



# Air, Climate, and Energy Research

Angie Shatas

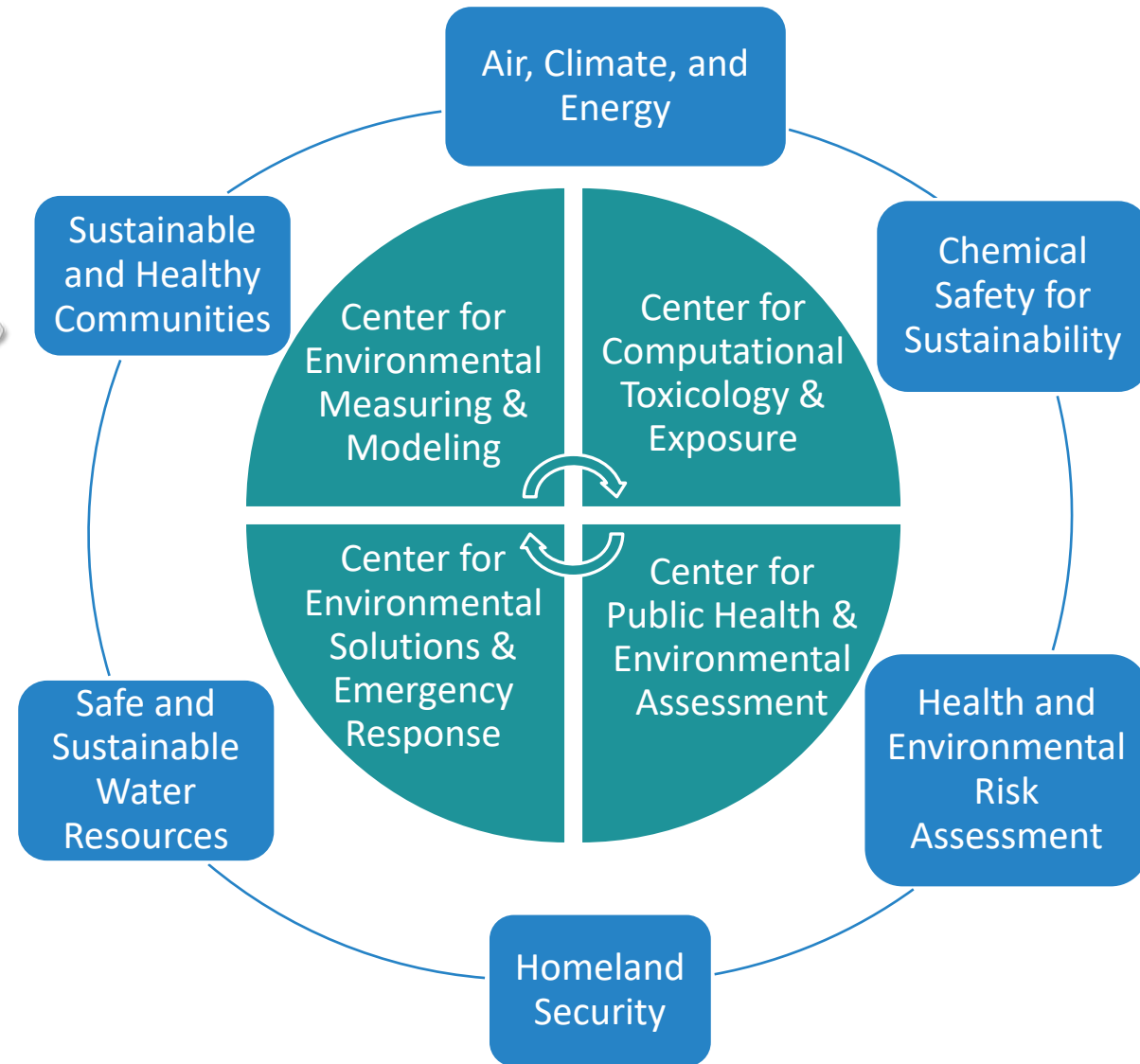
