Introduction to Community Air Monitoring Network

TRACKING CALIFORNIA
INFORMING ACTION FOR HEALTHIER COMMUNITIES

COMITE CIVICO DEL VALLE, INC.

May 6, 2020
Air Sensors
International Conference

Virtual Series

WELCOME

Paul English, Tracking California

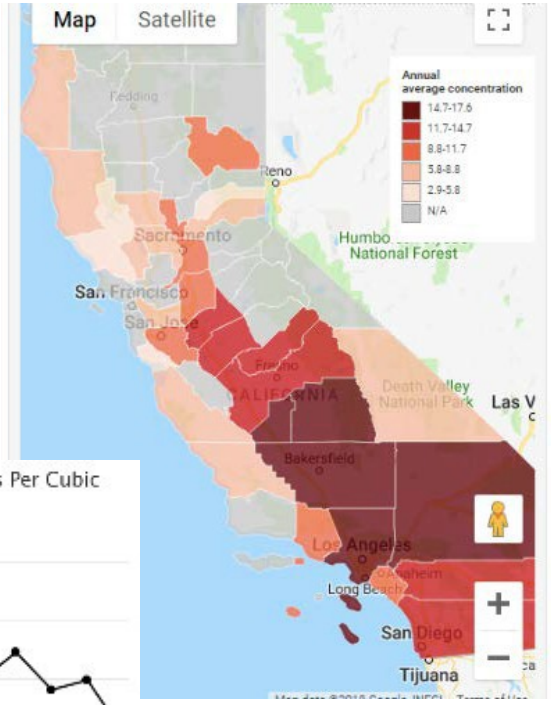
TRACKING CALIFORNIA

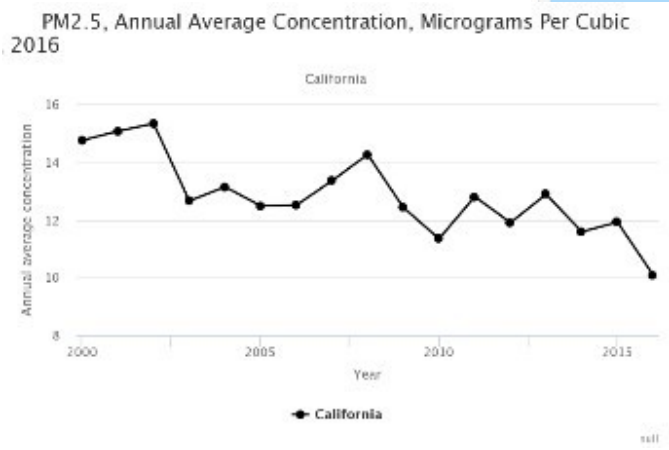
INFORMING ACTION FOR HEALTHIER COMMUNITIES

Mission: **Mobilize data to improve public health**

What we do:

- Data compilation and management
- Data access and visualization
- Health research and analysis
- Health communications
- Education and training



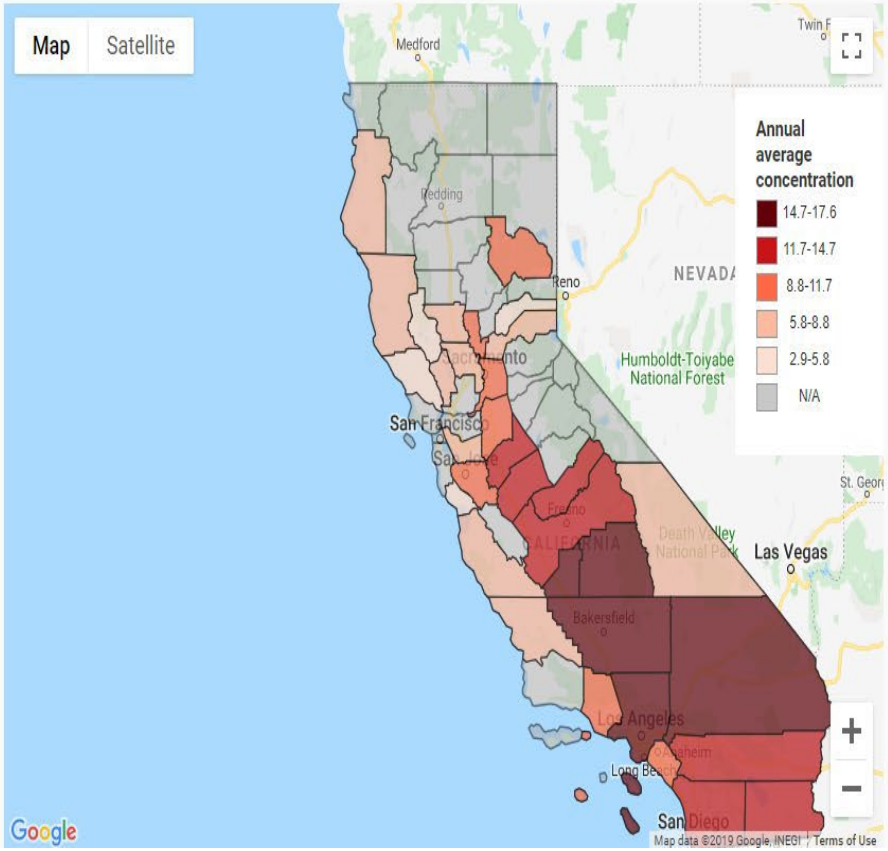


www.trackingcalifornia.org

Air Quality

Map | Time Trend | Chart | Table | About the data | **Change Data**

PM2.5, Annual Average Concentration, Micrograms Per Cubic Meter, 2016



The Imperial County Community Air Monitoring Project

- Imperial County
- 5 years, funded by the National Institute of Environmental Health Sciences
- Need identified by community members
- Network of 40 particulate matter monitors (IVAN AIR)
- Components: Community engagement, research, action

