

Activity Data Acquisition for Emission Inventory Preparation in the State of Mississippi

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ABSTRACT

In preparation for National Ambient Air Quality Standards (NAAQS) compliance determination, the Air Division of the Mississippi Department of Environmental Quality (MDEQ) has been collecting data to develop an ozone precursor emission inventory. The Air Division, working in conjunction with a contractor, Systems Applications International (SAI), Incorporated, has acquired area and mobile activity data utilized to make emissions calculations. Sources of direct activity data and surrogate factors are supplied in the document to simplify future data acquisition for other agencies. The emission inventory projections will be utilized in two multi-state ozone studies: the Gulf Coast Ozone Study (GCOS) and the Arkansas-Tennessee-Mississippi Ozone Study (ATMOS). Control strategies will be developed from the modeling projections for regional ground-level ozone control. Complete statewide emission inventories will be critical in air quality planning efforts, including new standards for ozone, particulate matter (PM_{2.5}) and regional haze.

INTRODUCTION

The focus of the paper is to define viable data sources for the activity data necessary to determine area and mobile emissions. Emissions activity data acquired through sources in the document should provide a starting point for the novice user in government agencies or in the private sector. Discussion of point source emission inventory data collection is not included in the document.

SUMMARY OF MAJOR POINTS

- Need for the area and mobile source emissions data the State of Mississippi
- Tips on data collection
- Area source emissions data acquisition
 - Pesticides
 - Forest Fires
 - Landfills
 - Solvents
 - Residential, Commercial and Industrial Fuel Combustion
 - Residential Wood Burning
 - Gasoline Service Stations
 - Publicly Owned Treatment Works (POTW)
- Mobile source emissions data acquisition
 - On-road mobile source emissions
 - Non-road mobile source emissions

Need for the area and mobile source emissions data the State of Mississippi

Compliance issues for ground-level ozone, particulate matter (PM_{2.5}), and regional haze have forced the need for a complete emission inventory within the State of Mississippi. The Air Division of the Mississippi Department of Environmental Quality (MDEQ) has been collecting data to begin a statewide emissions inventory for criteria pollutants. Approximately three (3) years prior to the publication of the paper, data collection for the emissions inventory commenced. When data collection began, the amount of documentation for acquiring data types was not as extensive as current guidance. In the search for data sources for emission calculations, the search proved difficult at times.

The condensed data sources of the document should provide a starting point for inventory development. Data were collected from federal, state and military institutions and the private sector. The year selected for the initial data collection was 1996. Modeling in the UAM-V model was based on 1996 for the initial emission modeling effort. Emissions from 1996 were grown from the 1996 emissions basis for targeted future years to develop control strategies for the state of Mississippi. In light of the National Ambient Air Quality Standards (NAAQS) for ozone being changed, the final modeling for future emissions will be delayed until the final standard is implemented. The inventory and the information obtained in its development will be utilized to develop the 1999 Periodic Emission Inventory (PEI).

Tips on data collection

When an agency begins the search for data, personnel collecting the data should anticipate a long-term project with sundry data obstacles. The following tips should expedite the data collection process.

Document, document, document. Make sure that accurate records are kept for phone conversation records (including the contact name, phone number, agency name, type of data supplied, and names that the initial contact supplied to get the data). In some instances, the first agency that is contacted is not the agency that will ultimately supply the data. Keep track of all of the agencies that have been called for information to avoid contacting any agency twice.

When collecting data, ask if the data are available in electronic format (i.e., in a spreadsheet, database, word processing document, mainframe pull, et cetera). If the data are in electronic format, the data collection and clean-up effort will be less resource-intensive. If the data are not in electronic format, a member or members of the emission inventory staff will be assigned the task of converting the hard copies of the data into a usable electronic copy (i.e., spreadsheet or database). If a high volume of data in hard copy needs to be entered into an electronic format, a contract worker may be an option utilized for data entry. If data entry clerk is utilized for the data entry function, ask members of the emission inventory group to check random documents for accuracy of the data entry.

As data are acquired, ensure that the units on the data are delineated clearly. For example, if railroad use data are acquired in gross ton miles (GTM), ask if the data have been delineated into a county-by-county format OR if the railroad data are for the entire state.

