Air Quality Workshop

Office of Sustainability

City Council
May 25, 2021

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Why Monitor Air Quality?

Assess the extent of pollution. Evaluate impacts to public health.

Provide air pollution data to the general public in a timely manner.

Support the implementation of air quality goals or standards, develop policies, and evaluate effectiveness of emissions control strategies.

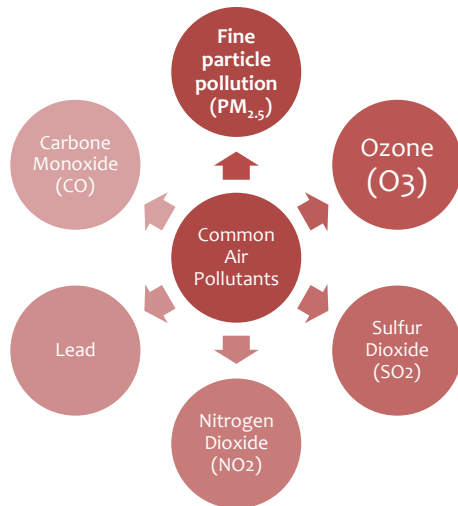Provide information on air quality trends: Support research and air quality models
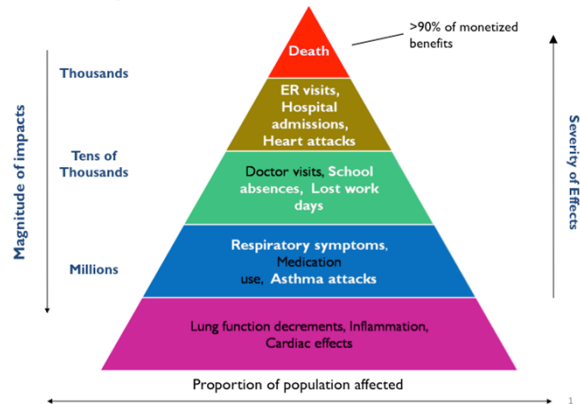
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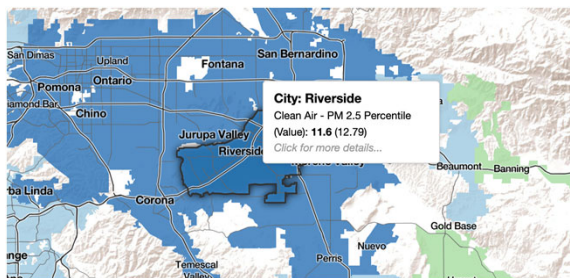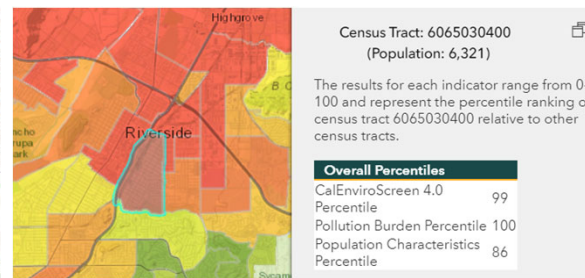
Transportation Emissions
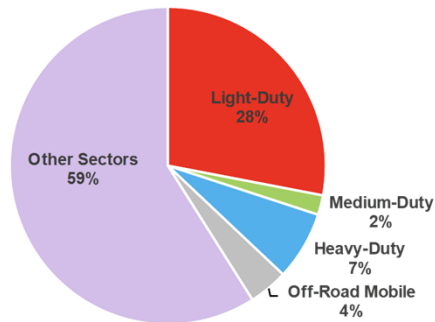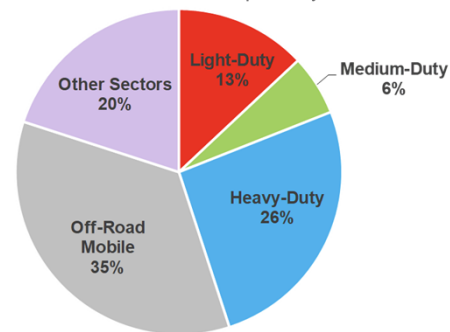
Source: ACC II Sept 2020 Workshop Presentation