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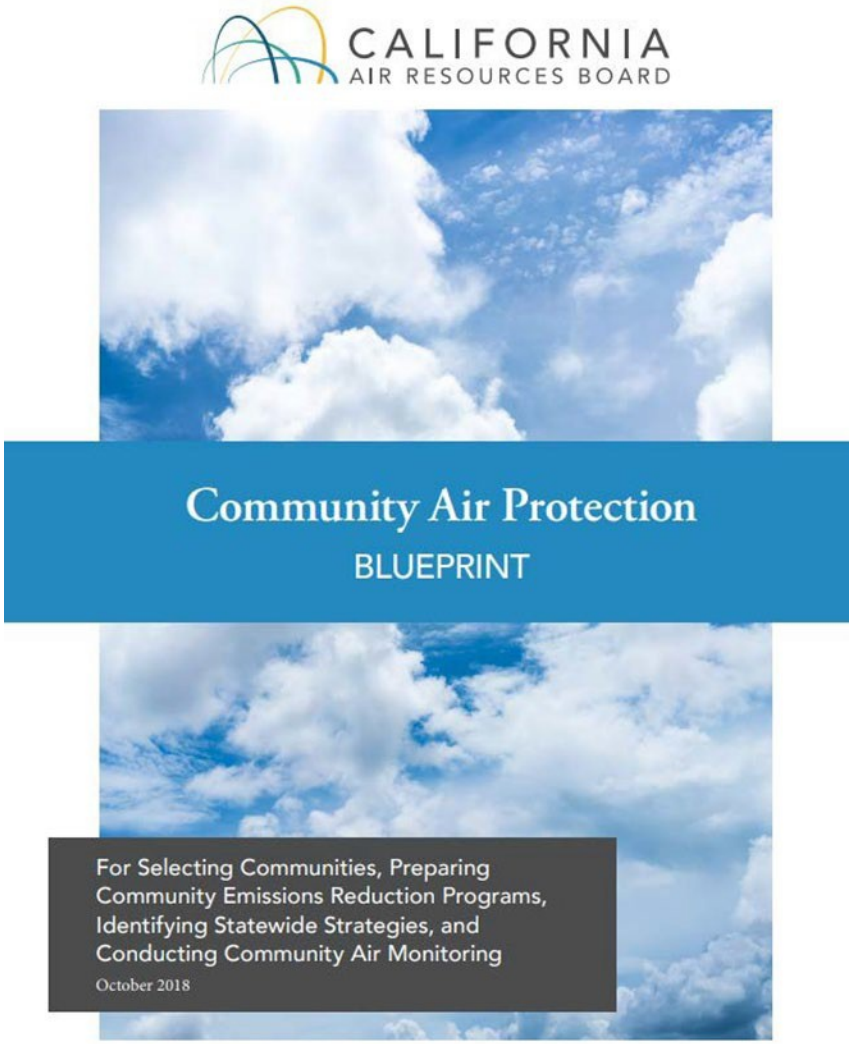
SCHOOL OF PUBLIC HEALTH
UNIVERSITY of WASHINGTON

What will you learn today?

- Considerations for starting a community air monitoring project
  - How do you know if community air monitoring is right for you?
  - How to tailor your approach to your community needs
- General processes for setting up a community air monitoring project
  - Establishing partnerships and engaging community
  - Technical and scientific considerations
  - Ways to communicate and use air monitoring data
- Examples from the Imperial County Community Air Monitoring Project

Resources for Developing an Air Monitoring Network



1. INTRODUCTION TO COMMUNITY AIR MONITORING

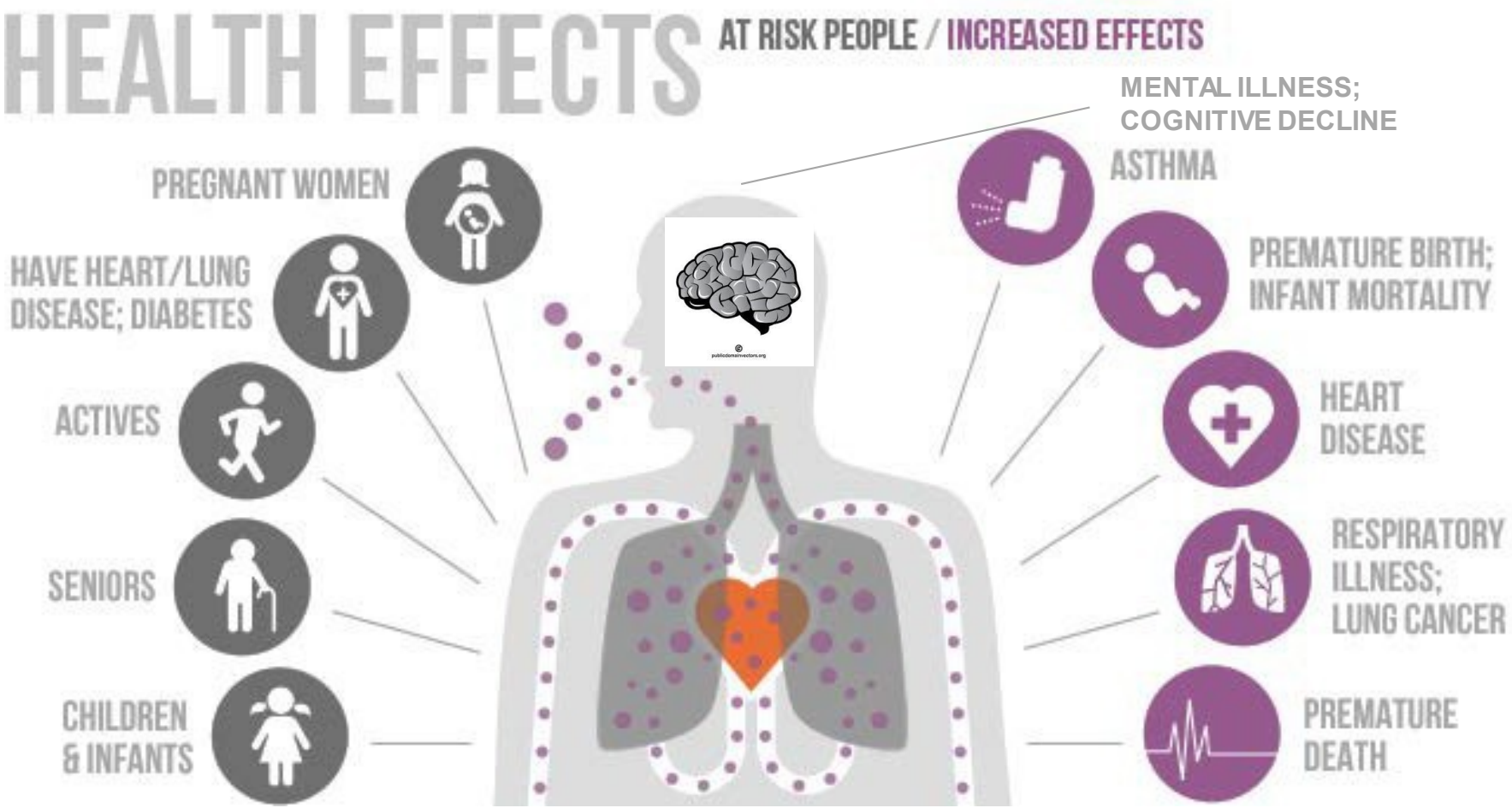
Catalina Garzon-Galvis, Tracking California

Related resources

- **Guidebook:** Chapters 1-3
- **CARB:** Appendix E - 3-5

WHAT IS COMMUNITY AIR MONITORING?

Health effects of air pollution



Source: https://images.app.goo.gl/TpC65gYwxP9SycJV8

What is community air monitoring?

At its broadest definition:

Community air monitoring is an effort to collect air quality data in which a local, community-based organization is:

- a **lead partner**
- has **decision-making power** throughout its implementation
- uses the data for **direct, positive impacts** in the community

Why community air monitoring?

- **Government air agencies have limitations**
  - Can't measure everything, everywhere, all the time
  - Regulatory and research monitors can be very expensive
  - Data may not tell you what's happening "on the ground"
  - Academic and private sector monitoring have their own limitations

- **Communities have air quality data needs**
  - Identify hot spots of pollution
  - Understand how air quality is changing at local level, real-time
  - Lead or guide scientific research
  - Make sure air quality data leads to action

- **Communities have important resources**
  - Local knowledge, capacities, experience
  - Relationships and networks
  - Advocacy and policy

Regulatory vs community air monitoring

Regulatory monitors are essential but limited

Community air monitoring can help

Different kinds of community air monitoring

Fenceline

Grab samples/ bucket brigade

Personal

Indoor

Temporary stationary monitoring

Mobile

Community air monitoring network


What are the air quality issues?
Do sensors exist?
Concern about multiple sources?
Community org that can lead?
Clear uses and users for the data?
Long term need?
What kind of community air monitoring project is right for you?