Area source emissions data acquisition

Pesticide application

The National Agriculture Statistics Service (NASS) of the United States Department of Agriculture (USDA) supplied a data set called "Agricultural Chemical Usage, Field Crops Summary" (<http://usda.mannlib.cornell.edu>). The report describes the fertilizer and pesticide use data for corn, cotton, peanuts, rice, sorghum, soybeans, wheat and fall potatoes for the State of Mississippi. Pesticide information will include the active ingredients, application rates and acres treated. In addition to the pesticide application, emissions will be determined utilizing crop data from the NASS in files available

called "CROP NAME: Acreage, Yield Production and Value"(<http://www.usda.gov/nass/sso-rpts.htm>). The six (6) most common volatile organic compounds (VOCs) in pesticides were found in Table 3.36-1 in the NET, Procedures Document (USEPA, 1998). Pesticide usage was delineated to the county level by distributing statewide pesticide emissions by the percentage of farmland in each county (Beizaie et al, 2000).

Forest fire data

Forest fire data were collected from the Mississippi Forestry Commission via the Mississippi Automated Resource Information System (MARIS). Forest fire data included

- location of the fire
- time the fire was reported (date and time)
- time that the fire was considered extinguished (date and time)
- area that was burned during the fire (acres).

“Wildfires and Prescribed Burning” in AP-42, Section 13.1 was utilized as a reference for the forest fire emissions (USEPA, 1995). Forest fire emissions calculations have not been completed. The times that the Mississippi Forestry Commission supplied may not reflect the complete time that the fire burned. For example, the time that the fire was reported may not be the time that the fire actually started. The discrepancy in burn times caused a problem in the emissions calculations. However, the data supplied by the Mississippi Forestry Commission is the best data that has been collected to date.

Forest fire activity may vary significantly from year to year depending on weather conditions. Therefore, a single year of forest fire emission data may not be representative and may not be suitable for future year projections. Several years of forest fire data may be averaged to reflect a typical forest fire emission year. The Air Division will continue to work on emissions calculations for forest fires in the State of Mississippi.

Landfills

Landfill data were obtained from the Groundwater Division of the Mississippi Department of Environmental Quality (MDEQ). The groundwater or solid waste division within the environmental agency in each state of interest should maintain landfill data. In addition to active landfill data, emissions from closed or inactive landfills should be calculated. However, data for closed or inactive landfills may not be monitored as closely as the active landfills. The Groundwater Division supplied the following information for the landfills:

- acreage of the landfill:
- permitted airspace (cubic yards, yd³)
- estimated life of the landfill (years)
- influx of solid waste on a daily basis (tons per day).

Emissions were calculated utilizing the AP-42, Sect. 2.4 methods (USEPA, 1995).

Solvents

Solvent usage was delineated into five (5) emissions categories: architectural coatings, industrial surface coating/cleaning/degreasing, consumer solvents, dry cleaning and traffic markings.

- **Architectural coatings** emissions were calculated using the EIIP, Volume III, Chapter 3 (Adams

et al, 1995). The preferred method is to survey usage in the inventory area. Resources did not allow for the preferred method and alternative methods were utilized. The U.S. Census Bureau report, "Paint, Varnish and Lacquer (MA28F)" (U.S. Census Bureau, 1997), EPA emissions factors (USEPA, 1995), and U.S. Census Bureau population data were utilized to develop a per capita emission factor. County level population data were utilized to determine emissions for counties. (<http://www.census.gov/industry/ma28f96.txt1>)

