

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



## Overview

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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 rule addresses two categories of particle pollution:
  - *fine particles* (PM<sub>2.5</sub>), which are 2.5 micrometers in diameter and smaller; and
  - *inhalable coarse particles*, which are larger than 2.5 micrometers and smaller than 10 micrometers in diameter.
- In the final rule EPA :
  - revised the fine particle standards to better protect public health and visibility, and
  - retained the 24-hour PM<sub>10</sub> standard to protect against exposure to inhalable coarse particles.
- 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

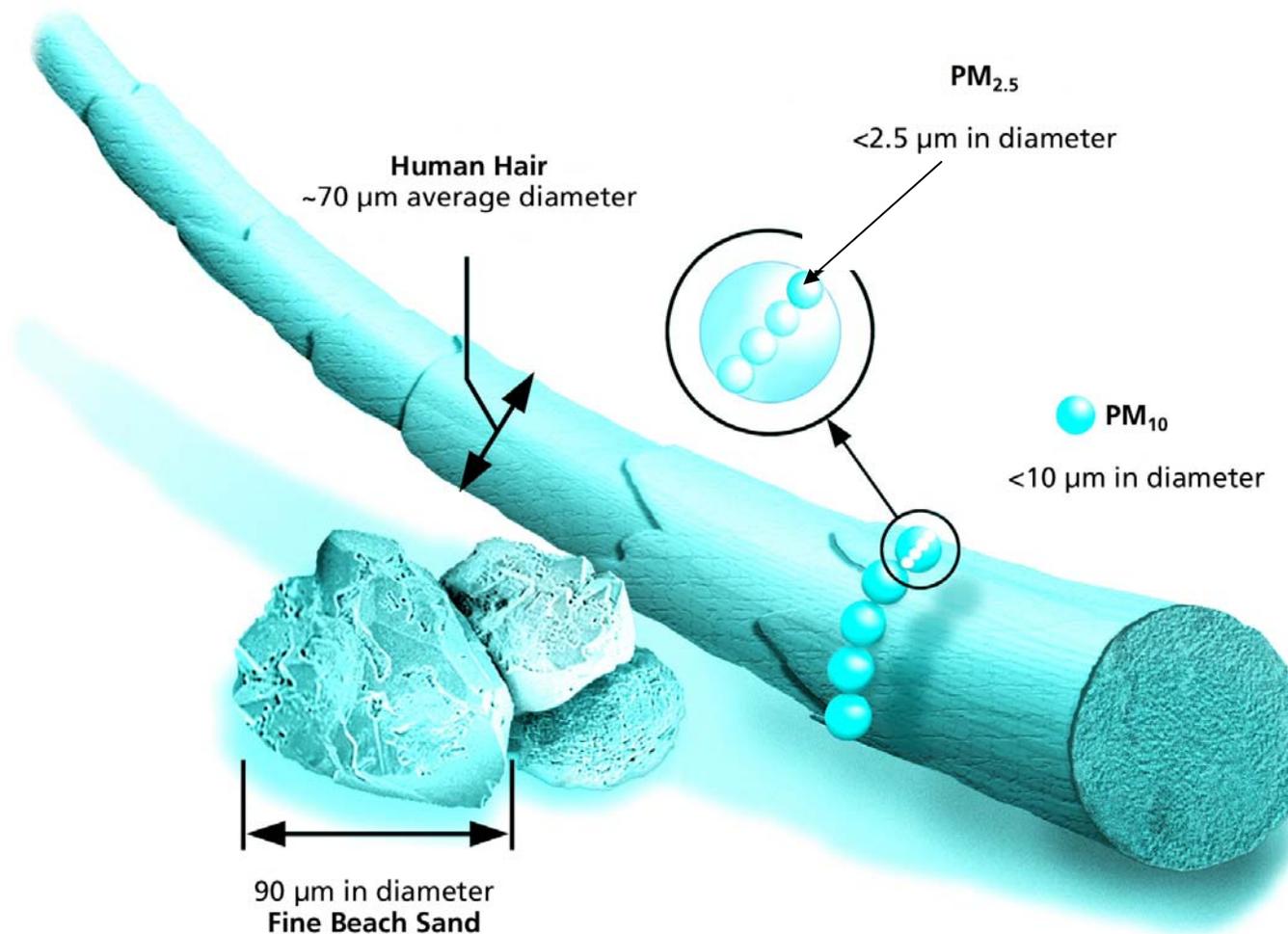


Image courtesy of EPA, Office of Research and Development

## *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 SO<sub>x</sub>, NO<sub>x</sub>, 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:**

