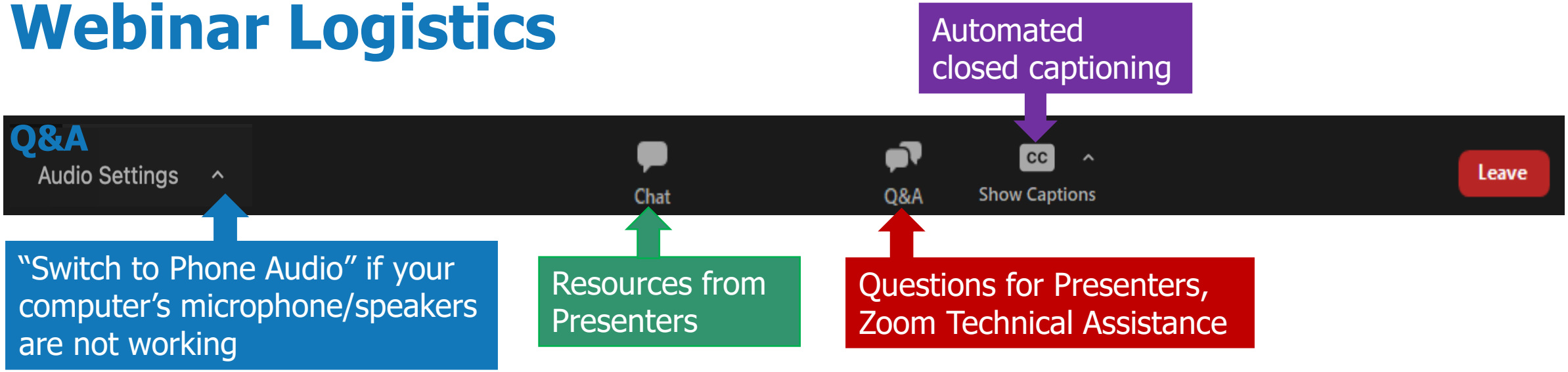
Community Air Monitoring Fundamentals

Webinar 3:
Building an Air Monitoring Network: Objectives and Data Management

TD Enviro
Eastern Research Group, Inc. (ERG)
US EPA Office of Air Quality Planning and Standards

Webinar Logistics



- **Closed captioning** is available by clicking the "CC" button in your control panel
- This webinar is being recorded.
- **To ask a question:** Type your question in the Q&A Box.
- **Technical difficulties:** If you are having technical difficulties, please send a message through the Q&A Box or email Kathryn.Harrison@erg.com

Disclaimers

- This webinar is being performed for the U.S. EPA Office of Air Quality Planning and Standards under contract number 68HERD21A0001.
- Any mention of trade names, manufacturers or products does not imply an endorsement by the U.S. Government, the U.S. EPA, or its presenters.
- This webinar is a resource for community air monitoring and does not necessarily represent U.S. EPA policies.

Your Speakers

TD Enviro

Story Schwantes

TD Enviro

Tim Dye

Overview of Webinar Series

Fundamentals of Air Quality:

Webinar #1: Introduction to Air Quality Concepts and Regulations

Webinar #2: Introduction to Community Air Monitoring and Measurements

Building a Community Air Monitoring Network:

Webinar #3: Objectives and Data Management

Webinar #4: Selecting Equipment, QAPPs, and Siting a Monitoring Device

Webinar #5: Installation, Operation, Data Analysis, and Communication

Agenda

1. Building a Community Air Monitoring Network Overview
2. Developing a Monitoring Objective
3. Setting Up Data Management
4. Recap
5. What's Up Next
6. Q&A

Recap of Webinar 2

- Air Monitoring
- Measurement Devices
- Important Concepts for Making Measurements
- Data and Quality Assurance Concepts
- Examples of Using Measurements

Regulatory Air Monitoring & Community Air Monitoring

This webinar series focuses on the **community** air monitoring process, not regulatory monitoring.

