Leveraging Sensors to Help Address Local Air Quality Concerns

Janice Lam Snyder
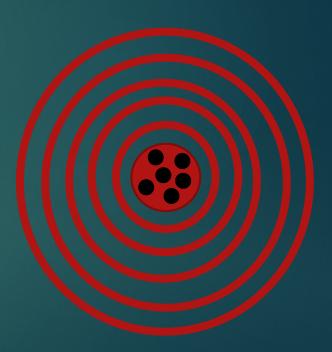
Sac Metro Air Quality District

EPA Air Sensors 2019 Workshop

July 16, 2019

Local Air Quality Agency:
A Policy Perspective

▶ Achieving Federal and State Health Standards

▶ California's Assembly Bill 617 - Community Air Monitoring

▶ Reduce public exposure to air pollution/air quality events

What are some applications for sensors in a regulatory world?

► Increasing our **understanding** of air pollution **behavior**

► **Localized Air Monitoring**

   ► "Hot Spot" Identification

   ► Spatial and Temporal Trends

   ► Screening Tools

► Enhance **Public Awareness**

   ► Air Quality Events – increase spatial information

   ► Outreach – tools for hands-on approach

Idea of:

"Don't let the Perfect Be The Enemy of The Good"

-Voltaire, Confucius, Shakespeare

How "**good**" does the sensor data need to be?

IT DEPENDS

(on the objective)
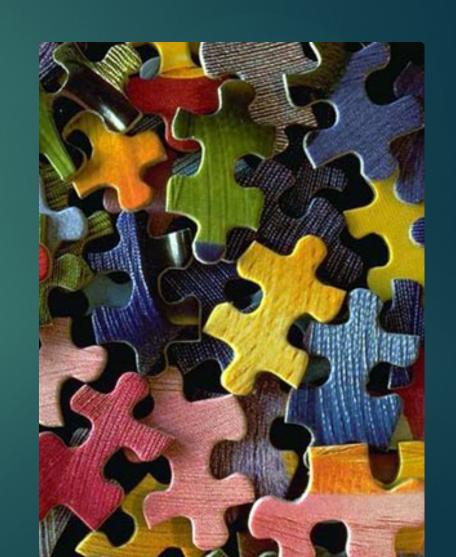
Regulatory data and Sensors

▶ Data for regulatory decisions needs to be **DEFENSIBLE.**

KEY: If sensors are to be comparable to FRMs/FEMs, then they need to meet 40 Part 58 Appendix D requirements

Accuracy   Completeness   *High*

Precision   Correlation
High

Bias

seasonal too!

Hot Spot & Weight of Evidence Tool

- **Hot Spots (Near Source Impacts)**
  - Fence line
  - Fugitive Dust
  - Near Roadway

- **Exceptional Events Demonstrations**
  - High Wind Dust
  - Wildfire

California Camp Fire: 11/08/18-11/25/18

Date	Site Name	PM 10 Regulatory Data Exceedance Concentration
11/16/2018	Sacramento T Street	252 µg/m3
11/15/2018	Sacramento T Street	292 µg/m3
11/14/2018	Sacramento T Street	181 µg/m3
11/12/2018	Sacramento T Street	183 µg/m3
11/11/2018	Sacramento T Street	176 µg/m3
11/10/2018	Sacramento T Street	189 µg/m3
11/10/2018	North Highlands	222 µg/m3
11/16/2018	North Highlands	163 µg/m3
11/10/2018	Del Paso Manor	212 µg/m3
11/16/2018	Del Paso Manor	166 µg/m3
11/10/2018	Del Paso Manor	202 µg/m3
11/16/2018	Del Paso Manor	163 µg/m3
11/10/2018	Sacramento – Branch Center	200 µg/m3

High accuracy and precision is less important
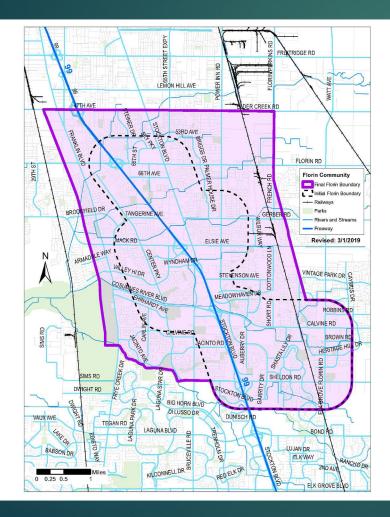
Some bias is acceptable

Sac typical max. conc. 40-90ug/m3

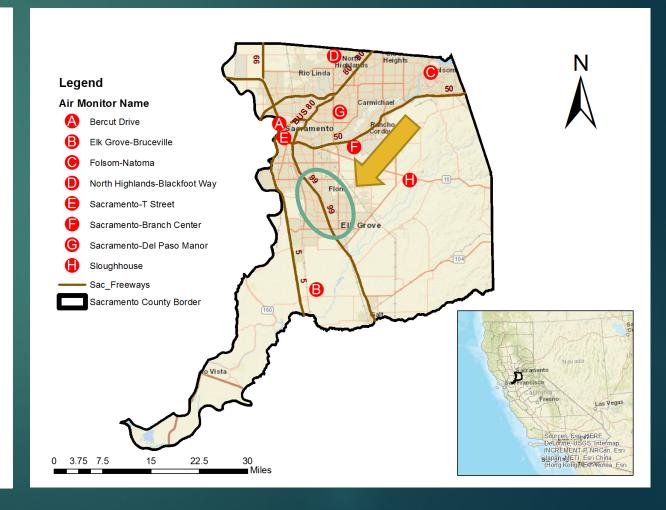**Reference:** EPA AQS Database. June 18, 2019. https://www.epa.gov/aqs