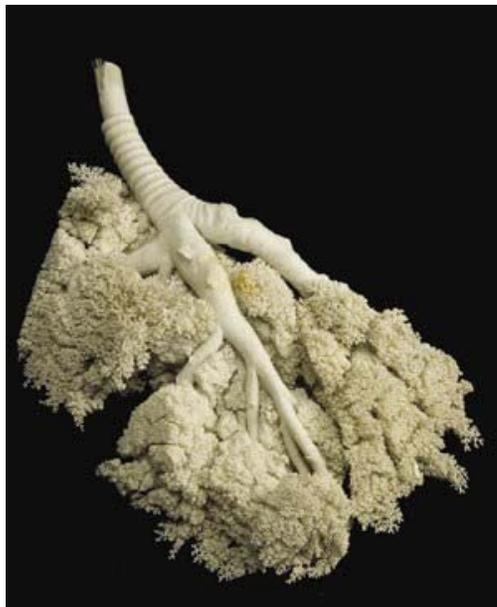
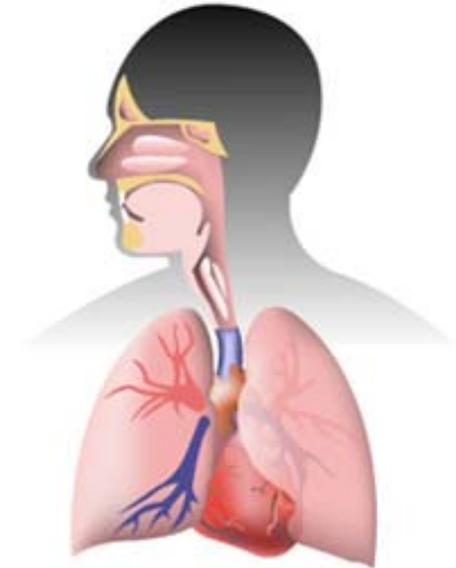
Resuspension of dust tracked onto roads  
Suspension from disturbed soil (farms, mines, unpaved roads)  
Construction/demolition  
Industrial fugitives  
Biological sources

### **Exposure/Lifetime:**

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

# Particulate Matter

- Larger particles ( $> PM_{10}$ ) deposit in the upper respiratory tract  $\longrightarrow$
- Smaller, inhalable particles ( $\leq PM_{10}$ ) penetrate deep into the lungs  $\longrightarrow$



- Both coarse particulate matter and fine particulate matter can penetrate to lower regions of the lung
- Deposited particles may accumulate, react, be cleared or absorbed

