Report and case studies on the benefits of air quality information

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Approximately 42 million Americans live in unmonitored areas, or monitor-sparse locations, for air quality. CTG's latest study says that satellite data from EPA's AirNow program has the potential to plug that gap.

The Center for Technology in Government (CTG) at the University at Albany has released findings from a study assessing the potential socio-economic and financial benefits of enhanced air quality data. The study was sponsored by NASA Applied Sciences and conducted through a partnership with EPA, CTG, and Sonoma Technology (STI).

The study sought to better understand the benefits provided by current air quality data and data products from EPA's AirNow program and how

enhancing AirNow with NASA satellite data might contribute to different or greater benefits in the future.

The AirNow program provides the public with easy access to national ambient air quality information using the Air Quality Index (AQI). The AQI is a standardized index for reporting air quality based on health effects for five major air pollutants: ground-level ozone, particles smaller than 2.5 microns in diameter (PM2.5), carbon monoxide (CO), sulfur dioxide (SO2), and nitrogen dioxide (NO2).

AirNow presents near-real-time hourly AQI conditions and daily AQI forecasts, with maps of interpolated AQI levels on national, regional, and local spatial scales. This information is converted into AQI forecasts and distributed to the public and media via vehicles such as USA Today and CNN. However, the current ground-based monitoring network is concentrated in population centers and therefore has large geographic gaps. Approximately forty-two million Americans live in unmonitored areas, or monitor-sparse locations. Satellite data could provide air quality information in these monitor-sparse locations and in monitor-dense locations.

CTG study director Sharon Dawes said, "This study showed that users with different needs and capabilities can all benefit from enhanced air quality data. Equally important, the study findings emphasize the importance of stewardship in ensuring the usability, usefulness, and value of any public data. When people understand the data sources, precision, timeliness, and format, they can use it for diverse benefits to individuals, groups, and society."

An example of enhanced benefits is how improved air quality data in rural agricultural areas could support research on how various air quality conditions impact the health and productivity of farm workers – studies that would have both public health and economic value. One researcher

interviewed for this study said, "[NASA] Satellite data might enable studies to associate levels of productivity with ambient air quality in small scale areas with findings that might inform both public policies and business practices."

The research involved two efforts:

- Face-to-face interviews in three case study locations (Denver, Colorado; Atlanta, Georgia; and Kansas City, Missouri) to assess the public value or community-level benefits.
- Analysis of the cost savings of using satellite data instead of installing new monitors to provide air quality information for public health decisions to populations in currently unmonitored locations conducted by STI.

The case studies looked at the ways in which government and related organizations use air quality data gathered from the existing ground-based monitoring network mandated by the Clean Air Act and projected how public value could be increased by fusing the existing network data with data collected by satellites for PM2.5.

The case study data comprised 26 interviews with federal, state, and local environmental and public health officials, nonprofit and community organizations, and researchers in the three metropolitan areas. The research team analyzed the case study data using CTG's Public Value Framework to assess the impact of the satellite enhanced data along several dimensions including economic, social, strategic, quality of life, stewardship, and mission impacts.

By interviewing actual data users, the study revealed that satellite-enhanced data could provide increased value to society in the following ways:

- Augment the ground sensor network. Satellite data could provide valuable information in areas not covered by the existing network for routine forecasts and public advisories or to identify potential air quality hot spots that warrant additional planning or regulatory attention.
- Support design and deployment of the regulatory monitoring network. Due to a combination of economic, geographic, and political factors, states cannot place ground sensors in all the places needed to provide complete coverage. Satellite data could help identify those areas in the state where the expensive investment in an additional monitor could provide the greatest value.
- Improve regional and local analysis of air quality conditions, from microscale environments to interstate pollution transport. Satellite data could increase confidence in the coverage, accuracy, and timeliness of the information state and local governments use for many routine responsibilities ranging from air quality forecasting to advisories about special events such as smoke impacts from wild fires.
- Improve understanding of the potential impact of industrial development and unregulated activities. In all three cases, emerging and growing industries outside the main population centers are generating air quality concerns.
- Support state-level air quality programs and longer range planning and priority setting. Satellite data can provide a broader context for state-level regulation and enforcement activities including modeling, compliance, and enforcement.
- Support state and local public health programs. NASA satellite products could provide an important information resource that health agencies and researchers could use to investigate the link between air quality and health effects.
- Enhance public health and policy research. Satellite data can improve the granularity, spatial coverage, and validity of air

quality data for public health research and policy analysis and provide data to extend this kind of research beyond urban centers to rural and agricultural areas.
- Support science education and workforce development. Many opportunities exist for using satellite products in the classroom and increasing student interest in science, technology, engineering, and math.

The financial analysis estimated the cost savings of using satellite data instead of installing new monitors to provide air quality information for public health decisions to populations in currently unmonitored locations. The fusion of NASA satellite data with ground measurements could make daily PM2.5 data available to 98.5 percent of people living in unmonitored populated places at a negligible cost; because the capital cost for the satellites and the data has long been paid, the data are just being used in a new way. By contrast, it would take 74 new monitoring stations to provide about half the coverage at a cost of $25.9 million over five years.

Tim Dye, STI Senior Vice President said, "We're excited about building the data fusion software framework which fuses together many different data sources to let us all breathe better. NASA data provided us with a comprehensive, nationwide data source to create the system. Now the system is poised to fuse other data sources (new satellite data, citizen based data, crowd sourced information, etc.)."

Phil Dickerson, Group Leader, US EPA, Office of Air Quality Planning & Standards said, "This study reveals the broad value proposition presented by air quality information. By understanding the data itself, who uses it and how they use it, US EPA and NASA have found novel uses for data that was already being collected."

More information: The full study and the cases are available online:

www.ctg.albany.edu/projects/pu … proj=airnow&sub=pubs.

Provided by University at Albany