SPECIAL REPORT

The politics of breathing

Both sides in a US pollution dispute claim that science is on their side. **Emma Marris** explains how environmental laws have forced them into this position.

Last month, the US Environmental Protection Agency (EPA) made a ruling on air pollution that contradicts the recommendations of its own staff scientists and a panel of external experts. Many groups, from the National Resources Defense Council to the American Lung Association, are protesting loudly. Both the protesters and the EPA claim that science supports their case, but neither side is really right.

All parties insist that concern for human health is the only factor influencing their decision. But in fact they include different external factors, such as cost, in reaching different figures for the acceptable level of pollution.

At issue here are small particles found in the air, often the product of combustion in a power plant or car. Formally called 'particulate matter', they are more generally known as soot. When breathed in, the particles inflame the lung tissue, and can lead to obstruction of the airways, and heart and lung disease.

Periodically, the EPA comes up with acceptable annual and 24-hour exposure levels for particles smaller than 2.5 micrometres across (fine particles) and for particles smaller than 10 micrometres (coarse particles). Many countries and the European Union (EU) regulate coarse but not fine particles (see 'Dirty cities'). The EU has set targets for coarse particles that — assuming that fine particles make up about half to three-quarters of the coarse ones — mean that fine particles would be regulated at around 10–14 micrograms per cubic metre annually by 2010.

In the United States, the annual standard for fine particles was set for the first time in 1997 at 15 micrograms per cubic metre. This year, when the EPA was set to reconsider the limit, many wanted it lowered. But when the rules were announced on 17 October, it wasn't.

Public-health experts consider this standard to be the most important — the smaller the particle, the deeper it gets into the lungs, and long-term exposure accounts for more deaths than short-term peaks. At least two large, well-respected epidemiological studies have documented the phenomenon in various cities and are cited extensively by both sides in making the case for different levels of regulation[1].

Arden Pope, an environmental epidemiologist at Brigham Young University in Utah, was involved in both studies. He says there is no evidence that it is safe to breathe any level of particulate. The relationship between particulate concentration and illness or death is more or less linear: the worse the air, the worse your health. The studies suggest that for every additional microgram of fine particulate in the air, between 0.6% and 1.6% more people will die every year — that's a few tens of thousands of deaths a year in the United States.

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Science on its own does not provide an obvious standard — pick any number, and a level set below it will produce fewer deaths — but a number must nonetheless be chosen. "There is no threshold at which some sensitive group is not harmed," says Pope. "The judgement then becomes: is there some level at which we quit trying to go lower? Then it becomes a policy judgement."

Finding a level

That judgement is made by EPA administrator Stephen Johnson. As part of the process, agency scientists pull together the available science and put some values on the table for discussion. An external panel of experts reviews this and makes recommendations: in this instance, to lower the annual standard to 14 micrograms per cubic metre. But in the end, Johnson maintained the level at 15 micrograms.

According to the final ruling, Johnson gave more weight to uncertainties in the data at lower exposure levels, and based the long-term standards on long-term studies, instead of also including some related data from short-term studies. Interested parties have until 17 December to file a complaint, or a lawsuit.

The panel of external experts was livid. "We took our tests very seriously and came up with a recommendation that the administrator didn't take," says Rogene Henderson, head of the panel and an air-pollution expert at the Lovelace Respiratory Research Institute in Albuquerque, New Mexico. "My concern is that the administrator chose not to take our advice, but other people's."

Some critics charge that in not lowering the standards, Johnson went along with the administration of President George W. Bush, who has close ties to powerful business interests in the oil and gas industry. The EPA estimates that it would cost an additional $2.5 billion to

Dirty cities

Cities worldwide vary dramatically in how much particulate matter, or soot, their air contains. New annual US standards for particles less than 2.5 micrometres across, set at 15 micrograms per cubic metre by the Environmental Protection Agency, have recently come under fire.

City	Particulate level ($\mu g\ m^{-3}$)*
Beijing	71–99
Mumbai	40–55
Mexico City	27–38
Athens	26–36
Los Angeles	18
London	6–9

*Values for non-US cities are estimated as a percentage of the value for particulate matter of 10 micrometres or less.

