

Harmful particles go unmeasured
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Maricopa County maintains an inventory of the major pollution sources across the metropolitan area, tracking dust from dirt roads and construction sites, fuel exhaust from highways and industrial operations, and organic compounds from industrial plants and landfills.

The inventory provides a foundation for everything state and county regulators do to reduce pollution.

And the U.S. Environmental Protection Agency says the inventory is inaccurate. In its decision to reject the county's coarse-dust-control plan in 2010, the EPA said the basic emissions inventory was flawed, placing too much emphasis on construction and not enough on vehicles and other traffic on paved and unpaved roads. As a result, the agency said, the dust-reduction plan itself was flawed. County officials disagreed, but the proposed revisions to the plan address the EPA's complaints.

The EPA's analysis underscored the importance of an accurate accounting of pollution sources, but it also exposed the potential traps for air-quality agencies: To measure pollutants correctly, you have to have a good idea of what to look for, and if you're wrong, the whole plan falls apart.

"The EPA knocked a leg out from the table," said Lindy Bauer, environmental-programs director for the Maricopa Association of Governments, the regional planning agency that helped develop the dust plan. "The inventory was the foundation of the plan. We knew we had to fix it first." The flawed inventory also reflects a narrow vision of air quality in the Valley, where officials often aim pollution-control measures at the sources most easily regulated, such as construction, and sidestep bigger issues, such as how new freeways could affect the health of people who live nearby.

In a series continuing today, The Arizona Republic examines the region's air-quality issues, including pollutants, health risks and attempts by state and local agencies to reduce pollution even as risks grow.

'Occasional snapshots' At any given moment, you may inhale minuscule specks of dust left over from a summer storm, pollen from a neighborhood tree, bits of topsoil stirred up by a landscaping crew, flecks of toxic metals from a salvage yard or tiny droplets of ammonia from fertilizer in a livestock yard.

Most of the time, you won't know precisely what is in the air where you are and neither will the agencies charged with monitoring the air and reducing the pollution. State and federal agencies typically measure the pollutants they are regulating based on rules that apply nationwide. That often means that other harmful gases or elements in the air go unmeasured, even if there are high levels in local areas. "There are no routine measurements of the composition of dust, except for some special studies, which are very expensive to do," said James Anderson, an atmospheric chemist at Arizona State University and a senior scientist at ASU's Global Institute of Sustainability. "The emissions inventories they do for the EPA only include the pollutants they know about."

It's even less than that at times. The EPA establishes health standards for six pollution sources: carbon monoxide, lead, nitrogen dioxide, sulfur dioxide, particulate matter and ozone. These pollutants are among the most common and are found across the United States.

Because those are the pollutants the EPA regulates, they are also what state and local air agencies look for and catalog.

"You could monitor for some of the other compounds, but it takes resources," Anderson said. "So you're left with occasional snapshots and only at specific locations."

Trying for 'the big picture'

Sitting on shelves in Maricopa County's mobile air monitor are rows of bulbous metallic tanks with special hoses attached, looking like a vacuum cleaner from a B-movie spaceship.

A county monitoring specialist can take the devices into the field, sample the air, solidify it with liquid nitrogen and then analyze it with a gas chromatograph and mass spectrometer inside the mobile station.

That's one way to figure out the composition of the air at any one time in any specific location. But the county's official inventory, the list of pollutants tracked and regulated, is compiled with much less "CSI"-like precision. Some of the information in the inventory is drawn from reports submitted by the polluters themselves, permit-holders such as sand-and-gravel pits, homebuilders, manufacturers or power plants. The county also collects data from fuel refiners and providers, chemical distributors, farmers and landfill operators and uses information about vehicle miles driven to help compute mobile pollution sources. "We don't measure for everything, everywhere, but we try to assemble the big picture," said Robert Downing, who manages the county's emissions-inventory

unit. "You can look at a PM-10 particle and tell something about its nature, but you can't tell whether it comes from a farmer plowing a field or from atop the White Tank Mountains 6,000 years ago."

The final inventory breaks down pollution sources in sometimes surprising detail. There is a category, for example, for vehicle fires. The county estimated that about 2,400 vehicle fires in

2008 produced about 30 tons of coarse-dust, or PM-10, particles and the same amount of fine-dust, or PM-2.5, particles. By comparison, leaf blowers produced an estimated 1,300 tons of coarse- and fine-dust particles; residential and commercial construction, about 6,700 tons; and travel on dirt roads and unpaved parking lots, about 18,000 tons of dust in 2008.

Out of proportion

In its analysis of the county's plan to reduce dust-particle pollution by 5 percent, the EPA identified problems in the inventory and concluded that the plan itself would not achieve the air-quality improvement.

The EPA found that because the inventory emphasized construction activities as a significant source of dust pollution, more control measures were aimed at those activities.

"With the economic downturn, the construction industry declined," said Colleen McKaughan, a Tucson-based regional associate director for the EPA. "Because they were relying on construction as a source, we were thinking the area should be attaining. But we didn't see that at the monitors."

In its analysis, the EPA cited figures estimating that, in 2010, construction sources would account for about 33 percent of coarse-dust particles, or PM-10. The county plan, meanwhile, estimated that 82 percent of the expected reduction in dust pollution would come from measures imposed on construction sources.