Question #1

A community air monitoring network is…

2. GETTING STARTED

Related resources

- **Guidebook:** Chapters 3-4,7
- **CARB:** Elements 2-4

What can community air monitoring data be used for?

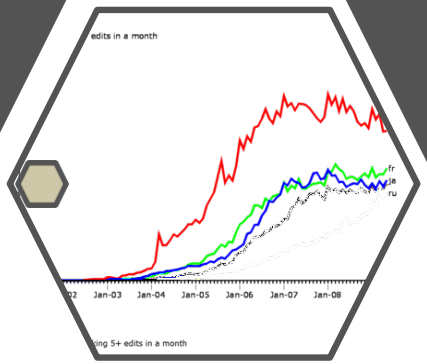
Research and other analyses

Inform policies and programs

Document AQ trends

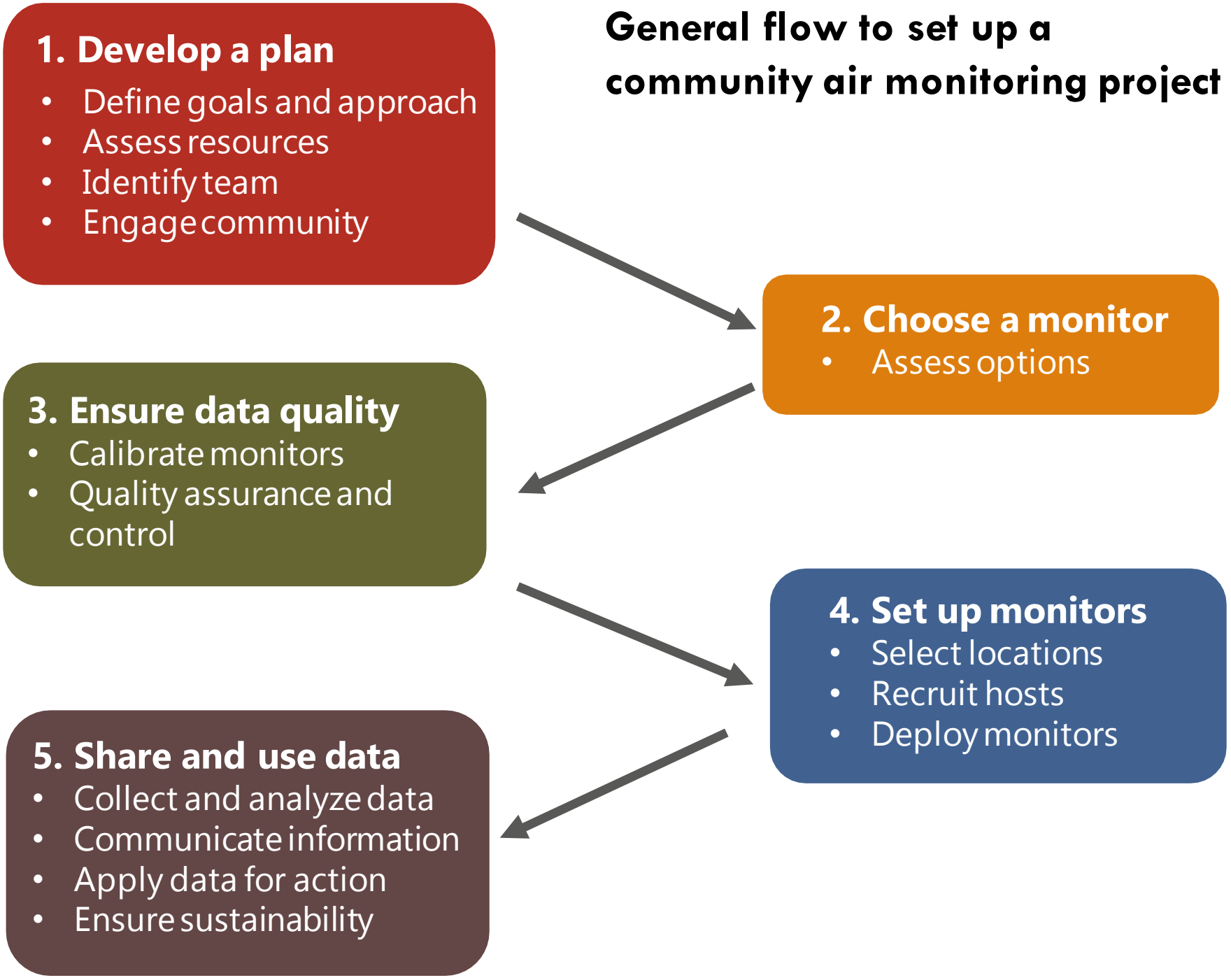
Community outreach, education, advocacy

Alert when AQ is poor to protect health



But not regulatory action

General flow to set up a community air monitoring project



DEFINING YOUR VALUES, GOALS, AND VISION

How important are these values in starting your project?

Values of community engagement

- Community leadership role
- Broad community engagement
- Equitable sharing of resources
- Shared capacity-building
- Awareness and education
- Community decision-making power
- Community data ownership

Values of scientific integrity

- Accuracy
- Utility
- Comprehensibility
- Accessibility
- Transparency
- Reliability

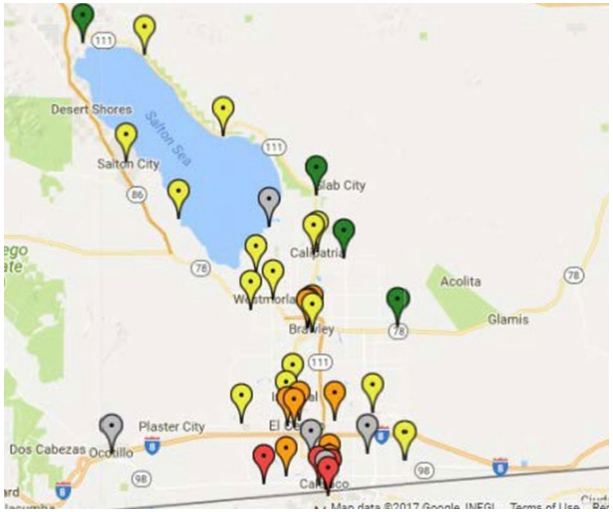
Journal of the Air & Waste Management Association

ISSN: 1096-2247 (Print) 2162-2906 (Online) Journal homepage: https://www.tandfonline.com/loi/uawm20

Development and field validation of a community-engaged particulate matter air quality monitoring network in Imperial, California, USA

Graeme N. Carvlin, Humberto Lugo, Luis Olmedo, Ester Bejarano, Alexa Wilkie, Dan Meltzer, Michelle Wong, Galatea King, Amanda Northcross, Michael Jerrett, Paul B. English, Donald Hammond & Edmund Seto

Imperial County example: IVAN AIR network



- Located throughout a large geographic region
- Established and operated by CCV with technical partners
- Long-term
- Measures outdoor PM across large county to provide real-time data for exposure reduction
- Collects data continuously
- Public is a direct user of the data

