CALIFORNIA
AIR RESOURCES BOARD

Proposed Research Concepts in Cumulative Impacts Public Meeting

January 30, 2026

How to Ask a Question

- Meeting is being recorded
- We will respond to questions at the end of the workshop
  - Submit your questions at any time in the Q&A

Welcome

Opening remarks

Bonnie Holmes-Gen
Chief of the Health & Exposure Assessment Branch

Facilitators

La Mikia Castillo
Castillo Consulting Partners, LLC

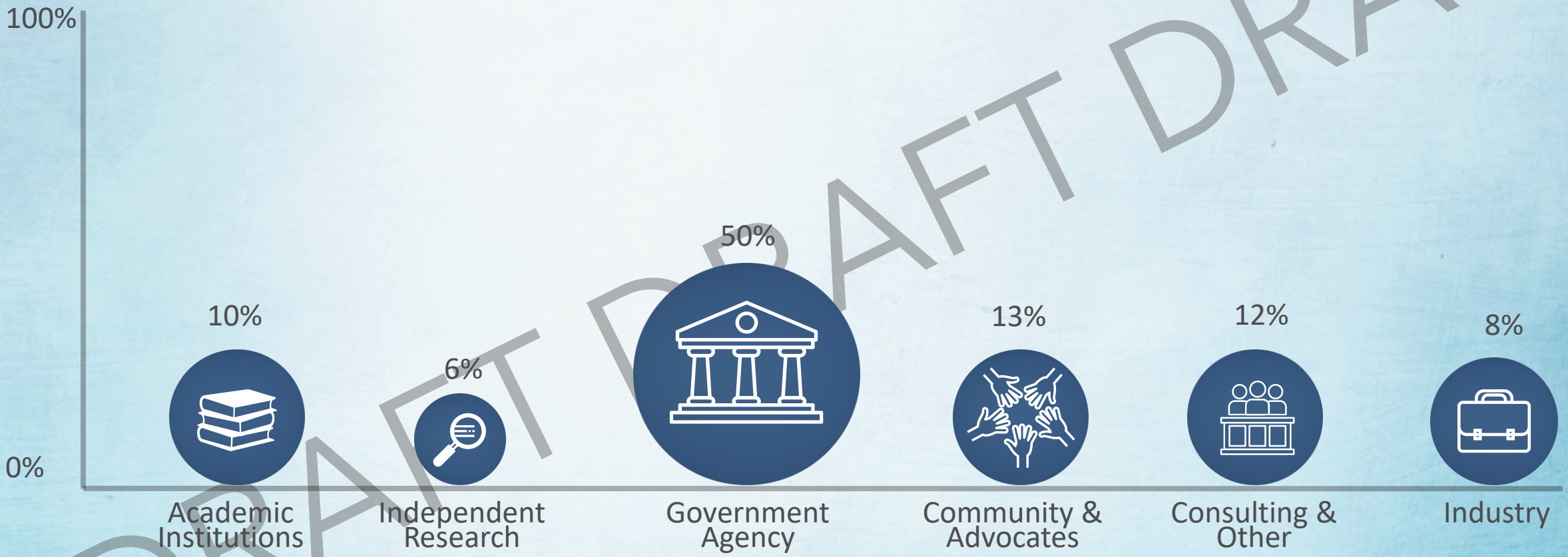
Diana Sarabia-Briseño
Castillo Consulting Partners, LLC

Presenters

Pradeep Prathibha, PhD
Manager, Health & Ecosystem Analysis Section

Joshua Montefalcon, MPH
Health & Ecosystem Analysis Section

Who's in the Room?