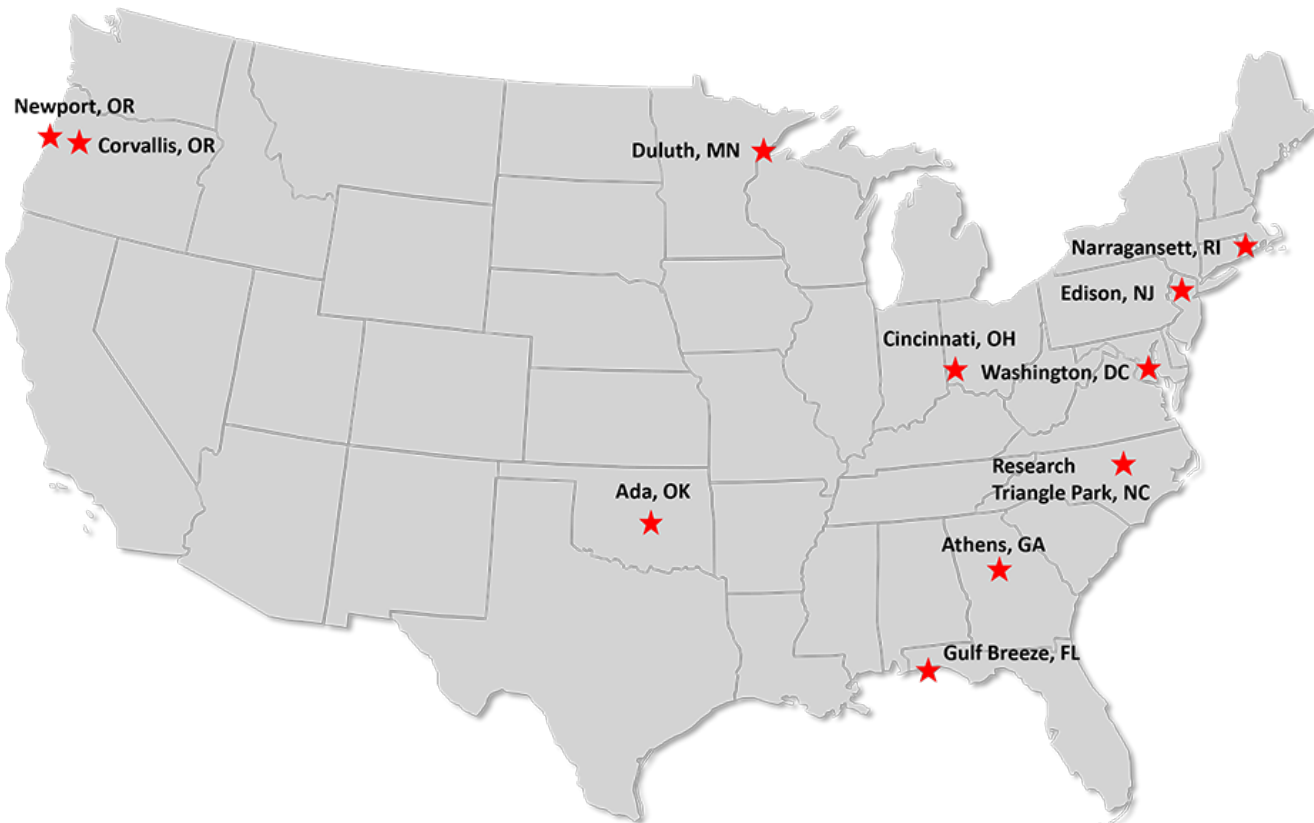
US EPA/Office of Research and Development/Air, Climate, and Energy National Research Program