Some questions to help define your goals and choose your approach

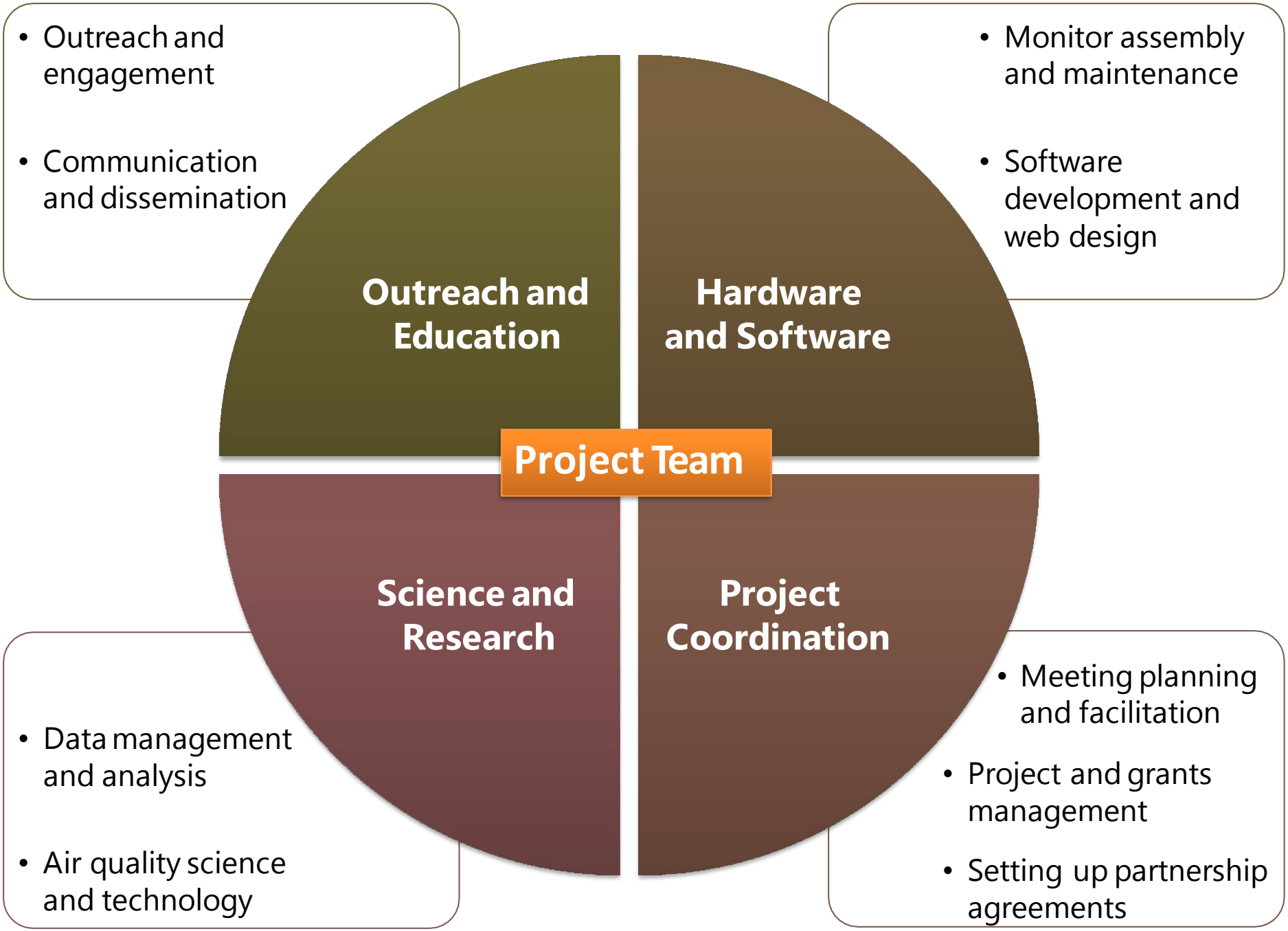
- What do you want the air monitoring data to tell you about?
- What do you want to do with the data?
- What do you want others to do with the data?
- What type of monitoring project will help you collect this data?
- What resources, capacities, and technologies are available to do this?

Who else will use the data?

Who will use the data?	For what?	How will they get the data?	Data quality needed?
School kids	Learning about their environment	On device or via website	Fair
School administrator	Keep kids indoors when air pollution is high	Website or alert	Good
Regulatory government agency staff	Investigate a pollution complaint	Website or dataset	Very Good
University or government researcher	Conduct study on air quality and health	Dataset	Very Good

Having a vision for your project will help with planning

PROJECT TEAM & PARTNERSHIPS


Outreach and engagement
Communication and dissemination
Monitor assembly and maintenance
Software development and web design
Outreach and Education
Hardware and Software
Project Team
Science and Research
Project Coordination
Data management and analysis
Air quality science and technology
Meeting planning and facilitation
Project and grants management
Setting up partnership agreements

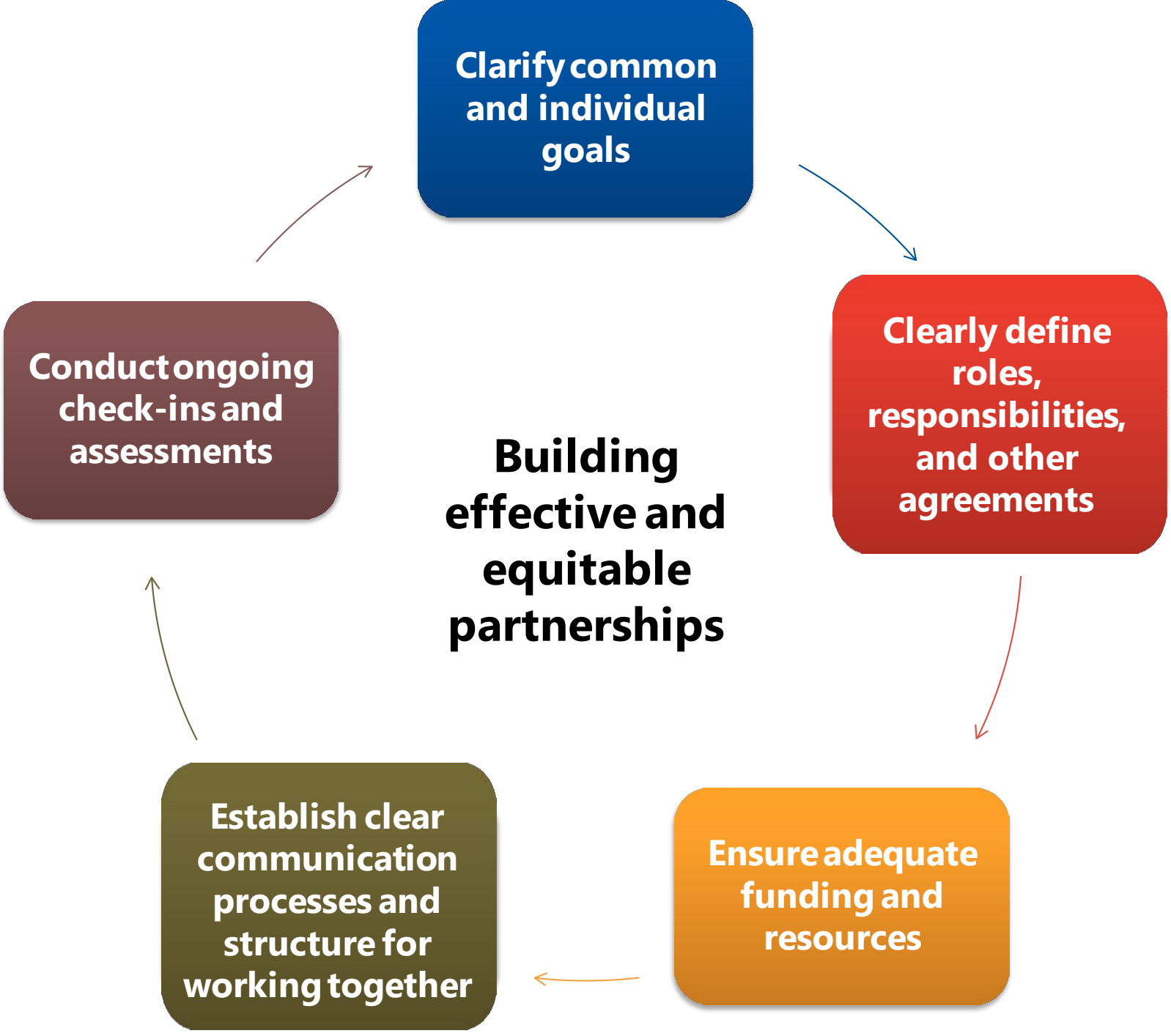
Who can be part of your project team?