CARB

Icebreaker

Why did you decide to join our conversation on research priorities in cumulative impacts today?

a. **Learn** more about this topic.

b. **Give feedback** on research gaps.

c. **Understand** how CARB is addressing cumulative impacts.

d. **Hear** about the research solicitation.

e. Other reason (please explain)

Workshop Outline

1. Purpose
2. Defining cumulative impacts
3. CARB's health research & impact analysis
4. Research development process
5. Proposed research concepts
6. Guided breakout discussions
7. Next steps

Goal: Identify Research Concepts in Cumulative Impacts

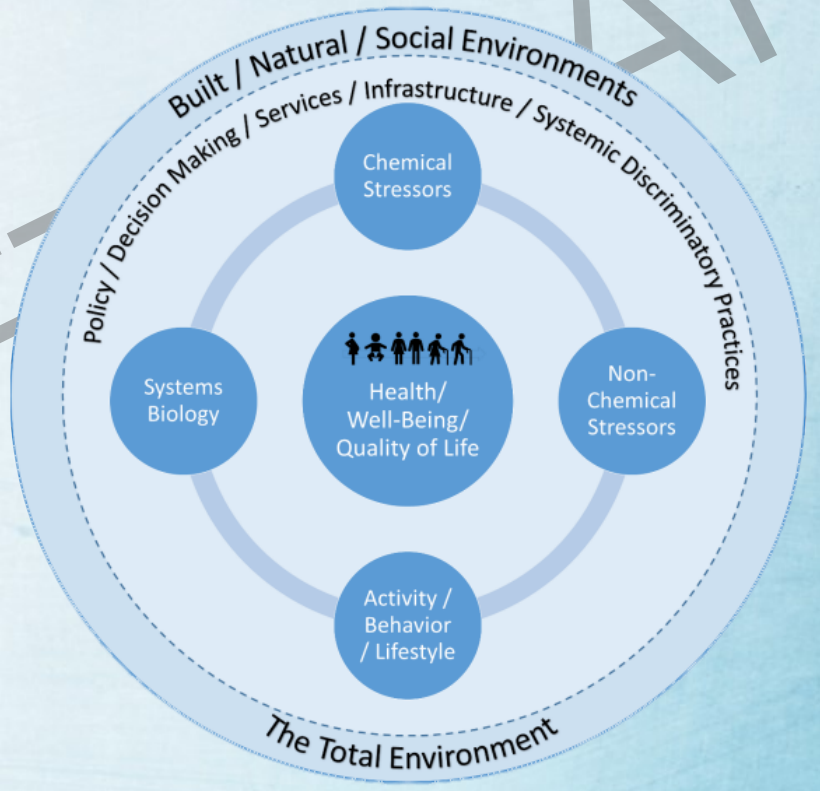
CARB is seeking **feedback to shape the scope of work of a research solicitation** on cumulative health impacts.

Participation as a researcher or community organization will not exclude you from applying for the solicitation.

Research concept: what are gaps in cumulative impacts relevant to Californians that CARB can fill by supporting robust scientific studies?

Why Cumulative Impacts Matter

- Characterize the **vulnerability or resilience** of a population through science-based methods
- Recognize that all communities face multiple pollution sources; socioeconomic aspects elevate burden in disadvantaged communities
- Close health and opportunity gaps across communities
- Inform regulatory decisions and plans



From *Cumulative Impacts Research: Recommendations for EPA's Office of Research and Development* (2022)

Existing Definitions of Cumulative Impacts

California Environmental Protection Agency (CalEPA)

Exposures, public health or environmental effects from the combined emissions and discharges in a geographic area, including **environmental pollution from all sources**, whether single or multi-media, routinely, accidentally, or otherwise released; account for sensitive populations and socioeconomic factors.

oehha.ca.gov/calenviroscreen/about-calenviroscreen

U.S. Environmental Protection Agency (EPA)

Totality of exposures to **combinations of chemical and non-chemical stressors** and their effects on health, well-being, and quality of life outcomes.

