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Air Quality: EPA's 2006 Changes to the Particulate Matter (PM) Standard

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Summary

On September 21, 2006, EPA Administrator Stephen Johnson signed a final revision to the National Ambient Air Quality Standards (NAAQS) for particulate matter (PM). EPA reviewed more than 2,000 scientific studies and found that the evidence continued to support associations between exposure to particulates in ambient air and numerous significant health problems, including aggravated asthma, chronic bronchitis, reduced lung function, heart attacks, and premature death in people with heart or lung disease. On the basis of various analytical approaches, the EPA estimates that compliance with the new NAAQS will prevent 1,200 to 13,000 premature deaths annually, as well as substantial numbers of hospital admissions and missed work or school days due to illness.

The new PM NAAQS would strengthen the existing standard for "fine" particulate matter 2.5 micrometers or less in diameter ($PM_{2.5}$). The existing $PM_{2.5}$ standard promulgated in 1997 is only now beginning to be implemented. The new standard would cut almost in half the allowable concentration of $PM_{2.5}$ in the air, averaged over 24-hour periods, from 65 micrograms per cubic meter ($\mu g/m^3$) to 35 $\mu g/m^3$. Eighty-eight million people live in the 208 counties designated as "nonattainment" areas for the current $PM_{2.5}$ NAAQS. EPA has not predicted the number of additional counties expected to exceed the new $PM_{2.5}$ standard; however, the new areas will likely be expansions of existing areas and other urban populated areas. States are required to recommend nonattainment areas by December 2007, and EPA anticipates it will make final designations in December 2009.

In addition to the 24-hour standard for $PM_{2.5}$, an *annual* $PM_{2.5}$ NAAQS addresses human health effects from chronic exposures to the pollutants. The annual standard is unchanged at 15 $\mu g/m^3$ as proposed, which is counter to the recommendations of the Clean Air Scientific Advisory Committee (CASAC), an independent scientific body that advises the Administrator. CASAC had recommended that this standard be reduced to a range of 13 to 14 $\mu g/m,^3$ a step that might have required more stringent controls in additional nonattainment areas. The new PM NAAQS also would retain the 24-hour standard and revoke the annual standard for slightly larger, but still inhalable, particles in the range of 10 to 2.5 micrometers (PM_{10}). The EPA recommends that states focus this standard on urban, industrial, and construction sources, but the new standard does not exclude any mix of particles "dominated by rural windblown dust and soils and PM generated by agricultural and mining sources," as proposed.

In addition to the divergence from the CASAC's recommendation, several elements of the new PM standard may prove controversial, including the decision not to exclude rural sources from the coarse particle standard. Some have also questioned EPA's strengthening of the standard for *all* fine particles, without distinguishing their source or chemical composition. The establishment of PM NAAQS in 1997 proved controversial and included extensive congressional oversight. Congress may conduct oversight of the new PM NAAQS, given its potential for public health and economic impacts. This report will be updated.

Contents

List of Figures

List of Tables

Air Quality: EPA's 2006 Changes to the Particulate Matter (PM) Standard

Introduction

To provide increased protection against potential health effects associated with short- and long-term exposure to particulate matter (including chronic respiratory disease and premature mortality), the Environmental Protection Agency (EPA) Administrator signed revisions to the National Ambient Air Quality Standards (NAAQS)[1] for particulate matter (PM) on September 21, 2006.[2] The Agency's final regulations include changes to standards for fine and coarse particles and are expected to generate controversy and national debate, as well as oversight in Congress, as did the previous changes leading up to the existing PM standard promulgated in 1997. The schedule for completion of the Agency's review of the PM NAAQS is governed by a consent decree resolving a lawsuit filed in March 2003. EPA was required to finalize its decision regarding the PM NAAQS by September 27, 2006.[3]

This action is the culmination of EPA's statutorily required[4] review of the NAAQS and the scientific criteria for setting the standards, which the agency initiated not long after their 1997 promulgation. Based on its review and analysis of numerous scientific studies available between 1997 and 2002, and on determinations made by the Administrator, the new PM NAAQS tighten the current standards primarily by lowering the daily (24-hour) standard for fine particles smaller than 2.5 microns ($PM_{2.5}$). The final PM NAAQS did not include several changes to modify the standards for inhalable coarse particles smaller than 10 microns but larger than 2.5 microns (PM_{10}), as proposed. Several public interest groups and scientists, including an EPA independent advisory committee, advocated tightening the standards further than proposed. Others contend that data do not support the need for stricter standards or, in some cases, the 1997 standards.

In a fact sheet supporting the new PM NAAQS, EPA estimated the most likely benefits associated with the new 24-hour $PM_{2.5}$ standard would range from $17 billion to $35 billion per year in 2020, based on published scientific studies, at a cost of $6 billion. EPA estimated that the benefits of meeting the annual $PM_{2.5}$ standard,

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[1] Sections 108-109 of the Clean Air Act (CAA).

[2] 71 *Federal Register* 61143-61233, Oct. 17, 2006. Available on EPA's website at [http://epa.gov/pm/actions.html].

[3] *American Lung Assn. v. Whitman* (No. 1:03CV00778, D.D.C. 2003), as modified by the court.

[4] Section 109(d)(1)) of the CAA.

which was not changed, would range from $20 billion to $160 billion a year in 2015, based on updated analyses, at a cost $7 billion. The EPA released a regulatory impact analysis (RIA) on October 6, 2006,[5] to meet its obligations under Executive Order 12866.[6] The RIA only analyzed the benefits and costs of implementing the $PM_{2.5}$ NAAQS. The Agency did not publish an RIA with its proposal in January 2006.[7] EPA had previously estimated that the national air quality regulations currently in place for reducing PM and other air pollutants from various sources, such as utilities and diesel emissions, would annually prevent "tens of thousands of premature deaths and reduce hospitalizations for cardiovascular and respiratory illness by tens of thousands more...," resulting in hundreds of billions of dollars in benefits.[8] At the time of the 1997 promulgation, EPA estimated the cost to partially attain the 1997 $PM_{2.5}$ standard by 2010 at $8.6 billion annually,[9] whereas industry estimates were several times higher.

