Congressional Research Service
Informing the legislative debate since 1914

IN FOCUS

August 12, 2019

Ozone and Particulate Matter Air Standards: EPA Review

The Clean Air Act (CAA) requires the U.S. Environmental Protection Agency (EPA) to review the standards for national ambient air quality every five years. In 2018, EPA announced strategies to expedite the National Ambient Air Quality Standard (NAAQS) review process while concurrently disbanding a pollutant-specific scientific review panel that has historically advised agency staff during their reviews. Although the CAA allows the EPA Administrator to specify the procedures for review of the NAAQS, past EPA reviews and revisions have garnered considerable congressional oversight. This In Focus discusses the status of EPA's current NAAQS reviews for ozone and particulate matter (PM), which EPA intends to complete in 2020, and issues of potential interest to Congress.

Background on Ozone and Particulate Matter

Ozone and PM are two of six principal pollutants referred to as "criteria pollutants" for which EPA has promulgated NAAQS under the CAA (42 U.S.C §7408(a)(1)).

Ground-level ozone, the primary component of smog, is formed when nitrogen oxides (NO_x) react with volatile organic compounds (VOCs) in sunlight. Ground-level ozone is associated with health effects, such as aggravated asthma, chronic bronchitis, heart attacks, and premature death. EPA has identified natural and anthropogenic sources of ozone precursors (e.g., NOx and VOCs) and ozone, including factories, lightning, power plants, vegetation, vehicles, volatile chemical products (e.g., paints and solvents) and wildfires.

PM refers to a mixture of solid particles and liquid droplets in the atmosphere. PM components may include acids, organic chemicals, metals, and soil or dust particles. The size of PM varies, ranging from tiny particles that can be seen only through a high-power microscope to larger particles (e.g., soot or smoke). Exposure to PM has been associated with adverse health effects, haze formation, and environmental impacts. The potential health effects include aggravated asthma, chronic bronchitis, decreased lung function, and premature death.

Typical sources of fine PM ($PM_{2.5}$)—measured at 2.5 micrometers or less in diameter—include direct emissions from vehicles, smokestacks, and fires. Coarse PM (PM_{10})—generally measuring 10 micrometers or less in diameter—is often associated with dust from paved and unpaved roads, construction and demolition operations, certain industrial processes and agriculture operations, and biomass burning. In addition, precursor emissions (e.g., sulfur oxides, NO_x, and VOCs) contribute to the formation of "secondary PM." $PM_{2.5}$ contains a much greater portion of secondary particles than PM_{10} does.

Notwithstanding air quality progress since 1970, ozone and PM concentrations exceed the NAAQS in some areas ("nonattainment areas"). **Table 1** lists these NAAQS and the estimated population in nonattainment areas.

Table 1. Selected NAAQS and the Estimated U.S. Population in Corresponding Nonattainment Areas

NAAQS	Primary Standard	Estimated U.S. Population in Nonattainment Areas
2015 Ozone	70 ppb	124 million
2012 Fine PM	12.0 μg/m³	22 million
1987 Coarse PM	150 μg/m³	9 million

Source: CRS, as adapted from EPA, Green Book, https://www.epa.gov/green-book. Estimated population based on 2010, rounded to nearest million. Data as of May 31, 2019.

Notes: Units of measure are parts per billion (ppb) and micrograms per cubic meter of air (μg/m³). See 40 C.F.R. Part 50 for detailed NAAQS. Table presents the most recent PM and ozone NAAQS. For other NAAQS nonattainment areas, see EPA's Green Book.

NAAQS Statutory Requirements

NAAQS do not directly limit emissions. Rather, NAAQS are concentration-based standards for ambient (outdoor) pollution. Under the CAA, Congress mandated that EPA establish two types of NAAQS for each criteria pollutant—a primary NAAQS, which must protect public health with an "adequate margin of safety," and a secondary NAAQS, which must "protect public welfare from any known or anticipated adverse effects" (42 U.S.C. §7409(b)). Public welfare includes damage to crops, vegetation, property, building materials, and climate (42 U.S.C. §7602(h)).

The CAA establishes a framework for EPA to set NAAQS based on the "latest scientific knowledge" through a notice-and-comment rulemaking process (42 U.S.C. §§7408, 7409). It requires EPA to review the NAAQS and the science upon which they are based every five years and then revise the NAAQS if necessary. The CAA also requires EPA to appoint an independent scientific review committee composed of seven members, which has become the Clean Air Scientific Advisory Committee (CASAC). The act directs CASAC to review the NAAQS every five years and recommend to the EPA Administrator "any new national ambient air quality standards and revisions … as may be appropriate" (42 U.S.C. §7409(d)(2)).

EPA's Review of the NAAQS

Beyond the aforementioned CAA requirements, procedural aspects of the NAAQS review are generally at the

discretion of the EPA Administrator. Historically, the agency has undertaken a multi-step process to review each NAAQS. Each NAAQS review typically begins with a planning phase in which EPA seeks public input and develops an Integrated Review Plan (IRP). The IRP maps out the schedule and process for the review and identifies policy-relevant science issues to guide the review.