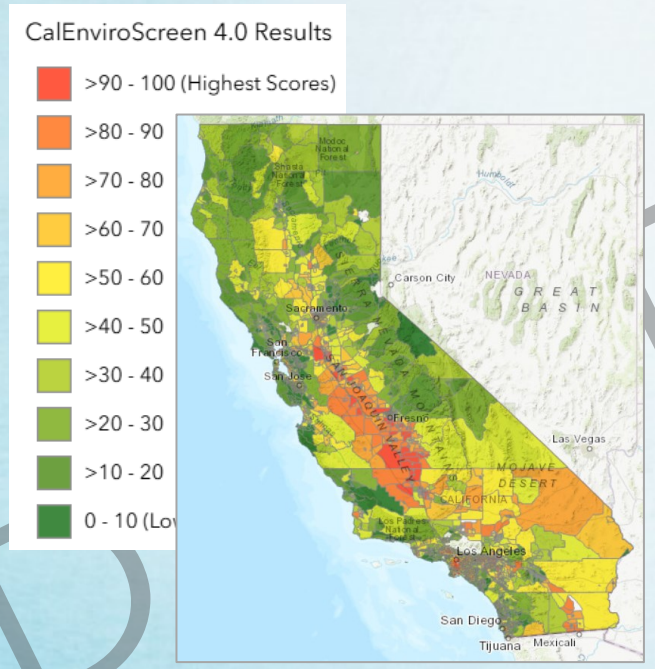
epa.gov/cumulative-impacts/cumulative-impacts-explained

Do these definitions serve all our needs?

Some Existing Tools Capturing Cumulative Impacts

Mapping tools

- CalEnviroScreen
- EPA's EJ Screen (removed)
- Climate & Economic Justice (removed)

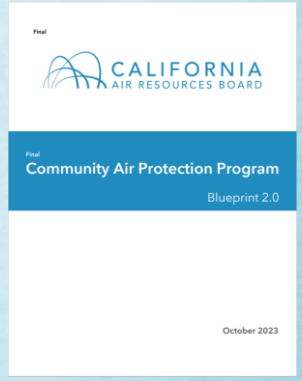


Frameworks

- NJ EJ Mapping, Assessment, and Protection Tool
- U.S. EPA
  - Interim Framework
  - Technical Guidance for Assessing EJ in Regulatory Analysis
- National Academies' State of Science and the Future

Community-based Approaches

- CARB (AB 617)
  - Community Air Protection Program
  - Community Air Grants and Community Incentives Program
- U.S. EPA's Environmental Justice Collaborative Problem Solving Program



CARB's Current Health Impact Analysis

Health analysis informs the benefits of CARB regulations, plans, and programs

12 health outcomes from exposure to $PM_{2.5}$

In use until 2023
Cardiopulmonary Mortality
Cardiovascular Hospital Admissions
Respiratory Hospital Admissions
Asthma Emergency Room Visits

Added in 2023
Cardiovascular Emergency Room Visits
Respiratory Emergency Room Visits
Acute Myocardial Infarction, Nonfatal
Asthma Onset
Asthma Symptoms / Exacerbation
Lung Cancer Incidence
Work Loss Days
Alzheimer's Disease
Parkinson's Disease

Proposed in 2026
Cardiac Arrest
Stroke
Allergic Rhinitis (Hay Fever)
Minor Restricted Activity Days

Examples of our research contracts

Air pollution & health studies

- **Metabolic Health** and criteria pollutants
  Diabetes incidence, medication use, ED visits, hospitalizations, death
- **Birth Outcomes** and criteria pollutants
  Pre-term birth, low birth weight, Autism Spectrum Disorder
- **Neurodegeneration** and criteria pollutants
  Parkinson and Alzheimer's Diseases, cognitive decline
- **Neurodevelopment** and criteria pollutants
  Student standardized test performance
- **Life Expectancy** and $PM_{2.5}$
  Change in life expectancy over time
- **Respiratory Symptoms** and train, port emissions
  Use of medication puff and ED visits in Southern California

