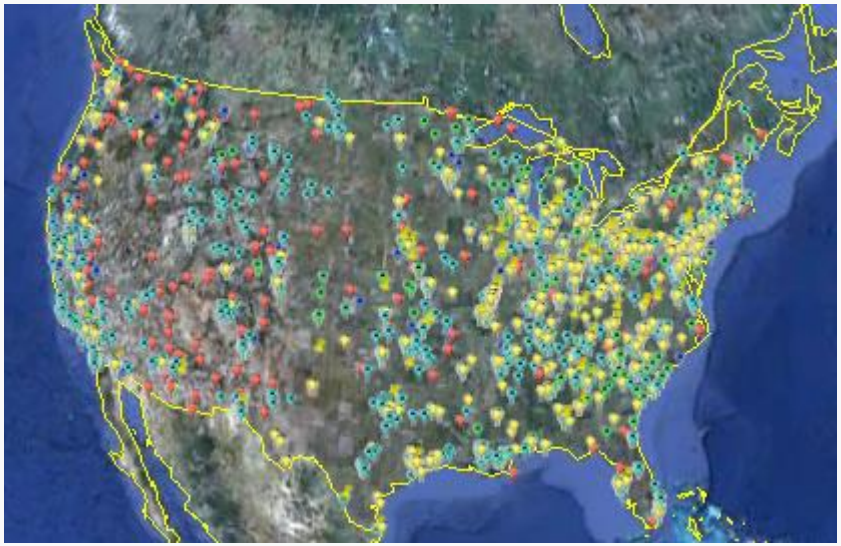
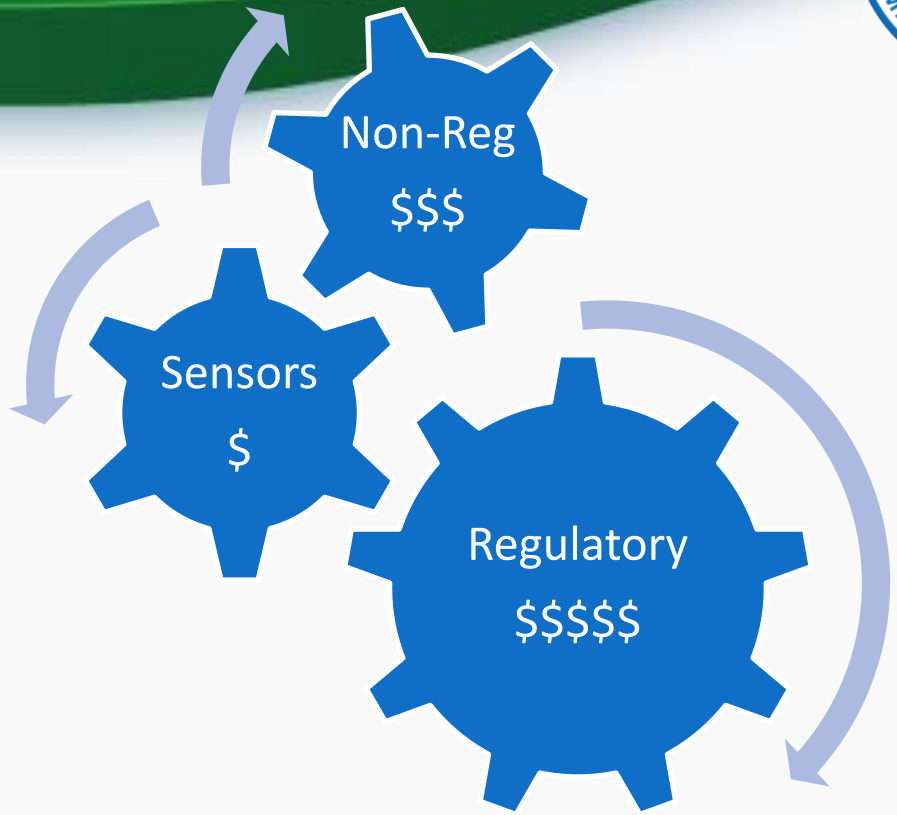
Air Monitoring

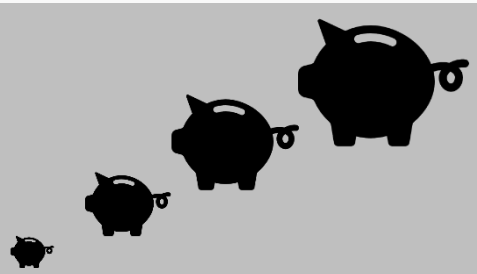


Marta A. Fuoco | U.S. Environmental Protection Agency R5 Air & Radiation Division | Air Monitoring and Analysis Section| Fuoco.Marta@epa.gov |312.886.6243