Project team can be:

- Partners
- Contractors
- Consultants

These may be:

- Other community groups
- Non-governmental organizations
- Government agencies
- Universities
- Private companies


Clarify common and individual goals
Clearly define roles, responsibilities, and other agreements
Ensure adequate funding and resources
Establish clear communication processes and structure for working together
Conduct ongoing check-ins and assessments
Building effective and equitable partnerships

ENGAGING COMMUNITY AND OTHER STAKEHOLDERS

Community Steering Committees (CSC) or Advisory Groups

Clear roles and responsibilities

Guidance and decisions on goals and activities

Evaluate progress and impacts

Participate in activities to carry out the project

Technical Advisory Group (TAG)

- Representatives from government, universities, private sector
- Not a decision-making body
- Guidance on technical aspects of the project
- Supports relationship-building and ongoing communications

Sensor selection

Monitor siting

Colocation and calibration

Quality control

Data analysis and interpretation of results

More ways to engage others

Who else may want to know that you're setting up a community air monitoring project?

Who else may be able to provide support?

Question #2

A technical advisory group can offer guidance on…

3. TECHNICAL CONSIDERATIONS FOR COMMUNITY AIR MONITORING

David Chang, Tracking California

Related resources

- **Guidebook:** Chapters 8-11
- **CARB:** Elements 6-7, 9

CHOOSING AIR MONITORS

Air sensor and air monitor often used interchangeably

Definitions for today…

Sensor

- The component that measures the air pollution
- Sold on its own or as part of a monitor

Remember: sensors measure for specific pollutants

Monitor

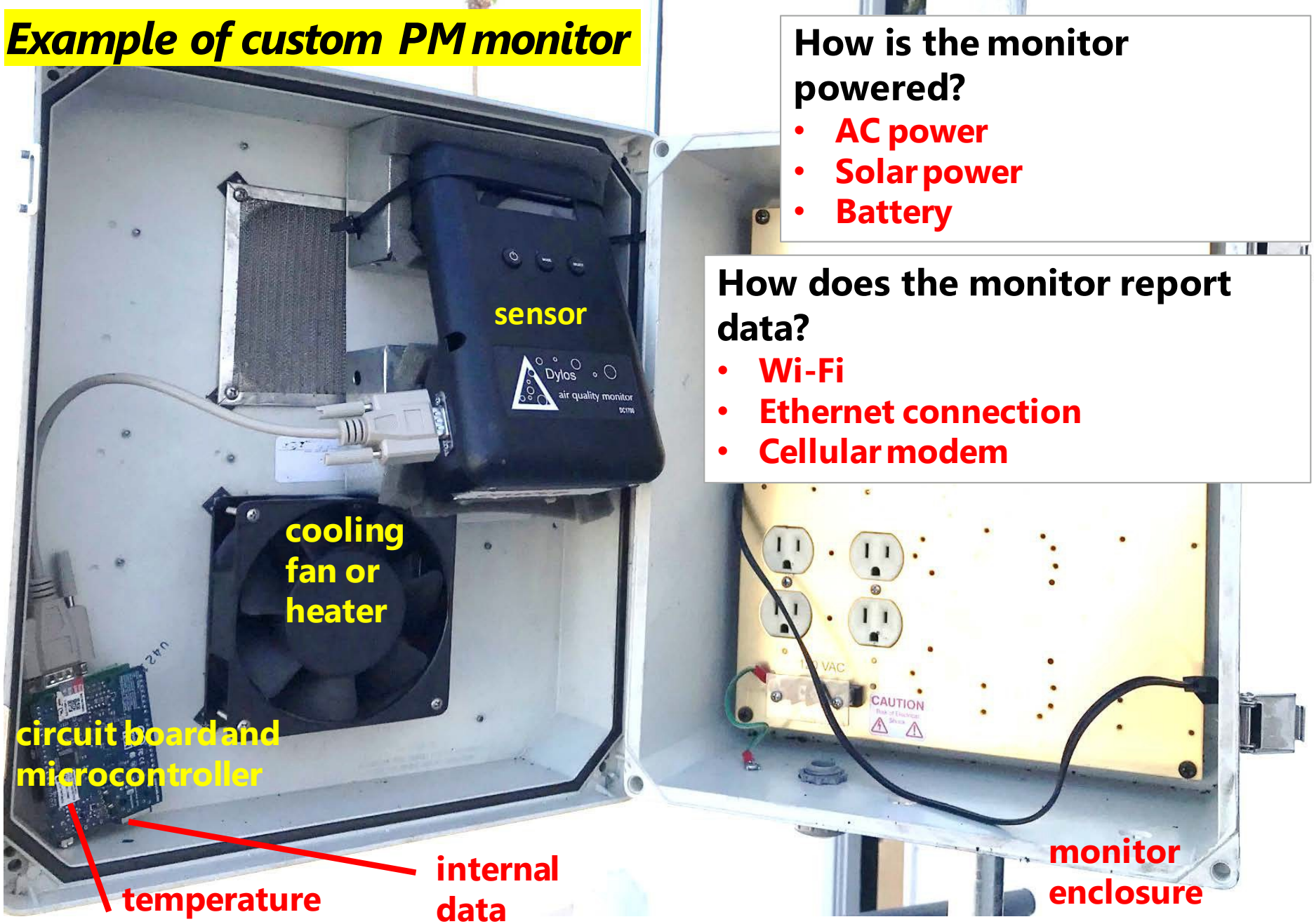
- Contains everything needed to collect and transmit data
- May include additional sensors for temperature, humidity
- Can be **custom-built** or purchased **ready-made**