Expanded analysis

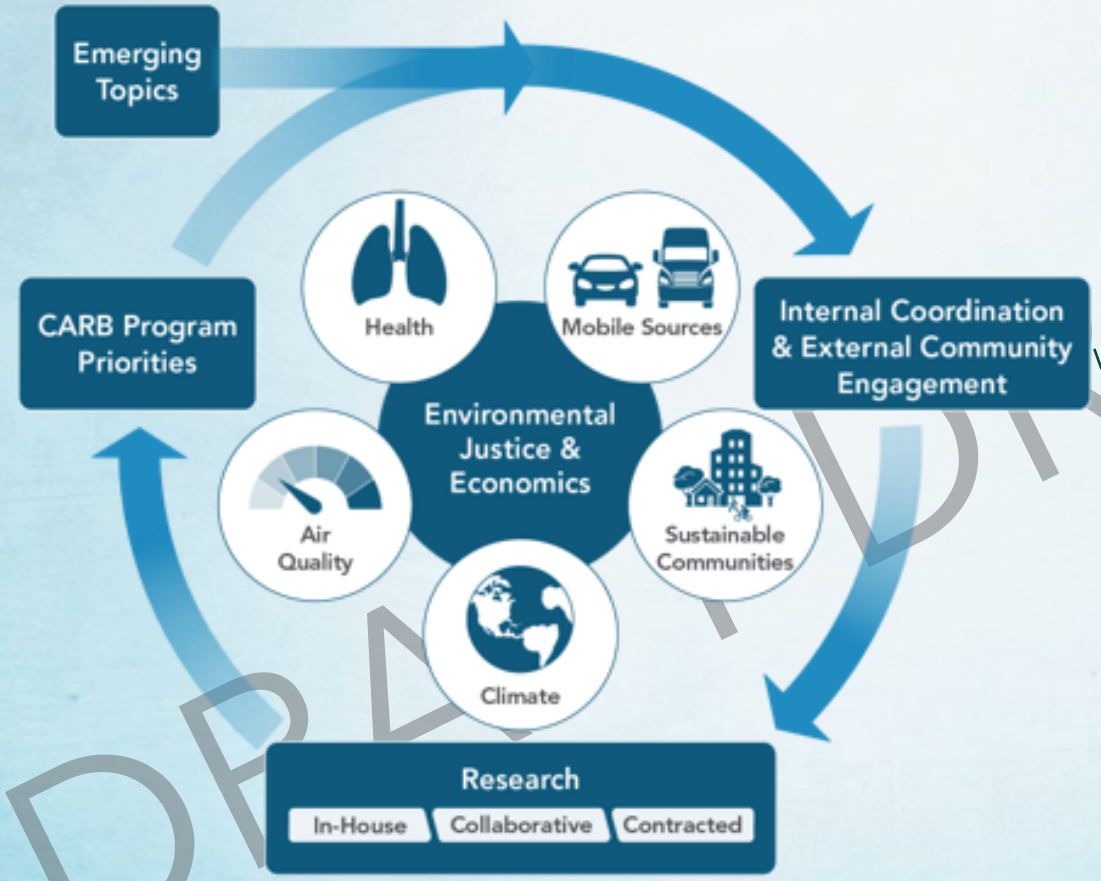
- **Combined effects** of climate stressors
- **Localized or community-scale** assessments of environmental and population factors

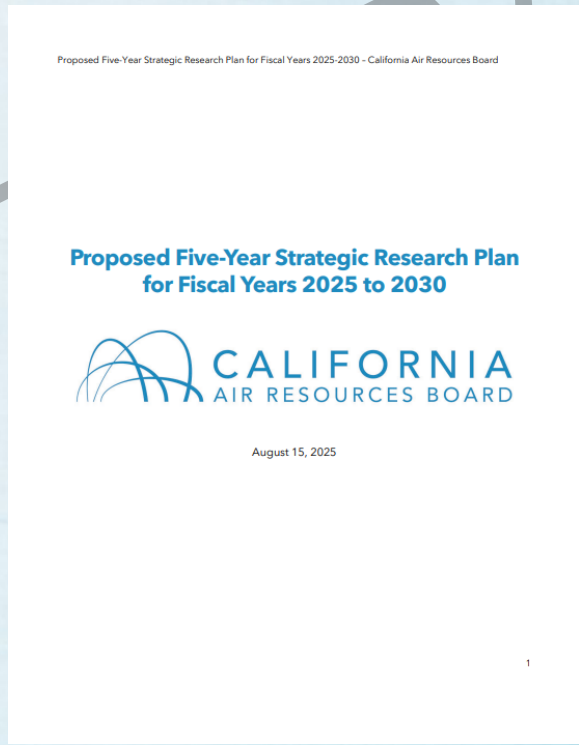
Active contracts: ww2.arb.ca.gov/active-research-contracts

Completed contracts: ww2.arb.ca.gov/recently-completed-research-contracts

Future Research: Why Focus on Cumulative Impacts?