AAPCA Fall Business Meeting, September 27, 2023

# US EPA's Office of Research and Development (ORD)

## Mission:

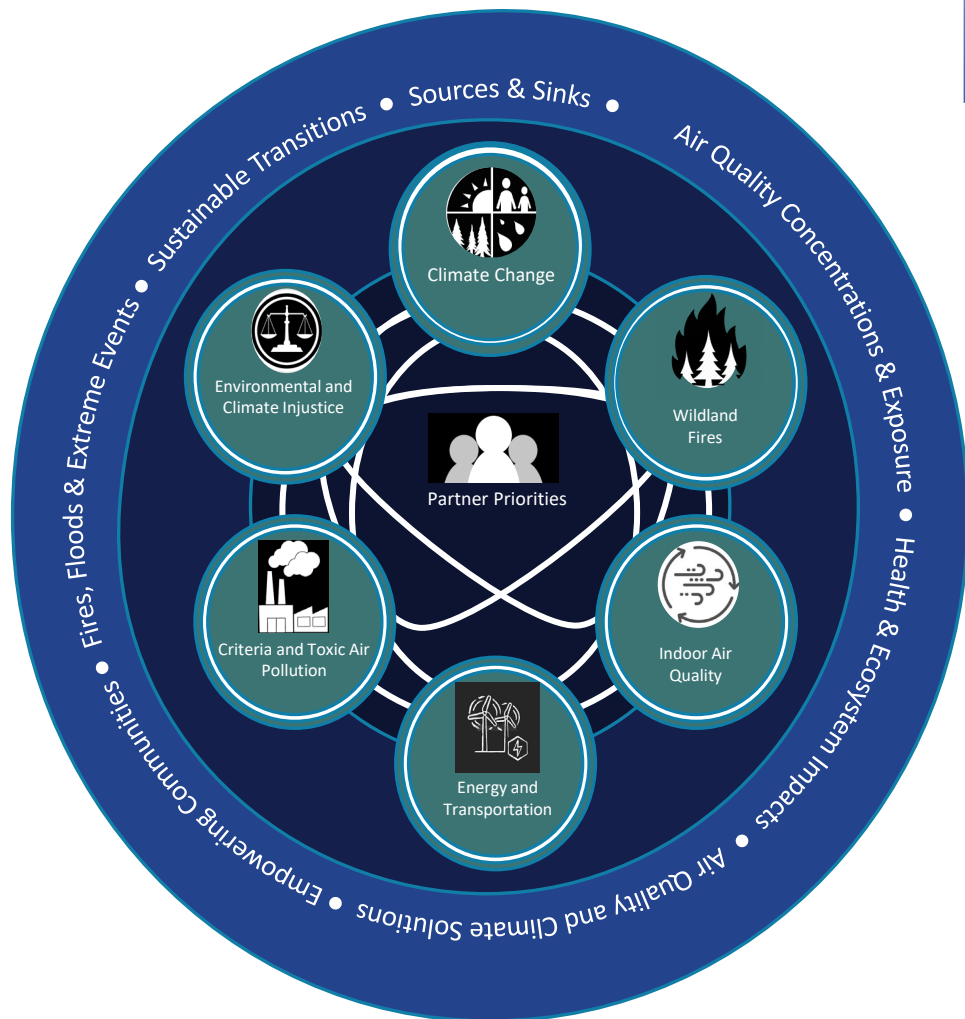
Provide leading-edge research to inform Agency decisions and support the emerging needs of EPA stakeholders, including state, tribal, and community partners.



Staff and researchers in 6 **National Research Programs** and 4 **Centers** are in labs and offices across the U.S.

# Air, Climate, and Energy Research Program

A holistic vision to reduce environmental and health inequities AND respond to the impacts of climate change.



## Topic 1: UNDERSTANDING Air Pollution and Climate Change and Their Impacts on Human Health and Ecosystems

**Research Area 1:**  
Sources and Sinks of Air Pollution and Climate Forcers

**Research Area 2:**  
Air Quality Concentrations and Exposure  
Characterization: Measurements

**Research Area 3:**  
Air Quality Concentrations and Exposure  
Characterization: Modeling

**Research Area 4:**  
Health Impacts of Air Pollution and Climate Change

**Research Area 5:**  
Ecosystem Impacts of Air Pollution and Climate Change

## Topic 2: RESPONDING to Risks and Impacts and Preparing for the Future

**Research Area 6:**  
Scientific Support for Climate Change and Air Quality Policy Solutions

**Research Area 7:**  
Empowering communities and individuals to improve public health

**Research Area 8:**  
Responding to Risks of Fires, Floods, and Other Extreme Events

**Research Area 9:**  
Transitions to a Sustainable Future

## Air Sensor Tools and Resources



The [Guidebook](#) can help individuals, communities, environmental agencies, and others in planning and collecting air quality measurements using air sensors.

