September 2006 Revisions to the National Ambient Air Quality Standards for Particle Pollution

Overview

09-06

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- On September 21, 2006 EPA completed its review of the National Ambient Air Quality Standards (NAAQS) for particle pollution.
- The final decision includes revisions to strengthen the fine particle standards to protect both health and visibility, and to retain the 24-hour coarse particle to protect public health.
- The revisions address two categories of particle pollution:
  - *fine particles* ($PM_{2.5}$), which are 2.5 micrometers in diameter and smaller; and
  - *inhalable coarse particles* (PM_{10}), which are larger than 2.5 micrometers and smaller than 10 micrometers in diameter.
- For more information go to http://www.epa.gov/air/particles

Particulate Matter: What is It?

A complex mixture of extremely small particles and liquid droplets

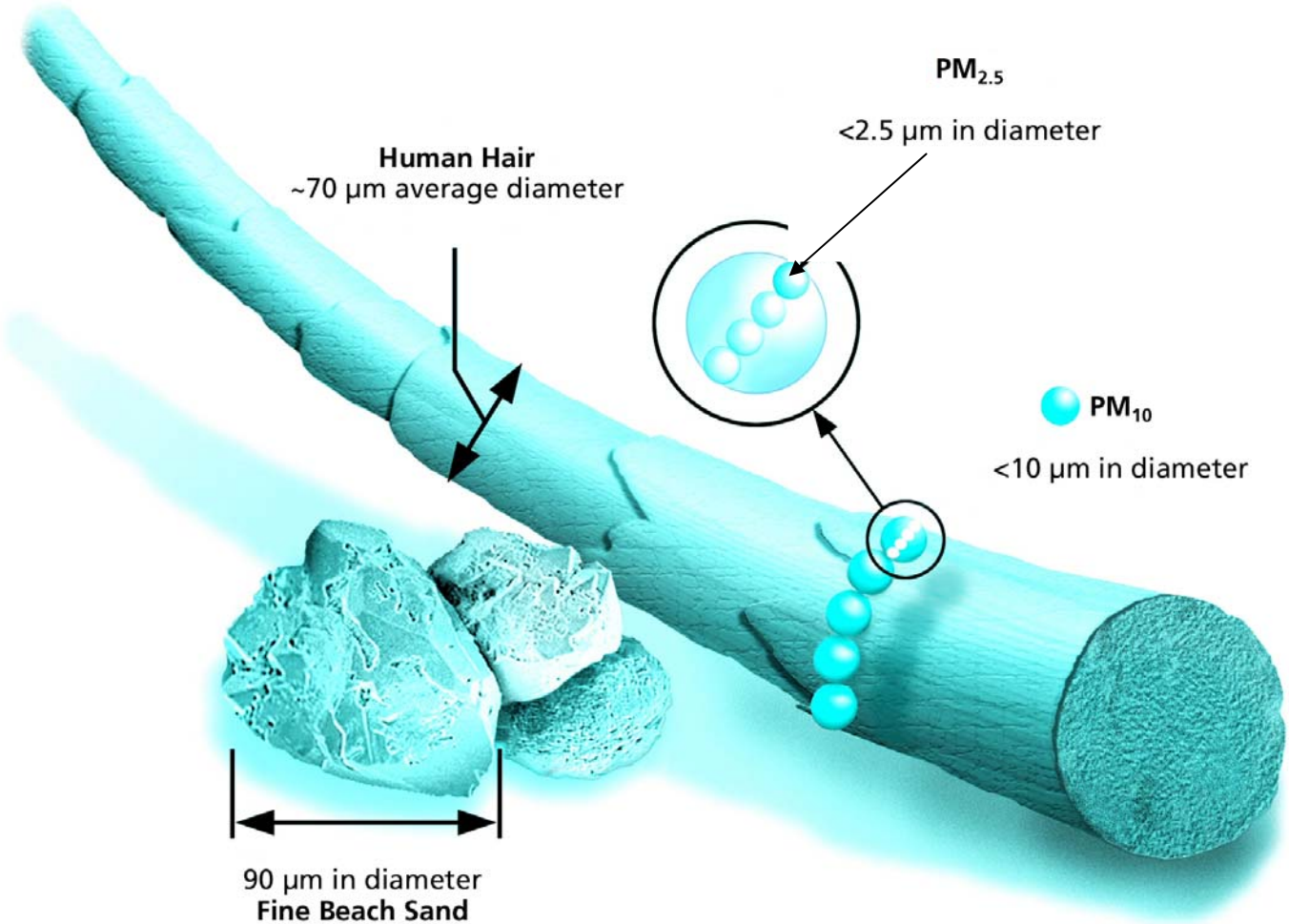


Image courtesy of EPA, Office of Research and Development

PM Components: fine and coarse

Fine Particles

Combustion, gases to particles

Sulfates/acids
Nitrate
Ammonium
Organics
Carbon
Metals
Water

Sources:

Coal, oil, gasoline, diesel, wood combustion
Transformation of SOx, NOx, organic gases including biogenics
High temperature industrial processes (smelters, steel mills)
Forest fires

Exposure/Lifetime:

Lifetime days to weeks, regional distribution over urban scale to 1000s of km

Inhalable Coarse Particles

Crushing, grinding, dust

Resuspended dusts (soil, street dust)
Coal/oil fly ash
Aluminum, silica, iron-oxides
Tire and brake wear
Inhalable Biological Materials (e.g., from soils, plant fragments)

Sources:

Resuspension of dust tracked onto roads
Suspension from disturbed soil (farms, mines, unpaved roads)
Construction/demolition
Industrial fugitives
Biological sources

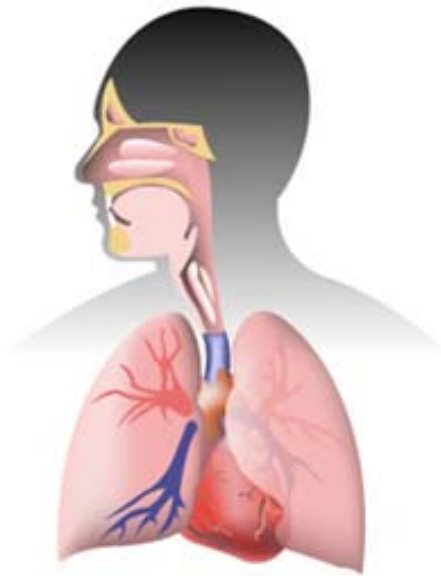
Exposure/Lifetime:

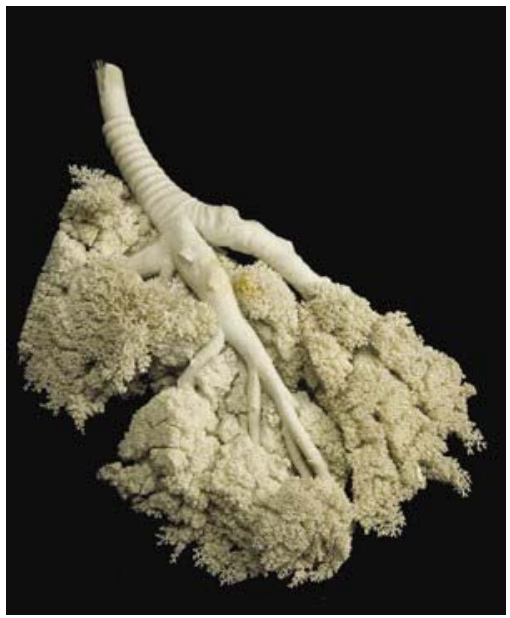
Coarse fraction (2.5-10) lifetime of hours to days, distribution up to 100s km

Particulate Matter

- Larger particles (> PM_{10}) deposit in the upper respiratory tract

- Smaller, inhalable particles (≤ PM_{10}) penetrate deep into the lungs





- Both coarse PM_{10} and fine $PM_{2.5}$ can penetrate to lower regions of the lung

- Deposited particles may accumulate, react, be cleared or absorbed

Heath Effects of Particle Pollution

- Many scientific studies have linked breathing particle pollution to a series of significant health problems, including:
  - Aggravated asthma
  - Increases in respiratory symptoms like coughing and difficult or painful breathing
  - Chronic bronchitis
  - Decreased lung function
  - Premature death in people with heart and lung disease