This report summarizes EPA's changes to the PM NAAQS , as compared with the Agency's January 17, 2006, proposal (71 *Federal Register* 2620) and the range of alternative NAAQS recommended by staff and the independent scientific advisory committee. This discussion is followed by highlights of potential issues and concerns associated with the Agency's actions. For a detailed discussion of the NAAQS process, see CRS Report 97-722, *Air Quality Standards: The Decisionmaking Process*, by John E. Blodgett and Larry B. Parker; for more information on the implementation of the current $PM_{2.5}$ NAAQS promulgated in 1997, see CRS Report RL32431, *Particulate Matter ($PM_{2.5}$): National Ambient Air Quality Standards (NAAQS) Implementation*, by Robert Esworthy.

EPA's Changes to the PM NAAQS

Under Sections 108-109 of the Clean Air Act (CAA), EPA sets NAAQS for pollutants whose emissions "may reasonably be anticipated to endanger public health (primary standards) or welfare (secondary)" and "the presence of which in the ambient air results from numerous or diverse mobile or stationary sources."[10] EPA's

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[5] EPA's Regulatory Impact Analysis (RIA) of the 2006 National Ambient Air Quality Standards for Fine Particle Pollution ($PM_{2.5}$), available on EPA's website at [http://www.epa.gov/ttn/ecas/ria.html].

[6] 58 *Federal Register* 51735, Oct. 4, 1993.

[7] EPA released interim and "provisional" analyses primarily focused on comparisons of potential risk scenarios in specified cities and locales. See EPA's *Particulate Matter Regulatory Actions* website at [http://www.epa.gov/air/particlepollution/actions.html].

[8] EPA Press release: *EPA Particulate Matter Research Report Released*, September 9, 2004 [http://www.epa.gov/pmresearch/pm_research_accomplishments/].

[9] EPA, *Regulatory Impact Analysis for the Particulate Matter and Ozone National Ambient Air Quality Standards and Proposed Regional Haze Rule*, July 1997, p. ES-18. Available at [http://www.epa.gov/ttn/oarpg/naaqsfin/ria.html]. Table 13-1.

[10] 42 U.S.C. 7408(a)(1). EPA has promulgated NAAQS for six principal pollutants classified by the agency as "criteria pollutants": sulfur dioxide (SO2), nitrogen dioxide (continued...)

1997 revisions to the PM NAAQS[11] revised the standards established in 1987[12] that focused on particles smaller than 10 microns (PM_{10} or coarse particles) and introduced standards for "fine" particles smaller than 2.5 microns ($PM_{2.5}$) for the first time.

The current primary (health protection) NAAQS for both $PM_{2.5}$ and PM_{10} include an *annual* and a *daily* (24-hour) limit. To attain the annual standard, the three-year average of the weighted annual arithmetic mean PM concentration at each monitor within an area must not exceed the maximum limit set by the agency. The 24-hour standards are a concentration-based percentile form, indicating the percent of the time that a monitoring station can exceed the standard. For example, a 98th percentile 24-hour standard indicates that a monitoring station can exceed the standard 2% of the days during the year. For $PM_{2.5}$ and PM_{10}, the secondary NAAQS, which are set at a level "requisite to protect the public welfare,"[13] are the same as the primary standards.[14]

As modified, the $PM_{2.5}$ and PM_{10} standards would be as follows:

- **$PM_{2.5}$:** strengthen the *daily* (24-hour) standard, which currently allows no more than 65 micrograms per cubic meter ($\mu g/m^3$), by setting a new limit of 35 $\mu g/m^3$, based on the current three-year average of the 98th percentile of 24-hour $PM_{2.5}$ concentrations; retain the *annual* standard at 15 $\mu g/m^3$;

- **PM_{10}:** retain the *daily* (24-hour) standard at 150 $\mu g/m^3$; eliminate the current *annual* maximum concentration (50 $\mu g/m^3$) standard for PM_{10}.[15]

EPA had proposed replacing the current particle size indicator of PM_{10} with a range of 10 to 2.5 micrometers ($PM_{10-2.5}$), referred to as inhalable (or thoracic) coarse particles, and setting a $PM_{10-2.5}$ *daily* standard of 70 $\mu g/m^3$ rather than the current PM_{10} daily standard of 150 $\mu g/m^3$. The proposal also included narrowing the focus of the $PM_{10-2.5}$ standard on "urban and industrial" sources, and excluding particles

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[10] (...continued)
(NO2), carbon monoxide (CO), ozone, lead, and particulate matter (PM).

[11] 62 *Federal Register* 38652-38896, July 18, 1997.

[12] PM_{10} NAAQS were promulgated in 1987 (52 *Federal Register* 24640, July 1, 1987).

[13] The use of public welfare in the CAA "includes, but is not limited to, effects on soils, water, crops, vegetation, manmade materials, animals, wildlife, weather, visibility, and climate, damage to and deterioration of property, and hazards to transportation, as well as effects on economic values and on personal comfort and well-being, whether caused by transformation, conversion, or combination with other air pollutants" (42 U.S.C. 7602(h)).

[14] 42 U.S.C. 7409(b)(2).

[15] Based on the findings in the EPA Criteria Document and Staff Paper, and the CASAC's concurrence, that studies reviewed do not provide sufficient evidence regarding *long-term* exposure to warrant continuation of an annual standard, see 71 *Federal Register* 2653, *Section III. Rationale for Proposed Decision on Primary PM_{10} Standards,* January 17, 2006.

typical to rural areas, including "windblown dust and soils and PM generated by agricultural and mining sources." The general concurrence among the CASAC members was in agreement with EPA staff recommendations that there was a specific need to address particles in the size of 2.5 to 10 microns.[16] However, based on further consideration of the data and in response to comments, EPA did not change the indicator and did not exclude any areas, but the Agency continues to recommend that states focus on urban and industrial sources.

The January 17, 2006, proposal to change the indicator of the standard for coarse particles was in response to a 1999 U.S. Court of Appeals for the D.C. Circuit decision[17] directing EPA to ensure that the standard did not duplicate the regulation of fine particles. EPA's standard for PM_{10}, as modified by the 1997 changes to the PM NAAQS, was challenged shortly after promulgation. Concluding that PM_{10} was a "poorly matched indicator" for thoracic coarse particles because it included the smaller $PM_{2.5}$ category as well as the larger particles, the Court of Appeals remanded the standard to EPA. The Agency contends that more thorough reasoning in support of the use of PM_{10} as the indicator for inhalable coarse particulate matter in its September 21,2006, final PM NAAQS will satisfy the court.