➤ Released December 2022



[The Enhanced Air Sensor Guidebook](#) - April 26, 2023

Presenters: Andrea Clements & Rachelle Duvall, EPA ORD

The Wildfire Smoke Air Monitoring Response Technology ([WSMART](#)) pilot

➤ [Air Sensor Loan Program](#) for state, local, and tribal air agencies affected by wildfire smoke.



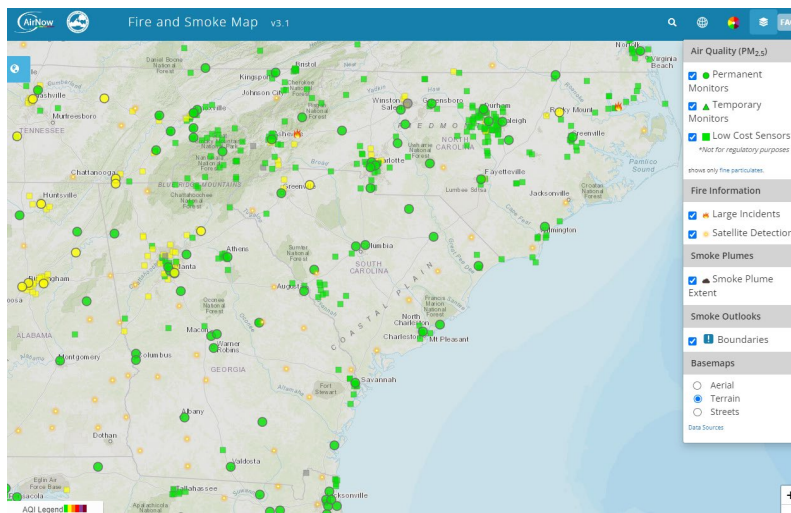
ThingyAQ  
PM<sub>2.5</sub>, CO,  
VOC  
sensor



Vehicle Add-on  
Mobile  
Monitoring  
System  
(VAMMS) PM<sub>2.5</sub>



PurpleAir  
PM<sub>2.5</sub>  
sensor



### [AirNow Fire and Smoke Map](#)

- Correction factor for PurpleAir PM2.5 sensors
- Allows display of both regulatory monitor and sensor data.



### [AirNow Fire and Smoke Map: Extension of the US-Wide Correction for PurpleAir PM2.5 Sensors](#) - May 19, 2021

Presenters: Andrea Clements, Amara Holder, and Karoline Barkjohn, EPA ORD; Ron Evans, EPA OAR; and Sim Larkin, US Forest Service

- Evaluate sensor performance
- Improve air sensor network data quality
- Try new technology via a loan program

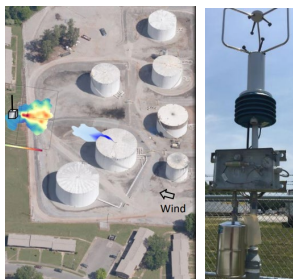
# Next Generation Emissions Measurements (NGEM)

- Measure emissions at fugitive and area sources and for fenceline monitoring

- Understand air emissions from storage tanks

- Understand air emissions from landfills

# Monitoring Approaches for VOC Emissions



## Sensor Pods (SPods)

- SPods can automatically trigger a canister grab sample
- EPA's open source version is commercially available
- Monitor fuel storage terminal emissions
  - Research near bulk terminals in Greensboro, NC
- In-plant leak detection analysis
  - Research in Corpus Christi, TX
- Fenceline/near-source VOC concerns
  - [Study](#) in Rubbertown (industrial area of Louisville, Kentucky)
  - EPA Region 4 Program to loan commercial SPods to state, local, or tribal partners



SPod sensors can help identify unknown emissions, indicate source direction, speciate VOC plumes (with triggered cans), and inform decision-making on investigations and/or monitoring.  
*Credit: Jake Carpenter, EPA R4*