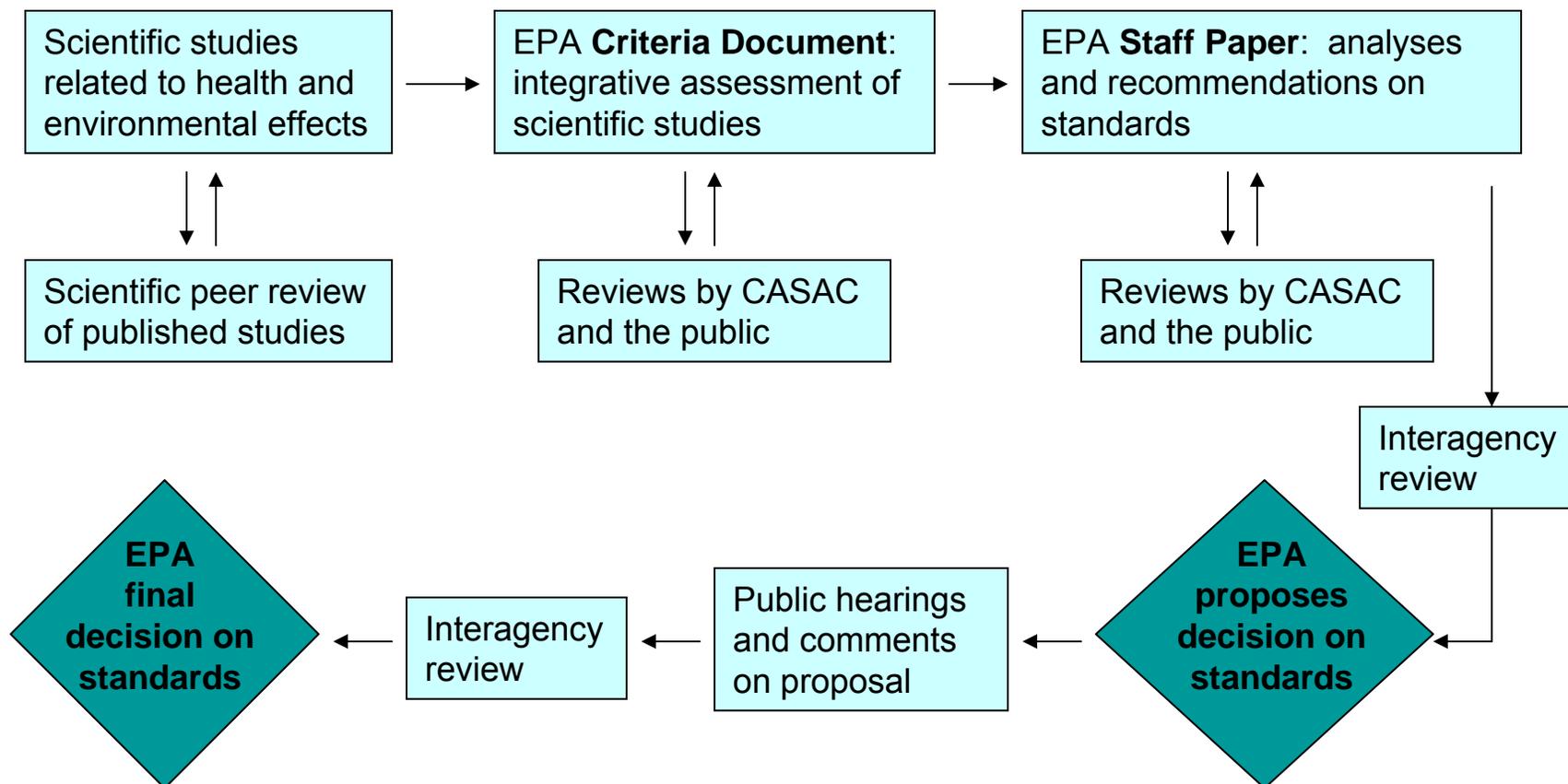
## *Health Effects of Particle Pollution*

- 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
  - Carbon monoxide
  - Nitrogen dioxide
  - Ground level ozone (smog)
  - Lead
  - 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 to 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)
    - Final Rule to Implement the 1997 PM Standards (October 2006)
    - Final Rule on Exceptional & Natural Events (March 2007)

## *Reviewing the PM Standards*

- EPA final decisions reflect the review of 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 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 Administrator was aware of new science before setting the final standards. That assessment did not materially change EPA's understanding of PM health effects.
- 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 and other relevant information 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

	Previous Standards		2006 Standards	
	Annual	24-hour	Annual	24-hour
<b>PM<sub>2.5</sub></b> <b>(Fine Particles)</b>	<b>15 µg/m<sup>3</sup></b> Annual arithmetic mean, averaged over 3 years (established in 1997)	<b>65 µg/m<sup>3</sup></b> 24- hour average, 98 <sup>th</sup> percentile, averaged over 3 years (established in 1997)	<b>15 µg/m<sup>3</sup></b> Annual arithmetic mean, averaged over 3 years	<b>35 µg/m<sup>3</sup></b> 24- hour average, 98 <sup>th</sup> percentile, averaged over 3 years
<b>PM<sub>10</sub></b> <b>(Coarse Particles)</b>	<b>50 µg/m<sup>3</sup></b> Annual average (established in 1987)	<b>150 µg/m<sup>3</sup></b> 24-hr average, not to be exceeded more than once per year on average over a three year period (established in 1987)	<b>Revoked</b>	<b>150 µg/m<sup>3</sup></b> 24-hr average, not to be exceeded more than once per year on average over a three year period

## *PM<sub>2.5</sub> – Primary 24-hour Standard*

- EPA has strengthened the level of the **24-hour PM<sub>2.5</sub> standard** from the 1997 level of **65 µg/m<sup>3</sup>** to **35 µg/m<sup>3</sup>**.
  - EPA made this change based on its assessment of a significantly expanded body of scientific information.
  - Epidemiologic studies show health effects at and below the levels allowed by the 1997 24-hour 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<sub>2.5</sub> 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<sub>2.5</sub> concentrations averaged over three years, is less than or equal to the level of the standard of 35 µg/m<sup>3</sup>. This is the same averaging convention as the 1997 24-hour PM<sub>2.5</sub> standard.

