Ambient Air Quality Monitoring

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Environmental Integrity Project
Introductory Terms

• Ambient Air
• Pollution concentration v. emissions
• Criteria pollutants – common, often emitted in large amounts
  – There are 6: ozone, particulate matter (PM), nitrogen dioxide (NO2), sulfur dioxide (SO2), carbon monoxide (CO), and lead.
• Hazardous air pollutants (HAPs)/air toxics – less common, emitted in smaller amounts
  – There are 187. HAPs can have adverse effects on human health in smaller doses. Lead is a HAP and a criteria pollutant.
# National Ambient Air Quality Standards (NAAQS)

<table>
<thead>
<tr>
<th>Standards</th>
<th>Pollutant [final rule cite]</th>
<th>Primary/Secondary</th>
<th>Averaging Time</th>
<th>Level</th>
<th>Form</th>
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</thead>
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<tr>
<td>Nitrogen Dioxide</td>
<td>Carbon Monoxide [76 FR 54294, Aug 31, 2011]</td>
<td>primary</td>
<td>8-hour</td>
<td>9 ppm</td>
<td>Not to be exceeded more than once per year</td>
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<td>Nitrogen Dioxide</td>
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<td>1-hour</td>
<td>35 ppm</td>
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<tr>
<td>Secondary Standards</td>
<td>Lead [73 FR 66964, Nov 12, 2008]</td>
<td>primary and secondary</td>
<td>Rolling 3 month average</td>
<td>0.15 μg/m³</td>
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<td>Nitrogen Dioxide [75 FR 6474, Feb 9, 2010]</td>
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<td>1-hour</td>
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<td>98th percentile of 1-hour daily maximum concentrations, averaged over 3 years</td>
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<td>Ozone Implementation</td>
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<td>Particulate Matter Standards</td>
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<td>PM Implementation</td>
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<td>Sulfur Dioxide Primary Standards</td>
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<td>Particle Pollution Dec 14, 2012</td>
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<td>PM$_{2.5}$</td>
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<td>0.075 ppm</td>
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<tr>
<td></td>
<td>PM$_{10}$</td>
<td>primary and secondary</td>
<td>24-hour</td>
<td>35 μg/m³</td>
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<td>Sulfur Dioxide [75 FR 35520, Jun 22, 2010]</td>
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<tr>
<td></td>
<td>Sulfur Dioxide [38 FR 25578, Sept 14, 1973]</td>
<td>secondary</td>
<td>3-hour</td>
<td>0.5 ppm</td>
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(1) Final rule signed October 15, 2008. The 1978 lead standard (1.5 μg/m³ as a quarterly average) remains in effect until one year.
Ambient Air Quality Monitoring Basics

• Purpose: to determine whether air quality in a given area meets or exceeds federal health-based standards for air quality (NAAQS).
  – Exceeds NAAQS → Nonattainment Area
  – Below or equal to NAAQS → Attainment Area

• Attainment/Nonattainment designation has many effects, including determining the level of control technology required for sources of air pollution in that area.

• Area may be nonattainment for one pollutant and attainment for another.
  – Example: Baltimore is a nonattainment area for ground-level ozone but an attainment area for PM2.5 (annual and daily).
EPA sets requirements for all aspects of monitoring network by regulation - 40 CFR Parts 50 and 58
Maryland’s Monitoring Network

26 sites

**Approximate monitor count- some sites house more than one instrument.**

- Ground-level ozone: 20
- Fine particles (PM2.5): 22
- Toxics: 4
- Lead: 1
- Nitrogen dioxide (NO2): 6
- Sulfur dioxide (SO2): 5
- Carbon monoxide (CO): 6
- PM10: 6
Baltimore Area Air Quality

• Nonattainment area for ozone
• Redesignated in 2014 as attainment area for annual PM2.5 standard
• Attainment or attainment/unclassifiable for other standards (for PM2.5 daily, NO2, PM10, CO, and lead) or has not received designation from EPA (1-hour SO2)
• Contributing to pollution levels in Baltimore:
  – Regional transport from out of state and local sources
  – Mobile sources (e.g. cars, trucks, trains, cranes, and ships) and stationary sources (e.g. industrial facilities)
Baltimore’s Monitoring Network

12 sites
PM2.5: 8 sites, 10 monitors
Ozone: 7 sites, 7 monitors
Carbon monoxide: 3
Nitrogen dioxide (NO2): 3
Sulfur dioxide (SO2): 1
Toxics: 3
Lead: 0
Baltimore PM2.5 Network
Baltimore Ozone Network
Baltimore Air Toxics Network
Maryland Lead Monitor Network
Efforts to obtain local air quality data

- EPA Next Generation Air Measuring Research
  
  **EPA Program Background Statement**
  
  - Traditionally, air pollution is measured by expensive, stationary and complex air-monitoring instrumentation. Only a few organizations, like federal, state and some industries, typically collect data of such high quality. Even so, this limits the amount of environmental monitoring data that is often available for exposure and health assessments. As air quality management problems become more complex, there is a need for enhanced air quality and exposure monitoring capabilities.
  
  - Development of Low Cost Sensor Technology for Neighborhood-Level Monitoring.
  
  - Most sensors would not provide data of sufficient quality to be used for attainment/nonattainment designations.
Minnesota Pollution Control Agency – Community Air Monitoring Project

  - Gathering 3 months of data in 7 neighborhoods over course or 2 years.
  - Monitoring PM$_{2.5}$ and air toxics, including metals and volatile organic compounds (VOCs).
- 2013 Minnesota Legislature instruction to prioritize “areas where low income, indigenous American Indians, and communities of color are disproportionately impacted by pollution from highway traffic, air traffic and industrial sources.”
- Eligibility - risk factor (using MNRisks database):
  - Health risks from all sources without diesel
  - Health risks from mobile sources (including diesel)
  - Modeled PM$_{2.5}$ air concentrations
- Eligibility – socio-economic factors:
  - Median household income
  - Percent non-white population
  - Percent American Indian non-Hispanic population
- January 2015 interim report found
  - Elevated PM2.5 levels compared with fixed monitors. Exploring possible causes.
  - No exceedances of short-term toxics benchmarks/standards but a few exceedances of annual standards.
- Funding is major challenge when it comes to community-level monitoring.
### EPA AirData Site - [http://www3.epa.gov/airdata/](http://www3.epa.gov/airdata/)

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Ambient monitoring data – strengths and weaknesses

• Strengths
  – Best type of data for assessing human health effects of air pollution.
  – For criteria pollutants, can measure data against NAAQS, which are based on evidence of human health effects.

• Weaknesses
  – Even for criteria pollutants, monitoring network is widely spaced and misses neighborhoods that may have elevated pollution levels.
  – No NAAQS for toxics.
Resources and Contact Information

• MDE, Ambient Air Monitoring Network Plan for Calendar Year 2016, available at http://www.mde.state.md.us/programs/Air/AirQualityMonitoring/Pages/Network.aspx

• EPA, Next Generation Air Measuring Website at http://www2.epa.gov/air-research/next-generation-air-measuring-research

• Leah Kelly, Environmental Integrity Project lkelly@environmentalintegrity.org