Impact of Heavy-duty Vehicles
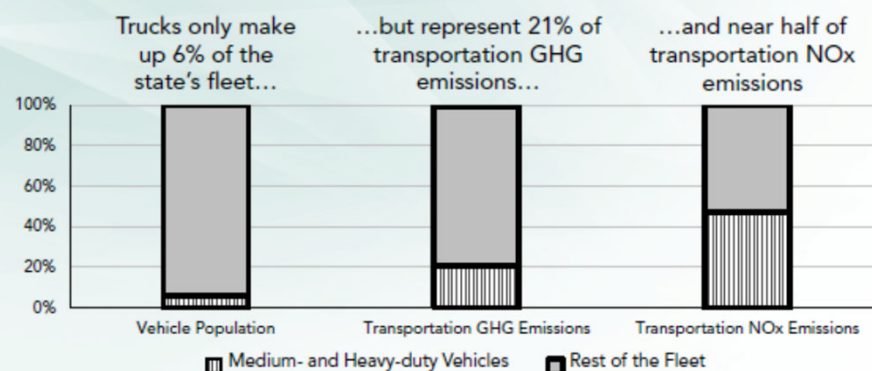
Truck traffic in Riverside

Caltrans 2018 traffic counts indicate high Truck-Traffic levels on Riverside freeways

Source: 2018 AADT Truck traffic count
https://dot.ca.gov/programs/traffic-operations/census

Freeway truck volumes in Riverside

157470

175750

13% → 23530

9250

RIVERSIDE ROUTE 60 | RIVERSIDE ROUTE 91

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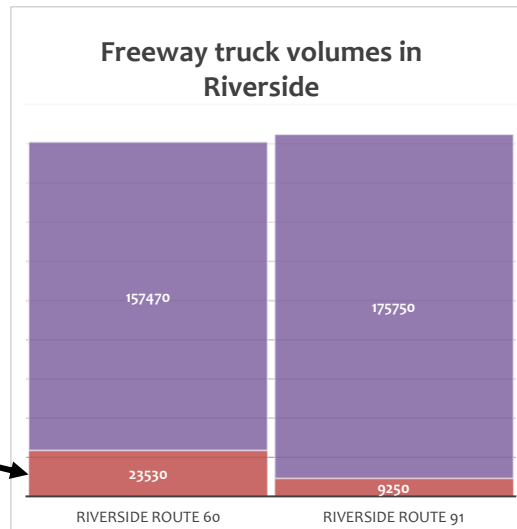
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Climate Change & Air Quality

1. Impact of Temperature

   Temperature variations impacts PM 2.5 production levels.

   Hot weather and sun light can increase Ozone production.

2. Weather conditions

   Wind can help with clearing smog and air pollution.

   Atmospheric inversion can trap the smog close to ground level.

3. Extended Fire Seasons

   Can be a major source of transient and local air pollution.

Warmer Temperatures Mean Higher Ozone Levels

Winter | Summer

Ozone Levels
Low — High

That's why ozone is more likely to affect your health during the summer.

^Source: https://patch.com/california/lakeelsinore-wildomar/hard-breathe-unhealthy-air-quality-plagues-riverside-county

< Source: CDC-Ozone

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Role of Technology in Air Quality Improvement

Air Quality Monitoring

Air purification?

Public communication and promotion: Air Now, Air Alerts, AQMD Interactive Maps

Renewable Energy and Clean mobility
• Power production (Solar/Wind)
• Low to Zero Emission transportation

https://www.iqair.com/air-quality-app

Image: Business Insider

Source: https://edinburghsensors.com/

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Ongoing City Efforts

- Transportation programs & incentives (clean fleet, EV infrastructure, EV funding, bus passes)
- 2025 Strategic Plan
- Housing Element – Environmental Justice
- Tree Planting
- TCC and AHSC Grants
- Upcoming General & Climate Action Plans
- Mobile Workforce, Virtual OSS
- … and more

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UC RIVERSIDE | Center for Environmental Research and Technology

- Innovation Corridor monitoring
- Horiba partnership
- Air pollution field work & modeling
  - Diverse measurement capabilities
  - SAPRC Mechanism Development
  - CMAQ State Implementation Plan Modeling
- CE-CERT Community Engagement
- RivInCor
  - Sustainable mobility & energy, and reduced air pollution

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Innovation Corridor Monitoring