California's Assembly Bill 617
Community Air Protection Program

▶ Historical focus on regional air quality, significant improvements

▶ Need for community-level focus

▶ Advances in technology

▶ Bring strategies and funding into communities to reduce localized emissions

Legend

Air Monitor Name

Ⓐ Bercut Drive

Ⓑ Elk Grove-Bruceville

Ⓒ Folsom-Natoma

Ⓓ North Highlands-Blackfoot Way

Ⓔ Sacramento-T Street

Ⓕ Sacramento-Branch Center

Ⓖ Sacramento-Del Paso Manor

Ⓗ Sloughhouse

— Sac_Freeways

▭ Sacramento County Border

0   3.75 7.5   15   22.5   30
Miles

Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri

California's Assembly Bill 617
Community Air Protection Program

Florin Community
Final Florin Boundary
Initial Florin Boundary
Railways
Parks
Rivers and Streams
Freeway

Revised: 3/1/2019

Legend
Air Monitor Name
A Bercut Drive
B Elk Grove-Bruceville
C Folsom-Natoma
D North Highlands-Blackfoot Way
E Sacramento-T Street
F Sacramento-Branch Center
G Sacramento-Del Paso Manor
H Sloughhouse
Sac_Freeways
Sacramento County Border

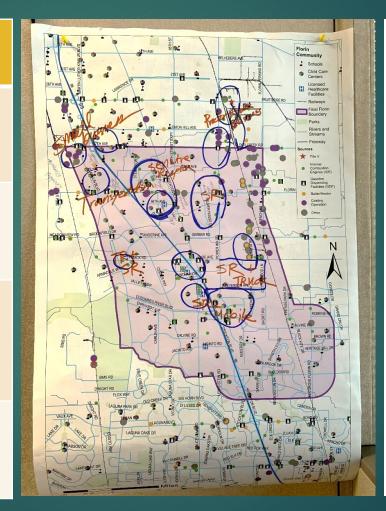# Community Concerns and Priorities
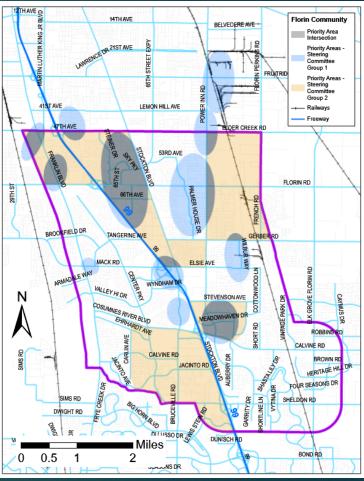
South Sacramento – Florin Community Concerns

Need to increase air quality education and outreach efforts, especially to the minority population

Emissions from Highway/traffic

Increasing rates of asthma and respiratory problems in the community

Emissions impacts from businesses

Three Phase Approach

Screening Tool (Understanding Trends and variability)

- Accuracy – **Moderate**
- Precision – **High** with other sensors
- Bias – **Moderate;** need to understand seasonal and geographical biases; correction factors
- Completeness – **Moderate**
- Drift – **Minimal**
- Range of Concentration – **Max & Min**

Reduce Public Exposure to Air Pollution – Air Quality Events

▶ Objective is to create **awareness of the impacts of event**

▶ Sensors provide a level of local information (Good, Unhealthy, Hazardous) that can supplement a regulatory network and/or modeling information

301 – 500	Hazardous
201 – 300	Very Unhealthy
151 – 200	Unhealthy
101 – 150	Unhealthy for Sensitive Groups
51 – 100	Moderate
0 – 50	Good

How "good" does the data need to be?

- Accurate **enough** to help inform the public of whether or not they need to protect themselves from the pollution

- **Bias** – conservative (protective end)

- **Response Time** – High

- Based on hourly standard

"Don't let the Perfect Be The Enemy of The Good"

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Regulatory data and Sensors

► Data for regulatory decisions needs to be **DEFENSIBLE.**

KEY: If sensors are to be comparable to FRMs/FEMs, then they need to meet Appendix D requirements

► Accuracy – **HIGH** (7-15% for gaseous, 10% for PM)

► Precision– **HIGH** ($\pm$7-15% for gaseous, $\pm$10% for PM)

► Bias – ($\pm$7-15% for gaseous, $\pm$10% for PM) & need to understand seasonal biases

► Completeness – **HIGH** (> 75% hour, day, month, year)

► Correlation Coefficient for FRM vs. FEM; 40 Part 58 Appendix D

► **R ≥ 0.97 for PM$_{10}$**

Monitoring Sites	PM10 High National 24-Hour Average							
	2010	2011	2012	2013	2014	2015	2016	2017
Sacramento County								
North Highlands-Blackfoot Way	48.0	65.0	34.0	48.0	29.0	45.0	31.0	66.0
Sacramento-Branch Center Road #2	62.0	69.0	60.0	59.0	45.0	44.0	45.0	79.0
Sacramento-Del Paso Manor	44.0	62.0	41.0	56.0	40.0	42.0	31.0	59.0
Sacramento-Goldenland Court	56.2	69.6	76.5	96.4	47.0	53.0	33.0	23.0
Sacramento-Health Dept Stockton Blvd	50.0	73.5	37.2	47.0	39.0	41.0	34.0	*
Sacramento-T Street	53.5	38.8	36.2	53.1	105.7	57.8	50.3	149.9

Notes: PM10 statistics may include data that are related to an exceptional event.

* There was insufficient (or no) data available to determine the value.

Go to: **Data Statistics Home Page** | **Select 8 Summary Start Page**

Reference:
CARB iADAM database. Retrieved July 12, 2019: https://www.arb.ca.gov/adam/select8/sc8start.php