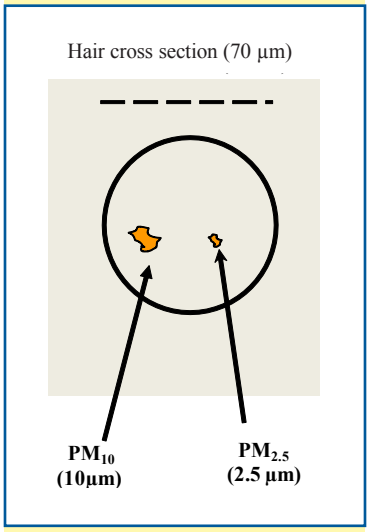
Particulate Matter 101



What is Particulate Matter?

- Particles suspended in the air, including dust, dirt, soot and liquid droplets are known as particulate matter (PM) or particle pollution. Particles can be suspended in the air for long periods of time and can travel long distances from the source. Some particles are large or dark enough to be seen as soot or smoke. Others are so small that they can only be detected with an electron microscope.
- $PM_{2.5}$ refers to **fine particles** that are smaller than 2.5 microns in diameter—a small fraction of the diameter of a human hair. *(see figure at left)*

What Are the Sources of Particulate Matter?

- Some fine particle pollution comes directly from combustion of fossil fuels, such as in cars, trucks, and buses, from wood burning, and from industrial processes. This kind of PM is called **primary particulate matter**.
- Fine particles also may be formed in the air when sulfur and nitrogen oxide emissions from fossil fuel combustion react with other chemical compounds in the air. This is called **secondary particulate matter**. These particles usually result from emissions from coal fired power plants, vehicles and industrial processes.

How Is $PM_{2.5}$ Regulated?

- In 1997, the Environmental Protection Agency (EPA) first developed National Ambient Air Quality Standards (NAAQS) to place limits on fine particle pollution because of growing evidence of links between PM and serious negative effects on public health. In 2006, with new evidence from additional scientific studies, EPA set new standards for fine particle pollution.
- EPA sets two kinds of standards for fine particles: an **annual standard**, designed to protect people from health effects caused by exposures over many days to years; and a **24-hour standard** to provide additional protection on days with high peak $PM_{2.5}$ levels.
- The current NAAQS for fine particles ($PM_{2.5}$) is 35 micrograms/cubic meter for a 24-hour period and 15 micrograms/cubic meter annually.

Does Georgia Have a Problem with $PM_{2.5}$?

- **Yes.** In 2004, EPA designated 20 counties and two partial counties in metro Atlanta as nonattainment for the annual $PM_{2.5}$ standard. EPA also designated areas around Macon, Rome, and in northwest Georgia as annual $PM_{2.5}$ nonattainment areas.
- Although not designated as nonattainment, monitors in the Augusta and Columbus areas and in Washington and Wilkerson counties show concentrations close to the annual standard for $PM_{2.5}$. Despite local efforts in coordination with EPD, these areas sometimes still experience unhealthy levels of $PM_{2.5}$, in addition to the 26 counties or partial counties officially designated as nonattainment for this pollutant.
- It is worth noting that the EPA standards for $PM_{2.5}$ that many parts of Georgia fail to meet are less stringent than those standards recommended by the World Health Organization: 10 micrograms/cubic meter for the annual limit and 25 micrograms/cubic meter for the 24-hour standard.

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What Are the Health Effects of Particulate Matter?

- A large body of research findings point to "persuasive evidence that exposure to fine particulate air pollution has adverse effects on cardiopulmonary health." [i] According to the EPA, fine particles have been linked to cardiovascular symptoms, cardiac arrhythmias, heart attacks, respiratory symptoms, asthma attacks and bronchitis. These health problems can result in increased hospital admissions, emergency room visits and absences from school or work. [ii]

- In addition to premature death and acute effects such as asthma attacks, a large body of research also has demonstrated **long-term, chronic heart and lung health effects**. Studies suggest that both the concentrations of PM pollution in the air and the length of exposure time affect the resulting health problems. [iii]

- A recent study in Atlanta examined health effects of $PM_{2.5}$ from different kinds of sources. The study found significant, positive associations between $PM_{2.5}$ from vehicles and wood or other biomass burning and cardiovascular disease emergency room visits. Secondary sulfate-rich $PM_{2.5}$, primarily from coal-fired power plants, was positively associated with respiratory disease related emergency room visits. [iv]

What Are EPA and EPD Doing to Reduce PM Levels in Georgia?

- Recent federal rules regulating emissions from heavy-duty diesel vehicles and machines, rail engines and small engines require that new engines emit much less $PM_{2.5}$ than older models.

- Georgia's Environmental Protection Division (EPD) is implementing a number of measures to reduce concentrations of $PM_{2.5}$ in Georgia, including a multipollutant rule that phases in new controls for coal-fired power plants, more effective controls on industrial emissions, local open burning restrictions, and better smoke management during controlled burns.

- Federal funding programs to reduce diesel emissions help pay for pollution control devices for construction equipment, transit and school buses, and other diesel vehicles. These "retrofits" can reduce $PM_{2.5}$ in exhaust by up to 90 percent.

What Else Can Be Done to Reduce Concentrations of This Pollutant?

- Coal-fired power plants are the biggest source of secondary $PM_{2.5}$ in Georgia, and while new controls reduce $PM_{2.5}$ and other pollutants, **they do not eliminate them**. The demand for electricity should be reduced through energy efficiency and conservation programs and older coal plants can be phased out through the development of clean, renewable sources of energy such as solar and wind power. Individuals can reduce energy use by buying energy-efficient appliances and heating and cooling systems, turning off electronics when not in use, sealing homes and office buildings with insulation, and being conservative in the use of heat and air conditioning.

- An estimated 11 million heavy-duty diesel engines nationwide pre-date new emissions standards, and these engines produce high concentrations of harmful particulates. Congress should continue to support full funding for the Diesel Emissions Reduction Act (DERA) and other measures such as clean construction equipment requirements for federal transportation projects. DERA has funded more than $7 million in diesel engine retrofit projects in the state of Georgia, reducing by many tons the concentrations of toxic diesel particulate matter in the air.

- Cars produce exhaust containing fine particles laced with toxic heavy metals. Alternatives to road travel, including commuter rail between major cities and efficient transit systems within large and mid-cities Georgia cities, are needed to reduce this source of $PM_{2.5}$. Choosing rail or bus travel and walking or bicycling whenever possible reduce harmful vehicle emissions.

i. Pope, C.A. III.; Dockery, D.W. Health Effects of Fine Particulate Air Pollution: Lines that Connect; *J. Air & Waste Mgt. Assoc. 2006, 56, 709-742.*

ii. EPA. Fine Particle Designations: Basic Information; www.epa.gov/pmdesignations/basicinfo.htm. 2008.

iii. Op. cit. Pope & Dockery.

iv. Sarnat, J.A.; Marmur, A.; Klein, M.; Kim, E.; Russell, A.G.; Sarnat, S.E.; Mulholland, J.A.; Hopke, P.H.; & P. Tolbert. *Fine particle sources and cardiorespiratory morbidity: An application of chemical mass balance and factor analytical source-apportionment methods*; Environmental Health Perspectives. 2008, 116:4, 459-466.

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