Air Quality Measurement World

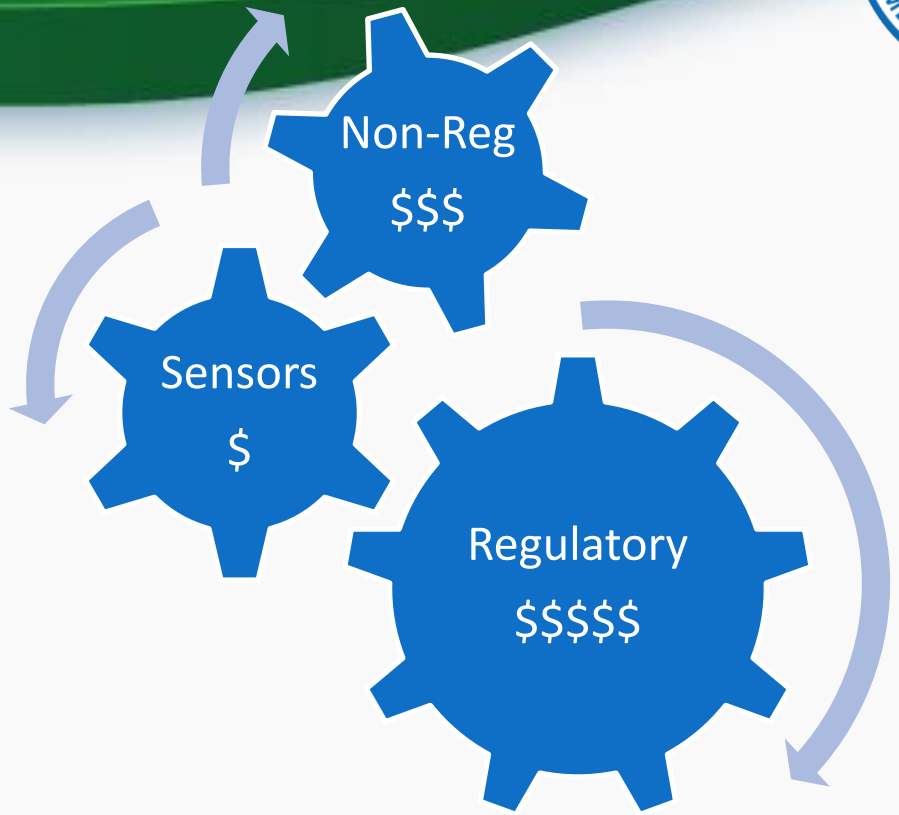


Cost:



Reliability:

Air Quality Measurement World



Cost:

Reliability:

Regulatory

Image courtesy of EPA Archives

Managing AQ - Air Pollutant Types

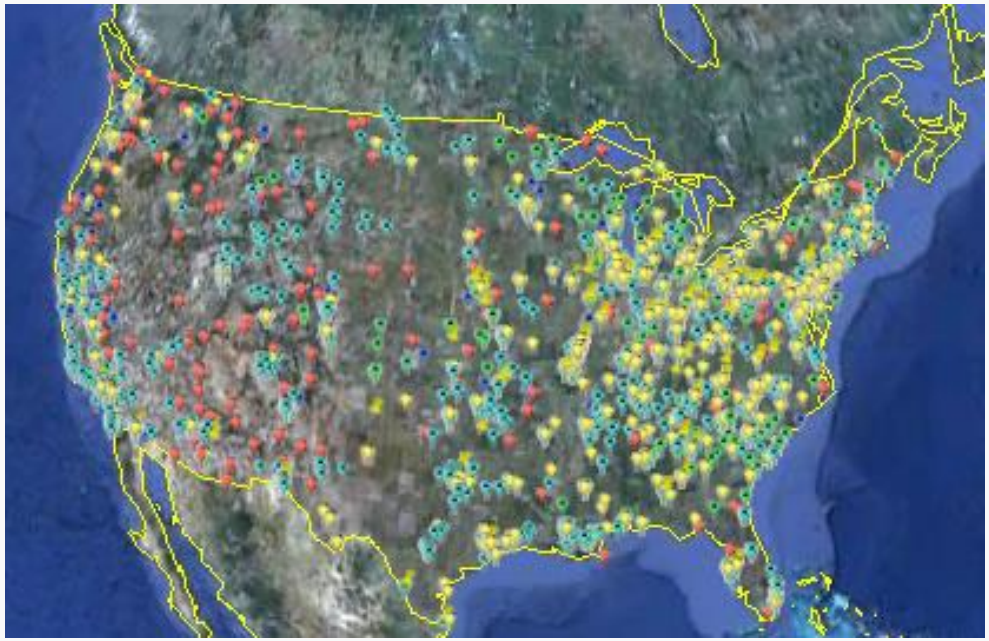
- Clean Air Act
  - *Requires U.S. EPA to set* National Ambient Air Quality Standards
  - *Limits developed on human health and/or environmental criteria*
  - *Criteria Pollutants:*
    - *PM (particle pollution)*
    - *Ground-level ozone*
    - *Carbon monoxide*
    - *Sulfur dioxide*
    - *Nitrogen dioxide*
    - *lead*