Regulatory Monitoring

- Uses EPA-certified equipment: Meet strict operating and performance requirements
  - Federal Reference Method (FRM)
  - Federal Equivalent Method (FEM)
- Follows precise operating procedures defined in Code of Federal Regulations
- Performed by regulatory air quality agencies
- Data used to make sure NAAQS are being met and for health research

Non-Regulatory Monitoring

- Uses a wide range of devices: high to lower-quality
- No required operating procedures to follow
- Can be undertaken by anyone: air agencies, community groups, researchers, businesses
- Cannot be used to ensure air quality standards are legally met
- Can be used for a range of applications

More regulatory monitoring information on EPA's Air Monitoring Methods website.

Building a Community Air Monitoring Network

What are the steps to building a community air monitoring network?

1. Develop monitoring objective
2. Set up data management
3. Select equipment
4. Develop QAPP/monitoring plan
5. Determine sites
6. Install and operate/maintain
7. Analyze and communicate data

Poll:
Where are you in the process of building your air monitoring project?

- Developing monitoring objective
- Set up data management
- Select equipment
- Develop QAPP/monitoring plan
- Determine sites
- Install and operate/maintain
- Analyze and communicate data

Developing a Monitoring Objective

Monitoring Objectives

Monitoring objectives describe why you are monitoring, or the purpose for your air monitoring.

Determining an objective involves asking a lot of questions and thinking about what you hope to achieve with your project.

All subsequent decisions and planning need to be driven by your air monitoring objective.

Why Are You Monitoring? Example Objectives

Example 1: To understand when $PM_{2.5}$ in your neighborhood reaches unhealthy levels and from what direction the wind is blowing. To understand some of the potential causes of higher $PM_{2.5}$ in your neighborhood.

Example 2: To see if black carbon concentrations are worse in your neighborhood than surrounding ones. To understand what influence the highway in your neighborhood may have on black carbon levels.

Example 3: To understand the spatial extent of local wildfire smoke and provide residents with air quality data and information that they can use to make immediate health decisions, like if they should spend time outdoors or close their windows.

Defining a Monitoring Objective: Questions

1. What is your main air quality concern?
2. What pollutant measurements/data will help you address those concerns? Does all or some of this data exist already?

Defining a Monitoring Objective: Questions

3 What is the desired outcome of this monitoring project? **How does this relate to your concern?**

4 How will the monitoring and data you collect meet your desired outcome?

Defining a Monitoring Objective: Questions

5

If you had that data right now, how would it change:

- What you would do
- What you would want others (peers, neighbors, politicians, regulators, sources of pollution, etc.) to do

6

Summarize and define an objective:

- Why are you monitoring?
- What do you plan to monitor and do?
- Where will you do this?
- How long do you plan to monitor?
- What equipment will you use?

Defining a Monitoring Objective: Build One

Example:

A neighborhood association in a large metro area wants to monitor the air. Residents are concerned about two major highways intersecting in their neighborhood. While criteria air pollutants are measured by the state air agency two miles away, residents want to understand when traffic-related pollutants, including black carbon and NO_2, are high throughout the day. The residents want to increase awareness around traffic pollution in the community and use the data to meet with the city to advocate for ways to protect residents. Instruments will be installed and operated within 200 to 300 feet of the intersection and will collect data for a two-year period. The instruments will measure black carbon and NO_2 and weather parameters, including wind speed and direction.

Let's work through the questions together:

Summarize and define an objective:

1. Why are you monitoring?
2. What do you plan to monitor and do?
3. Where will you do this?
4. How long do you plan to monitor?
5. What equipment will you use?

Independent Assignment:
What is your project's monitoring objective?

Questions to ask yourself:

1. What is your main air quality concern?
2. What pollutant measurements/data will help you address those concerns? Does all or some of this data exist already?
3. What is the desired outcome of this monitoring project? How does this relate to your concern?
4. How will the monitoring and data you collect meet your desired outcome?
5. If you had that data right now, how would it change:
    1. What you would do
    2. What you would want others (peers, neighbors, leaders, sources of pollution, etc.) to do

Summarize and define an objective:

1. Why are you monitoring?
2. What do you plan to monitor and do?
3. Where will you do this?
4. How long do you plan to monitor?
5. What equipment will you use?

