



Project Summary

Area Source Documentation for the 1985 National Acid Precipitation Assessment Program Inventory

Janice L. Demmy, Wienke M. Tax, and Thomas E. Warn

EPA's Office of Air Quality Planning and Standards (OAQPS) has developed a nationwide data base of estimated air pollutant emissions from point and area sources known as the National Emission Data System (NEDS). Point source emissions estimates for every plant are submitted annually by each state to EPA for review. Area source data files developed from the NEDS system will serve as the basis for the 1985 NAPAP area source emissions inventory. However, to date, NEDS area source data have been developed mainly by OAQPS with data voluntarily submitted by State agencies.

This report provides, to states and other participants and users of the 1985 NAPAP Emissions Inventory, a general understanding of the estimating procedures that will be used by NAPAP and OAQPS to generate 1985 emissions estimates for area source categories. General methodology and assumptions are discussed as well as the original source of algorithms, activity levels, and emission factors.

Emission estimates are updated annually by a series of computer programs which multiply each current area source activity level by an emission factor that accounts for emissions removed by any control technology. County emissions estimates are then summed to produce national emissions estimates.

For this report, area sources are divided into stationary sources, mo-

bile sources, solid waste disposal, miscellaneous area sources, and additional area sources. Additional area sources includes categories for which methodologies have been developed to estimate emissions for the 1985 NAPAP Emissions Inventory that are not part of the current NEDS Area Source Categories.

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).

Introduction

The USEPA's Office of Air Quality Planning and Standards (OAQPS) has developed a nationwide data base of estimated air pollutant emissions from point and area sources known as the National Emission Data System (NEDS). Point source emissions estimates for every plant are submitted annually by each state to EPA for review. Area source data files developed from the NEDS system will serve as the basis for the 1985 NAPAP area source emissions inventory. However, to date, NEDS area source data have been developed mainly by OAQPS with data voluntarily submitted by State agencies.

This report provides, to state and other participants and users of the 1985 NAPAP Emissions Inventory, a general understanding of the estimating proce-

dures that will be used by NAPAP and OAQPS to generate 1985 emissions estimates for area source categories. General methodology and assumptions are discussed as well as the original source of algorithms, activity levels, and emission factors necessary to calculate emissions for each area source in NEDS.

The report presents methodologies for all identified sources not defined as point sources in a specific geographic region. Area sources include all mobile sources, and stationary sources too small, difficult, or numerous to classify as point sources. Area sources are divided into five major groups: stationary fuel combustion, mobile sources, solid waste disposal, miscellaneous area sources, and additional area sources. Additional area sources include categories for which methodologies have been developed to estimate emissions for the 1985 NAPAP Emissions Inventory that are not part of the current NEDS Area Source Categories. Activity level and emission factor methodologies used to produce emissions estimates are presented for each area source within the above groups.

Discussion

Activity levels are derived primarily from related information published by other Federal agencies, supplemented by special data developed by EPA for the purpose of developing NEDS area source inventories. Published data (e.g., fuel use by state, motor vehicle miles of travel by state and county, and forest fire acres burned by state) are used with related data (e.g., employment, population, and miscellaneous geographic or economic data) to derive annual county estimates of the activity levels for each NEDS area source category. The activity levels derived are adjusted to account for point source activity (e.g., fuel use by point sources) so that the area source data reflect only the activity levels (and resulting calculated emissions) that are not accounted for by point sources.

Area source emissions estimates for five pollutants (particulates, SO_x , NO_x , VOCs, and CO) are calculated for each area source category utilizing appropriate emission factors, contained in the NEDS area source emission factor file. For many categories, the same emission factors are used for all counties; however, for some source categories, state or county specific emission factors account for local variables that affect emissions. The more specific emission factors are used in NEDS calculations for all highway

motor vehicle categories, fugitive dust categories, and selected other categories in a few counties where data are available to develop more applicable emission factors than the national emission factors. Provision is also made to override computer-calculated emissions with hand-calculated emissions that may be more accurate than any simple emission factor calculation.

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Stationary Sources

Stationary sources are divided into three major fuel categories: Residential, Commercial and Institutional, and Industrial. Each category is further subdivided into fuel types for which consumption data are estimated using algorithms and published fuel use data. For each of the above categories, consumption data are multiplied by emission factors to obtain emissions estimates.

The residential fuel category estimates emissions for residential activities which utilize fuel for water heating, space heating, and cooking. Emissions contributed by residential fuel consumption are determined for six fuel types using algorithms which consider heating degree days, number of residential units, and median number of rooms per dwelling. For each estimated fuel type, county activity levels are then normalized with published state data.

Area source emissions from fuel use by commercial and institutional sources include emissions from hospitals, hotels, laundries, schools, and universities. Consumption data for each of five fuel types are obtained in the following steps: (1) estimating total county fuel consumed by the five identified commercial categories, (2) distributing total fuel consumption by the subcategories to each fuel type, (3) determining state total commercial area source fuel consumption, (4) normalizing estimates against published state consumption, and (5) determining and allocating county consumption by "other" commercial categories.

Emissions generated by the industrial sector which are not accounted for by point source categories are calculated for four fuel types: bituminous coal, distillate oil, residual oil, and natural gas. County fuel consumption is estimated by multiplying

county employment figures for Standard Industrial Classification (SIC) categories 20 through 39 by a fuel intensity factor. Results are then normalized with published state values.

Mobile Sources

Mobile sources that contribute to area source emissions are divided into Highway Vehicles, Off-Highway Vehicle Railroad Locomotives, Aircraft, and Marine Vessels.