NAAQS

Pollutant		Primary/ Secondary	Averaging Time	Level	Form	Source	Health Effects
Carbon Monoxide (CO)		primary	8 hours	9 ppm	Not to be exceeded more than once per year	Burning fossil fuels	Reduces the amount of oxygen in the blood stream
			1 hour	35 ppm			
Lead (Pb)		primary and secondary	Rolling 3 month average	0.15 $\mu g/m^3$	Not to be exceeded	Ore/metals processing; incinerators; utilities; smelters	Adversely affects nervous system, reproductive, developmental, neurological effects
Nitrogen Dioxide (NO_2)		primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years	Burning fossil fuels	Irritate airways and aggravate respiratory diseases (asthma); react to form PM and O_3
		primary and secondary	1 year	53 ppb	Annual Mean		
Ozone (O_3)		primary and secondary	8 hours	0.070 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years	Chemical reaction in sunlight between NO_x and VOC; auto, power plants, boilers, refineries	Chest pain, coughing, throat irritation, airway inflammation; reduce lung function and harm lung tissue
Particle Pollution (PM)	$PM_{2.5}$	primary	1 year	12.0 $\mu g/m^3$	annual mean, averaged over 3 years	Emitted directly from source: construction, unpaved roads, smokestacks, fires and result of chemical reactions	Premature death in people with heart and lung disease; heart-attacks; irregular heartbeat; aggravate asthma
		secondary	1 year	15.0 $\mu g/m^3$	annual mean, averaged over 3 years		
		primary and secondary	24 hours	35 $\mu g/m^3$	98th percentile, averaged over 3 years		
	PM_{10}	primary and secondary	24 hours	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years		
Sulfur Dioxide (SO_2)		primary	1 hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years	Burning fossil fuels; natural sources (volcanoes)	Aggravated respiratory symptoms; impact PM; contribute to acid rain that harms ecosystems
		secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year		

How do we know how we're doing?

- EPA works with SLTs to monitor AQ



How do we know how we're doing?

Illinois Environmental Protection Agency

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Ambient Air Monitoring Network

AIR MONITORING

Ambient Air Monitoring Network

2019 Plan

Federal Regulations require States to submit to USEPA an annual air monitoring network plan for the prospective calendar year. The plan is to provide a detailed description of the monitoring network for all of the criteria pollutants: carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), ozone (O3), particulate matter (PM10 and PM2.5), and lead (Pb). Among other information, the plan is to include location information (address and latitude/longitude), site type, objectives, spatial scale, sampling schedule, and equipment type. In addition, changes from the previous network plan are to be listed. Also, this plan includes an Appendix with the information necessary to meet the Data Requirements Rule SO2 emissions assessment for those areas modeled to be in attainment with the SO2 National Ambient Air Quality Standards.

- View the Illinois Ambient Air Monitoring Network Plan for 2019

Relevant supporting air quality data in past Illinois Annual Air Quality Reports is available here. These summaries contain detailed monitoring data from the network which show comparisons to the various air quality standards as well as establish trends over time. If you have questions, please contact Brad Frost at the numbers listed below.

The Illinois EPA is accepting comments on the 2019 Plan until June 21, 2018. Comments should be sent to the contact listed below.