The revised $PM_{2.5}$ daily standard is among the less stringent within the range of alternative levels recommended by EPA staff, and the annual standard is not as stringent as the standard recommended by the independent Clean Air Science Advisory Committee (CASAC) mandated under Section 109(d)(2) of the CAA (see discussion in the next section of this report). Following the release of the proposal for revising the PM NAAQS, in response to the discrepancies between the proposal and the recommendations, the EPA Administrator emphasized that the standard was a proposal subject to public comment and that the agency planned to assess information contained in more recent studies.[18] The Administrator indicated that his decision required consideration of a number of factors and "judgment based upon an interpretation of the evidence." The Administrator relied on the evidence of long-term exposure studies as the principal basis for retaining the annual $PM_{2.5}$ standard.[19]

CASAC strongly disagreed with the Administrator and took the unprecedented step of urging reconsideration of the proposal.[20] Since it was established in the

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[16] Clean Air Scientific Advisory Committee (CASAC) Review of the EPA Staff Recommendations Concerning a Potential Thoracic Coarse PM Standard in the *Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of Scientific and Technical Information* (Final PM OAQPS Staff Paper, EPA-452/R-05-005, June 2005), September 15, 2005.

[17] *American Trucking Assns. v. EPA*, 175 F.3d 1027, 1054-55 (D.C. Cir. 1999).

[18] Transcript of December 20, 2005, media conference call with EPA Administrator Johnson, available at [http://www.epa.gov/air/particles/actions.html].

[19] For the EPA Administrator's rationale for proposing to retain the current level for the annual $PM_{2.5}$ standard and recognition of the CASAC's recommendation not endorsing this approach, see 71 *Federal Register* 2650-2653.

[20] Letter of Dr. Rogene Henderson, Chair, Clean Air Scientific Advisory Committee, to the (continued...)

1970s, this is the first time that the committee has challenged an EPA Administrator's decision regarding NAAQS.

EPA had asked for broad public comment on the proposed standards for fine and coarse particles, as well as comment on a range of alternative standards, including no changes to the current 1997 annual and daily standards and more stringent standards than proposed — similar to those recommended by EPA staff and the CASAC. According to the docket for the proposal, EPA received more than 120,000 comments.

Alternative PM Standards

Section 109(d)(1)) of the CAA requires EPA to review the criteria that serve as the basis for the NAAQS for each covered pollutant every five years, to either reaffirm or modify established NAAQS. The process for setting and revising NAAQS consists of the statutory steps incorporated in the CAA over a series of amendments. Several other steps have also been added by the EPA, by executive orders, and by subsequent regulatory reform enactments by the Congress.

The CAA is quite specific on certain steps of the process — in particular, on the preparation of a "criteria document" summarizing the scientific information, on the review of that document by an independent scientific committee, on the criteria to be used by the Administrator in deciding on the final standard, and on the procedural process for promulgating the standard. In addition, EPA has administratively added a key step, the preparation of a "staff paper" that summarizes the criteria document and lays out policy options. Supplemental to public comment, the CASAC reviews each criteria document and staff paper as it is prepared, recommends improvements, and, after further meetings and reviews, signs off *only* when the CASAC panel of members is convinced that each accurately reflects the status of the science. The CASAC closure letter indicates that the majority of the CASAC panel members agree that the criteria document and the staff paper provide an adequate scientific basis for regulatory decisionmaking.

EPA released the report *Air Quality Criteria for Particulate Matter* on October 29, 2004, following sign-off by the CASAC.[21] The criteria document is the result of a rigorous evaluation of research information relevant to PM NAAQS criteria development from pertinent literature available between early 1996 through April 2002, and a few relevant studies published through 2003. In July 2005, EPA published its final "staff paper," prepared by EPA's Office of Air Quality Planning

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[20] (...continued)
Hon. Stephen Johnson, Administrator, U.S. EPA, March 21, 2006, available at [http://www.epa.gov.sab/pdf/casac-ltr-06.002.pdf]; or from the federal docket for the proposed rule Docket ID No. EPA-HQ-OAR-2001-0017, on the Federal Docket website [http://www.regulations.gov/fdmspublic/component/main].

[21] 69 *Federal Register* 63111. The Criteria Document and information about the review process are available at [http://www.epa.gov/ttn/naaqs/standards/pm/s_pm_index.html].

and Standards (OAQPS) staff.[22] The staff paper presents the staff conclusions and recommendations on the elements of the PM standard based on evaluation of the policy implications of the scientific evidence contained in the criteria document and the results of quantitative analyses (e.g., air quality analyses, human health risk assessments, and visibility analyses) of that evidence.

The staff paper concluded, and most of the CASAC panel concurred, that the scientific evidence supported modifying the PM standard.[23] Recognizing certain limitations of the data, a range of alternatives were presented for consideration for modifying the current PM NAAQS. The staff paper and CASAC recommendations for PM_{10} were similar to those included in the December 2005 proposal, but those for $PM_{2.5}$ included a range of more stringent levels than those proposed. In addition, the majority of the CASAC panel "did not endorse the option of keeping the annual standard at its present value."[24] Recommendations were based on the primary or "health based" standards; as is the case with the current and proposed PM NAAQS, secondary standards were recommended to be the same as the associated primary standards. **Table 1** summarizes the recommendations for $PM_{2.5}$ NAAQS.

Table 1. Final (2006), Proposed and Alternative, and 1997 $PM_{2.5}$ Primary (Health) NAAQS

$PM_{2.5}$ NAAQS Options	24-hour Primary (98th percentile)	Annual Primary (arithmetic mean)
Current NAAQS (1997)	65 $\mu g/m^3$	15 $\mu g/m^3$
EPA Proposed Rule (January 2006)	35 $\mu g/m^3$	15 $\mu g/m^3$
EPA Staff Paper (December 2005)	35-25 $\mu g/m^3$	15 $\mu g/m^3$
	or	
	40-30 $\mu g/m^3$	14-12 $\mu g/m^3$
CASAC (December 2005)	35-30 $\mu g/m^3$	14-13 $\mu g/m^3$
EPA Final Rule (September 2006)	35 $\mu g/m^3$	15 $\mu g/m^3$

[22] EPA. "*Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of Scientific and Technical Information, OAQPS Staff Paper*," Office of Air Quality Planning and Standards, EPA-452/R-05-005, July 2005. The staff paper can be accessed at [http://www.epa.gov/ttn/naaqs/standards/pm/s_pm_cr_sp.html].