Ready-made monitor examples

"Off the shelf"

"Plug-and-play"

Example of custom PM monitor



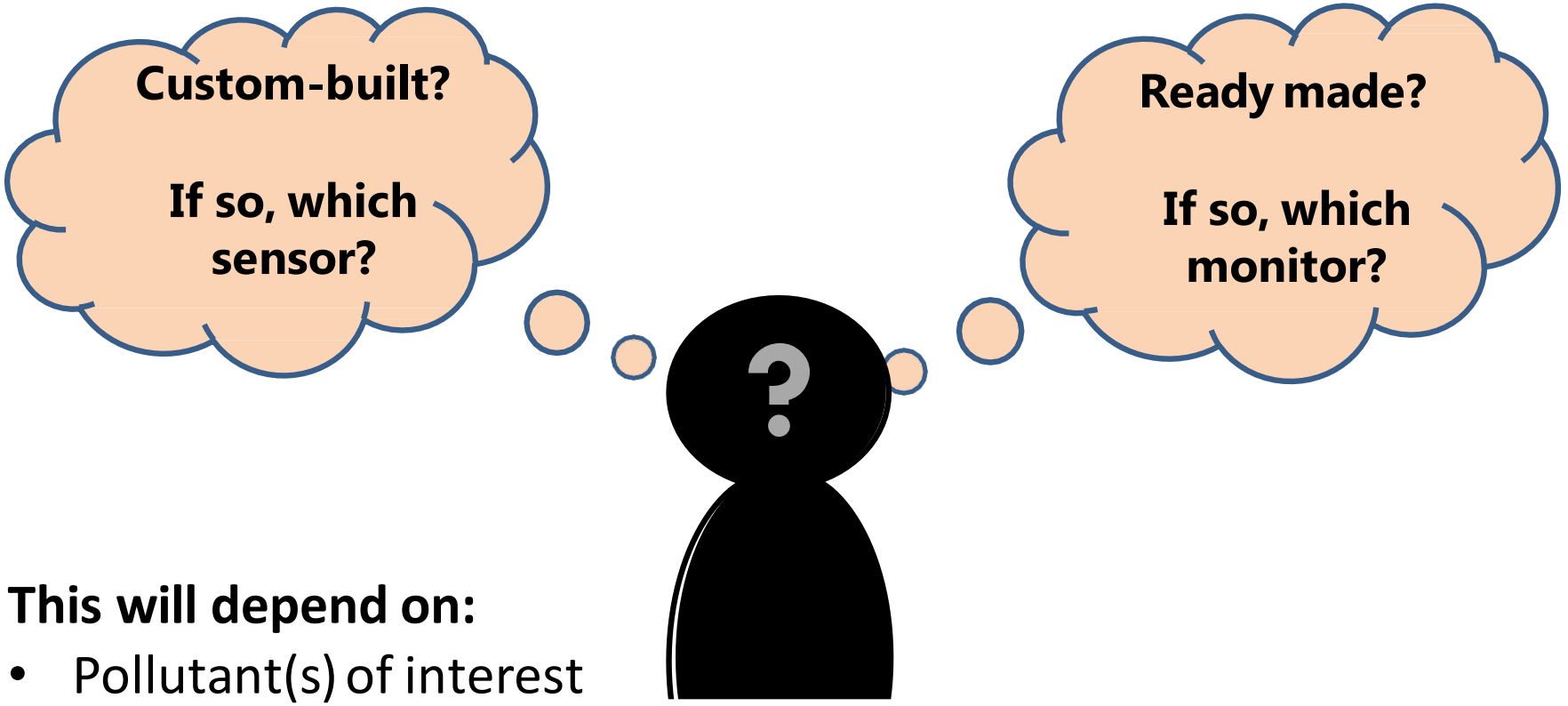
How is the monitor powered?

- AC power
- Solar power
- Battery

How does the monitor report data?

- Wi-Fi
- Ethernet connection
- Cellular modem

Which monitor to use?



This will depend on:

- Pollutant(s) of interest
- Project goals
- Data collection method
- Financial and technical resources
- Available technology

Question #3

How do you know which monitor is right for you?

ENSURING DATA QUALITY

Why do we care about data quality?

- Better informed community
- More appropriate actions taken
- More usable for government, researchers, technology developers
- Increased credibility

Data quality should match your project goals and data needs

What can impact data quality?

1. Quality of the sensor and monitor

2. Calibration

3. Quality control

4. Monitor maintenance

Questions to ask when selecting a sensor or monitor

How well does it estimate pollution levels?

- How accurate?
- How consistent?
- What levels can be detected (low and high)?

How has it been tested?

- Lab testing
- Field testing
  - Real-life environmental conditions
  - In your community

Who is doing the testing?

- Manufacturer
- University researchers
- Government
  - AQ-SPEC
  - CARB
  - EPA

What can impact data quality?

1. Quality of the sensor and monitor

2. Calibration

3. Quality control

4. Monitor maintenance

What is calibration?

- No monitor is completely accurate
- Calibration helps improve accuracy
  - Apply a math equation to monitor results to **improve accuracy**
  - Equation is developed by **comparing your monitor's results**
    - With results from a high-end monitor
    - Or known amounts of pollutants in a lab setting
  - Equation should include **other factors that impact monitor readings**
    - Temperature, humidity, other pollutants
- Does your monitor need calibration?
  - Yes, unless you are only using it for personal, educational, or outreach purposes

What can impact data quality?

1. Quality of the sensor and monitor

2. Calibration

3. Quality control

4. Monitor maintenance

What is Quality Control (QC)?

- Removing bad data to prevent inaccurate results
  - "Data cleaning"
- When does QC happen?
  - Real-time as data are produced and displayed
  - Later when working with datasets
- Can include
  - Removing measurements known to be incorrect
  - Addressing incomplete measurements
  - Alerting when a monitor is not functioning well or is offline
- Who might do this?
  - Manufacturer
  - Project team

What can impact data quality?

1. Quality of the sensor and monitor
2. Calibration
3. Quality control
4. **Monitor maintenance**

Many things can impact monitor performance

Heat

Critters

Loss of signal

Cold

Dust and dirt

Loss of power

Monitor "drift" over time

Theft and vandalism

Monitor maintenance is essential for data quality

Data quality assurance and control is an ongoing process that

- **should happen throughout the length of your project**
- **can be improved as more opportunities and resources become available**

What else should you consider when selecting a monitor?

How will data be stored?

- On the monitor? Immediately uploaded to a server?
- Is the data secure? Backed up?

Will you have access to the "raw" data free-of-cost?

- Can you access the data easily?
- Can you make back up copies of the data?

How are the data made available?

- To you and to the public?
- How are results calculated? How are they displayed?

Question #4

How often should you perform data quality and assurance?

SETTING UP MONITORS

Why is the location of a monitor important?

- Locations should be **meaningful to the community**
  - Increase community awareness
  - Data more likely to be used
  - Data more likely to be impactful
- Locations should
  - align with **project goals**
  - consider **existing data** & **local knowledge**

Example – Process to engage community in choosing stationary monitoring locations

1. Define monitoring area
2. Identify colocation site
3. Recruit community residents
4. Identify and assess possible locations
5. Select final and alternate locations

What is the role of a monitor host?