Brad Frost

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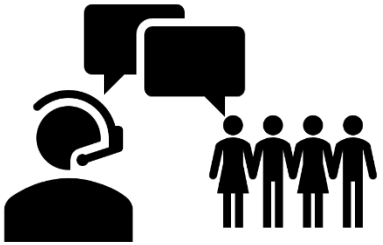
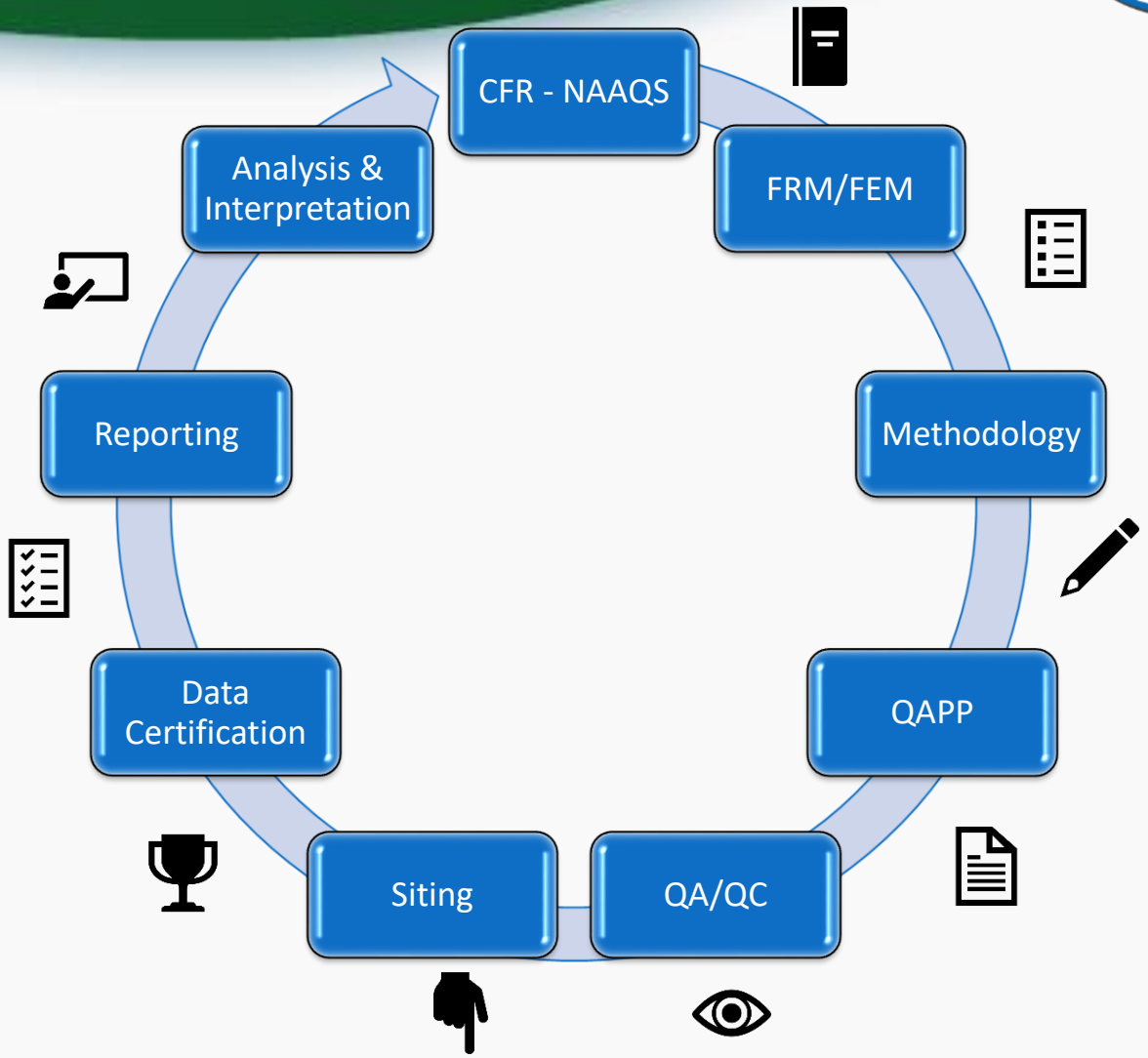
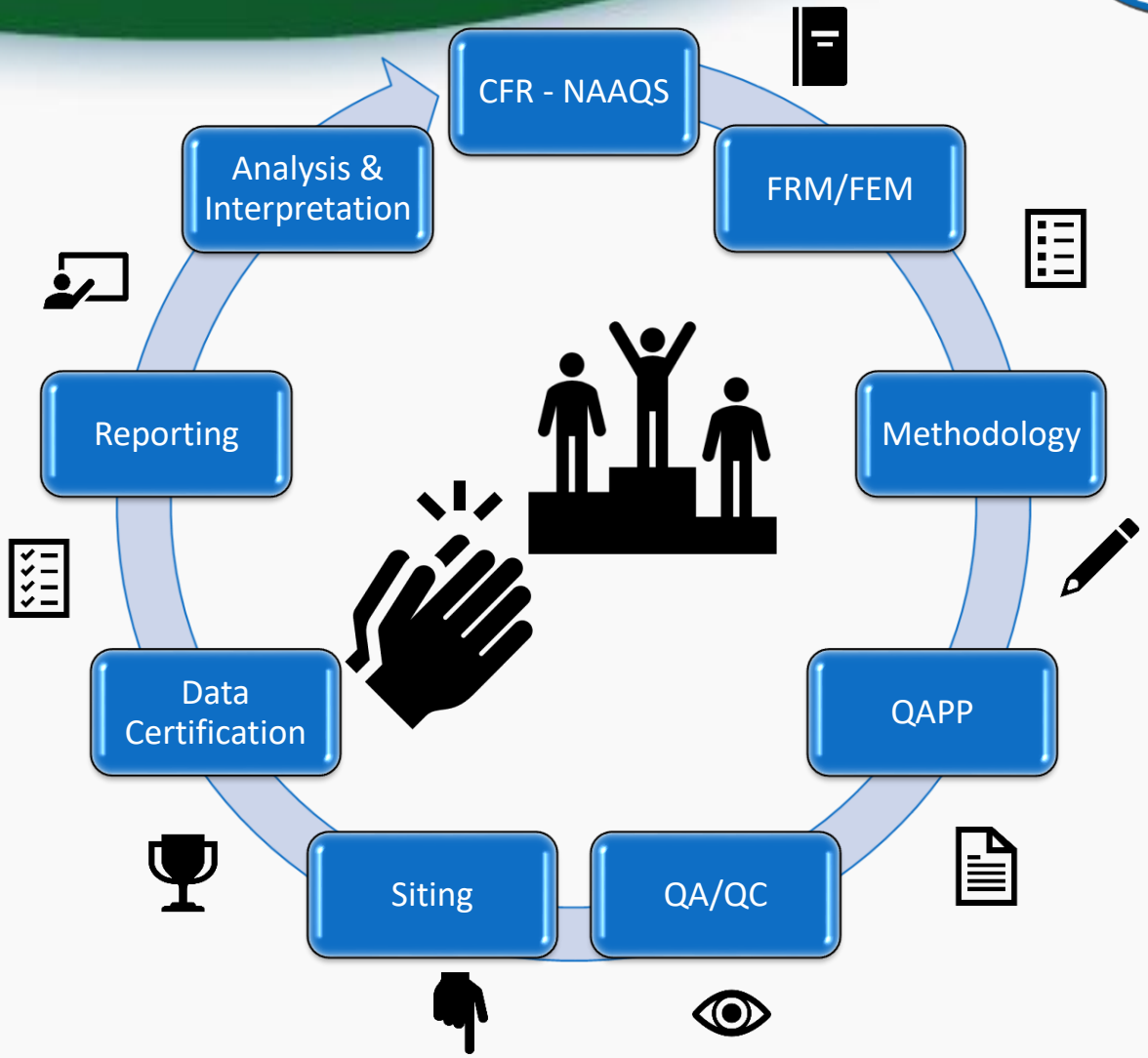