[23] Clean Air Scientific Advisory Committee (CASAC) Particulate Matter (PM) Review Panel, *EPA's Review of the National Ambient Air Quality Standards for Particulate Matter (Second Draft PM Staff Paper, January 2005)*, EPA-SAB-CASAC-05-007, June 6, 2005, available at [http://www.epa.gov/sab/panels/casacpmpanel.html].

[24] *Ibid*, pg. 7. "Of the options presented by EPA staff for lowering the level of the PM standard, based on the above considerations and the predicted reductions in health impacts derived from the risk analyses, most Panel members favored the option of setting a 24-hour $PM_{2.5}$ NAAQS at concentrations in the range of 35 to 30 g/m^3 with the 98th percentile form, in concert with an annual NAAQS in the range of 14 to 13 g/m^3. The justification for not moving to the lowest staff-recommended levels within these ranges is that these were generally associated with only small additional predicted reductions in risk."

Source: Prepared by the Congressional Research Service (CRS), with information from EPA's final PM NAAQS (September 21, 2006), EPA's proposed PM NAAQS (71 *Federal Register* 2620, December 20, 2005), and related technical documents,[25] available at [http://www.epa.gov/air/particles/actions.html].

Potential Impacts of More Stringent PM Standards

In setting and revising the NAAQS, the CAA directs the EPA Administrator to protect public health *with an adequate margin of safety*. This language has been interpreted, both by the Agency and by the courts, as requiring standards based on a review of the health impacts, without consideration of the costs, technological feasibility, or other non-health criteria.[26] This being the case, the costs and benefits did not play a central role in shaping the PM NAAQS. Costs and feasibility are generally taken into account in NAAQS implementation (a process that is primarily a state responsibility).

In its regulatory impact analysis (RIA) released on October 6, 2006,[27] EPA analyzed the benefits and costs of implementing the new PM NAAQS to meet its obligations under Executive Order 12866[28] and in compliance with guidance from the White House Office of Management and Budget.[29] The RIA only analyzed the impacts of implementing the $PM_{2.5}$ NAAQS. Citing time, data, and modeling limitations, the EPA did not analyze the benefits and costs of retaining the PM_{10} standard. EPA did not release an RIA assessing the costs and benefits of setting the standard at both the proposed and alternative levels with, or subsequent to, the January 17, 2006, proposal, but conducted interim and "provisional" analyses regarding certain aspects of potential risk reductions in specific locations. These analyses did not address national impacts.[30]

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[25] EPA's final staff paper and the CASAC review of the EPA staff paper (see references earlier in this report).

[26] With regard to the non-relevance of cost considerations, see generally *Whitman v. American Trucking Asss.*, 531 U.S. 457, 465-472, 475-76 (2001).

[27] EPA's Regulatory Impact Analysis (RIA) of the 2006 National Ambient Air Quality Standards for Fine Particle Pollution ($PM_{2.5}$), available on EPA's website at [http://www.epa.gov/ttn/ecas/ria.html].

[28] 58 *Federal Register* 51735, Oct. 4, 1993.

[29] Changes made by EPA in response to OMB recommendations have been documented in the docket for this action (Docket ID No. EPA-HQ-OAR-2001-0017on the Federal Docket website [http://www.regulations.gov/fdmspublic/component/main]); for more information on Executive Order 12866 and OMB's guidance see OMB's website, "Regulatory Matters" at [http://www.whitehouse.gov/omb/inforeg/regpol.html#rr].

[30] Analyses are available on EPA's *Particulate Matter Regulatory Actions* website at [http://www.epa.gov/air/particlepollution/actions.html].

Potential Health Effects

EPA's most recent review found that the data since 1997 reinforce the associations between exposure to PM and numerous cardiovascular and respiratory health problems, including aggravated asthma, chronic bronchitis, reduced lung function, irregular heartbeat, nonfatal heart attacks, and premature death. The CASAC commented that "numerous epidemiological studies that are reviewed in this chapter [chapter 2] have shown statistically significant associations between the concentrations of ambient air $PM_{2.5}$ and PM_{10} (including levels that are lower than the current PM NAAQS) and excess mortality and morbidity."[31] Although EPA and the CASAC recognize gaps in certain aspects of the data, they concurred that the evidence supported updating the PM NAAQS.

EPA's most recent report on air quality trends[32] reported that nationally, in 2003, fine particle concentrations were the lowest since monitoring began in 1999, and coarse particle concentrations were the second lowest since 1988 (concentrations were lower in 2002). Despite the decline, the EPA reports that there were 62 million people in 97 counties with monitors measuring fine and coarse particles above the current NAAQS in 2003.

Fine PM ($PM_{2.5}$). EPA estimated the nationwide monetized human health and welfare benefits of attaining two alternatives to the current suite of $PM_{2.5}$ NAAQS. The monetized health and visibility benefits associated with the change in the $PM_{2.5}$ daily (24-hour) standard are estimated to range from $9 billion to $75 billion. EPA based these estimates on using published epidemiology studies and opinions of outside experts regarding PM and the risk of premature death, and other benefits criteria. EPA contends that based on published scientific studies alone, estimated benefits of meeting the new daily (24-hour) $PM_{2.5}$ standards range from $17 billion to $35 billion. The monetized benefits include the value of reductions in health effects summarized in **Table 2**.

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[31] Page 5 of the CASAC review. The Criteria Document and information about the review process are available at [http://www.epa.gov/ttn/naaqs/standards/pm/s_pm_index.html].

[32] EPA, *The Particle Pollution Report: Current Understanding of Air Quality and Emissions through 2003*, EPA 454-R-04-002, December 2004 [http://www.epa.gov/airtrends/aqtrnd04/pm.html].

Table 2. EPA's Predicted Reductions in Adverse Health Effects Associated with Meeting the New $PM_{2.5}$ Daily (24-hour) NAAQS

Adverse Health Effect	Predicted Reductions
Premature deaths in individuals with pre-existing cardiovascular and respiratory disease	2,500 to 5,700
Cases of chronic bronchitis	2,600
Cases of acute bronchitis	7,300
Nonfatal heart attacks	5,000
Hospital admissions for cardiovascular or respiratory symptoms	1,630
Emergency room visits for asthma	1,200
Cases of aggravated asthma	51,000
Cases of upper and lower respiratory symptoms	97,000
Days where individuals miss work or school	350,000
Days when individuals must restrict their activities because of symptoms related to particle pollution	2 million

Source: Prepared by the Congressional Research Service with data presented in Chapter 5 of the Environmental Protection Agency *Regulatory Impact Analysis of the 2006 National Ambient Air Quality Standards for Fine Particle Pollution ($PM_{2.5}$)* Oct. 6, 2006, and available on the EPA's website at [http://www.epa.gov/ttn/ecas/ria.html].