- Can include:
  - Providing a secure location
  - Supplying the monitor with power and internet
  - Allowing access for installation and maintenance
  - Alerting you to any concerns or changes
  - *Additional information for monitor hosts can be found in guidebook pages144-146*

Before using a monitor

- Schedule a **site visit** with the monitor host or go on a **trial run** along your monitoring route
- Agree upon **where to install** the monitor
- Identify **tools and materials** that will be needed
- **Test connectivity** to the internet and GPS

What might installing a fixed monitor entail?

Example from Imperial Project:

- **Affix** a tripod or pole to the base/side of the roof of the building
- **Mount** the monitor
- **Connect** the power and network cables
- **Test** the monitor
- **Document** installation details, equipment used, passwords, and observations

What might using a portable monitor entail?

Example from Air Beams:

- **Calibrating or zeroing** the monitor to ensure fresh start
- **Connection** to an android device or GPS
- **Charge** the power of the air beam before going out on your route
- **Create** a log to track where you will be monitoring
- **Go out multiple** times to obtain baseline and capture different measurements when PM may be high

4. COMMUNICATING AND USING AIR MONITORING DATA FOR ACTION

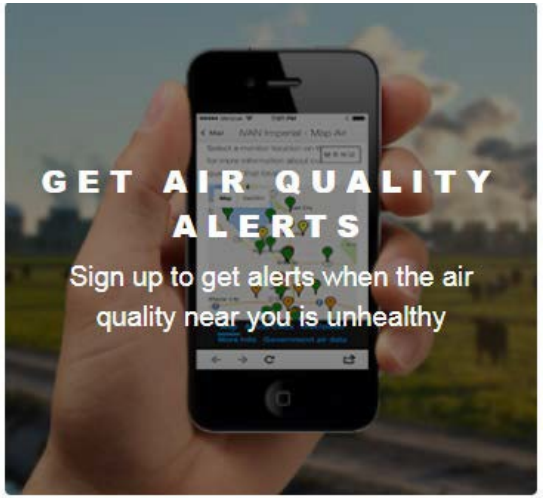
Christian Torres, Comite Civico del Valle

Related resources

- **Guidebook:** Chapters 12-16
- **CARB:** Elements 8, 11-14

Real-time air quality data

- What is it?
  - Estimates of current air pollution levels at the monitor locations
- Possible uses
  - Increase awareness, knowledge, engagement
  - Personal exposure reduction
  - Inform school flag programs
  - Trigger additional monitoring
- People may need to know
  - It exists
  - Where to find it
  - What it means
  - How to use it



Historical air quality data

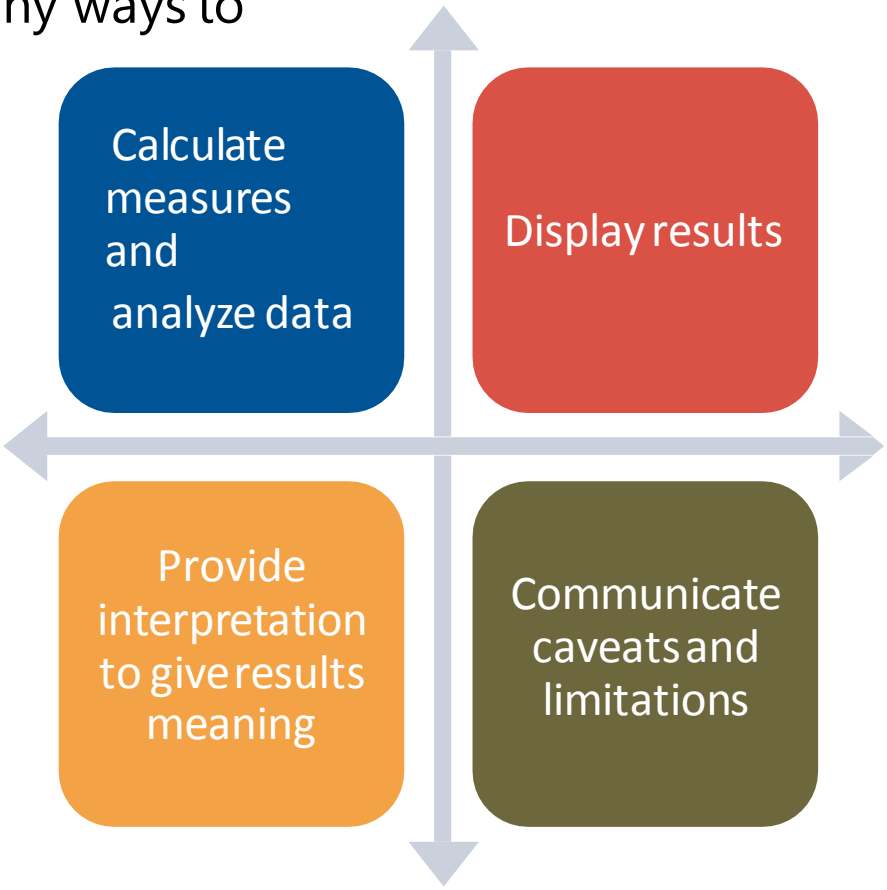
- What is it?
  - Air monitoring data collected over time
  - Includes raw data, calculated measures

- Possible uses
  - Document trends and hot spots
  - Respond to community concerns; investigate pollution events
  - Evaluate programs, policies
  - Conduct research
  - Inform planning and policy-making
  - Support advocacy

- People may need to know
  - How and where to get it
  - Data collection methods
  - Quality assurance and control measures
  - How to interpret different measures

Your goals should guide how data are communicated

- There are many ways to



- Will the information be appropriate for
  - **Your project goals?**
  - **Your target audiences and their data needs?**

Example from Imperial Project

Who? **What data?**	• Community residents • Real time particulate matter (PM) data
What do they want to know or do?	• How safe is the air right now? • What should I do to protect my health?
Considerations	• What air quality measures? • How to interpret their meaning? • Is this consistent with gov't messaging?

What is understandable and useful for your community?

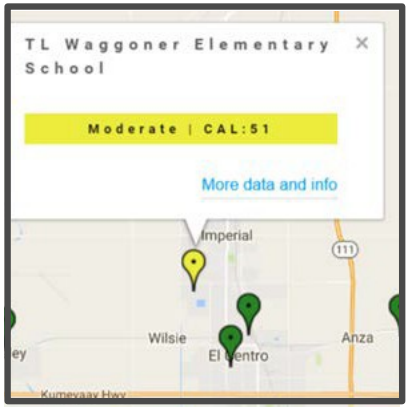
Community Air-Quality Levels (CALs)

Number range	Category	Color	Health Recommendation
0-50	Low Risk	Green	It's a good time to be active outside
51-100	Moderate	Yellow	**If you are unusually sensitive to particle pollution,** reduce physical activity outdoors. Watch for symptoms like coughing or breathing problems.
101-150	Unhealthy for Sensitive Groups	Orange	**Sensitive groups*** should reduce physical activity outdoors. Watch out for symptoms like coughing, breathing problems, unusual heartbeat, or unusual fatigue.
Above 150	Unhealthy	Red	Avoid physical activity outdoors.