Regulating Particle Pollution

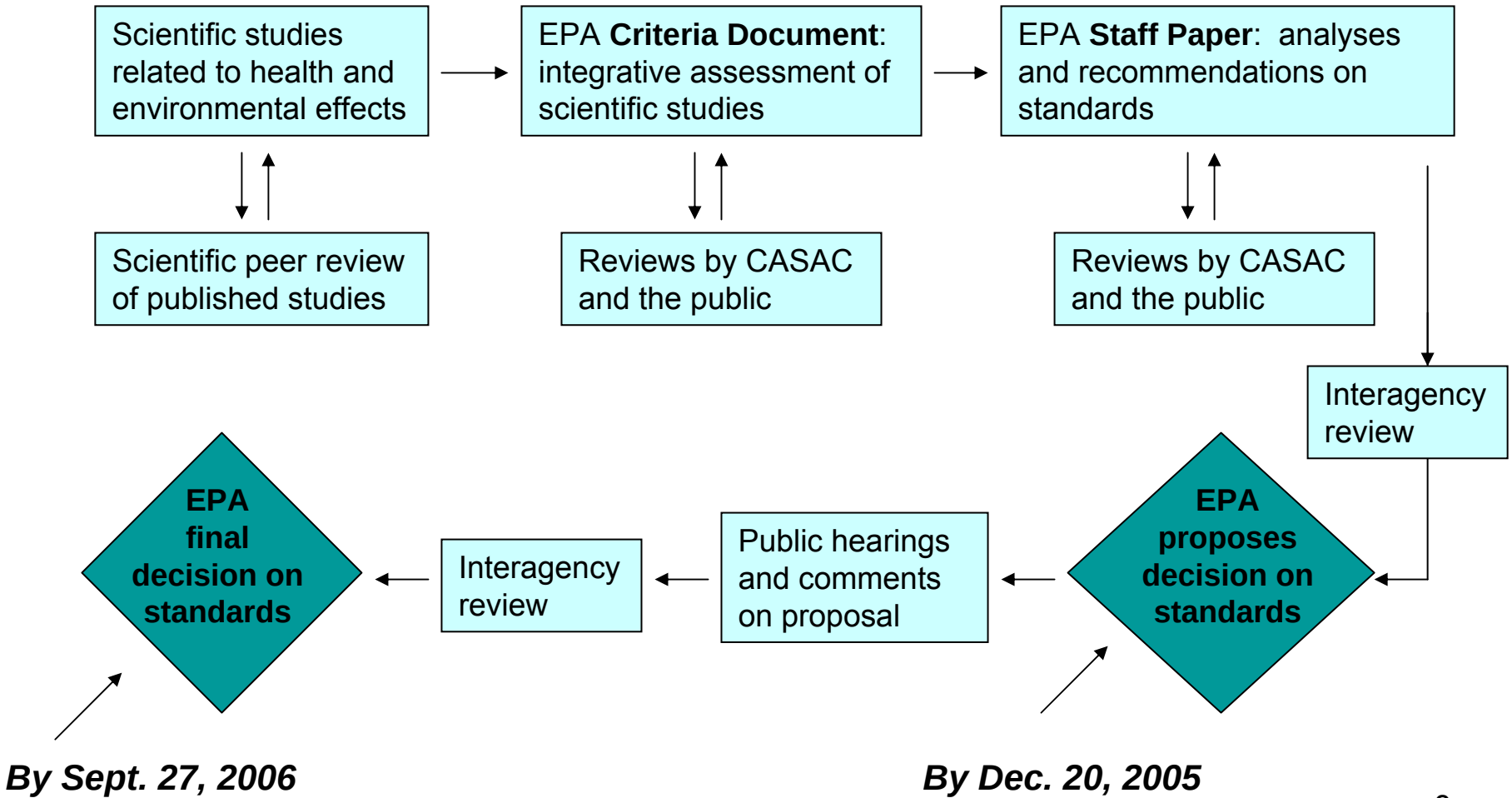
- The Clean Air Act requires EPA to set two types of national ambient air quality standards (NAAQS) for 'criteria' air pollutants
  - ***Primary standards*** to protect public health with an adequate margin of safety
  - ***Secondary standards*** to protect public welfare and the environment (visibility, wildlife, crops, vegetation, national monuments and buildings)

- EPA has set NAAQS for six common air pollutants:
  - Particulate matter - Ground level ozone (smog)
  - Carbon monoxide - Lead
  - Nitrogen dioxide - Sulfur dioxide