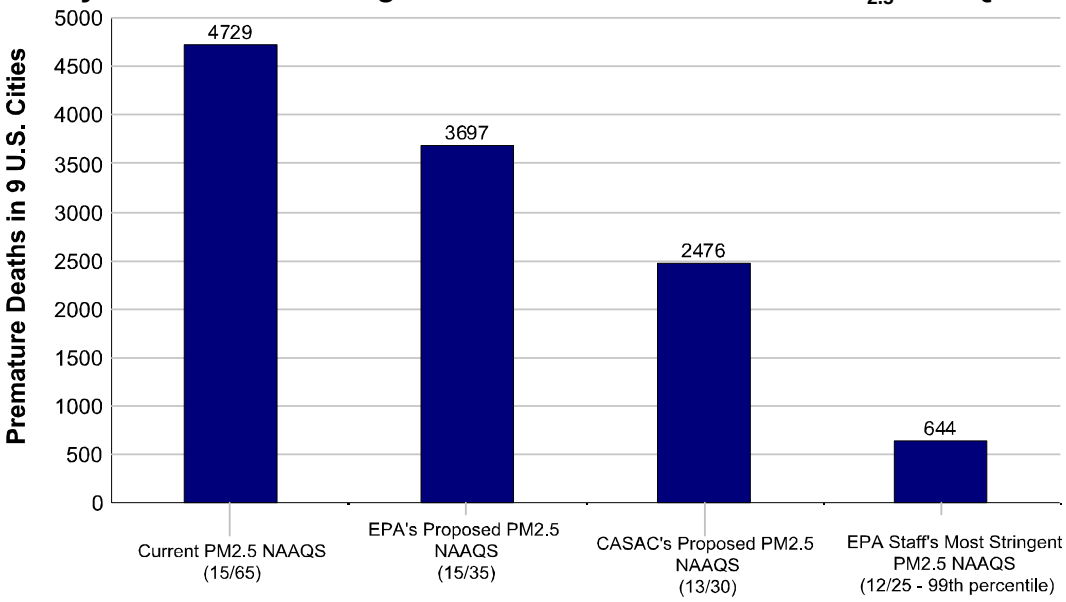
When promulgating the 1997 $PM_{2.5}$ NAAQS, EPA estimated that compliance would result in the annual prevention of 15,000 premature deaths, 75,000 cases of chronic bronchitis, and 10,000 hospital admissions for respiratory and cardiovascular disease, as well as other benefits. These estimates have been the subject of significant debate and re-analysis. Since 1998, with dedicated funding from Congress, EPA accelerated its research and re-analysis on $PM_{2.5}$ to better understand the potential associated health effects and to develop ways to reduce risks.[33] The funding supported numerous EPA intramural and extramural PM research projects and the establishment of five university-based PM research centers around the country. EPA's most recent review has increased its confidence in earlier findings associating exposure to $PM_{2.5}$ to increases in respiratory health problems, hospitalizations for

[33] Congress increased EPA's appropriations for particulate matter research from $18.8 million in FY1997 (H.Rept. 104-812) to $49.6 million in FY1998 (H.Rept. 105-297). PM research appropriations averaged more than $60 million per year from FY1999 through FY2004, and Congress provided $60.5 million for FY2005. Congress did not specify PM research funding in EPA's FY2006 appropriation but included $61.0 million for NAAQS research prior to a 0.476% across-the-board rescission (P.L. 109-54; H.Rept. 109-188).

heart and lung disease, and premature death, particularly for children, the elderly, and those with preexisting heart and lung disease.[34]

Although EPA did not complete a national analysis of the proposed and alternative PM standards at the time of its proposal, it assessed potential risk reduction for PM standards in several cities using modeling for assessing the effects of other EPA air quality regulations. Using data from the nine cities EPA studied, the American Lung Association (ALA) estimated fine particulates would result in 4,729 premature deaths in nine cities under the current 1997 $PM_{2.5}$ standard. ALA developed a table consolidating the EPA data from the nine cities[35] to illustrate comparative risk reductions of several alternative PM standards. According to ALA's analysis, EPA's proposed $PM_{2.5}$ standard would reduce premature deaths by 22%, compared with the current standard; further, the ALA projected that a combination of the CASAC's most stringent recommendations for both the daily and annual levels (30 $\mu g/m^3$ daily with 13 $\mu g/m^3$ annual) would result in a potential 48% reduction. Opposing views suggest that EPA's proposed standard would provide limited, if any, tangible public health benefits and could result in significant costs to states and industry. Some opposed to more stringent PM NAAQS claim that more recent studies of health effects attributable to PM actually demonstrate that risk estimates are lower and less statistically significant than they were in 1997, when the last standard was set.[36]

Figure 1. Number of Premature Deaths in Nine U.S. Cities, Estimated by the American Lung Association for Alternative $PM_{2.5}$ NAAQS



[34] For EPA criteria and technical documents in support of the December 20, 2005, proposal and the 1997 NAAQS, see [http://www.epa.gov/ttn/naaqs/standards/pm/s_pm_index.html].

[35] Boston, Detroit, Los Angeles, Philadelphia, Phoenix, Pittsburgh, St. Louis, San Jose, and Seattle; see [http://www.cleanairstandards.org/article/articleview/402/1/41/].

[36] Communication with Mr. Frank Maisano, Media Contact for the Electric Reliability Coordinating Council, January 17, 2006.

Source: The American Lung Association. Compiled with data from EPA, *Particulate Matter Health Risk Assessment for Selected Urban Areas*, Appendix A. The nine cities are Boston, Detroit, Los Angeles, Philadelphia, Phoenix, Pittsburgh, St. Louis, San Jose, and Seattle. All $PM_{2.5}$ NAAQS alternatives are shown as µg/m³ for the annual and 24-hour standards at the 98th percentile, except as noted; see [http://www.cleanairstandards.org/article/articleview/402/1/41/]).