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Governments struggle with setting pollution limits when even small amounts cause health problems.

clean the air to 14 micrograms per cubic metre, instead of 15, by 2020. But the same analysis also suggests that lowering the standard to 14 micrograms per cubic metre would save the economy an additional $10 billion in health and visibility-related costs.

Many also charge that Johnson's decision violated the Clean Air Act, which says the administrator must set levels "requisite to protect the public health with an adequate margin of safety". This vague phrase has been interpreted by Congress and the courts to mean that the EPA must protect the public's health without considering other factors, such as cost. The law does not say how many deaths are acceptable. Many pollutants other than soot, including some carcinogens, have a linear relationship between dose and health, so considering health alone would seem to demand that the agency set for all pollutants the politically and practically impossible standard of zero.

David Schoenbrod, professor of environmental law at New York Law School, argues that Congress knew about this problem in the wording of the act when it was passed in 1970. In a recent article[2] he quotes the act's sponsor, Senator Edmund Muskie, as saying in 1977: "Our public health scientists and doctors have told us that there is no threshold, that any air pollution is harmful. The Clean Air Act is based on the assumption, although we knew at the time it was inaccurate, that there is a threshold."

Congress passed the act anyway, Schoenbrod contends, so that it could make perfect decisions about banishing harm and let the EPA worry about the inevitable compromises. "The EPA, as a practical matter, must decide exactly how much health risk to tolerate," he says. "The EPA weighs health risks against cost."

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Of course, the EPA cannot legally admit to doing this. Bill Wehrum, the agency's acting assistant administrator for air and radiation, says the new regulations were based only on science. But in that case, why not bow to the wishes of the staff scientists and lower the regulatory level? "We give absolute deference to what the science says, but reasonable minds can differ," Wehrum says.

Wehrum also points to a Supreme Court case in 2000, in which the court supported the idea that air-quality standards should be set "at the level that is 'requisite' — that is, not higher or lower than necessary". In that case, the EPA was being sued by a group of industries who argued that the annual fine-particulate level was set too low. This year, any potential lawsuit is likely to come from the health and environmental groups, saying it is set too high. The particulate standard they are suing over is, of course, the same.

Political decision

Whereas the EPA's external experts wanted the level to be lowered to 14 micrograms per cubic metre, the American Lung Association plumped for a safe level of 12. But the World Health Organization (WHO) recommends setting the limit even lower, at 10 micrograms. The association isn't saying it is willing to accept 50,000 more deaths each year than the WHO; rather, it supports the level of 12 micrograms on political grounds, as the EPA was never willing to consider 10 micrograms per cubic metre.

Deborah Shprentz, a consultant to the association, says various analyses support a level of 12 micrograms per cubic metre, and fumes that "the EPA did not provide a robust scientific justification for leaving the standard at the current level. It seems like a betrayal of trust".

The New York Times gave its 14 October editorial on this matter the title "Science Ignored, Again", but this might more properly be "Scientists Ignored, Again", as it was scientists' policy wishes, rather than scientific facts, that were disregarded. Any decision about what standard to set that considered just health would slide right down the linear relationship to zero.

Sixteen years ago, in a National Academies report[3] on environmental decision-making, Boston University political-science professor Shep Melnick summed up what he called a uniquely American phenomenon: "The widespread hostility to the use of benefit–cost and risk assessment analysis," he wrote, "is based on an absolutist health-only position that virtually no one is willing to embrace in the real world. To put it more bluntly, almost no one really believes what many informed people emphatically maintain in public." ■

1. Pope, C. A. & Dockery, D. W. *J. Air Waste Mgmt Assoc.* **56**, 709–742 (2006).
2. Schoenbrod, D. *Regulation* **29** (3), 36–42 (2006).
3. Hammond, P. B. & Coppock, R. (eds) *Valuing Health Risks, Costs, and Benefits for Environmental Decision Making* (National Academies Press, Washington DC, 1990).