- The law requires EPA to review the scientific information and the standards for each pollutant ***every five years***

- The law also requires EPA obtain advice from the Clean Air Scientific Advisory Committee (CASAC) on each review

PM NAAQS Review Process – Extensive Peer Review and Public Input



Current PM NAAQS Review – Schedule

- Rulemaking on PM NAAQS:
  - ***Proposal*** signed on December 20, 2005 (as required by consent agreement)
  - ***Public comment*** period: ended April 17, 2006. EPA received more than 120,000 comments.
  - ***Public Hearings*** held March 2006 in Philadelphia, Chicago and San Francisco
  - ***Final Rule*** signed on September 21, 2006 (consent agreement required signature by September 27, 2006)
  - September 21, 2006 rulemaking includes:
    - PM NAAQS, Federal Reference Method, & Data Handling (Part 50)
  - Upcoming and related rulemakings:
    - Air Monitoring Regulations: Requirements for Reference and Equivalent Methods, Network Design Requirements (Parts 53 & 58) (September 27, 2006)
    - Proposed Rulemaking on Implementing the new standards (Spring 2007)
    - Final Rule on Exceptional & Natural Events (March 2006)
    - Final rule to implement the 1997 standards (October 2006)

Reviewing the 1997 PM Standards

- EPA selected the levels for the final standards after reviewing thousands of peer-reviewed scientific studies about the effects of particle pollution on public health and welfare.

- External scientific advisors and the public provided extensive review of the agency's science and policy documents.

- The agency also carefully considered public comments on our proposal. EPA held three public hearings and received over 120,000 written comments.

Reviewing the 1997 PM Standards

- The Agency provisionally assessed new, peer-reviewed studies about particle pollution and health (including some studies received during the comment period) to ensure that the Agency was aware of new science before setting the final standards. That assessment did not materially change EPA's understanding of PM.

- EPA did not base its decision on these new studies, however, because they have not been through as rigorous a level of review as the science on which the Agency based its December 2005 proposal.

- EPA will consider these new studies during the next review of the PM standards.

- The rigorous review has resulted in a suite of standards that will protect the health and welfare of all Americans.

EPA's PM Standards: Old and New

	1997 Standards		2006 Standards	
	Annual	24-hour	Annual	24-hour
PM2.5 (Fine)	**15 µg/m³** Annual arithmetic mean, averaged over 3 years	**65 µg/m³** Annual arithmetic mean, averaged over 3 years	**15µg/m³** Annual arithmetic mean, averaged over 3 years	**35µg/m³** Annual arithmetic mean, averaged over 3 years
PM10 (Coarse)	**50µg/m³** Annual average	**150µg/m³** 24-hr average (99^{th} percentile)	**Revoked**	**150µg/m³** 24-hr average (99^{th} percentile)

$PM_{2.5}$ – Primary 24-hour Standard

- EPA has strengthened the level of the **24-hour standard** from the 1997 level of ***65 µg/m³*** to ***35 µg/m³***.
  - EPA made this change based on its assessment of a significantly expanded body of scientific information.
  - Studies show health effects at and below the levels allowed by the 1997 standard including premature death, increased emergency room visits and increased hospitalizations.
  - There was consensus among CASAC panelists to place more emphasis on lowering the 24-hour $PM_{2.5}$standard.
  - EPA's assessment concluded that the standard should be strengthened to better protect the public from short-term fine particle exposures.
- An area will meet the 24-hour standard if the average of the 98th percentile of 24-hour $PM_{2.5}$ concentrations in each of three years, is less than or equal to the level of the standard of 35 µg/m^3. This is the same averaging convention as the 1997 24-hour standard.

$PM_{2.5}$ – Primary Annual Standard

- EPA has retained the current **annual standard** at ***15 µg/m³***
  - EPA retained this standard based on its assessment of several expanded, re-analyzed and new studies.
  - The study results have increased the Agency's confidence in associations between long-term $PM_{2.5}$ exposure and serious health effects, including heart and lung-related death.
  - While the Administrator carefully considered the advice received from CASAC, he has a different view than CASAC on whether the evidence warrants a further tightening of the annual standard. In the Administrator's judgment, an annual standard of 15 µg/m³ provides the appropriate level of protection with an adequate margin of safety.