Coarse PM (PM_{10}). The new standards retain the existing PM_{10} daily (24-hour) standard, as promulgated in 1987, to continue to protect against the associated adverse health and welfare effects. The scientific evidence supports the standard based on short-term exposure to certain coarse particles, particularly in urban and industrial areas. The emphasis on urban and industrial areas is based on the findings reported in the Criteria Document, the Staff Paper, and the CASAC that "the evidence for the toxicity of $PM_{10-2.5}$ comes from studies conducted primarily in urban areas and is related, in large part, to the re-entrainment of urban and suburban road dusts, as well as primary combustion products."[37] EPA and most of the CASAC panel members concluded that there was a lack of evidence (often a lack of studies) on long-term adverse health effects of specific PM_{10} measurements. The new standard revokes the current *annual* PM_{10} standard, as proposed.

EPA had proposed replacing the current particle size indicator of PM_{10} with a range of 10 to 2.5 micrometers ($PM_{10-2.5}$), referred to as inhalable (or thoracic) coarse particles, and setting a $PM_{10-2.5}$ *daily* standard of 70 µg/m^3 rather than the current PM_{10} daily standard of 150 µg/m^3. EPA decided to maintain PM_{10} as the indicator citing the limited body of evidence on health effects associated with thoracic coarse particles from studies that use $PM_{10-2.5}$ measurements, including the Agency's recognition that the only studies of clear quantitative relevance to health effects most likely associated with thoracic coarse particles used PM_{10}. Further, in the Preamble for final revised PM NAAQS, EPA notes that "...having considered the issues raised in extensive public comment on the proposal, the Administrator's final decision differs from that in the proposal regarding whether it is appropriate to revise the indicator in order to retain protection from coarse particles."[38] Although EPA has not established NAAQS for $PM_{10-2.5}$, the Agency is promulgating a new reference method (FRM) for measurement of mass concentrations of $PM_{10-2.5}$ in the atmosphere as the standard of reference for measurements of $PM_{10-2.5}$ concentrations in ambient air. EPA anticipates that the new FRM should provide a basis for gathering scientific data to support future reviews of the PM NAAQS.[39] According to EPA, these monitors will employ the latest in speciation technology to advance the science, so that future regulation will provide more targeted protection against the effects of only those coarse particles and related source emissions.

In addition, EPA did not further qualify the coarse PM indicator to include any ambient mix of $PM_{10-2.5}$ dominated by re-suspended dust from high-density traffic on

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[37] Pages 7-8 of the CASAC review. The Criteria Document and information about the review process are available at [http://www.epa.gov/ttn/naaqs/standards/pm/s_pm_index.html].

[38] 71 *Federal Register* 61143-61233, Oct. 17, 2006, Section III.C.3. *Decision Not to Revise PM_{10} Indicator*, available at [http://epa.gov/pm/actions.html].

[39] Ibid, see *Section VI. Reference Methods for the Determination of Particulate Matter as $PM_{10-2.5}$ and $PM_{2.5}$*, beginning on p. 190.

paved roads and generated by industrial and construction sources, and exclude any ambient mix of $PM_{10-2.5}$ that is dominated by rural windblown dust and soils and PM generated by agricultural and mining sources, as proposed. Although there is some evidence that emissions from the proposed excluded sources are largely composed of less-toxic components for which evidence of health issues is either limited or nonexistent, EPA determined that the existing evidence is inconclusive with regard to whether community-level exposures to thoracic coarse particles are associated with adverse health effects in non-urban areas. Therefore, EPA is expanding its research and monitoring[40] programs to collect additional evidence on the differences between coarse particles typically found in urban areas and those typically found in rural areas.

The proposed approach, and how EPA would distinguish the sources during its implementation, raised a number of questions and resulted in numerous comments. According to EPA, with the exception of representatives of those sources (e.g., agriculture and mining) who would have been excluded under the proposal, other commenters, including environmental and public health groups, state and local agencies, and industries not excluded from the proposed indicator (e.g., transportation and construction), opposed the proposed qualified indicator. In its letter dated March 21, 2006, CASAC stated that while it recognized the scarcity of information on the toxicity of rural dust it "neither foresaw nor endorsed a standard that specifically exempts all agricultural and mining sources, and offers no protection against episodes of urban-industrial $PM_{10-2.5}$ in areas of populations less than 100,000." The Committee recommended the "expansion of our knowledge of the toxicity of rural dusts rather than exempting specific industries (e.g. mining, agriculture)" from control under the standard.

Potential Impacts of NAAQS Implementation

As described earlier, in setting and revising the NAAQS, the CAA directs the EPA Administrator to protect public health *with an adequate margin of safety*, which has been further interpreted to exclude consideration of the costs, technological feasibility, or other non-health criteria.[41] Nevertheless, costs and feasibility associated with the NAAQS implementation (a process that is primarily a state responsibility) are a key elements of the debate regarding the new PM NAAQS.

Promulgation of a NAAQS sets in motion a process under which the states and EPA first identify geographic nonattainment areas — those areas failing to comply with the NAAQS, based on monitoring and analysis of relevant air quality data. The proposed tightening of the $PM_{2.5}$ standards are expected to increase the number of areas (typically defined by counties or portions of counties) in nonattainment. Because the current PM_{10} daily (24-hour) standard is retained and the annual standard revoked, EPA is not requiring new nonattainment designations for PM_{10}.

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[40] 71 *Federal Register* 61236-61328, Oct. 17, 2006.

[41] *Lead Industries Association* v. *EPA*, 647 F. 2d 1130 (D.C. Cir. 1980).

Following formal designation (a process that EPA estimates will not be completed before April 2010 for the new $PM_{2.5}$ NAAQS), the states have three years to submit State Implementation Plans (SIPs) that identify specific regulations and emission control requirements that will bring an area into compliance. If new or revised SIPs for attainment establish or revise a transportation-related emissions allowance ("budget"), or add or delete transportation control measures (TCMs), they will trigger "conformity" determinations. Transportation conformity is required by the CAA, Section 176(c),[42] to prohibit federal funding and approval for highway and transit projects unless they are consistent with ("conform to") the air quality goals established by a SIP and will not cause new air quality violations, worsen existing violations, or delay timely attainment of the national ambient air quality standards.