Highway vehicles are disaggregated into four categories on the basis of use and gross vehicle weight for the purpose of calculating consumption. The categories include light duty gasoline vehicle, light duty gasoline trucks, heavy duty diesel vehicles, and heavy duty gasoline vehicles. NEDS utilizes vehicle type registration data and published average miles traveled by each vehicle type to allocate consumption to the county level. Fuel consumption, average fuel efficiencies, and road type mileage in each county are used to determine vehicle miles traveled (VMT) for three road classes: limited access roads, rural roads, and urban roads. Emission factors obtained from the execution of a computer simulation model are applied to determine emissions for vehicle type and speed class.

Emissions from off-highway vehicle are generated by activities of gasoline and diesel vehicles which do not utilize road systems. Vehicles contributing to off-highway emissions are divided into several general categories: farm equipment, construction equipment, industrial equipment, motorcycles, lawn and garden equipment, and snowmobiles. Consumption is estimated separately for each category by either apportioning national fuel consumption to counties on the basis of employment, population, etc., or calculating county or state totals by applying national fuel consumption rates to average usage figures and equipment populations. Emission factors are weighted for each category using equipment populations. Off-highway motorcycle emissions are computed using emission factors from a computer model for uncontrolled vehicle emissions.

The activity level for railroad locomotive use of distillate oil is calculated by allocating published state consumption data to the county level based on county population statistics. Fuel consumption data are used with emission factors to determine emissions.

Activity level calculations for aircraft (private, military, and commercial) utilize

aircraft operations data and plane type populations to estimate number of landing/takeoff cycles (LTOs) in each group. Emission factors are defined as emissions per LTO.

Marine vessel consumption of distillate oil, residual oil, and gasoline is determined by adjusting published consumption data. County allocation of distillate and residual oil consumption by vessels utilizes home port location for registered boats and port tonnage handled for the remaining boat population. Gasoline vessel consumption computations utilize inboard and outboard boat registration and published average consumption data to determine consumption. County allocation is based on inland water area, coastline, and the number of months suitable for recreational boating. Emission factors are applied to consumption data to obtain emissions estimates.

Solid Waste Disposal

The area source category for solid waste disposal includes on-site refuse disposal activities by residential, commercial/institutional, and industrial sectors. Solid waste generation in hundreds of tons is used as a measure of activity level for burning and on-site incineration. This is multiplied by specific emission factors to obtain emissions estimates.

Miscellaneous Area Sources

NEDS area sources which are not defined by the first three categories are compiled in the miscellaneous area sources category. The importance of these area categories is that, while total emissions from each source are relatively small compared to the major categories, emissions at a particular time may be significant. Methodologies are presented for the following: Gasoline Marketed, Organic Solvent Consumption, Unpaved

Road Travel, Unpaved Air Strip Use, Land Tilling, Forest Wildfires, Managed Burning, Agricultural Burning, and Structural Fires.

In brief, activity levels, measured using category specific data, are multiplied by emission factors to obtain emissions estimates. Activity levels for Gasoline Marketed are determined using county retail service station sales data. Activity levels for Organic Solvent Consumption are determined by allocating national estimates of organic solvent consumption by end use category to counties according to manufacturing employment data or population. The Unpaved Road Travel category utilizes vehicle miles traveled (VMT) and rural population for the basis of allocation. Unpaved Airstrip Use is measured by landing/takeoff (LTO) cycles. Number of acres burned and fuel loading factors are used to measure activity levels for Forest Wildfires, Managed Burning, and Agricultural Burning. The Structural Fires category utilizes the number of building fires to allocate to the county level.

Additional Area Sources

The 1985 NAPAP inventory will provide detailed county level VOC emissions estimates for additional area sources which previously have not been included in the NEDS area source categories. Alliance methodologies developed for the 1985 NAPAP inventory are presented for the following area sources: Publicly Owned Treatment Works (POTWs); Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDFs); Fugitive Emissions from Synthetic Organic Chemical Manufacturing; Bulk Terminals and Bulk Plants; Fugitive Emissions from Petroleum Refining Operations; Process Emissions from Bakeries, Pharmaceutical, and Synthetic-Fiber Manufacturing;

Crude Oil and Natural Gas Production Fields; and Cutback Asphalt Paving Operations. For most categories, national VOC emissions estimates are allocated to the county level using category-specific data such as industrial flow and production figures. Activity levels, emission factors, and control efficiencies are used to determine emissions for the remaining sources.

Conclusions

Emissions estimates for each area source category are computed and updated annually by a series of hand calculations and computer programs described by specific area source methodologies. In general, the current activity level for each area source is multiplied by the appropriate emission factor and a factor which accounts for any emission control technology employed. Activity level estimation procedures involve the manipulation of state-supplied data and/or information published by Federal agencies with special data developed by OAQPS to develop the NEDS area source inventories. Emission factors and control data for most categories are obtained from the EPA/OAQPS publication *Compilation of Air Pollutant Emission Factors - Volume I: Stationary Point and Area Sources (AP-42)*. For this report, area sources are divided into three primary groups: stationary fuel combustion, mobile sources, and solid waste disposal. NEDS Area Source Categories which do not fit the above categories are classified as miscellaneous area sources. Additional area sources include categories for which methodologies have been developed to estimate emissions for the 1985 NAPAP inventory that are not part of the current NEDS Area Source Categories.

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The complete report, entitled "Area Source Documentation for the 1985 National Acid Precipitation Assessment Program Inventory," (Order No. PB 89-151 427/AS; Cost: \$28.95, subject to change) will be available only from:

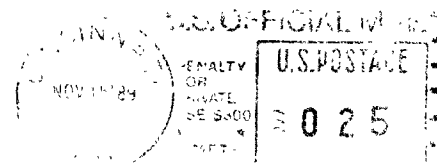
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