5 Minute Break (& 5 Minute Q&A)

Guest Speaker

Dr. Jason Low, SCAQMD

Setting Up Data Management

Why You Need Data Management: An Example

10 monitoring devices x 4 parameters x 1 year x 1 minute data

= **21,024,000 data points**

That needs to be:

- Collected
- Processed (QA/QC)
- Analyzed
- Visualized
- Shared

What is Data Management?

Data management is the process of collecting, storing, and using data securely, efficiently, and cost-effectively.

It ensures that your data are complete, correct, and accessible enough in your air monitoring project.

Properly managing data takes time and planning, and good data management results in higher-quality data that helps you make sound decisions and achieve your desired outcome.

Why is Data Management Important?

Saves your project time and money

Increases data quality and credibility

Enables problem detection & reduces data loss

Makes data more usable & easier to share

Steps to Managing Data

Choosing a Data Management System (DMS)

	Manufacturer Provided DMS	Buy	Build
Description	Air monitoring companies and manufacturers often provide a DMS integrated with their air monitoring devices.	Companies provide third-party DMS's focused specifically on managing data from many different devices. Often customized to meet specific air quality needs.	Develop your own DMS by writing software or using existing tools. Can range from a spreadsheet to complex database and webpage systems.

Choosing a Data Management System (DMS)

	Manufacturer Provided DMS	Buy	Build
Description	Air monitoring companies and manufacturers often provide a DMS integrated with their air monitoring devices.	Companies provide third-party DMS's focused specifically on managing data from many different devices. Often customized to meet specific air quality needs.	Develop your own DMS by writing software or using existing tools. Can range from a spreadsheet to complex database and webpage systems.

Best for	• Getting started
	• Limited budgets
	• Projects with one type of device
		• Projects with multiple device types
		• Projects with more advanced needs:
		  • Quality assurance
		  • Data visualization
		  • Data exploration
			• Organizations with people, skills, and resources to develop
			• Very customized needs

Choosing a DMS: Important Considerations

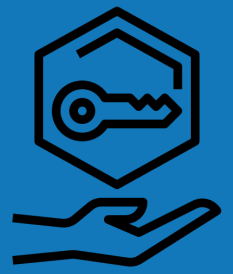
Size & Complexity of Network

Total Time of Project

User Skills

Budget

Data Handling



Data Ownership

Selecting DMS Features

A DMS may have many potential features. Before deciding which are relevant to your project, determine the tasks and steps to collect, process, view, and distribute your data.