EPA then reviews the relevant scientific literature published since the last NAAQS revision and summarizes it in a report currently known as the Integrated Science Assessment (ISA). The ISA compiles information about sources of the pollutant, exposure pathways, empirical evidence regarding the causality link between exposure and adverse health effects, and other topics. The ISA is intended as the scientific foundation for the EPA Administrator's assessment of whether the NAAQS sufficiently protect public health and welfare. EPA solicits public comment and, historically, multiple CASAC reviews before finalizing it.

The final ISA informs EPA's preparation of the Risk and Exposure Assessment (REA), which presents quantitative estimates of exposures and health risks under defined air quality scenarios. As with the IRP and the ISA, EPA has sought CASAC and public comment on the REA.

Subsequently, EPA prepares a Policy Assessment (PA), which summarizes information from the ISA and REA and provides the Administrator with options regarding the indicators, averaging times, statistical form, and numerical level (concentration) of the NAAQS. EPA solicits comment on the PA from CASAC and the public, then finalizes a decision on the NAAQS standard through the rulemaking process. The agency proposes a decision—to retain or to revise the standard—after considering information in the ISA, REA, and PA and the advice of CASAC.

EPA Restructuring of the NAAQS Reviews

The NAAQS review process has evolved over time, with multiple Administrations introducing procedural modifications intended to streamline the process, improve transparency, or strengthen the scientific basis. In 2018, EPA announced plans to streamline NAAQS reviews and obtain CASAC advice regarding background pollution and potential adverse effects from NAAQS compliance strategies. Historically, EPA has not requested CASAC to advise the agency with respect to adverse effects from NAAQS compliance strategies, although it is among the topics listed in CAA Section 109(d)(2)(C).

Under its CASAC charter, EPA may form subcommittees or workgroups, such as pollutant-specific panels, to serve under CASAC. Past panels, which included individuals with expertise in specific pollutants, assisted with the NAAQS reviews. In 2018, EPA disbanded the Particulate Matter Review Panel, which was formed in 2015, and directed the seven-member CASAC to assist EPA with the reviews for the 2012 PM and 2015 ozone NAAQS on an expedited timeline.

Some stakeholders and interest groups have raised concerns about the lack of pollutant-specific panels. CASAC recommended that EPA either reappoint the CASAC PM panel or appoint a new panel with similar expertise to inform the PM review. CASAC stated that the "breadth and diversity of evidence to be considered exceeds the expertise of the statutory CASAC members" (letter from CASAC to EPA, April 11, 2019).

CASAC also recommended "substantial revisions" to the Draft PM ISA, finding that it did "not provide a sufficiently comprehensive, systematic assessment of the available science." CASAC members did not reach consensus as to "whether there is robust and convincing evidence to support the EPA's conclusion that there is a causal relationship between $PM_{2.5}$ exposure and mortality" (CASAC letter).

EPA replied that it would make "necessary adjustments" to the PM ISA while finishing the PA by fall 2019 and reaffirmed its goal to complete the PM review by 2020. EPA has not formed a new PM-panel nor convened an Ozone panel. In its letter to CASAC, EPA stated it plans to make a "pool of subject matter consultants" available to provide feedback on the PM and ozone reviews to the CASAC chair "in a manner consistent with the Federal Advisory Committee Act" (letter from EPA to CASAC, July 25, 2019).

The current ozone review began in 2018, marking the first NAAQS review initiated in the current Administration. To date, EPA has released a draft ozone IRP and projected that the review will last a little over two-and-a-half years. The previous ozone review lasted about seven years. EPA will not develop a new REA in the current review. Instead, EPA plans to fold "REA-related analyses" into the PA (EPA, Draft IRP for Review of the Ozone NAAQS). EPA also plans to issue drafts of the ozone ISA and PA by October 2019 for "simultaneous review by the CASAC" and the public, which "should conclude" by end of 2019 (EPA letter). This approach differs from previously completed reviews, in which EPA has considered CASAC input and public comments on the ISA as it developed other milestone documents—for example, the PA.

Issues for Consideration

Congress, in its oversight capacity, may consider whether or not the EPA's current approach meets the CAA objectives to review the NAAQS and the science upon which they are based in a timely manner.

EPA's proposed modifications to the NAAQS review process underscore the tension between competing concerns. Some stakeholders, interest groups, and Members of Congress have criticized the timeliness of past NAAQS reviews, which routinely have not been completed within the five-year review cycle. Others have raised concerns about whether EPA's NAAQS decisions have been based on research that reflect the latest science and that the scientific basis is rigorous and unbiased.

Kate C. Shouse, Analyst in Environmental Policy
Robert Esworthy, Specialist in Environmental Policy

IF11288

Disclaimer