Goal: Understand local air pollution response to energy savings in connected vehicle
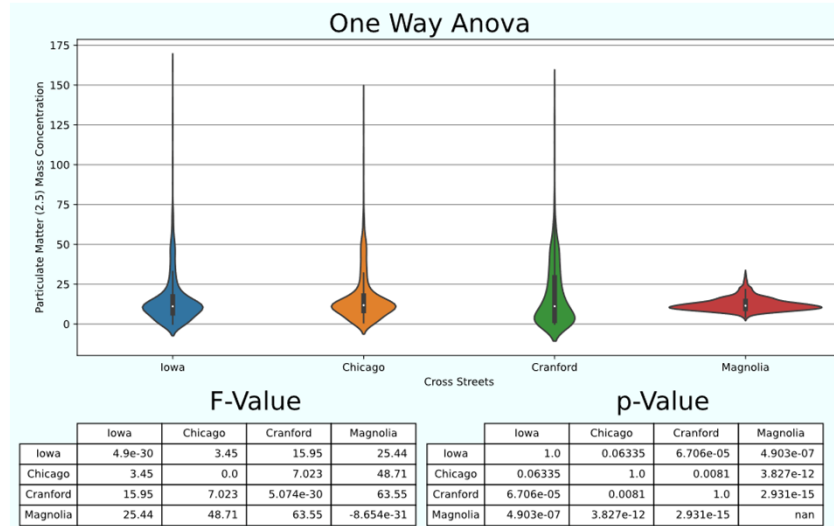
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Innovation Corridor Monitoring

Preliminary: Higher peaks in $PM_{2.5}$ observed along IC compared to upwind site at Magnolia

F-Value

	Iowa	Chicago	Cranford	Magnolia
Iowa	4.9e-30	3.45	15.95	25.44
Chicago	3.45	0.0	7.023	48.71
Cranford	15.95	7.023	5.074e-30	63.55
Magnolia	25.44	48.71	63.55	-8.654e-31

p-Value

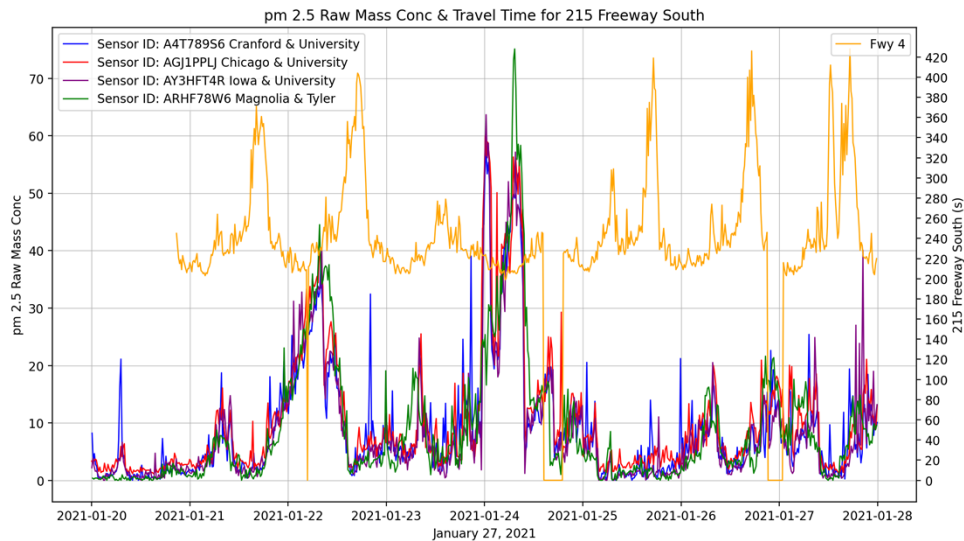|	Iowa	Chicago	Cranford	Magnolia
Iowa	1.0	0.06335	6.706e-05	4.903e-07
Chicago	0.06335	1.0	0.0081	3.827e-12
Cranford	6.706e-05	0.0081	1.0	2.931e-15
Magnolia	4.903e-07	3.827e-12	2.931e-15	nan

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Trip Time vs $PM_{2.5}$: Jan 20-27, 2021

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Horiba CE-CERT Partnership

- Leverage source apportionment for "smart" applications of Horiba PX-375 (April 2019)
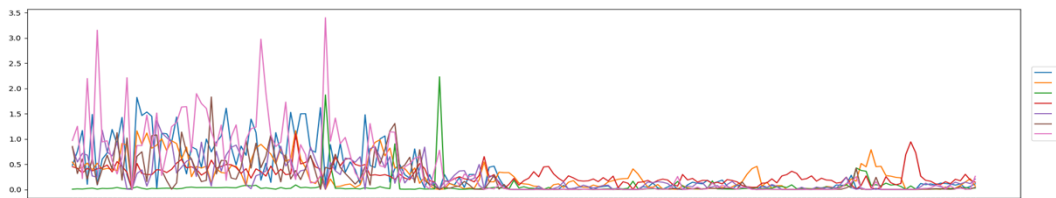