CARB's Research Program




Proposed Five-Year Strategic Research Plan for Fiscal Years 2025-2030 - California Air Resources Board

Proposed Five-Year Strategic Research Plan for Fiscal Years 2025 to 2030

CALIFORNIA AIR RESOURCES BOARD

August 15, 2025

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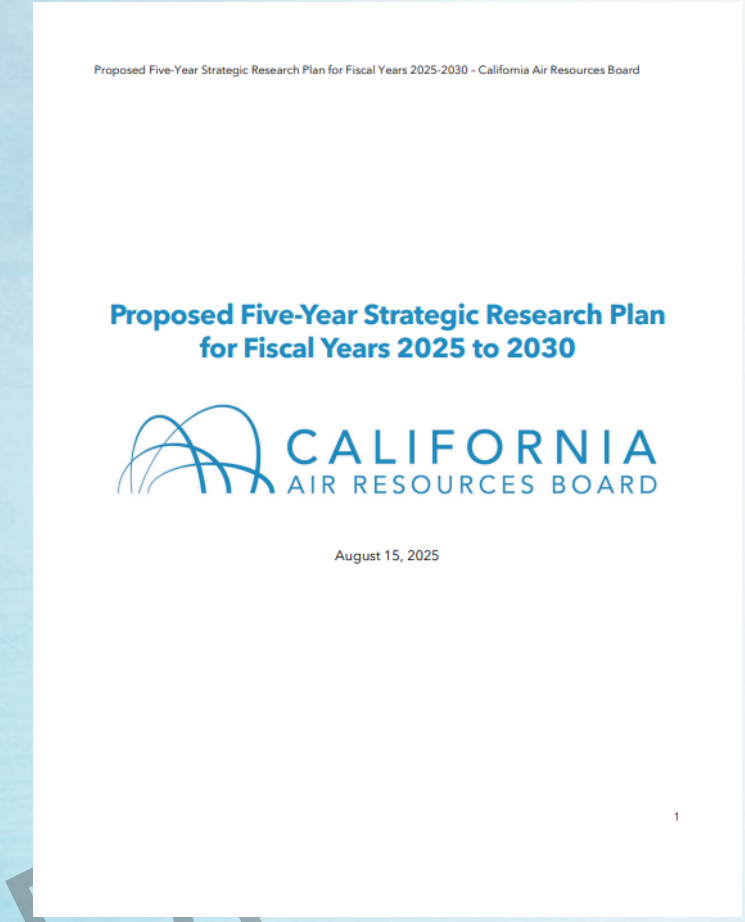
- Identify research gaps and program needs
- Public engagement (meeting surveys)
- Engage community-based organizations

Cumulative Impacts from Five-Year Strategic Plan


Proposed Five-Year Strategic Research Plan for Fiscal Years 2025-2030 – California Air Resources Board

Proposed Five-Year Strategic Research Plan for Fiscal Years 2025 to 2030

CALIFORNIA AIR RESOURCES BOARD

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1. Evaluate local health impacts from multiple sources.
2. Identify climate change-related impacts that worsen burdens.
3. Identify communities & Tribal populations bearing greatest burdens.
4. Explore new assessment methods
5. Research to support equitable decision-making

ww2.arb.ca.gov/resources/documents/strategic-research-plans

CARB Outreach Process

Identify institutions	Compiled list of over 60 universities & organizations in or working closely with overburdened communities in CA and in federal programs
Contact experts	Reached out to over 50 researchers, community leaders, toxicologists, epidemiologists, and other technical experts
One-on-one discussions	Discussed current methods, frameworks, and research gaps in health outcomes, social determinants, and exposures
Analysis	Synthesize suggestions to refine research concepts

Recurring themes

Recurring themes

Integrate chemical ($PM_{2.5}$, ozone, air toxics) **and non-chemical stressors** (heat, drought, health care access, noise)

$PM_{2.5}$ + O_3, NO_x …

Multipollutant exposures and **pollutant mixtures** drive health impacts

Emission sources (ports, rail yards, refineries) and **land use** (agricultural burning, pesticides) play a major role in shaping cumulative burden