**Upcoming:** *NGEM Emission Measurements: Helping to Improve Air Quality and Source Understanding*



[ACE Research Webinar](#) October 17, 2023

Presenters: Eben Thoma & Rachelle Duvall

[Sensor Pods for Volatile Organic Compound Fenceline Monitoring and Data Analysis](#)



Webinar, December 1, 2022

Presenters: Eben Thoma & Megan MacDonald

[New Air Monitoring Technology to Understand Leaks and Irregular Emissions](#) - Science Matters, October 11, 2022



## [Odor Explore](#)

- Mobile app - helps the public capture and report detailed information about odors
- Developed in partnership with Louisville Metro Air Pollution Control District (APCD)



## The Community Multiscale Air Quality Modeling System (CMAQ)

- Tool for translating fundamental atmospheric science principles to policy scenarios
- Release of CMAQ version 5.4
- 3-part CMAQ 25<sup>th</sup> anniversary Science Matters series:

[CMAQ: Celebrating 25 Years of Air Quality Modeling Excellence](#) Science Matters, June 21, 2023

[CMAQ: Demonstrating Skill Across Media and Around the World](#) Science Matters, June 21, 2023

[CMAQ: Tackling Emerging Concerns and Building for the Future](#) Science Matters, June 21, 2023

## AERMOD

- Dispersion model
- [AERMOD](#) and [updates](#) (December 2022)
- *Evaluation of AERMOD options for mobile source modeling*, presentation at RSL Modelers' Workshop, Kansas City, MO, June 27-29, 2023

## EQUATES: EPA's Air QUALity TimE Series Project

- Unified set of modeling data: Meteorology, emissions, air quality and pollutant deposition
- Spans the years 2002 through 2019
- Consistent input data and methods across all years is useful to examine trends across years, states and sectors



[What Can We Learn From a Consistent 18-Year Data Set?](#) September 20, 2022

Presenters: Kristen Foley, EPA ORD and Gregory Beachley, EPA OAP

# PFAS measurement methods and model updates

## Method updates

- **Modified TO-15A**
  - Explore TO-15A based technique using canisters for targeted measurements of PFAS
- **Field evaluations of OTM-45**
  - Measurement of PFAS at two industrial facilities (a sewage sludge incinerator (SSI) and a pilot-scale aqueous film forming foam (AFFF) thermal treatment facility)
  - [Other Test Method 45 \(OTM-45\) Measurement of Selected Per- and Polyfluorinated Alkyl Substances from Stationary Sources](#)

## Modeling updates

- [Predictions of PFAS regional-scale atmospheric deposition and ambient air exposure](#) December 2023
- [Characterizing Air Emissions, Transport, and Deposition of PFAS from a Fluoropolymer Manufacturing Facility](#) January 2021



**Upcoming:** *PFAS and Emerging Contaminant Technology Transfer to States and Tribes* - October 18

Presenters: Tim Buckley and Jon Sobus, EPA ORD

Register at <https://www.epa.gov/research-states/epa-tools-and-resources-webinar-series>



[EPA PFAS Strategic Roadmap: Research Tools and Resources](#) - August 17, 2022

Presenters: Alice Gilliland, Laura Carlson, Avanti Shirke, and Phillip Potter, EPA ORD



[Modeling PFAS Air Emissions, Chemistry, and Deposition](#) - May 18, 2021

Presenters: Emma D'Ambro and Ben Murphy, EPA ORD

# Reducing Indoor Air Exposures

- Advance solutions-driven research

- Evaluate clean air spaces during smoke episodes

- Investigate the effectiveness of air filtration systems to reduce PM2.5.

# Indoor Reductions of Smoke Exposures: WF-ASPIRE\*

## ASHRAE's [Planning Framework for Protecting Commercial Occupants from Smoke During Wildfire Events](#)

- Recommends building measures to minimize occupant health impacts from wildfire and prescribed fire smoke events.
- 45-day public review process for the draft guideline runs August 18 to October 2, 2023.

## Cleaner Indoor Air During Wildfires Challenge Phase 2

- [Phase 1 winners](#) invited to submit prototypes for evaluation
- Judging is underway

## Field studies

- Underway in Tulare County, CA with community partner Central California Environmental Justice Network (CCEJN) to evaluate DIY air cleaners in homes.
- Completed in Missoula, MT and Hoopa, CA with a focus on clean indoor air spaces in commercial and public buildings.