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Horiba CE-CERT Partnership

- Applying source apportionment (PMF) for a fireworks case in Japan

| Source	Fe	Ni	Cu	Zn	Al	Si	S	K	Ca	Ti	Cr	Mn	Pb	NO	NO2	CH4	NMHC	O3	SO2
Second generation factor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Soil and dust factors	1	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0
Road traffic factor (exhaust gas)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Road traffic factors (road dust and brake das)	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Biomass burning factor	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
factors (from ships, thermal power plants, and in	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coal combustion factor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial factor	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Sea salt factor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Firework factor (Target)	1	0	1	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0

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Horiba CE-CERT Partnership

- Making local measurements along I-5 in Irvine
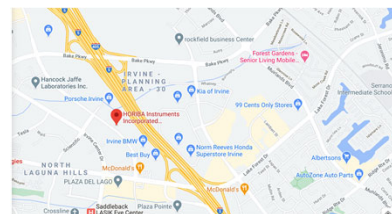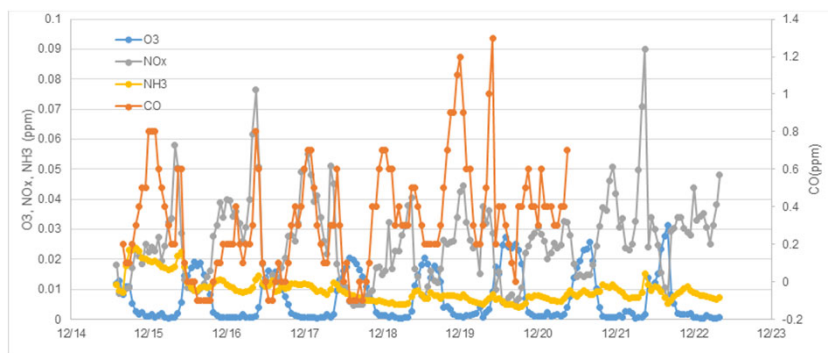
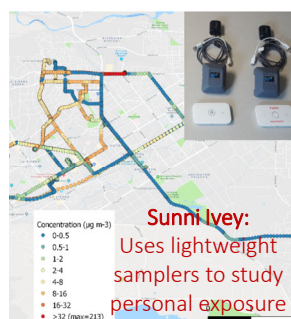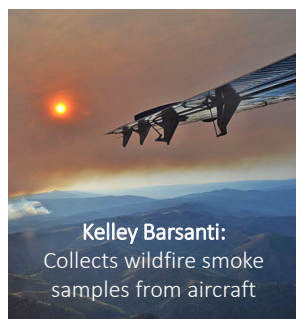**Preliminary**: Nighttime peaks allude to roadway construction

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Diverse Field Work

- Take advantage of multiple measurement platforms

Don Collins: Uses drones to measure ozone and other pollutants

Kelley Barsanti: Collects wildfire smoke samples from aircraft

Sunni Ivey: Uses lightweight samplers to study personal exposure

Francesca Hopkins : Measures GHGs in a novel mobile lab
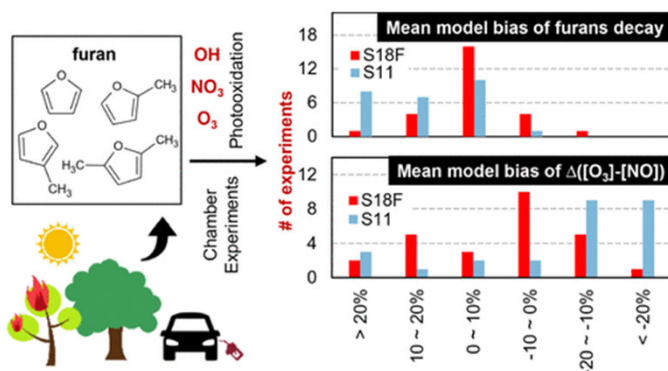
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SAPRC Development