DATA INPUT

DATA QUALITY

DATA VISUALIZATION

DATA SHARING

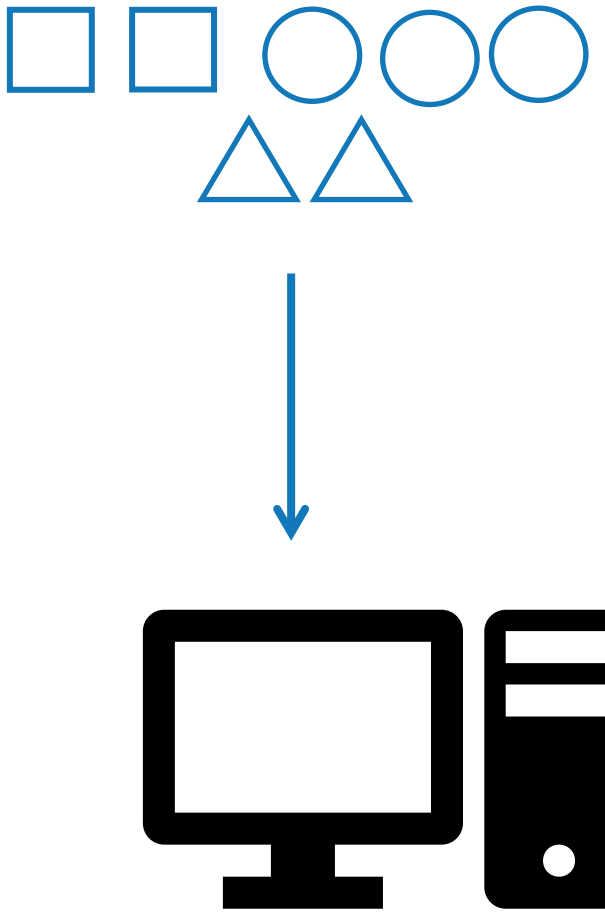
Features: Data Input

Receiving data from the monitoring device in the field and storing it in the DMS

Also called **data ingest**

<u>Options to consider:</u>

- Wi-Fi, cellular connection, or on-board memory (e.g., SD cards)
- Real-time vs. historical retrieval
- Notification when a monitor doesn't report data
- Summary of the monitoring network status
- Ingest data from multiple device types



Features: Data Quality

DMS and supporting procedures can help increase the data quality

<u>Options to consider:</u>

- Automated quality control checks
- Quality-controlled vs. raw data access
- Flagging data (e.g., quality indicators)
- Correction or calibration tools
- Ability to capture device maintenance notes

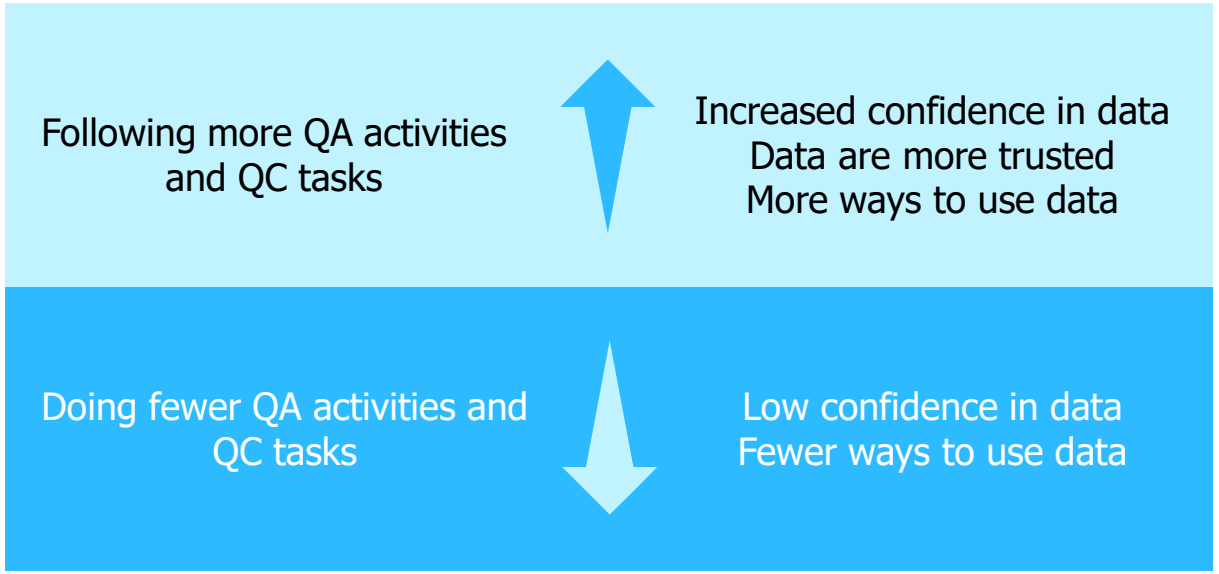


Image Source: EPA

Features: Data Visualization

Viewing your data using graphs, tables, and displays will be needed to monitor your network, understand your data, and share and communicate it

Options to consider:

- What displays are included or needed?
- Display customization
- Access to data visualizations
- Saving visualizations

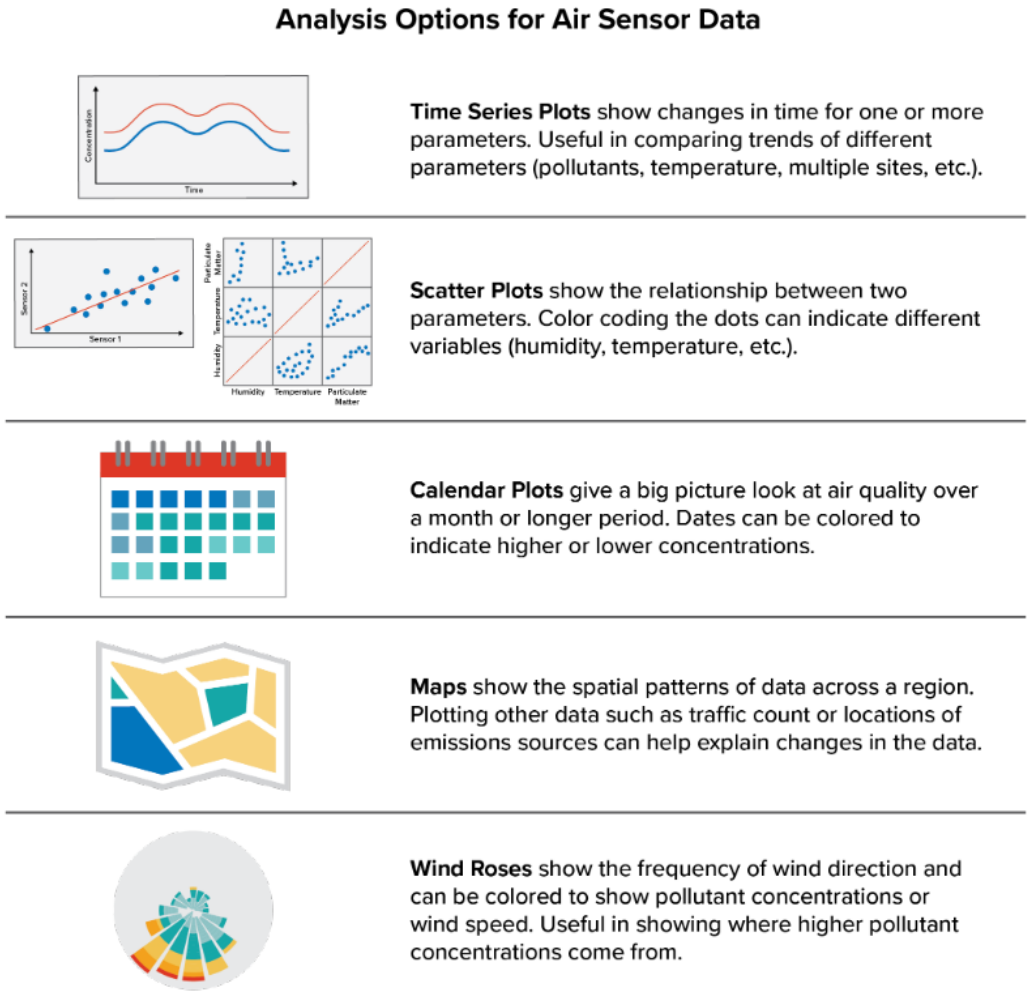


Image Source: EPA

Features: Data Sharing

