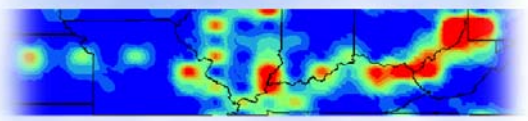
Preparation of Fine Particulate Emissions Inventories

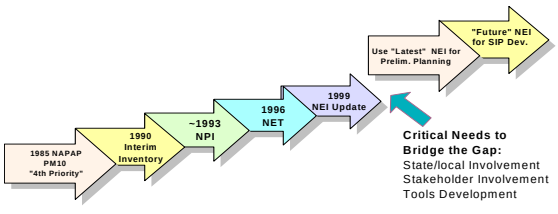
Chapter 2 - The National Emissions Inventory and Emission Inventory Tools



Information Included in the NEI

- National tabulation of emissions of PM2.5, SO2, NOx, Ammonia, and VOC
  - Point sources by lat-long: 52,000 facilities, each containing multiple emission points
    - Over 4,500 types of processes represented
  - Area & Mobile by County
    - 400 categories of Highway & Non-Road Mobile
    - Over 300 categories of Area sources
- Annual emissions, start/end dates, stack parameters
- Also, in the NEI
  - HAP emissions for over 6,000 types of processes

Evolution of EPA's National Emission Inventory

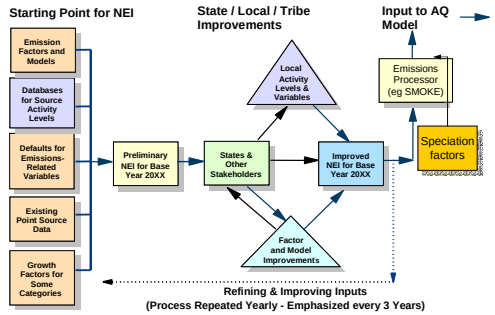


NAPAP - National Acidic Precipitation Assessment Program
NPI National Particulate Inventory
NET National Emission Trends Inventory
NEI Merger of NET and Nat'l Toxics EI

Wildfires in the National Emission Inventory

- Will be included as point sources
- Data on location, and start and stop dates
- Currently handled as areas sources
  - Allocated by county and season
- Impossible to determine impact under the current approach

NEI Development ~ Cooperative, Iterative



Inventory Preparation Tools

- Emission Factors & Activity Data
  - www.epa.gov/ttn/chief
  - (~ 20,000 factors in FIRE)
  - Processes vary over time ~ Factor representiveness issue

Inventory Preparation Tools (cont.)

- Emissions Models
  - TANKS
  - NONROAD
  - Others

Inventory Preparation Tools (cont.)

- Spatial Characterization & Locator Aids
  - GIS
  - GPS
  - Satellites
- Emissions Processing, including Speciation

Overview of Emissions Processing

- Processors include:
  - SMOKE, EPM
- Processor output
  - Gridded, hourly emissions file
  - Speciation of Primary Emissions (EC, Organics, SO4, Nitrates)
  - Model-ready
- Processor inputs
  - Annual, county-level area source EI
  - Annual point source data (except for CEM data)

Overview of Emissions Processing (cont.)

- Processor contains default factors & profiles, including:
  - County-to-Grid Allocation Factors
  - Temporal Allocation Profiles (hourly & seasonal)
  - Speciation Profiles

Speciation of EC & POA

- Speciation Profiles ~ estimate of the EC & POA portion of each PM2.5 source's emissions
  - All PM2.5 sources "assigned" to 1 of 73 "profiles"
- EC, POA
  - Derived within the Emissions Processor from PM2.5 using speciation profiles
  - NOT part of the NEI
- Current Issues
  - EC – POA Split, carbon analysis methods
  - OC – POA compound adjustment

Process-based Emissions Models

- Space- & time- sensitive emissions reflective of real time conditions
  - wind, temperature
  - RH, vegetation types
  - soil type & moisture
- Linkage:
  - MM5
  - GIS coverages
  - Emission algorithms
- Currently ~ BEIS3, MOBILE6
  - No other categories linked to real time conditions

Process-based Emissions Models (cont.)

- Process-based emission model needs
  - Ammonia (fertilizer application, animal husbandry, removal)
  - Fugitive Dust (wind, unpaved roads, construction, tilling, removal)
  - Wildland Fires (fuels, fuel consumption, plume rise)
  - Residential Wood Burning
  - Evaporative Loss
  - Others ?

Status of Process-based Emissions Models (Integrated w/ Emissions Processor)

- Biogenics (always integrated w/ EP)
- On-Road (optional integration w/ EP)
- Ammonia (development just began)
- Fugitive Dust (under development)
- Wildland Fire (under development)

Wildland Fire Emissions Module (under development)

- Modular input to Emission Models (e.g., SMOKE, OpEM) to interface with the CMAQ modeling system.
- User Inputs: Fire locations, duration, size

Wildland Fire Emissions Module (under development) (cont.)

- Model Components
  - Fuel loading default: NFDRS / FCC map
  - Fuel Moisture: Calculates using MM5 met data
  - Fuel Consumption: CONSUME2.1 / FOFEM
  - Emissions, Heat Release & Plume Rise: EPM & Briggs (modified)

Wildland Fire Emissions Module (under development) (cont.)

- Outputs: Gridded hourly emissions, plume characteristics
- Integrate, Test & Release Module (late 2004 earliest – w/ funding)

Fugitive Dust Emissions Module (under development)

- Modular input to Emission Models (e.g., SMOKE, OpEM) to interface with the CMAQ modeling system. It will:
  - establish consistent database of resource info (soil map, land use, vegetation cover, moisture, precipitation, wind speed) for making emission estimates for use with grid models.
  - demonstrate proof-of-concept of emission models for wind erosion, unpaved roads, construction, other dust sources.

Receptor Models

- Inventory refinement, bounding uncertainties
  - Fossil vs Contemporary Carbon
  - Gas vs diesel
  - Cold starts, smokers

Specific PM2.5 Categories Needing Input from Federal / State / Local / Tribes

- Wildland Burning
  - Forests, Rangeland & especially private & State / tribal burners
  - (acreages burned, fuel loadings for largest fires, timing)
- Residential Open Burning
  - Household Waste, Yard waste (volumes & burning practices)
  - Regulations & their effectiveness, local surveys of burn activities)

Specific PM2.5 Categories Needing Input from Federal / State / Local / Tribes (cont.)

- Construction Debris & Logging Slash
  - Regulations & their effectiveness, local surveys of burn activities
- Agricultural Field Burning
  - Acreages, fuel loadings, timing
- Residential Wood Combustion
  - Fireplaces, Wood Stoves
  - local surveys of fuel burned, fireplace vs wood stoves, local regulations

Specific PM2.5 Categories Needing Input from Federal / State / Local / Tribes (cont.)

- Area-specific industrial process sources
- Fugitive Dust as indicated by local conditions