- Chemical mechanism development using 0-D models and chamber data
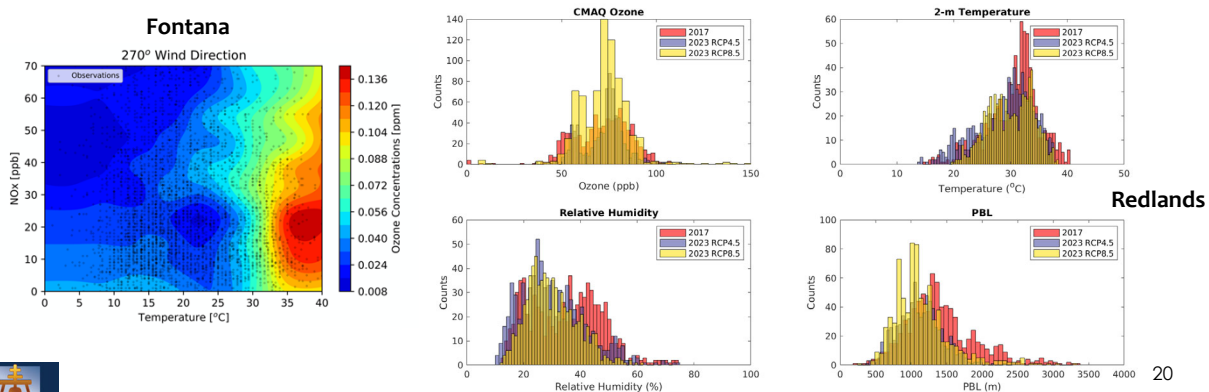

Jiang, Barsanti et al., 2020

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Air Quality Modeling for SIP

- Chemical transport modeling to support SCAQMD state implementation planning

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CE-CERT Community Engagement

- Year 1 Grant: Educating and engaging our community about the air quality and health concerns unique to our region through classroom training, field campaigns, and in-depth community air scientist training
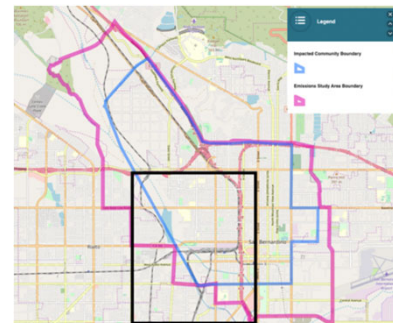

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CE-CERT Community Engagement

- Year 2 Grant: Conducting personal monitoring in the West San Bernardino community (AB 617 San Bernardino/Muscoy) to understand personal exposure to $PM_{2.5}$ and develop individualized air pollution resilience plans

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RivInCor: Smart & Connected Communities

- Proposal for four years, working with City of Riverside and Riverside Community Health Organization
- Three research thrusts: Smart Corridor Management, Shared Electric Mobility Deployment, Local Air Pollution Monitoring and Modeling; Community Engagement
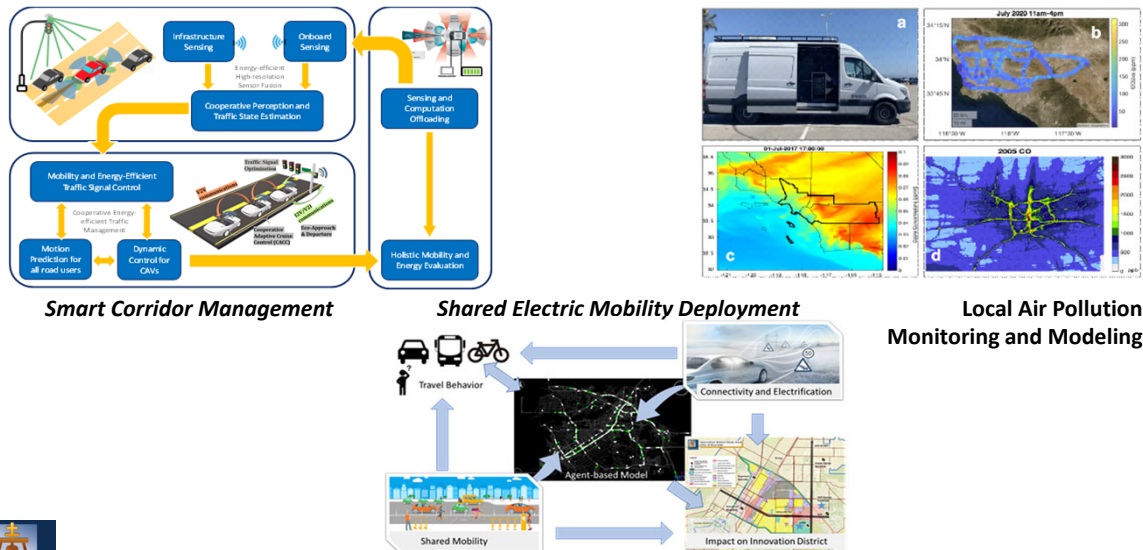

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RivInCor: Smart & Connected Communities

Smart Corridor Management   *Shared Electric Mobility Deployment*   **Local Air Pollution Monitoring and Modeling**

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