# Science Policy Outreach Task Force at Northwestern University OVERVIEW OF FEDERAL AIR QUALITY TESTING PROCEDURES

SPOT

**SPOTlight:** The EPA regulates and monitors different types of air pollution differently, but the complex interactions between these pollutants may mean that multiple actions are required to address air quality issues.

#### What are regulated air pollutants?

- The interaction of natural and anthropogenic (human-caused) factors influence urban air quality. Elevated temperatures altered land cover, and human activities (cars, construction, electricity, etc.) result in cities typically having higher levels of pollution than more rural areas. [1]
- The Environmental Protection Agency (EPA) classifies pollutants as either hazardous air pollutants (HAPs) or criteria pollutants. HAPs include 180 chemicals that the EPA considers health-hazardous or environmentally degrading, e.g., mercury, benzene, dioxin, and lead compounds [2]. Health-hazardous, outdoor criteria pollutants include ozone (O<sub>3</sub>), sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), particulate matter (PM<sub>10</sub>, PM<sub>2.5</sub>), and nitrogen dioxide (NO<sub>2</sub>) [1]. These criteria pollutants stress the health of the population (through asthma, cardiovascular, and lung diseases) and cause visibility issues (through smog and dust).
- Both anthropogenic and natural sources emit criteria pollutants. In contrast, specific anthropogenic sources such as a power plant (major source) or a collection of car washes in a small area (minor source) are more likely to be HAP emitters.

## How are pollutants monitored?

- The Clean Air Act (CAA) authorizes the EPA to monitor air quality. National Emission Standards for Hazardous Air Pollutants (NESHAPs) sets standards for HAP emissions. The National Ambient Air Quality Standards (NAAQS) are set for the original six CAA (1970) health-hazardous, outdoor criteria pollutants.
- The EPA places NAAQS sensors (for criteria pollutants) in areas that are representative of the region, while NESHAP sensors monitor specific facilities that produce HAPs. There are significantly more ambient NAAQS monitors than HAPs monitors [2].
- Compliance standards vary by pollutant [3,4,5], but generally measurements are averaged over a time window to determine compliance. For instance, there are 1-hr and 8-hr standards for carbon monoxide that cannot be exceeded more than once a year for the site to still be in compliance.
- For NAAQS censors monitoring the regional level of criteria pollutants, multiple measurements must be used to confirm noncompliance. Alternatively, a single elevated HAP reading from a NESHAP sensor may be enough to consider a specific facility out of compliance.
- The EPA holds states responsible for criteria pollutants that violate NAAQS, and individual facilities are liable for HAP levels that exceed NESHAPs thresholds [3,4,5].
- Although the frameworks to regulate HAPs and criteria pollutants are distinct, the concentrations of HAPs and criteria pollutants can affect the concentrations of each other due to atmospheric chemistry and meteorological processes. Likewise, emissions from cars and other mobile sources can significantly impact air pollution but these emissions are regulated under separate car and fuel standards. [6]

## How are air quality standards updated?

- The EPA sets NESHAPs by using the Maximum Achievable Control Technology (MACTs), which considers the level of emissions of the top-performing, similar-source industries. Eight years after promulgation, the effectiveness of the rule is evaluated through modeling and risk analysis. [2]
- The EPA updates NAAQS through a multistep process facilitated by the EPA, scientific experts, and the Clean Air Scientific Advisory Committee (CASAC) which consists of political appointments by the EPA administrator (see Fig. 1).



Fig. 1 Steps to update NAAQS for monitoring criteria pollutants, adapted from Glass et al., 2013 [7]

#### References and additional resources

[1] Environmental Protection Agency, Criteria Air Pollutants, https://www.epa.gov/criteria-air-pollutants

[2] Environmental Protection Agency, Hazardous Air Pollutants, https://www.epa.gov/haps

[3] Environmental Protection Agency, NAAQS Table, <u>https://www.epa.gov/criteria-air-pollutants/naaqs-table</u>

[4] Environmental Protection Agency, National Emission Standards for Hazardous Air Pollutants (NESHAP), https://www.epa.gov/stationary-sources-air-pollution/national-emission-standards-hazardous-air-pollutantsneshap-9

[5] Environmental Protection Agency, Clean Air Act (CAA) Compliance Monitoring, https://www.epa.gov/compliance/clean-air-act-caa-compliance-monitoring

[6] Environmental Protection Agency, Reducing Emissions of Hazardous Air Pollutants, https://www.epa.gov/haps/reducing-emissions-hazardous-air-pollutants

[7] Glass et al. 2013. Causal inference in public health. Annual Review of Public Health, 34, 61-75.

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