Community- or place-based research for distinct exposures and stressors

Timing of exposure affects risk and varies with different life stages

Produce research that is **practical and relevant** to policy and regulatory applications in California and beyond

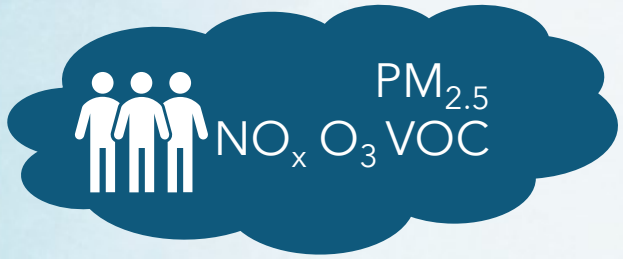
Key Research Gaps

- Move from single-pollutant analysis to **multiple pollutants** and other stressors
- Improve methods to collect and analyze **fine-scale community data**
  - Statewide averages do not necessarily reflect local cumulative burdens
- Consider **effect modification** of non-chemical stressors
- Investigate burden from **exposures over lifetime**

Proposed Research Concepts

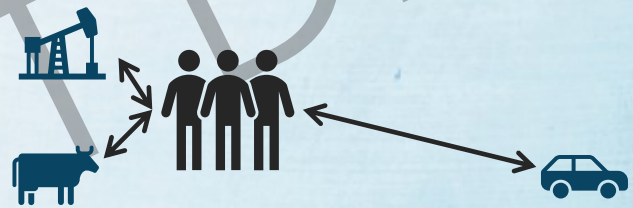
1. Multi-Pollutant Exposure

Health impacts from multiple or clustered pollutants



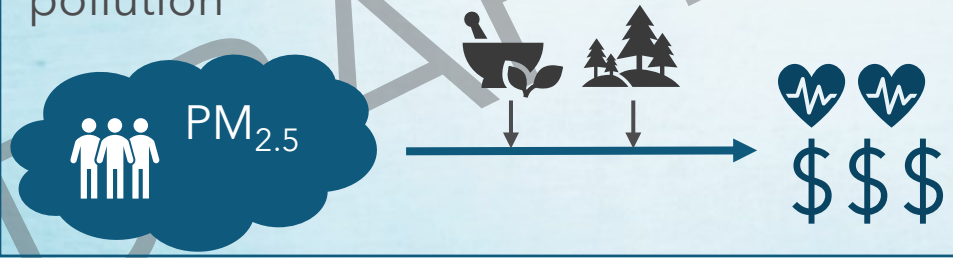
2. Exposure by Proximity

Health impacts based on community's proximity to different emission sources



3. Effect modification

How environmental and socioeconomic stressors change health impacts from air pollution



4. Life-Course Assessment

Age-specific or lifetime risk of health outcomes from air pollution

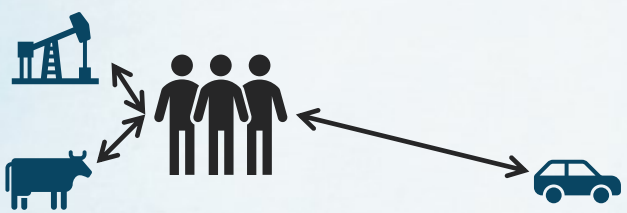
Proposed Concept 1: Multi-Pollutant Exposure

Objective	Assess health impacts from exposures to multiple or clustered pollutants

Use in impact analysis	Associations between health and complex air pollution mixtures
Sample research questions	• How does combined exposure to criteria pollutants and air toxics affect all-cause mortality? • Do co-exposures result in additive or compounding health impacts? • Which pollutant mixtures contribute most to health burdens?

Proposed Concept 2: Exposure by Proximity

Objective	Assess health impacts based on community's proximity to different emission sources or combinations of sources



Use in impact analysis	Associations between health and cumulative effects by emission sectors, individually or combined

Sample research questions	• Do communities near certain combinations of emission sources experience different health impacts than those near others? • Are certain combinations of emissions worse for health than others?