## *PM<sub>2.5</sub> – Primary Annual Standard*

- EPA has retained the level of the **annual PM<sub>2.5</sub>** standard at **15 µg/m<sup>3</sup>**.
  - EPA retained this level, set in 1997, based on its assessment of several expanded, re-analyzed and new epidemiologic studies.
  - The study results have increased the Agency’s confidence in associations between long-term PM<sub>2.5</sub> exposure and serious health effects, including heart and lung-related death.
  - While the Administrator carefully considered the advice received from CASAC to lower the annual standard to 13 – 14 µg/m<sup>3</sup>, 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/m<sup>3</sup> provides the appropriate level of protection with an adequate margin of safety.
- An area will meet the annual PM<sub>2.5</sub> standard when the three-year average of the annual average PM<sub>2.5</sub> concentration is less than or equal to 15 µg/m<sup>3</sup>.
- EPA made a small revision to the form of this standard, tightening the conditions under which more than one monitor could be used to determine the annual average PM<sub>2.5</sub> levels in an area. This is known as spatial averaging.

## ***Inhalable Coarse PM – Primary 24-hour Standard***

- The Agency has retained the existing 24-hour PM<sub>10</sub> standard of 150 µg/m<sup>3</sup> 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 lack of evidence about coarse particles in rural areas, and after considering public comments, EPA decided to take a cautious approach and retain the existing 24-hour PM<sub>10</sub> standard to protect people in all areas of the country.
- An area will meet the 24-hour PM<sub>10</sub> standard when the 150 µg/m<sup>3</sup> level is not exceeded more than once per year on average over a three year period.

## *Inhalable Coarse PM – Revoking the Annual Standard*

- The Agency is revoking the annual PM<sub>10</sub> standard.
- Available evidence does not suggest a link between long-term exposure to PM<sub>10</sub> at current ambient levels and health problems.
- Analysis of air quality data shows that the 24-hour PM<sub>10</sub> standard generally results in annual average PM<sub>10</sub> levels at or below the level of the former annual standard of 50 µg/m<sup>3</sup>.

## *Secondary Standards—*

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

PM<sub>2.5</sub>

- EPA revised the 24-hour PM<sub>2.5</sub> standard to be 35 µg/m<sup>3</sup> and retained the annual PM<sub>2.5</sub> standard at 15 µg/m<sup>3</sup>.

PM<sub>10</sub>

- EPA retained the 24-hour PM<sub>10</sub> standard at 150 µg/m<sup>3</sup> and revoked the annual PM<sub>10</sub> secondary standard

- These standards were established to protect against 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 12866 and as a good government practice, to inform Congress and the public of benefits and costs.
- When fully met, the revised 24-hour PM<sub>2.5</sub> standards are estimated to yield between \$9 billion and \$75 billion a year in health and visibility benefits in 2020. This estimate is based on the opinions of outside experts on PM and the risk of premature death, along with other benefits information.
- The results of one key study alone suggest that a central estimate of the benefits of meeting the revised 24-hour PM<sub>2.5</sub> standards is \$17 billion per year in 2020, though other recent studies suggest the benefits may be higher.
- These benefits are in addition to the benefits of meeting the 1997 standards.
- EPA estimates the cost of meeting these revised standards at \$5.4 billion per year in 2020.

## *Benefits and Costs*

- The benefits of meeting the revised 24-hour PM<sub>2.5</sub> standards include the value of estimated annual reductions of:
  - 1,200 to 13,000 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 PM<sub>2.5</sub> Standard

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

### Annual PM<sub>2.5</sub> Standard and 24-hour PM<sub>10</sub> 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<sub>2.5</sub> NAAQS*

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