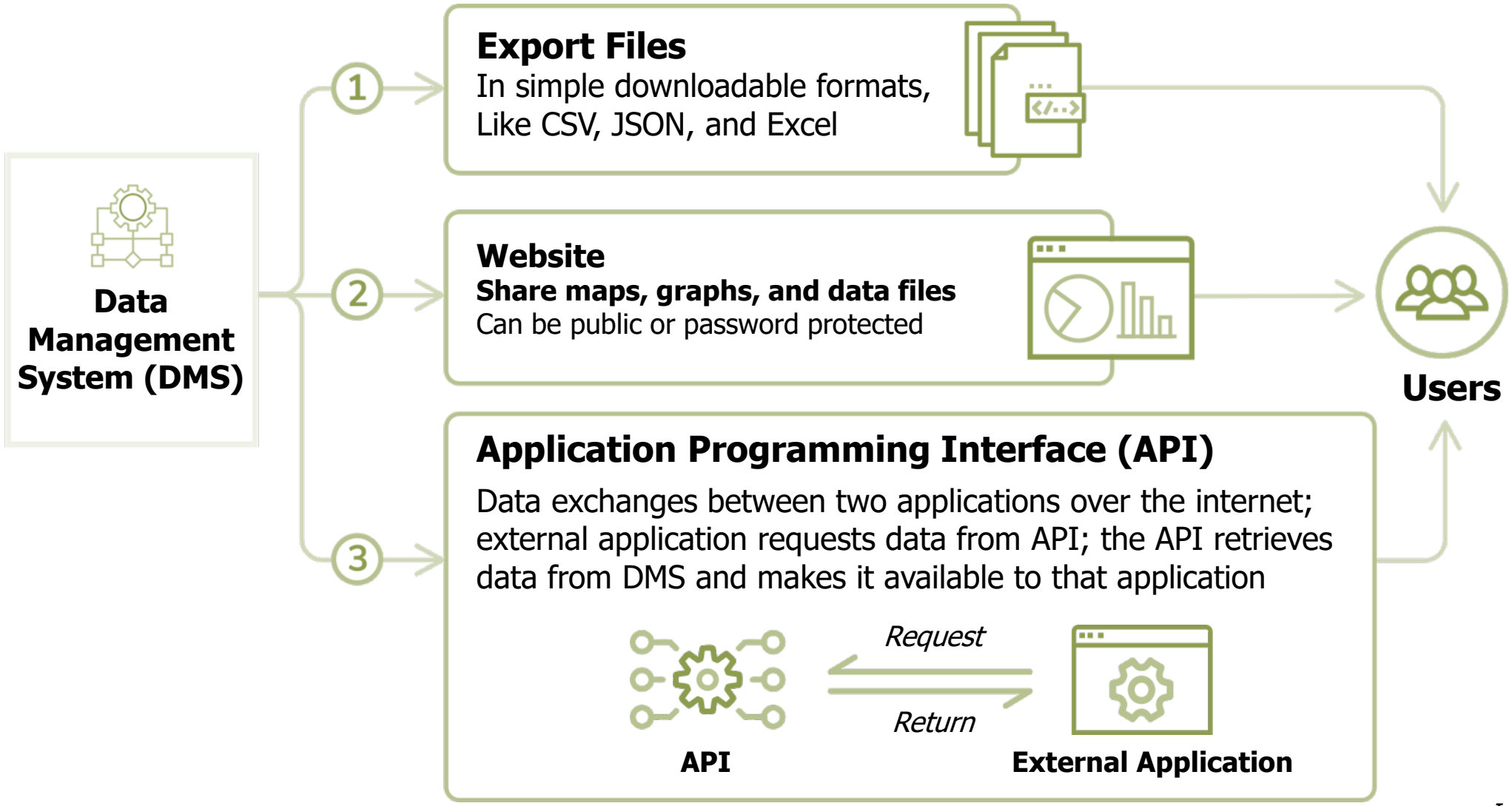
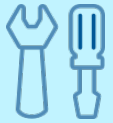


Image Source: EPA

Poll:
What type of data management system might make the most sense for your project?