- **Industrial surface coatings/cold cleaning/degreasing** emissions were calculated using the EIIP, Volume III, Chapter 8 (TRC Environmental Corporation et al, 1997a). The preferred methodology for determining emissions requires Standard Industrial Classification (SIC)-specific, area-specific employment data. Several state agencies were contacted to obtain the preferred method data with no success. After an extensive search, the U.S. Census Bureau supplied the information in CD-ROM format "County Business Patterns 1997" (U.S. Census Bureau, 1998). Data from the CD-ROM were utilized to calculate all categories, excluding three categories: other product coatings, high performance maintenance coatings, and other special purpose coatings. Population data were utilized for determining emissions in the categories (product coatings, high performance maintenance coatings, and other special purpose coatings) precluded from the initial calculations.
- **Consumer solvents** emissions were calculated using EIIP, Volume III, Chapter 5 (Eastern Research Group, 1996). The per capita approach using U.S. Census Bureau population data was utilized to determine emissions.
- **Dry cleaning** emissions were calculated using EIIP, Volume III, Chapter 4 (Adams et al, 1996). The preferred method for determining emissions is to utilize local per facility emission factors using survey or permit information. While a portion of the information was available within Air Division, the data did not meet data needs for use of the preferred method. The method using per employee emission factors was utilized. The employee data were obtained from the "County Business Patterns 1997" CD-ROM (U.S. Census Bureau, 1998).
- **Traffic markings** emissions were calculated using EIIP, Volume III, Chapter 14 (Adams et al, 1997). The preferred method for determining emissions is to make a survey of traffic markings use in the inventory area. Resources did not allow for the preferred method; alternative methods were utilized. Data from the "Paint, Varnish and Lacquer (MA28F)" report (U.S. Census Bureau, 1997) were utilized to determine the total traffic paint shipped. Federal Highway Administration (FHWA) highway maintenance fund disbursements (USDOT/FHWA, 1996) were utilized to apportion the traffic paint to the state level and population data were utilized to apportion the paint usage to the county level.

Residential, commercial and industrial fuel combustion

Consumption of fuels was determined utilizing the 1996 statistics from the State Energy Data Report (SEDR) (USDOE, 1999) and aggregated into Area Source Category (ASC) bins. ASC-specific data (http://www.eia.doe.gov/emeu/states/_states.html) in conjunction with AP-42 factors for external combustion sources (USEPA, 1995).

Residential wood burning

"Total residential wood consumption for the State of Mississippi in 1996 was obtained from the State Energy Data Report 1996 and aggregated into Area Source Category (ASC) bins." (USDOE, 1999,

Beizaie et al, 2000). Employment data from the "County Business Patterns 1997" CD-ROM (U.S. Census Bureau, 1998) were utilized to delineate wood consumption from the state level to the county level. "For county apportionment of residential ASC's, Mississippi household data from the USA Counties CD (U.S. Census Bureau, 1999) were used." The report, "Procedures for Preparing Emission Factor Documents" (USEPA, 1997), Section 1, was utilized as a reference.

Gasoline service stations

Emissions from gasoline service stations (including gasoline tank truck in transit emissions and underground storage tank filling and breathing) were estimated utilizing Emission Inventory Improvement Program (EIIP), Volume III, Chapter 11 (TRC Environmental Corporation et al, 1997b).

Publicly-Owned Treatment Works (POTW)

Annual activity data for the POTWs within were provided by the Surface Water Division of the Mississippi Department of Environmental Quality (MDEQ). Capacity in millions of gallons per day (MGD) and spatial data in latitude-longitude coordinates (degrees-minutes-seconds) were provided for each POTW utilizing the emission factors from the "Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I: General Guidance for Stationary Sources." (USEPA, 1991). The 1991 documentation is being phased out and the Emission Inventory Implementation Program (EIIP) information is recommended for POTW emission estimations (<http://www.epa.gov/ttn/chief/eiip/>).

Mobile source emissions data acquisition

On-road mobile source data were collected from the Mississippi Department of Transportation (MDOT) in the form of Vehicle Miles Traveled (VMT). State transportation agencies should maintain the VMT data needed for modeling purposes. In addition, local planning organizations may maintain data necessary to calculate mobile source emissions.

The VMT data may be in a format that needs to be delineated again for use within a mobile model (e.g., MOBILE5A/MOBILE6). Release of the MOBILE6 model is scheduled for the summer 2001. Changes in the MOBILE6 model will affect mobile source emission estimates. The VMT data should be delineated to a county level basis. VMT data may be collected from the Office of Highway Information Management, Federal Highway Administration (FHWA), Washington, D. C. (www.fhwa.dot.gov) (Heiken et al, 1996).

The NONROAD mobile model was utilized to calculate emissions for agricultural/farm equipment, lawn and garden activity, and recreational marine vessels.

Agriculture/farm equipment

The NONROAD model (<http://www.epa.gov/otaq/nonrdmdl.htm#model>) was utilized to generate the agricultural equipment emissions. The USDA-NASS crop data (<http://www.nass.usda.gov>) utilized in the pesticide emissions calculations were utilized to generate agriculture emissions (Beizaie et al, 2000).

Lawn and garden activity

The NONROAD model was utilized to estimate emissions from lawn and garden equipment. The Emission Inventory Improvement Program (EIIP), Volume IV, Chapter 3 (Heiken et al, 1997) was utilized as guidance for the emissions estimations.