Proposed Concept 3: Effect modification

Objective	Assess how environmental and socioeconomic stressors change health impacts from air pollution exposure in vulnerable communities

Use in impact analysis	Identify non-air pollutant stressors that worsen health burden from air pollution

Sample research questions	• For two identical populations with the same air pollution levels, does water quality, access to healthcare, greenspace, or education result in differing health impacts? • In overburdened communities, which stressor(s) worsen health impacts of air pollution?

Proposed Concept 4: Life-Course Assessment

Objective	Assess age-specific risk of health outcomes from air pollution exposure across the lifespan

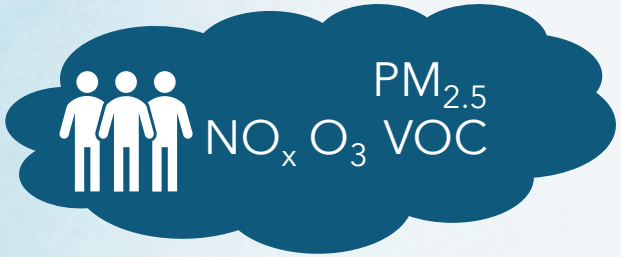
Use in impact analysis	Age group-specific associations between health and air pollution at different life stages

Sample research questions	• How does exposure to a pollutant over lifetime change health outcomes? • Does age at exposure to a pollutant change the type or severity of health outcomes?

Proposed Research Concepts

1. Multi-Pollutant Exposure

Health impacts from multiple or clustered pollutants



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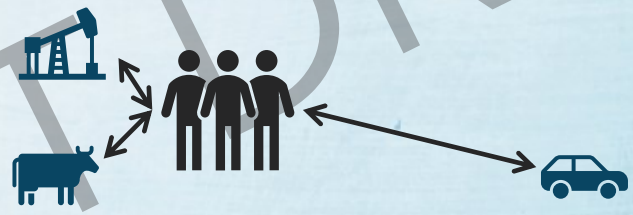
Health impacts based on community's proximity to different emission sources



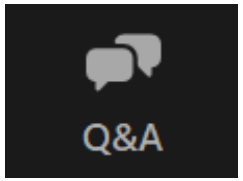
3. Effect modification

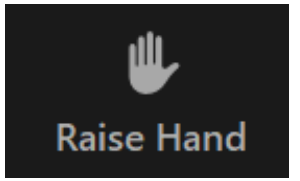
How environmental and socioeconomic stressors change health impacts from air pollution

4. Life-Course Assessment

Age-specific or lifetime risk of health outcomes from air pollution

- Type your question
- Raise your hand to join speaking queue (**Dial *9** by phone)





We need your perspective!

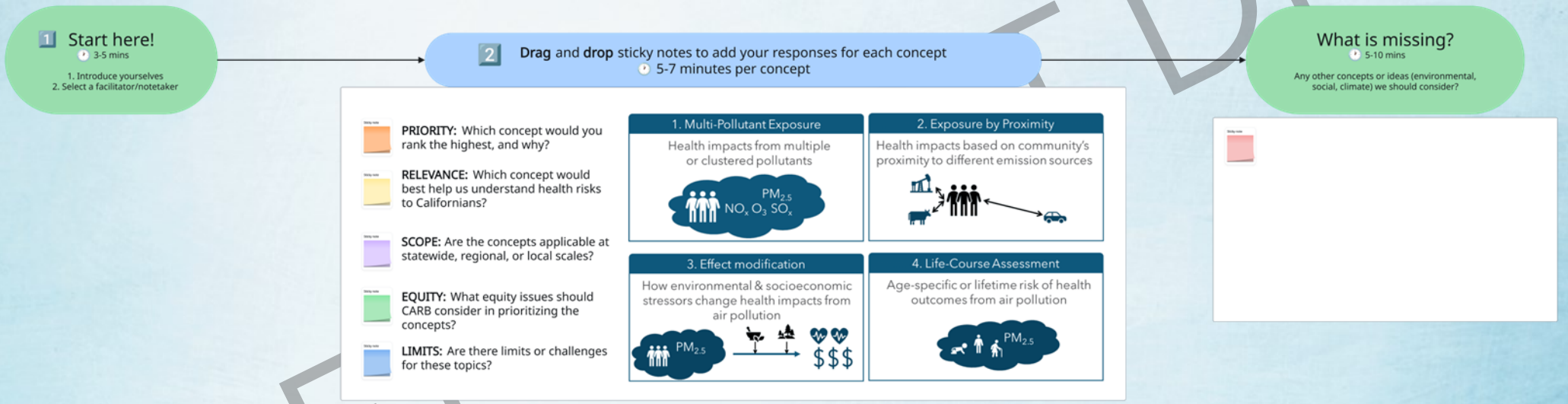
1. Introduction **(recommended: 3-5 mins)**
2. Proposed concepts **(recommended time: 5-7 mins per concept)**
   a. Priority: Which concept would you rank the highest, and why?
   b. Relevance: Which concept would best help us understand health risks to Californians?
   c. Scope: Are the concepts applicable at statewide, regional, or local scales?
   d. Limits: Are there limits or challenges for these topics?
   e. Equity: What equity issues should CARB consider in prioritizing the concepts?
3. What is missing? Are there other concepts or ideas (environmental, social, climate) that should we consider? **(recommended: 5-10 mins)**