Brad Frost

Regulatory Requirements



Regulatory Requirements



Managing AQ - Air Pollutant Types

- Clean Air Act
  - *Requires U.S. EPA to regulate emissions of hazardous air pollutants (HAPs)*
    - *Toxic air pollutants*
      - *known or suspected to cause cancer or other serious health effects*
    - *187 HAPs (list modified through rulemaking)*

Examples of toxic air pollutants include:	Found in:
• benzene	• gasoline
• perchloroethylene	• emitted from some dry cleaning facilities
• methylene chloride	• used as a solvent and paint stripper by a number of industries

Managing AQ - Air Pollutant Types

- Air Toxics monitoring
  - Support reduction of public exposure to HAPs
  - Data provides a critically important role
    - Characterizing HAPs concentrations
      - **Trends:** provide a basic measure of air quality differences across cities and regions and over time
      - **Exposure Assessments**: ambient measurements provide direct input into more detailed human exposure models that can be used to estimate actual human exposures
      - **Air Quality Model Evaluation:** provide basic ground truthing of models used for exposure assessments, development of emission control strategies, and related assessments of program effectiveness

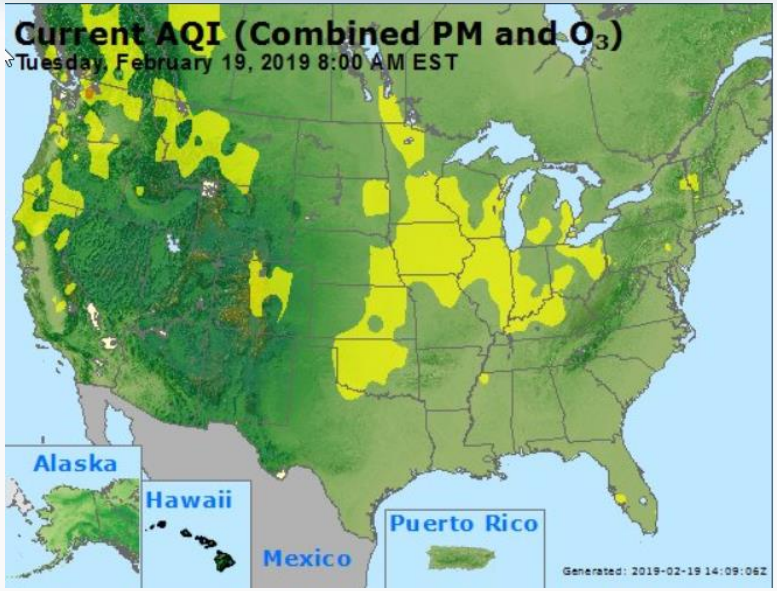
Managing AQ - Air Pollutant Types

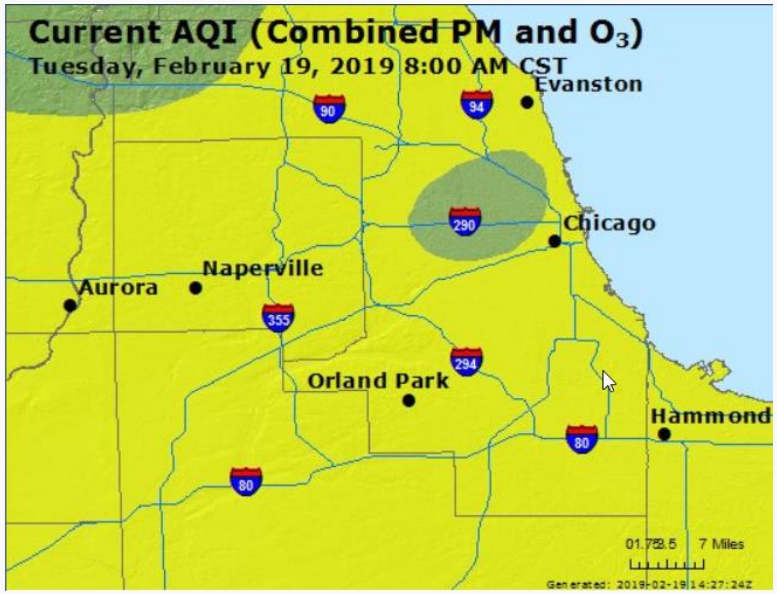
AIR TOXICS MONITORING NETWORK

- Long-term
- Canisters
  - 24-H lab
  - GC/MS analysis

Images courtesy of Broward County Government

How can we access this data?





AirNOW.gov

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	*...air quality conditions are:*	*...as symbolized by this color:*
0 - 50	Good	Green
51 - 100	Moderate	Yellow
101 - 150	Unhealthy for Sensitive Groups	Orange
151 - 200	Unhealthy	Red
201 - 300	Very Unhealthy	Purple
301 - 500	Hazardous	Maroon

How can we access this data?

EPA United States Environmental Protection Agency

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Outdoor Air Quality Data

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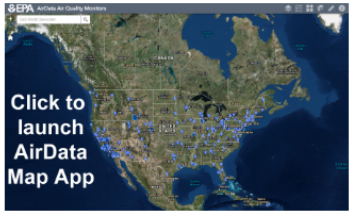
- Download Daily Data
- Download Raw Data
- **Interactive Map**
- Air Quality Index Report
- Air Quality Statistics Report
- Monitor Values Report
- Monitor Values Report - Hazardous Air Pollutants
- Air Quality Index Daily Values Report
- Tile Plot - Multiyear
- Tile Plot - Single Year
- AQI Plot
- Concentration Plot
- Ozone Exceedances
- Concentration Map
- PM2.5 Continuous Monitor Comparability Assessments
- PM10 Continuous Monitor Comparability Assessments
- Single Point Precision & Bias Report

Interactive Map of Air Quality Monitors

The AirData Air Quality Monitors app is a mapping application available on the web and on mobile devices that displays monitor locations and monitor-specific information. It also allows the querying and downloading of data daily and annual summary data.

Map layers include:

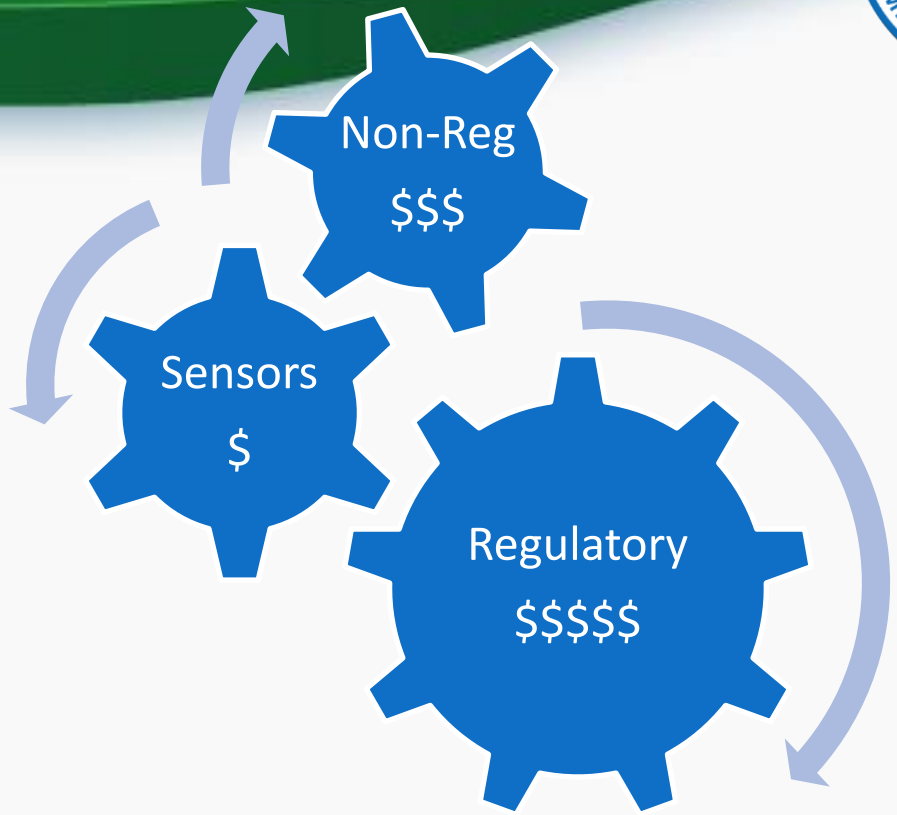


- Monitors for all criteria pollutants (CO, Pb, NO2, Ozone, PM10, PM2.5, and SO2)
- PM2.5 Chemical Speciation Network monitors
- IMPROVE (Interagency Monitoring of PROtected Visual Environments) monitors
- NATTS (National Air Toxics Trends Stations)
- NCORE (Multipollutant Monitoring Network)
- Nonattainment areas for all criteria pollutants
- Tribal areas
- Federal Class I areas (national parks and wilderness areas)

Map services are available in Google Earth, ArcGIS desktop, ArcGIS JavaScript, ArcGIS Explorer and ArcGIS.com.

Contact Us to ask a question, provide feedback, or report a problem.

Air Quality Measurement World



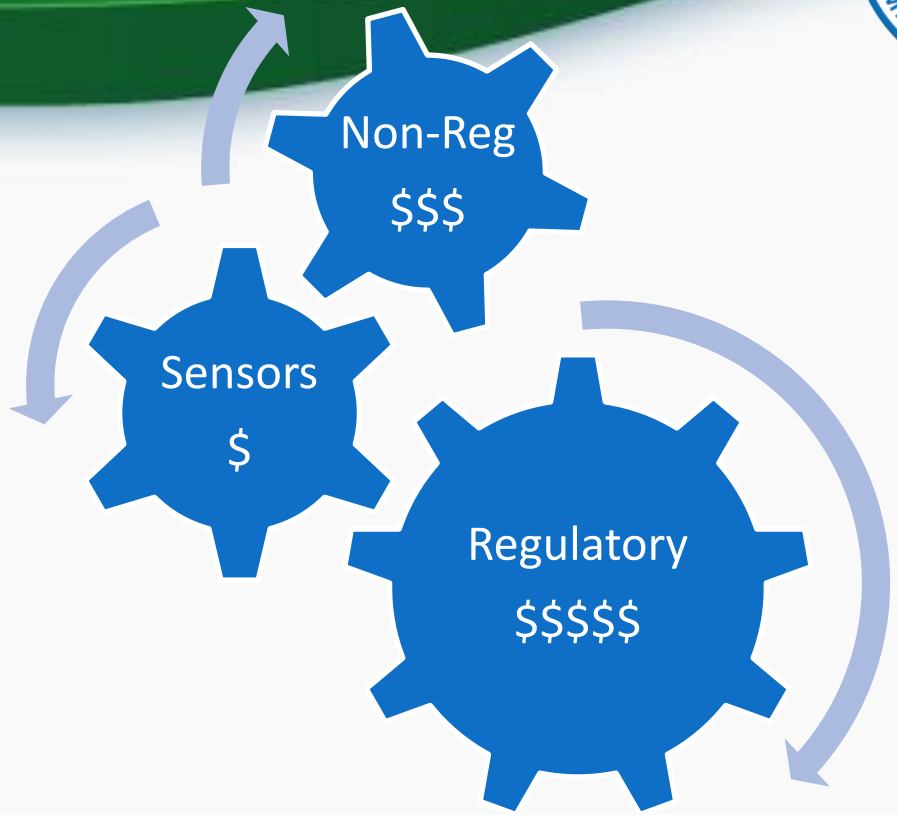
Cost:

Reliability:

Non-Regulatory

Image courtesy of epa.gov

Air Quality Measurement World



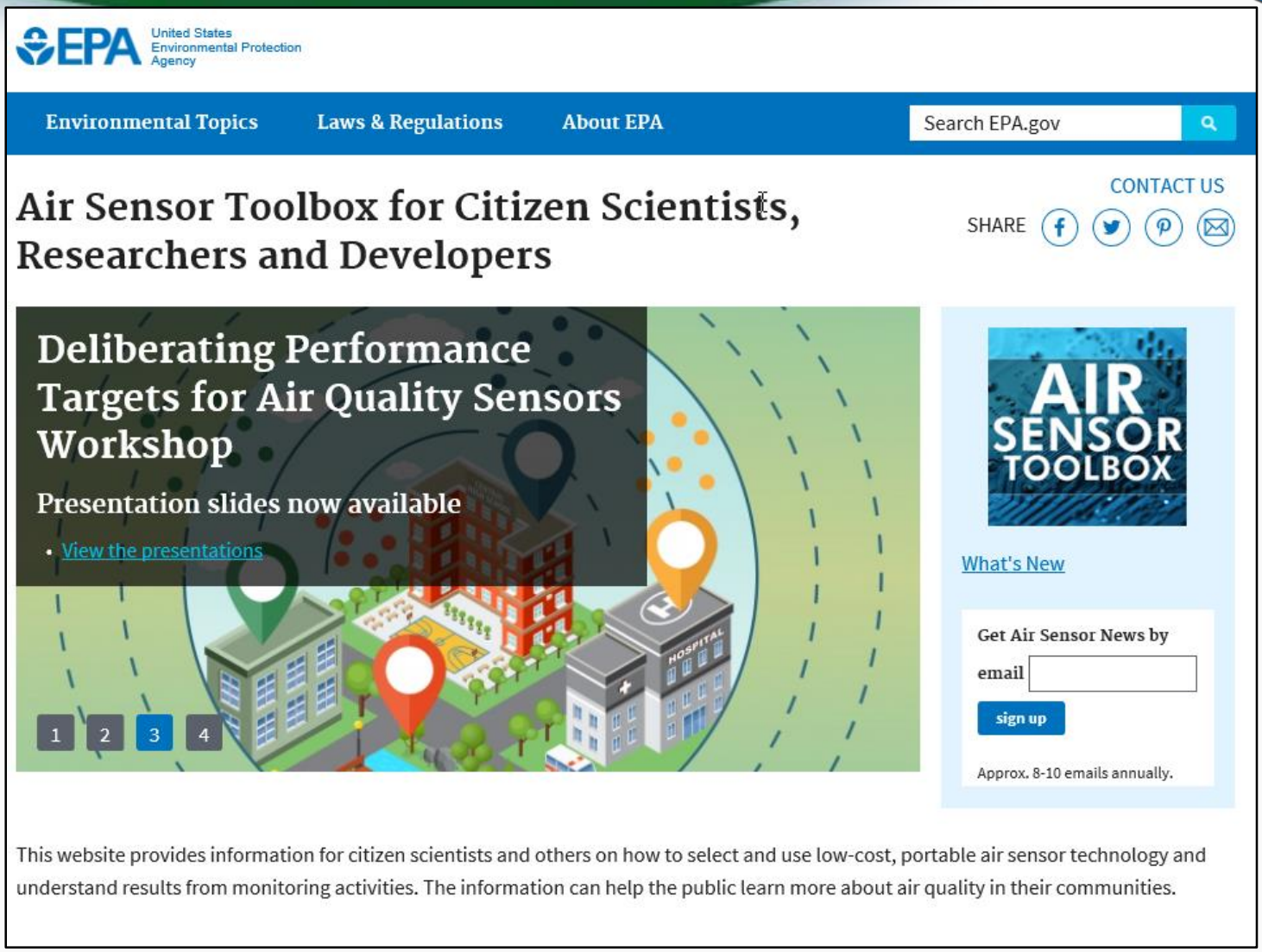
Cost:

Reliability:

Sensors

Image courtesy of EPA Sensor Toolbox
Use of image not an endorsement of product

Citizen Science Tools



ORD:

- Sensor performance
- Sampling Plan
- QA
- Analysis
- Messaging

R5:

- Sensor Loan Program
- Cit Sci QAPP
- SOPs
- Guidance to callers
  - Groups
  - Schools

Data:

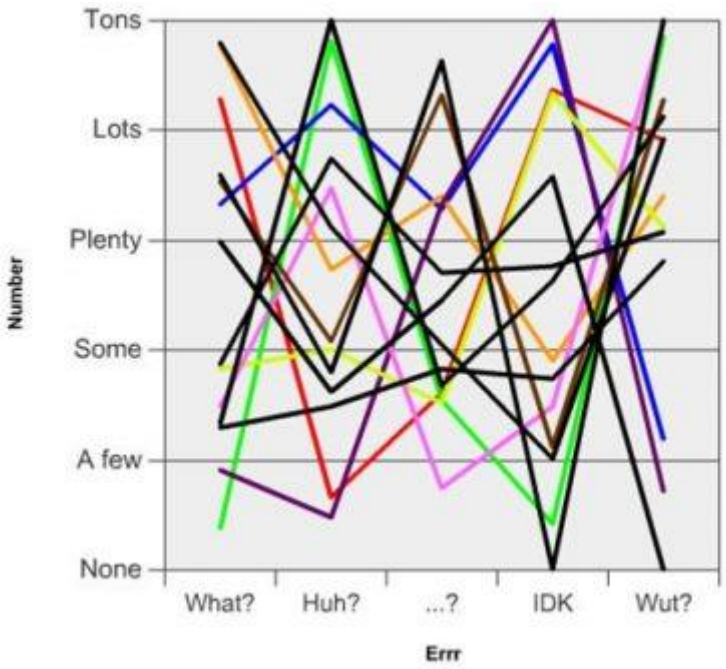


Image courtesy of CPSC683 - InfoVis

Data:

"DO SOMETHING!"

Image courtesy of CPSC683 - InfoVis

Sensor Data:

1. None of the previous requirements for regulatory
2. No studies to support 1-minute ozone and PM2.5 health effects messaging
3. Sensor Data ≠ AQI or NAAQS

tempered expectations