## [Do-It-Yourself Air Cleaners: Making Cleaner Air More Accessible](#)

Science Matters, September 6, 2023

\*[Wildfire Study to Advance Science Partnerships for Indoor Reductions of Smoke Exposures](#)



Interconnected components of WF-ASPIRE



## DIY Air Cleaner to Reduce Wildfire Smoke Indoors: Basic Design

Materials	Assembly
<p>20" X 20" X 1" or 4" air filter Suggested rating: MERV 13</p>	<ol style="list-style-type: none"><li>1. Attach the air filter to the back of the box fan using either clamps, duct tape or bungee cords.</li><li>2. Check the filter for the direction of the air flow (marked on the side of the filter).</li><li>3. Replace filters when dirty.</li></ol>
<p>20" X 20" box fan Only use certified fans with UL or ETL marking (2012 model or newer)</p>	
<p>Clamps or Duct Tape or Bungee Cords</p>	

Learn about box fan safety tips:  
<https://www.epa.gov/air-research/research-diy-air-cleaners-reduce-wildfire-smoke-indoors#FAQ>



# Tools for Helping State and Municipal Decision-Makers Meet Air Quality, Climate, and Energy Objectives



- **GLIMPSE** supports energy system modeling at the national, regional and state level.
- Helps EPA program offices, states, researchers, and others with long-term environmental, climate, and energy planning.
- Version 1.0 was released to the public in June 2023.
- Training and technical assistance to Climate Pollution Reduction Grants (CPRG) planning grant recipients.
- GLIMPSE Training Series, September 5 – October 17, 2023



- **COMET** supports energy system modeling at the city level.
- Helps cities make sustainable and resilient energy decisions.
- Allows users to examine the next 40-50 years of energy technology evolution.
- Pilot study in New York City - transportation emissions scenarios under different electricity carbon intensities and EV adoption rates.

**EPA's Comet Tool**, Science Matters, September 6, 2023



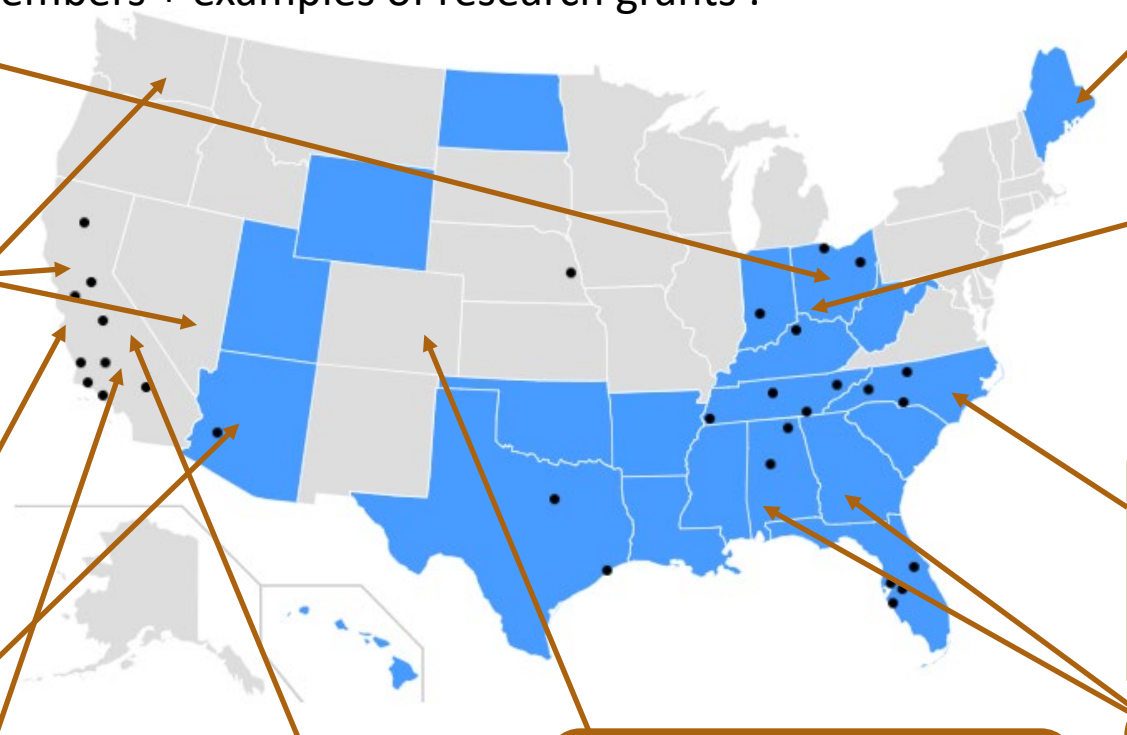
**Tools for Helping State and Municipal Decision Makers Make Air, Quality, and Climate Objectives: GLIMPSE and COMET** - August 15, 2023