In terms of implementation of existing coarse PM standards, according to EPA, the Agency has designated 87 areas as nonattainment with the PM_{10} NAAQS since 1990. Of the original 87 PM_{10} areas, 39 have been redesignated to attainment. Of the remaining 48 nonattainment areas, 41 have submitted the required SIPs for PM_{10} to EPA; 23 PM_{10} nonattainment areas have approved SIPs, and 16 of these have "clean air quality" (based on 2002-04 data) but have not yet been formally redesignated to attainment.[43] Although EPA has not provided any quantitative analysis, the new PM NAAQS are not expected to affect continued implementation of PM_{10} SIPs.

Although it has not yet published an RIA with supporting analyses, EPA released estimates of national costs of the new PM NAAQS based on a limited number of emissions control scenarios that States and Regional Planning Organizations might implement to achieve the new $PM_{2.5}$ standards. EPA estimated that meeting the new $PM_{2.5}$ daily (24-hour) standard would cost $6 billion. Updating its assessment of costs of meeting the $PM_{2.5}$ annual standard as promulgated in 1997, EPA estimated that meeting this standard, which is unchanged, would cost $7 billion.

Designation of geographical areas and the associated impacts on specific areas would be speculative at best because implementation of any revised PM NAAQS would be several years off. States would not be required to meet the proposed $PM_{2.5}$ standard until April 2015 (April 2020, if qualified for an extension). With regard to the current NAAQS, states are required to submit "implementation" plans for how they will meet the $PM_{2.5}$ NAAQS by April 2008 and must be in compliance by 2010, unless they are granted a five-year extension.

Implementation of the 1997 PM standard, delayed several years by litigation, the lack of monitoring capability, and other factors, is ongoing. EPA's recent final designation of 39 geographical areas, composed of 208 counties in 20 states and the District of Columbia, in nonattainment (those areas with or contributing to air quality levels exceeding the annual and 24-hour standards) with the $PM_{2.5}$ NAAQS became effective on April 5, 2005. A direct comparison of nonattainment with the current

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[42] 42 U.S.C. 7506(c).

[43] For more information about EPA's PM_{10} designations see [http://www.epa.gov/air/oaqps/greenbk/pindex.html].

standard and the proposal is not available. However, in conjunction with the January 17, 2006, proposal, EPA projected that the numbers of counties with monitors that would not attain the $PM_{2.5}$ NAAQS could increase from 116 counties (those with monitors within the total 208 counties), based on the current standard, to 191, with the proposed $PM_{2.5}$ NAAQS, by 2010. Taking into account those areas without monitors but contributing to air quality levels exceeding the standard, and other factors considered by the Agency when determining the designations, the total number of a counties likely to be in nonattainment with the proposed standard would be even larger.

Table 3 below summarizes the EPA's comparative nonattainment designation projections of counties with monitors for 2010 and 2015, based on the 1997 $PM_{2.5}$ standard, the new standard, and other alternative $PM_{2.5}$ standards that EPA considered. EPA notes that its projections are based on 2001-2003 monitoring data, whereas the actual nonattinment designations would be based on 2004-2006 monitoring data.[44] EPA's projections also take into account those PM reductions that the agency expects will occur as the result of air quality regulations promulgated in 2005,[45] including the Clean Air Interstate Rule (CAIR), the Clean Air Mercury Rule (CAMR), and the Clean Air Visibility Rule (CAVR).

Table 3. Counties with Monitors Projected To Be in Nonattainment for Current, New, and Alternative $PM_{2.5}$ NAAQS

	2010			2015 with CAIR/CAVR/CAMR		
$PM_{2.5}$ NAAQS Options (24-hour and annual $\mu g/m^3$)	National	East	West	National	East	West
15/65 — current	116	102	14	32	18	14
15/35 — new	191	141	50	76	30	46
14/35	235	185	50	96	50	46
15/30	326	264	62	178	116	62

Source: Prepared by the Congressional research Service with data presented in the *EPA White Paper Preliminary Analyses of Proposed PM2.5 NAAQS Alternatives, Office of Air Quality Planning and Standards*, Office of Air and Radiation, December 21, 2005, available at [http://epa.gov/pm/pdfs/whitepaper20051220.pdf].

Notes: CAIR = Clean Air Interstate Rule, CAMR= Clean Air Mercury Rule, and CAVR = the Clean Air Visibility Rule, promulgated in 2005.

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[44] Revisions to Ambient Air Monitoring Regulations, final rule, 71 *Federal Register* 61235-61328, Oct. 17, 2006. In a separate but related action, EPA amended its national air quality monitoring requirements, including those for monitoring particle pollution, to help federal, state, and local air quality agencies "improve public health protection and inform the public about air quality in their communities" by taking advantage of improvements in monitoring technology. Information on the changes are available at [http://www.epa.gov/air/particlepollution/actions.html].

[45] For more information on these and other recent EPA's air quality regulations, see [http://www.epa.gov/cleanair2004/].

Reaction to the Proposed PM NAAQS

Well before the EPA formally proposed revising the NAAQS, stakeholders were providing evidence and arguments at public hearings and other forums for their preferred recommendations — in general, business and industry oppose more stringent standards, and public health and environmental interest groups advocate tighter standards. EPA received thousands of comments during various stages of development of the criteria document and in response to drafts of the EPA staff paper. Many of the public interest groups, as well as the association representing state air quality regulators,[46] felt that the December 2005 proposal should have been more stringent — at a minimum, at the lower levels within the range of EPA staff/CASAC recommendations. Based on EPA's references to the comments in the Preamble, a review of several comments in the Federal Docket for the January 17, 2006, proposal, and several media articles and available press releases:

Proponents of more stringent standards generally assert that

- the standards should be at least as stringent as the more stringent combined daily and annual levels recommended in the EPA staff paper and those recommended by the CASAC based on its review of the criteria and the EPA staff analysis;
- scientific evidence of adverse health effects are more compelling than when the standards were revised in 1997;
- exclusion of rural sources from the coarse particle (PM_{10}) standard is not sufficiently protective of human health and would be difficult to distinguish and implement;
- more stringent standards ensure continued progress toward protection of public health with an adequate margin of safety as required by the CAA, in addition to avoidance of other adverse health effects;
- welfare effects, such as visibility, crop yield and forest health, will be enhanced.

Critics of more stringent PM NAAQS contend that

- more stringent (and in some cases the existing) standards are not justified by the scientific evidence; the proposal did not take into account hundreds of studies completed since the 2002 cut-off;
- requiring the same level of stringency for all fine particles without distinguishing sources is unfounded;
- costs and adverse impacts on regions and sectors of the economy are excessive; some of those identified as "urban" sources contend exemption of rural particles may result in a disproportional compliance burden;

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[46] Personal communication with Mr. William Becker, Executive Director, State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officials (STAPPA/ALAPCO), Jan. 5, 2006.