The emphasis on reducing construction dust appeared to be so out of proportion, the EPA reasoned, that the county would fail to impose controls on other sources, such as traffic on paved roads, which accounted for 20 percent of 2010 dust emissions.

State and county officials have worked with the EPA over the past year to refine the inventory and better match control measures with accurate dust sources.

Starting with the 2011 inventory, the county will refine the list of sources to create a better snapshot of conditions and will watch new permit applications to better spot possible trends.

ASU's Anderson said state and county agencies shouldn't undervalue the knowledge of what's in the air. "There are ways to sort it out," he said. "But we're not going to have a plan until we have good data. Right now, we just don't have the answers."

THE AIR ELSEWHERE:

LAS VEGAS

THE ISSUE: Like Maricopa County, Clark County, Nev., consistently exceeded EPA standards for coarse-dust, or PM-10, particles. The urban areas -- Las Vegas and two other cities, along with a large unincorporated area -- are surrounded by open desert, and the cities are checkered with vacant lots. Unlike Maricopa County, urban Clark County has almost no agricultural activity to generate dust.

THE RESPONSE: Clark County adopted a dust-control plan with a wide range of control measures, along with a separate section that addresses natural events, or windblown dust.

The county imposes dust-control measures on potential sources of dust pollution, but also agrees to take stronger steps on vacant lots. The county takes steps to control dust on such lots, then charges the property owner, placing a lien on the lot if needed. The county outlines specific steps for roads, paved and unpaved, an element the EPA said was underaddressed in the Maricopa County plan.

The separate plan for natural, or high-wind, events includes steps to notify the public and potential dust sources of impending windstorms, along with a series of steps, or best management practices, that should be carried out when wind alerts are received.

The plan also addresses unpaved roads and vacant lots, including limits on unpaved parking lots, construction of windbreaks and limits on off-road-vehicle use on unpaved roads.

County looks to cut ozone, dust

In the Valley, most air-quality-control measures focus on three of six pollutants regulated by the Environmental Protection Agency: dust, carbon monoxide and ozone. Control measures for carbon monoxide, such as vehicle-emission

inspections, help reduce pollution levels and allow the region to meet federal standards for that pollutant. Here is a closer look at ozone and dust:

OZONE

Ozone is found at ground level and in the stratosphere, 10 to 30 miles above the Earth's surface. In both cases, the chemical makeup is the same: three oxygen atoms. But while the high-altitude ozone helps protect the Earth from the sun's harmful rays, ground-level ozone is a harmful pollutant.

Ground-level ozone is not emitted directly into the air. It forms when heat and sunlight react with nitrogen oxides, gasoline fumes, or organic compounds such as fumes from paint and solvents. In Phoenix, it is considered a warm-weather pollutant because concentrations are highest between April and October. Ozone can form in one location and move with the air currents to another. In metro Phoenix, ozone can form in the central urban area early in the day and then accumulate to the north and east. Fountain Hills often records some of the highest ozone levels.

Ozone can cause lungs and airways to swell or feel irritated, causing tightness in the chest, as well as wheezing and coughing. The lungs' functions can be reduced, and asthma or other heart and lung ailments can be aggravated.

The current EPA standard for ground-level ozone is 75 parts per billion as recorded over an eight-hour period. An EPA review of the standard last year concluded that the limit should be lowered to 70 parts per billion or even lower, but President Barack Obama decided to postpone any change to the standard until at least 2013.

Maricopa County had attained the previous one-hour standard for ozone. The region will likely be designated as not attaining the new eight-hour standard. State and county air-quality officials will submit a plan to demonstrate how they will meet that standard.

DUST The EPA regulates two kinds of particulate matter, or dust: fine particles, known as PM-2.5, for particles 2.5 micrometers or smaller in diameter, and coarse particles, known as PM-10, for particles 10 micrometers or smaller in diameter. (A human hair is about 70 micrometers in diameter; a blood cell is 7.5 micrometers in diameter or smaller.)

PM-2.5 is a mix of particles from vehicle exhaust, emissions from power plants, wood burning and industrial operations. Gases from burning fuels can also react with sunlight and water vapor to form fine particles. Fine-dust particles can make

their way deep into the lungs and into the bloodstream. They can aggravate heart and lung diseases and have been linked to heart attacks, asthma attacks and bronchitis.

The EPA has set two standards for PM-2.5: a 24-hour average of 35 micrograms per cubic meter of air and an annual average of 15 micrograms per cubic meter of air. Maricopa County is designated as attaining the standard, but continues to impose controls in an effort to avoid violating the limit. PM-10 is a mix of materials both solid and liquid, including smoke from wildfires or other open burning, soot, dust from construction sites, landfills, farm fields and unpaved land parcels. PM-10 can also form when dust particles from vehicle exhaust or roads come into contact with moisture, allowing dust to remain in the air.

Coarse-dust particles can accumulate in lung passages, forcing lungs to work harder. PM-10 is linked to asthma attacks and heart attacks and can aggravate bronchitis and other heart and lung ailments. Healthy people can find it difficult to breathe or can feel irritation in their lungs.

The EPA standard for PM-10 is 150 micrograms per cubic meter of air, a level not to be exceeded more than once a year on average over three years. Maricopa County has never attained the standard, and with the state is working on a plan to reduce dust levels.

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