Breakout discussion (25 mins)

- You will be automatically sorted into breakout rooms.
- Please select one facilitator/notetaker in each room.
- Every breakout room will have a Whiteboard:
  - Proposed research concepts
  - Discussion questions
  - Sticky notes: **notes will be anonymous**
- Share your thoughts and add responses to the Whiteboard.
- If you have questions, type them into the main chat or return to the main room.

Using Zoom Whiteboards

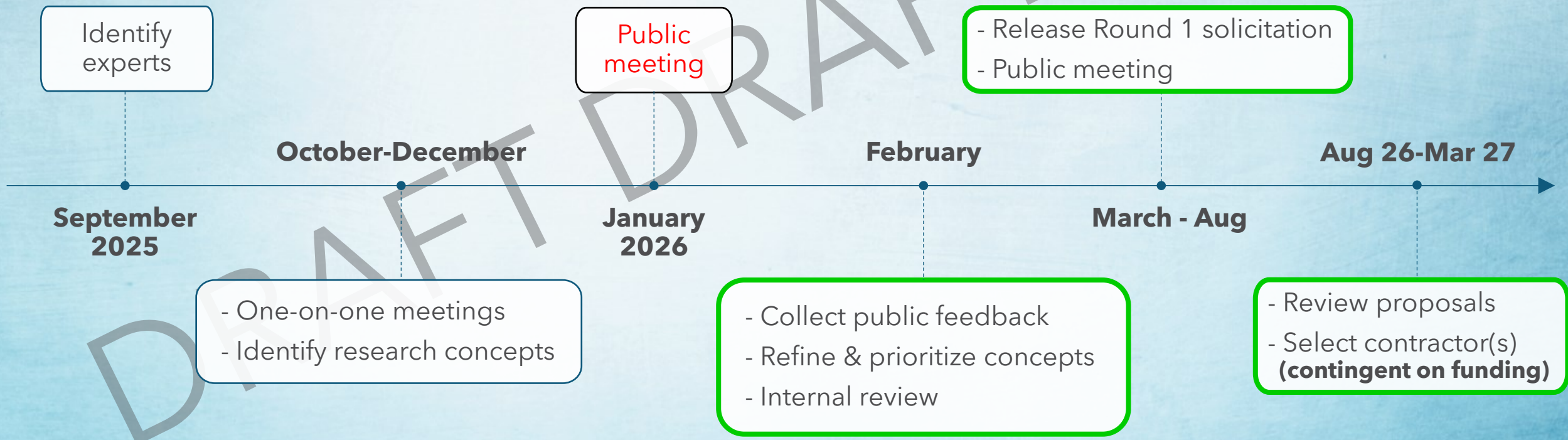
- Accessible through Zoom app (desktop & phone) or browser



Welcome back! What's next?

- Public comment period: Jan 30-Feb 13, 2026

ww2.arb.ca.gov/public-comments



Thank you for attending!

Questions to healthimpacts@arb.ca.gov