Presenters: Dan Loughlin and Ozge Kaplan, EPA Office of Research and Development



# US EPA Science to Achieve Results (STAR) grants

Map of AAPCA State and Local members + examples of research grants :



**FLEETS for All: Facilitating Local Energy and Transportation Services for All**  
Jeff Bielicki, Ohio State  
Urban & rural underserved communities in Columbus Metro area

**Environmental Justice Impacts Across the Life Cycle of Energy Storage**  
Alida Cantor, Portland State U  
Rural & tribal communities near energy storage infrastructure & activities in CA, NV, and WA

**Community Health and Air Quality Implications of Refinery Retrofits and Retirements (CHAIRS)**  
Lara Cushing, U California Los Angeles  
\*Community Partner: **Asian Pacific Environmental Network**  
Communities near oil refineries in the San Fran. Bay area

**Environmental Justice Implications of Public Transit Electrification and Changing Generation Portfolios in AZ**  
Danae Hernandez-Cortes, Arizona State U  
\*Community Partners: **Unlimited Potential**  
Maricopa County, AZ

**Filtration for Respiratory Exposure to wildfire Smoke from Swamp Cooler Air (FRESSCA)**  
Gina Solomon, Public Health Institute  
Fresno and Kern counties, CA

**Participatory Design of Effective Risk Communication about Wildfire Smoke for Hard-to-Reach Populations**  
Linda Neuhauser, UC Berkeley  
CA; Tachi Yokut Tribe, Santa Rosa Rancheria

**Assessing the Transport of Wildfire-Generated Particulate Matter Into Homes and Developing Practical Interventions to Reduce Human Exposure (WildPM)**  
Marina Vance, CU Boulder  
CO or other parts of western U.S.

**The Role of State Networks in Advancing Community-Initiated and -Engaged Sustainable Energy Action in Underserved Communities**  
Sharon Klein, U Maine  
\*Tribal Partner: **Penobscot Nation**  
Indigenous, rural, & low-income communities in Maine

**Evaluating the Environmental, Behavioral, and Financial Benefits of Electrification and Energy Efficiency for Underserved Communities**  
Ryan Mooney-Bullock, Green Umbrella  
\*Community Partner: **Over-the-Rhine Community Housing**  
Low-income multifamily-unit residents in Cincinnati

**Renewable ENERGY, Environmental justice, and public Wellbeing (RENEW) - Evaluating biogas transformation in Eastern NC**  
Crystal Lee Pow Jackson, Research Triangle Institute  
Community Partner: **Environmental Justice Community Action Network**  
Communities in Sampson & Duplin Counties, NC

**Integrated Communication and Intervention Strategies to Reduce Exposure to Prescribed Wildland Fire Emissions in Schools, Schoolchildren and Communities**  
Ted Russell, Georgia Tech  
Southern GA and southern AL



Coming soon: Recipients of Understanding and Control of Municipal Solid Waste Landfill Air Emissions

- Legend:
- Drivers and Environmental Impacts of Energy Transitions in Underserved Communities - \$11 million awarded to eleven institutions
  - Address Interventions and Communication Strategies to Reduce Health Risks of Wildland Fire Smoke Exposures - \$7 million awarded to ten institutions

# Contact

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