Recreational marine vessel data

The Mississippi Department of Wildlife, Fisheries and Parks registers all recreational marine vessels in the state of Mississippi. The boat registration information was obtained and utilized to run the NONROAD model. A listing of similar agencies for other states is supplied on the website <http://www.nctc.fws.gov/fedaid/mat/website/statelinks.html>.

The NONROAD model does not calculate emissions for railroads, aircraft, or commercial marine vessels. As a result, inventories were not updated as part of the project. However, activity data were collected for railroads, aircraft and commercial marine vessels for future emissions calculations.

Railroads

As railroad data are collected, sources will refer members of the emission inventory staff to the Interstate Commerce Commission (ICC). The ICC was dissolved and records have been archived with National Archives and Records Administration (NARA) (<http://www.nara.gov/>). Railroad data from NARA will be beneficial for analyzing past ozone episodes.

Current railroad data are collected via the Surface Transportation Board (STB) of the United States Department of Transportation (USDOT) (<http://www.stb.dot.gov/>). The STB supplied Gross Ton Mile (GTM) data for a state-wide distribution. When modeling commences, a county level delineation of GTM will be necessary for modeling purposes. Collecting railroad data was difficult at best. During attempts to collect GTM data from private railroads, portions of the railroad data were claimed as proprietary by the private companies. When communicating with other state environmental agencies, some states had success acquiring railroad data via private companies. The MDEQ did not have success collecting railroad data via private companies, but utilized the STB data for the statewide analysis.

Aircraft activity data

Attempts were made to obtain information for commercial, general aviation, and military aircraft in Mississippi. Landing and Take-Off (LTO) data were acquired by contacting each military installation in the State of Mississippi. Contacting each military installation with aircraft was a resource-intensive effort. Emission inventory personnel should plan two (2) to three (3) telephone calls to each military installation to obtain LTO data. Aircraft information was obtained from the Federal Aviation Administration Aircraft Engine Emission Database (FAEED). However, there were problems encountered in finding emissions factors for specified engine types and in resolving data inconsistencies. Aircraft emissions were not updated. The Air Division will continue to pursue viable methods for obtaining information for calculating aircraft emissions.

Commercial marine vessels

Obtaining the information and determining the methodology necessary to calculate emissions for commercial marine vessels are difficult. In addition, neighboring states experienced similar difficulties and contacted the MDEQ for assistance in collecting data for emissions calculations. Data for commercial marine vessels may be obtained on CD-ROM, "Waterborne Commerce of the United States (WCUS)" from the U.S. Army Corps of Engineers (U.S. Army Corps of Engineers, 1999). (<http://www.wrsc.usace.army.mil/ndc/datawcus.htm>) In addition to the WCUS CD-ROM, state port authorities and county development agencies may provide data for shipping traffic. The Air Division will continue to pursue viable means of emissions calculations for commercial marine vessels.

CONCLUSIONS

As the emission inventory group begins data acquisition for modeling, be prepared for a long-term project that is resource-intensive. Data may not be acquired at the initial source of information; however, a continued search for the data may prove successful; if emissions inventory personnel did not collect the data necessary for emissions calculations, utilize an alternative method described in the documents in the reference section. In January 2001, the USEPA drafted the "Emission Inventory Review Guidelines" (USEPA, 2001) to develop a continuity of emissions data from state to state. The "Emission Inventory Review Guidelines" serve as a condensed list of methods utilized to calculate emissions for modeling scenarios. Alternate methods of emissions calculations are provided in the document to accommodate different data acquisition uses. Upon completion of the "Emission Inventory Review Guidelines", state emission inventory staff will have a helpful tool for emissions estimation in a single document. In the future, Geographic Information System (GIS) coverages may be utilized for a portion of the data collection. As Geographic Information Systems are implemented in an increasing number of state and federal agencies, the development and utilization of GIS coverages will be highly beneficial in emissions analysis.

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KEYWORDS

Emission Inventories

Area Source Emissions

Mobile Sources Emissions

State of Mississippi

Data Collection/Acquisition

Pesticides

Forest Fires

Landfills

Solvents

Fuel Combustion

Gulf Coast Ozone Study (GCOS)

Mississippi Department of Environmental Quality (MDEQ)

Air Division

Ozone Precursors