American Lung Association.
Something in the Air

Air Quality Data

Monitors and Satellites

How do we know what's in the air we breathe? Satellite technology is helping fill in air quality data gaps.

In our annual "State of the Air" report, the Lung Association relies on data from the national network of regulatory air quality monitors to inform the public about the levels of pollution in their communities. But not all communities have monitoring data available and thus cannot be included in the report. In the new "Something in the Air" series, the Lung Association is exploring emerging ways technology can provide more information to more people about the quality of the air they are breathing.

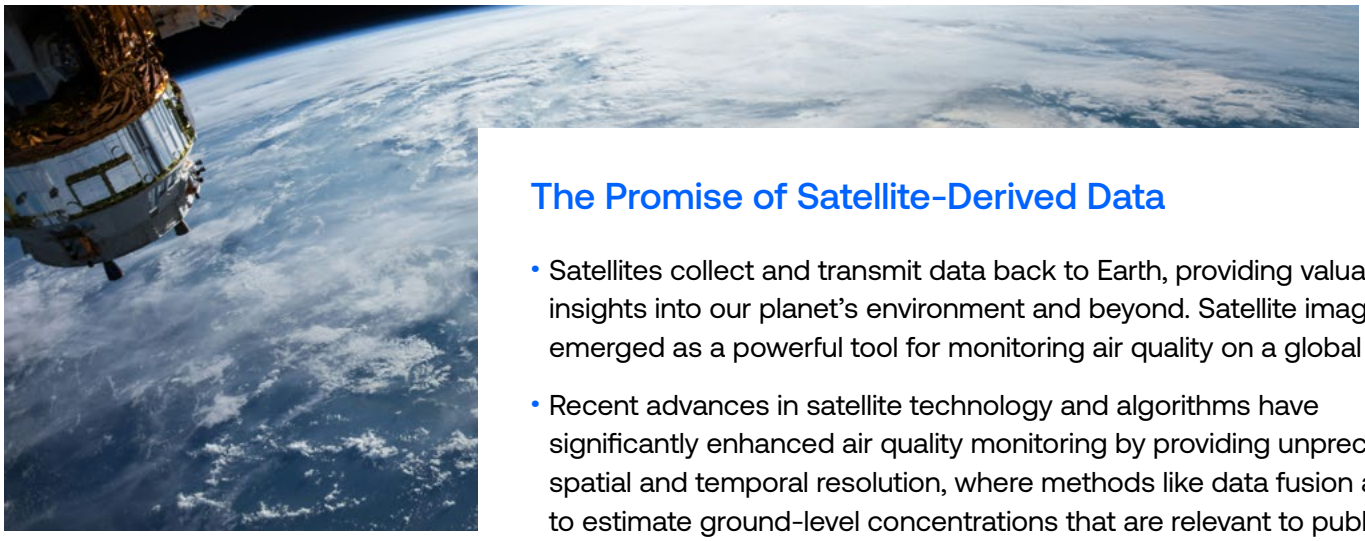
Regulatory Monitors Guide Pollution Control Efforts

- The national network of regulatory air quality monitors is the backbone of our understanding of air pollution nationwide. They provide high-precision, ground-based data essential for regulatory and public health decisions.
- This network comprises thousands of monitoring stations strategically placed to measure air quality, ensure compliance with the National Ambient Air Quality Standards (NAAQS) and to fulfill the requirements of Tribal/State Implementation Plans.
- States and Tribes manage the placement, maintenance, and operation of most air quality monitors, following federal guidelines. Each state updates its monitoring plan every five years to ensure ongoing compliance with NAAQS.
- Monitors are strategically located to capture data in areas of high population density, near significant emission sources such as roadways and industrial sites, and in more remote locations to capture background pollution levels.
- In addition to their regulatory role, these monitors are also the source of data used with EPA's Air Quality Index to inform individuals about their personal need to protect themselves when air pollution reaches unhealthy levels.

Limitations of Monitoring Data

- Nearly two-thirds of U.S. counties do not have official monitoring stations, including some areas that are experiencing high levels of pollution from wildfires, expanded oil and gas extraction and other sources.
- AirNow, an EPA program, provides near real-time air quality information for the public by aggregating data from federal, state, and local monitors, offering forecasts and “nowcasts” nationwide.
- In areas without nearby monitors, AirNow uses interpolation to estimate air quality by averaging readings from surrounding monitors, which may be miles away and could be in inaccurate representation of local conditions.

An Airly device monitoring hyperlocal air quality.



To learn more about the American Lung Association’s work using emerging technology to understand local air quality, visit Lung.org/something-in-the-air.

The Promise of Satellite-Derived Data

- Satellites collect and transmit data back to Earth, providing valuable insights into our planet’s environment and beyond. Satellite imaging has emerged as a powerful tool for monitoring air quality on a global scale.
- Recent advances in satellite technology and algorithms have significantly enhanced air quality monitoring by providing unprecedented spatial and temporal resolution, where methods like data fusion are used to estimate ground-level concentrations that are relevant to public health.
- Satellite data provides finer resolution capabilities that can capture community-level variations in air quality, offering insights into localized issues, pollution patterns and trends previously difficult to observe, particularly in regions where traditional ground-based monitoring is limited or absent.
- Satellite data is particularly useful in remote or inaccessible regions where installing traditional monitors is challenging and they ultimately offer opportunities to continue transforming the way the public and decision-makers understand air quality.

Looking Forward

- While satellite-derived data is not directly comparable to ground-based measurements, the evolving science, technology and partnerships between researchers, government agencies and advocates are continuing to enhance the accuracy and usability of satellite data for air quality assessment.
- The future of air quality management will benefit from leveraging both ground-based monitoring and data from satellites to provide every community with the information they need to protect their health and advocate for clean air.