Manufacturer Provided

Buy



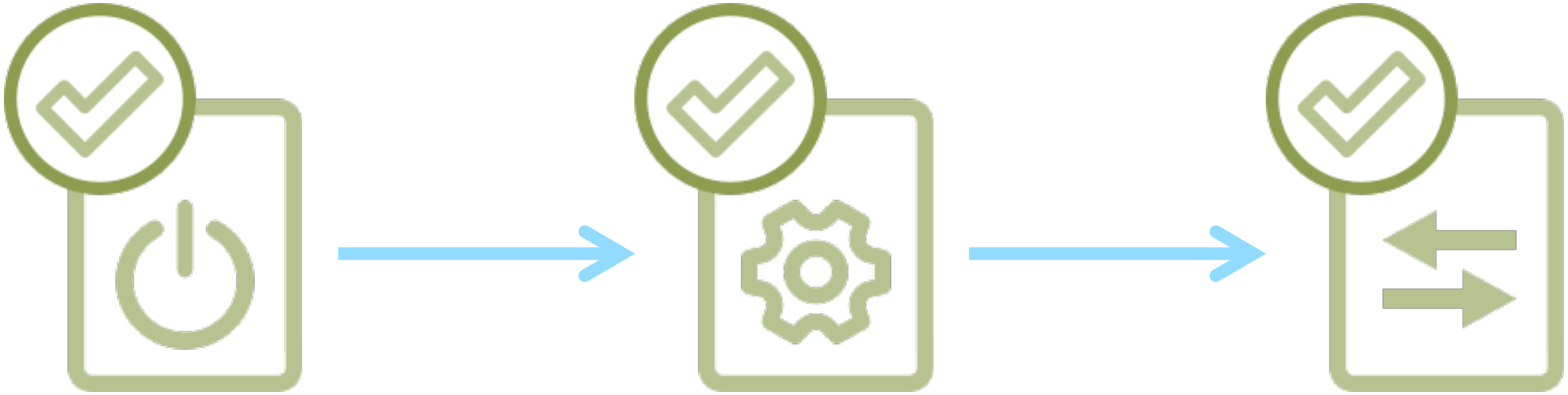
Build

EPA TDEnviro

Guest Speaker: DMS User

Dr. Ashley Collier-Oxandale, CDPHE

Setting up and Operating a DMS



Setup Checks
Do these checks to ensure the device and DMS are correctly set up and configured

Operational Data Checks
Do these checks on a regular basis to ensure the quality of the data being collected

Data Sharing Checks
Do these checks when sharing data with others

Image Source: EPA

Setup Checks

Is the device up and running? Ensure everything on the device and within the DMS is correctly set up and configured

Checks to do when a new device comes online:

- The DMS ingests data, and the data are complete
- Review values for reasonableness
- Check that the timestamp and time zone are correct
- Confirm that the location information is correct
- Confirm that parameter names are correct
- All adjustments/calibrations are working
- Record all metadata – (site address, device details, photos, nearby sources, etc.)
- All other data look correct (temperature, battery charge, the speed the air is being pumped, etc.)

Operational Data Checks

Now that data are flowing from the air monitoring device to the DMS, establish operational (i.e., day-to-day) procedures

- Daily data checks: review plots & tables to confirm all sites are reporting valid data
- Apply automatic and manual quality control and quality assurance checks
- Identify questionable data
- Correct and calibrate the data
- Log any maintenance activities and document any network changes
- Maintain the DMS; keep it up-to-date

Data Sharing Checks

Create procedures to check your data prior to sharing it with others

- Share the best quality data when possible
- Utilize DMS features to share: exports, display website, API
- Provide documentation about the data when sharing
- Provide users with attribution information
- Provide contact information and notification procedures for when things go wrong

Recap of Webinar 3

- Building a Community Air Monitoring Network Overview
- Developing a Monitoring Objective
- Setting Up and Operating a DMS

Interactive End-of-Session Feedback

What's the most useful thing you learned today?

What’s up next

Webinar 4

Building an Air Monitoring Network: Selecting Equipment, Creating QAPPs, and Siting a Monitoring Device

Selecting air monitoring equipment, planning and developing a QAPP, determining sites for monitors, reviewing your plan

Q&A