- An area will meet the annual PM2.5 standard when the three-year average of the annual average PM2.5 concentration is less than or equal to 15 µg/m³. This is the same form as the current annual standard.

- EPA changed the spatial averaging convention. The Agency tightened the conditions under which more than one monitor could be used to determine the annual average.

Inhalable Coarse PM – Primary 24-hour Standard

- The Agency has retained the existing 24-hour PM_{10} standard of 150 micrograms per cubic meter in order to protect the health of Americans in all areas of the country.
  - EPA based its final decision on a number of factors, including the review of the scientific information and public comments.
  - While the available science indicates that coarse particles in urban areas generally are linked to adverse health effects, the evidence is inconclusive about whether coarse particles in rural areas harm health.
  - Based on the limited evidence about coarse particles in rural areas, and after considering public comments, EPA decided to take a cautious approach and keep the current 24-hour PM_{10} standard to protect people in all areas of the country.
- An area will meet the 24-hour PM_{10} standard when the 150µg/m^3 level is not exceeded more than once per year on average over a three year period. This is the same form as the current 24-hour standard.

Inhalable Coarse PM – Revoking the Annual Standard

- The Agency is revoking the annual PM_{10} standard.
- Available evidence does not suggest a link between long-term exposure to PM_{10} at the current ambient levels and health problems.
- Analysis of air quality data show that the 24-hour PM_{10} standard would maintain annual levels at or below those of the former annual standard of 50 $\mu g/m^3$.

Secondary Standards–

- EPA set the secondary standards to be identical in all respects to the revised primary standards.

$PM_{2.5}$
  - EPA revised the 24-hour $PM_{2.5}$ standard to be 35 µg/m^3 and retained the annual $PM_{2.5}$ standard at 15µg/m^3 .

PM_{10}
  - EPA retained the 24-hour PM_{10} standard at 150 µg/m^3 and revoked the annual PM_{10} secondary standard

- These standards will address visibility impairment and other PM welfare effects including effects on vegetation and ecosystems and materials damage and soiling.

Benefits and Costs

- The Clean Air Act prevents EPA from considering costs in setting or revising NAAQS.
- However, the Agency does analyze the benefits and costs of implementing standards as required by Executive Order.
- When fully met, the revised 24-hour PM2.5 standards will yield an estimated $17 billion to $35 billion a year in health and visibility benefits in 2020.
- These benefits are in addition to the benefits of meeting the 1997 standards. EPA estimates the cost of meeting these standards at $6 billion.

Benefits and Costs

- The benefits of meeting the revised 24-hour PM2.5 standards include estimated annual reduction in:
  - 2,500 to 5,700 premature deaths in people with heart or lung disease.
  - 2,600 cases of chronic bronchitis.
  - 5,000 nonfatal heart attacks,
  - 1,630 hospital admissions for cardiovascular or respiratory symptoms,
  - 1,200 emergency room visits for asthma,
  - 7,300 cases of acute bronchitis,
  - 97,000 cases of upper and lower respiratory symptoms,
  - 51,000 cases of aggravated asthma,
  - 350,000 days when people miss work or school, and
  - 2 million days when people must restrict their activities because of particle pollution-related symptoms

Implementation Issues

24-hour PM2.5 standard

- We intend to designate areas in late 2009.
- These designations would likely become effective in early 2010 -- 3 years plus 60 days after the PM standards are published in the *Federal Register*.

Annual PM2.5 standard and 24-hour PM standard

- In the near future, EPA intends to address, as necessary, issues such as designations, conformity, and new source review, related to implementation of today's final rule.

Expected Timeline for Revised $PM_{2.5}$ NAAQS

Milestone	1997 $PM_{2.5}$ Primary NAAQS	2006 $PM_{2.5}$ Primary NAAQS
Promulgation of Standard	July 1997	Dec. 2006
State Recommendations to EPA	Feb. 2004 (based on 2001-2003 monitoring data)	Dec. 2007 (based on 2004-2006 monitoring data)
Final Designations Signature	Dec. 2004	Dec. 2009
Effective Date of Designations	April 2005	April 2010
SIPs Due	April 2008	April 2013
Attainment Date	April 2010 (based on 2007-2009 monitoring data)	April 2015 (based on 2012-2014 monitoring data)
Attainment Date with Extension	Up to April 2015	April 2020