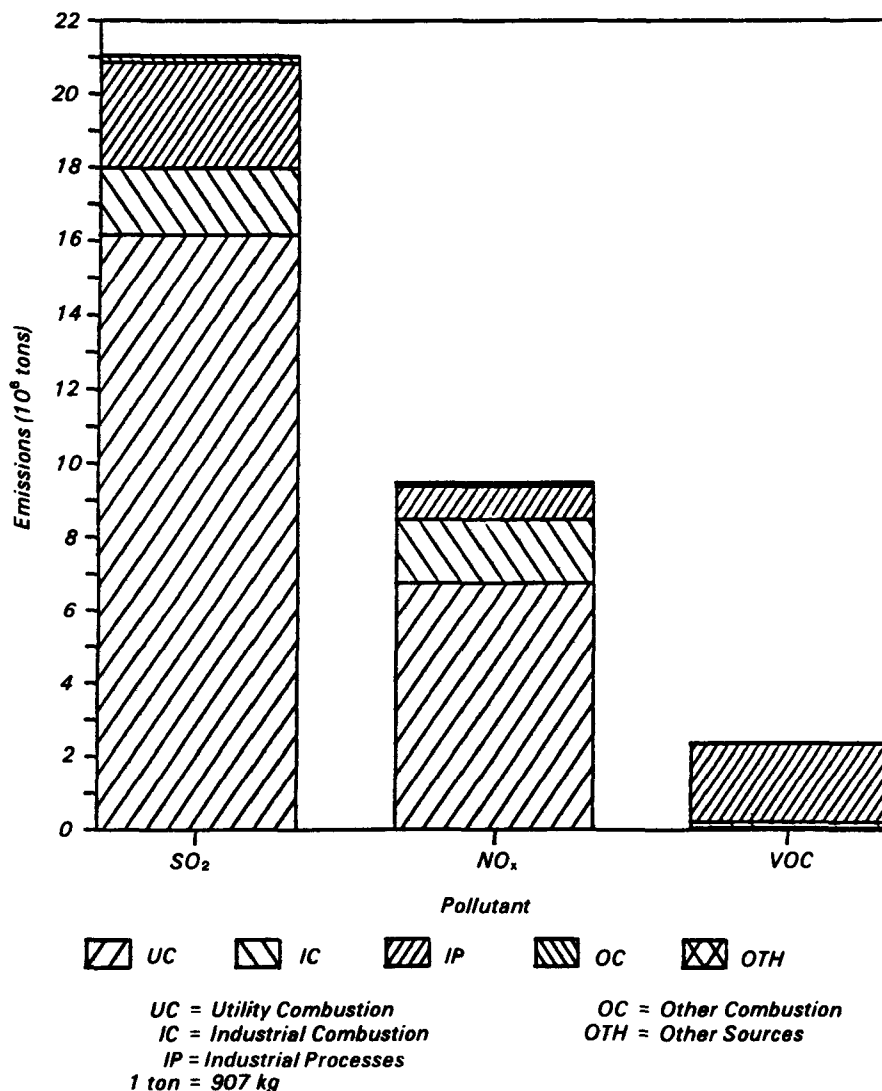
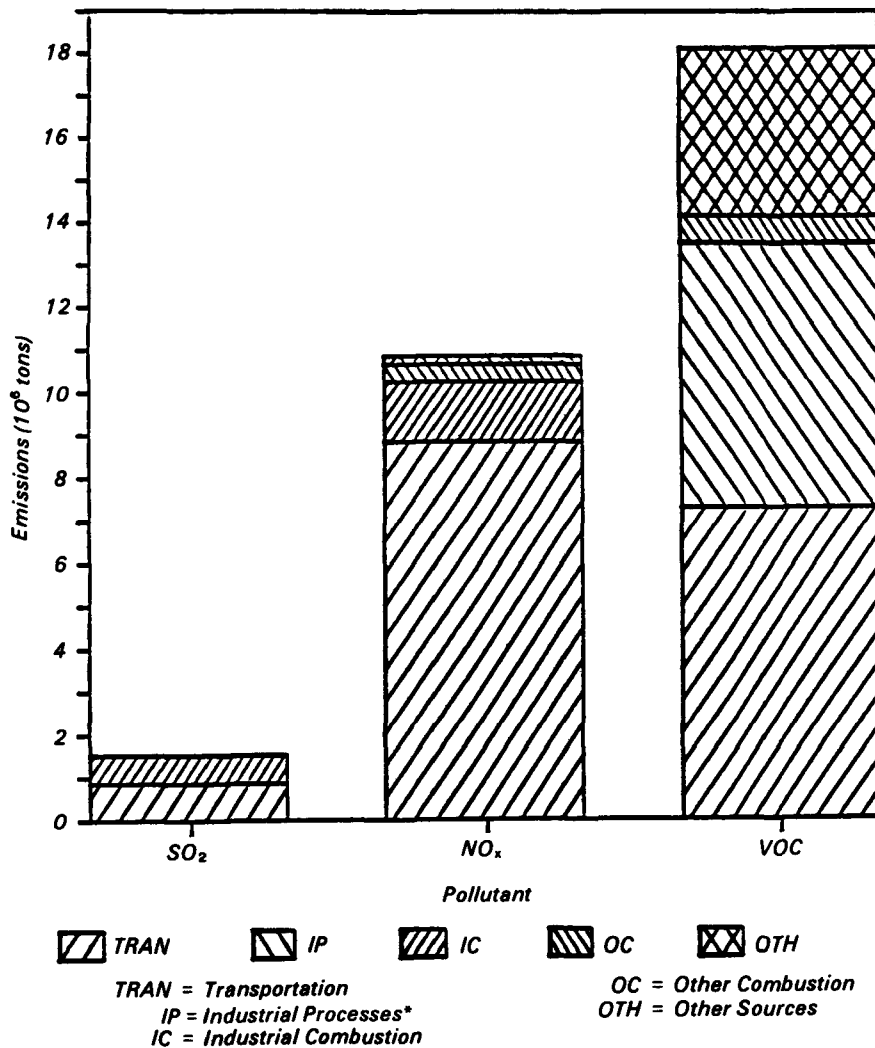
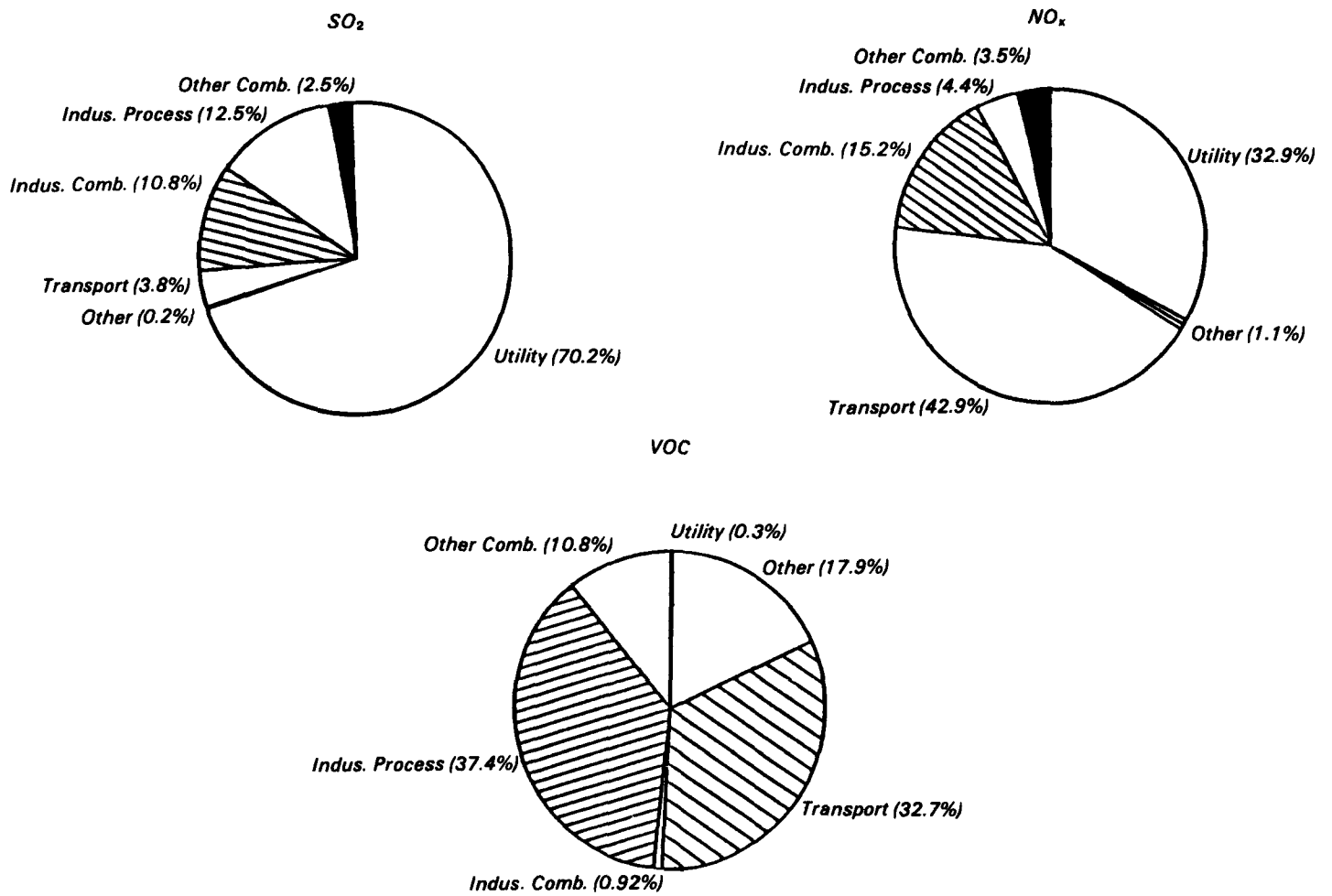


Figure 2. U.S. anthropogenic point source emissions.



**Figure 3.** U.S. anthropogenic area source emissions.



**Figure 4.** Distribution of 1985 SO<sub>2</sub>, NO<sub>x</sub>, and VOC emissions by major category.

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The complete report, entitled, "Anthropogenic Emissions Data for the 1985 NAPAP Inventory," (Order No. PB 89-151 419/AS; Cost: \$28.95, subject to change) will be available only from:

*National Technical Information Service*

*5285 Port Royal Road*

*Springfield, VA 22161*

*Telephone: 703-487-4650*

The EPA Project Officer can be contacted at:

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