Air Sensors 2018:
Deliberating Performance Targets

by Ron Williams, Vasu Kilaru, and Kristen Benedict

A summary of highlights and outcomes from EPA's Air Sensors 2018 Workshop.

Low-cost, widely available air sensor technologies have the potential to make a dramatic impact on the state of air quality monitoring. While they are not currently as accurate as regulatory-grade monitors—which are certified to meet specific performance and operating standards—they can provide an understanding of local air quality, help identify hot spots, and provide continuous streams of data. This information can empower individuals to make personal decisions, such as choosing to take a different route to work or remaining indoors for exercise. The technology also can help a community work with their local officials to address an air quality issue. Sensor technologies continue to improve at a rapid pace and hold promise for greater air quality monitoring effectiveness and application.

Currently, the value of sensor data collections can be questioned due to the lack of information about how well the sensor technology works.[1] Some of the uncertainties raised include how well the technologies perform under various meteorological conditions, how well they meet basic data quality indicators of performance (e.g., precision, accuracy), and how long the devices perform over time. With many useful applications that do not require regulatory levels of performance, there is still a need to know how much uncertainty is associated with these devices and whether they are adequate for the intended purposes.

To address these and other questions, the U.S. Environmental Protection Agency (EPA) convened a workshop on June 25–26, 2018, in Research Triangle Park, NC, entitled "Air Sensors 2018: Deliberating Performance Targets," to gather information on the state of air quality sensor technologies; learn how they are used to meet a wide range of monitoring needs; and obtain stakeholders' perspectives on non-regulatory performance targets for fine particulate matter and ozone sensor devices. The workshop was conducted in collaboration with the Environmental Council of the States (ECOS), and with the assistance of numerous national and international air quality experts.

Approximately 700 people attended the workshop in-person or via webinar, with diverse representation from sensor manufacturers, and other private entities; community groups/nonprofit organizations; academic institutions; state, local, and tribal air quality agencies; and the federal government.

Workshop Highlights

International colleagues who are actively engaged in developing European and Chinese-based sensor performance standards provided an overview of their efforts and why key decisions on performance targets had been made. Their perspectives on the process to develop performance targets were very valuable in considering how any future U.S.-based approach might be achieved.

State, local, and tribal nation officials provided an overview of their considerations and needs involving low-cost air sensor data. They expressed great interest in using sensor devices to identify pollution hotspots, monitor in new areas, and build community awareness about air quality. As community groups and individuals are already using these devices, they emphasized the need to address performance characteristics of the sensor devices, provide guidance on their use, and develop tools for data management, analysis, and display. While academics expressed similar concerns regarding unknown performance characteristics, they provided multiple examples of purposeful use of sensor data and provided examples of how quality assurance principles might be applied.

Sensor manufacturers provided their perspectives on performance standardization. While not asked to define any process, many indicated that well-defined performance targets by a governmental organization or independent third-party institution would benefit their community and their customer base.

The workshop included presentations on peer reviewed literature findings associated with key data quality performance indicators for fine particulate matter and ozone. In brief, the majority of the findings indicated sensors are often used to address research on the spatial and temporal coverage of pollutants with only a small fraction of reports indicating use of air sensor data for policy decision-making.

The literature reviews also indicated that without a systematic approach to reporting data quality, interpreting published findings is difficult and often the treatment of erroneous data is not discussed, raising concerns on the use of potentially incorrect or bad air quality data.

EPA continues its extensive collaboration with stakeholders to develop non-regulatory air quality sensor performance targets and to evaluate the feasibility of an independent voluntary third-party certification program. The workshop is a major step toward developing consistent performance targets that promote data quality. **em**

More Information

A summary of the main outcomes and findings of the workshop, as well as presentations from the workshop, will be published this fall on EPA's Air Sensor Toolbox website (www.epa.gov/air-sensor-toolbox).

For more general information on the research discussed in this column, contact Ann Brown, U.S. Environmental Protection Agency (EPA), Office of Research and Development, Research Triangle Park, NC; phone: 1-919-541-7818; e-mail: **brown.ann@epa.gov**.

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Disclaimer
The views and opinions expressed in this article are those of the author and do not represent the official views of the U.S. Environmental Protection Agency (EPA).

Reference

1. Woodall, G., et al. Interpreting mobile and handheld air quality sensor readings in relation to air quality standards and health effect reference values: Tackling the challenges; *Atmosphere* **2017**, *8*, 182.