- revising the standards could impede implementation of the existing PM NAAQS and the process of bringing areas into compliance, given the current status of this process; revisions could also impede efforts to meet air quality regulations promulgated in 2005, such as the Clean Air Interstate Rule (CAIR);[47]
- the benefits (and costs) associated with implementation of the 1997 PM standard, as well as compliance with recent EPA air quality regulations, have not yet been realized.

At the time of proposal, EPA responded to both sides by emphasizing that the Agency's conclusions and decisions were provisional and proposed in nature, and the agency solicited comment (90-day comment period from the date of publication in the *Federal Register*) regarding its supporting analysis and a variety of alternative PM NAAQS. In addition to written comments, EPA held public hearings in early March 2006 in Philadelphia, Chicago, and San Francisco. EPA also declared its intention to review and evaluate significant new studies developed since 2002 and those published since the close of the criteria document.[48] EPA has indicated its response to many comments in its rationale for the final standards throughout the Preamble. In some cases, EPA has revised elements of its proposal based on certain comments; in other cases, EPA lays out its reasoning for disagreeing with other comments.

Congressional Activity

Congress and a wide variety of stakeholders have closely followed the development of the new PM NAAQS. Most recently during the first and second sessions of the 109th Congress, the Senate Committee on Environment and Public Works and the Committee's Subcommittee on Clean Air, Climate Change, and Nuclear Safety have held hearings regarding implementation and review of the PM NAAQS.[49] Several Members of the House Committee on Agriculture submitted a letter to EPA Administrator Johnson regarding their views as to the consideration of agriculture concerns in the developments of the PM NAAQS.[50] Some Members of the House Committee on Agriculture expressed their concerns about the EPA's final

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[47] EPA, Clean Air Interstate Rule, Clean Air Mercury Rule, and Clean Air Nonroad Diesel Rule. [http://www.epa.gov/cleanair2004/].

[48] 71 *Federal Register* 2625, July 17, 2006.

[49] U.S. Senate Committee on Environment and Public Works, full Committee, *The Science and Risk Assessment Behind the EPA's Proposed Revisions to the Particulate Matter Air Quality Standards*, July 19, 2006; Subcommittee on Clean Air, Climate Change, and Nuclear Safety, *EPA's Proposed Revisions to the Particulate Matter Air Quality Standards*, July 13, 2006, and *Implementation of the Existing Particulate Matter and Ozone Air Quality Standards*, Nov. 10, 2005.

[50] Letter to EPA Administrator Stephen L. Johnson, from the Chairman, the Ranking Member, and other Members of the House Committee on Agriculture, July 27, 2006.

actions with regard to the exemptions at a September 28, 2006, hearing regarding the EPA's pesticide programs.[51]

Because of health and cost implications, NAAQS decisions have often been the source of significant concern to many in Congress. The evolution and development of the PM (and ozone) NAAQS, in particular, have been the subject of extensive oversight. Congress enacted legislation specifying deadlines for implementation of the 1997 standard, funding for monitoring and research of potential health effects, and the coordination of the PM (and ozone) standard with other air quality regulations.

In 1997, when the current standard was promulgated, Congress held 28 days of hearings on the EPA rule. Since FY1998, in an effort to expedite research and strengthen the science underlying EPA's review of the standard, Congress has appropriated funding specifically for PM research annually,[52] including $60.5 million for FY2005. Congress did not specify PM research funding in EPA's FY2006 appropriation but included $61.0 million for NAAQS research prior to a 0.476% across-the-board rescission.[53] The research, including re-analysis of key studies underlying the 1997 standard, has largely confirmed EPA's earlier conclusions, although new questions have been raised regarding the methodology used in some of the studies.

Because of the potential impacts PM NAAQS could have on public health and the economy, EPA's reassessment of and proposed modifications to these standards will likely be of continued interest to Congress.

Conclusions

EPA's September 21, 2006, announcement of its final modifications to the existing PM NAAQS following completion of its statutorily required review has sparked interest and conflicting concerns among a diverse array of stakeholders, and in Congress. Because the health and economic consequences of particulate matter standards are so potentially significant, the PM NAAQS are likely to remain a prominent issue of interest during the second session of the 109th Congress.

Tightening the PM NAAQS will result in more areas classified as nonattainment and needing to implement new controls on particulate matter. States and local governments would be required to develop and implement new plans for addressing

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[51] House Committee on Agriculture, Subcommittee on Conservation, Credit, Rural Development, and Research, *Review of the Environmental Protection Agency's Pesticide Program*, Sept.28, 2006.

[52] Congress increased EPA's appropriations for particulate matter research from $18.8 million in FY1997 (H.Rept. 104-812) to $49.6 million in FY1998 (H.Rept. 105-297). PM research appropriations averaged more than $60 million per year from FY1999 through FY2004.

[53] P.L. 109-54; H.Rept. 109-188.

emissions in those areas that do not meet the new standards. A stricter standard means increased costs for the transportation and industrial sectors most likely affected by particulate matter controls, including utilities, refineries, and the trucking industry. In terms of public health, a stricter standard is estimated to result in fewer adverse health effects for the general population and particularly sensitive populations such as children, asthmatics, and the elderly.

The EPA's previous review and establishment of PM NAAQS was the subject of litigation and challenges, including a Supreme Court decision in 2001.[54] EPA's 1997 promulgation of standards for both coarse and fine particulate matter prompted critics to charge EPA with overregulation and spurred environmental groups to claim that EPA had not gone far enough. Not only was the science behind the PM NAAQS challenged, but EPA was also accused of unconstitutional behavior. More than 100 plaintiffs sued to overturn the standard. Although EPA's decision to issue the standards was upheld, for the most part, stakeholders on both sides of the issue continued to advocate their recommendations for more stringent and less stringent (in some cases no) PM standard.

It would not be surprising if interested parties return to the courts or initiate challenges to EPA's final standards. Thus, the final form of the current efforts to revise PM NAAQS may not be known for some time.

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[54] *Whitman v. American Trucking Associations*, 531 U.S. 457 (2001). Along with deciding issues specific to PM and ozone, the Court ruled unanimously that costs could not be considered in setting primary (health-based) NAAQS.