Example from IVAN AIR

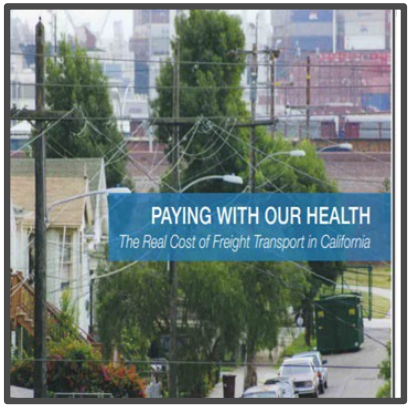
Social media

Websites



Air Quality Alerts

Reports



Media partnerships

Data sets

Flag programs

Meetings & Events

Question #5

Real Time air quality data can be used for all but the following…

Displaying data on the web

- Who operates the website where the data will be displayed?

- If you are not operating the website

  - How much influence will you have?
    - Data display, interpretation, messaging

  - How dependable is the website operator?
    - How long can they ensure the service?
    - Will you find out if it's discontinued?
    - Can you take over?

IMPERIAL

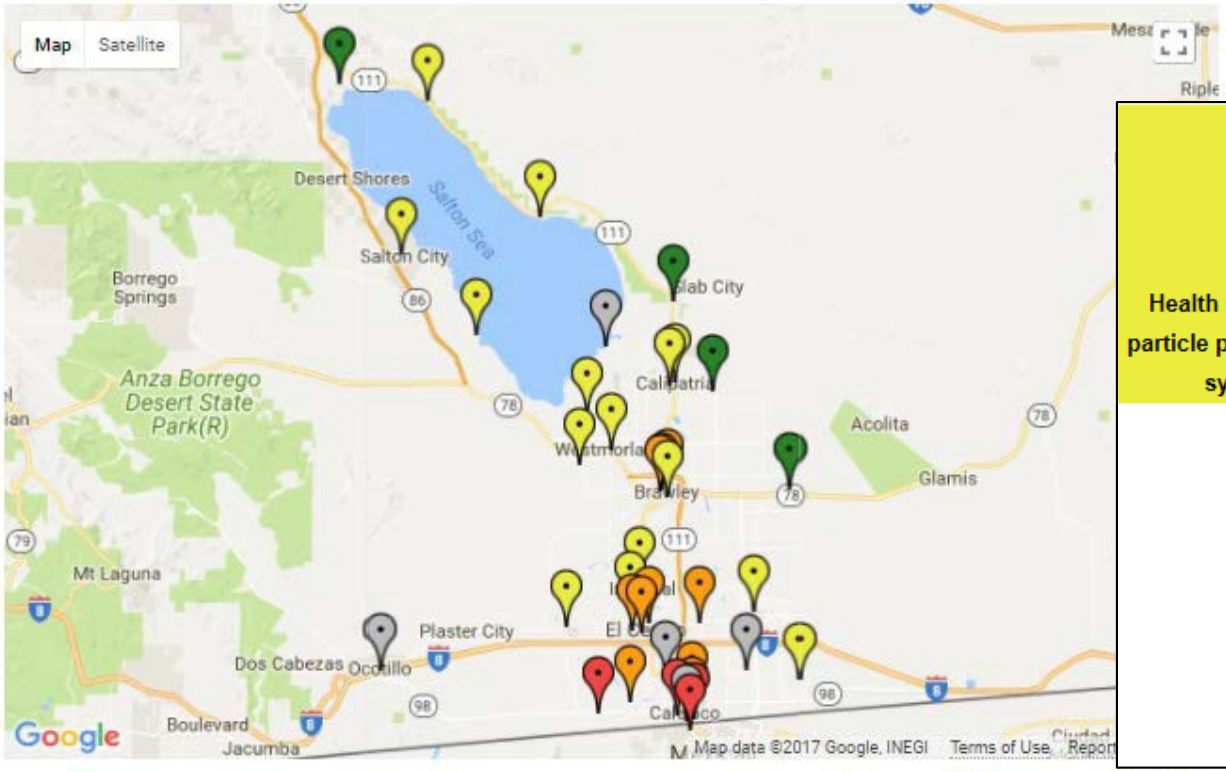
MENU

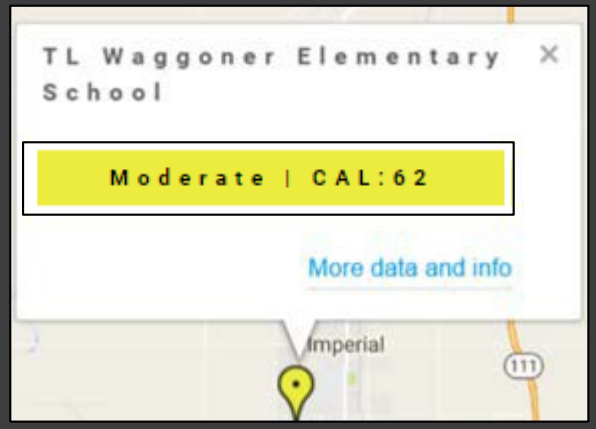
Map of Monitors

Select a monitor location on the map for more information about current air quality at that location.

Learn what the Community Air-Quality Level (CAL) colors mean. Gray monitors are offline.

Wednesday, December 20, 2017 at 10:00 AM



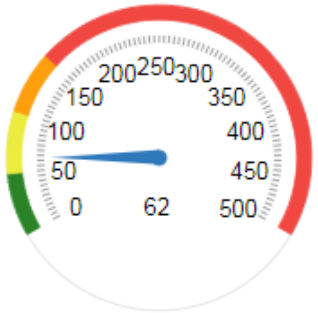


The current air quality at this monitor is

62

Moderate

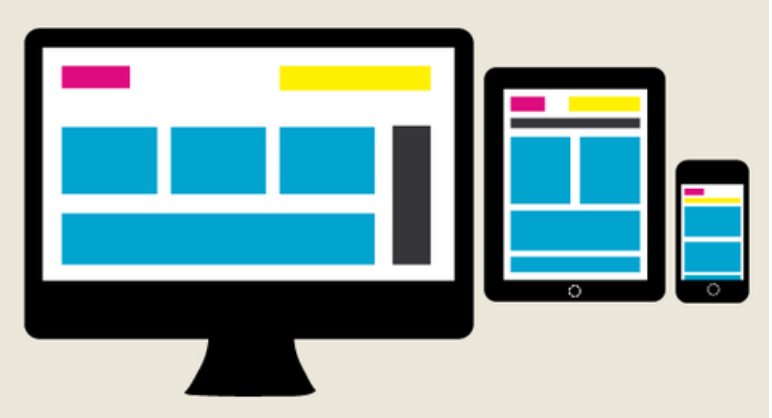
Health recommendations: If you are unusually sensitive to particle pollution, reduce physical activity outdoors. Watch for symptoms like coughing or breathing problems.



Map | About CALs | Disclaimer | More info | Government air data | Report an air problem

ivan-imperial.org/air

Considerations



- Many ways to communicate and display data
- Which measures to use? Do they add useful information?
- What is the main reason people want this data?
- Is it easy to interpret the information?
- Test with your primary audience
- Can plan for future enhancements

When creating your community air monitoring project, cultivate partnerships, capacities, and relationships with a long-term focus

Q&A

THANK YOU

Tracking California | A Program of the Public Health Institute

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