CALIFORNIA
AIR RESOURCES BOARD

Cumulative Health Impacts from Air Pollution in California

Pradeep Prathibha, PhD, Manager, Health & Ecosystem Analysis Section

Joshua Montefalcon, MPH, Air Pollution Specialist

Bay Area Air District Advisory Council Meeting - October 5, 2026

CARB's Current Health Impact Analysis

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

17 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

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

Goal: Develop Methods to Comprehensively Assess Health Benefits

Board Resolution 20-13: Health Evaluation of Air Quality and Climate Regulations and Programs

- New qualitative and quantitative approaches
- Assess health impacts in disadvantaged communities
- Quantify additional pollutants
- Update health endpoints from pollution exposure
- Assess and communicate GHG reduction benefits

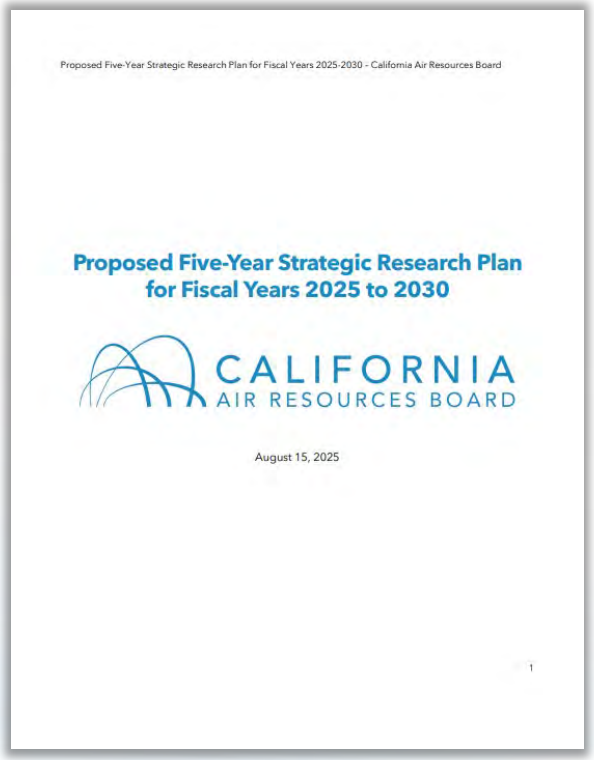
Board Resolution 20-33: A Commitment to Racial Equity and Social Justice

- Establish and enhance proactive measures to ensure racial equity in all CARB activities

GHG: green house gas

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

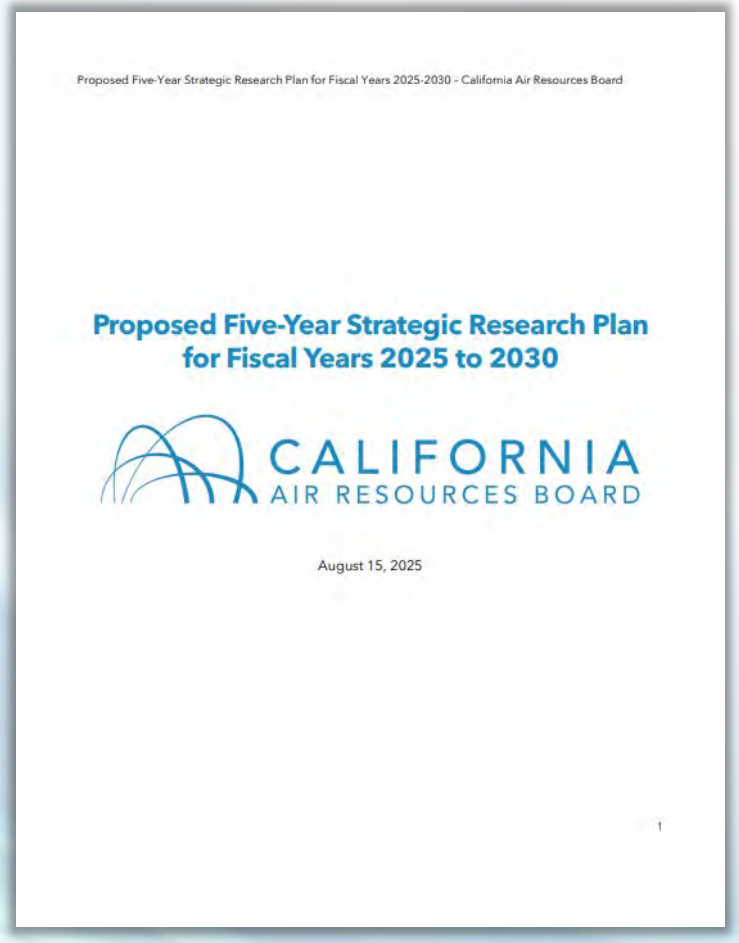
CALIFORNIA AIR RESOURCES BOARD

August 15, 2025

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

CARB Research Project Priorities

Cumulative Impacts from Five-Year Strategic Plan



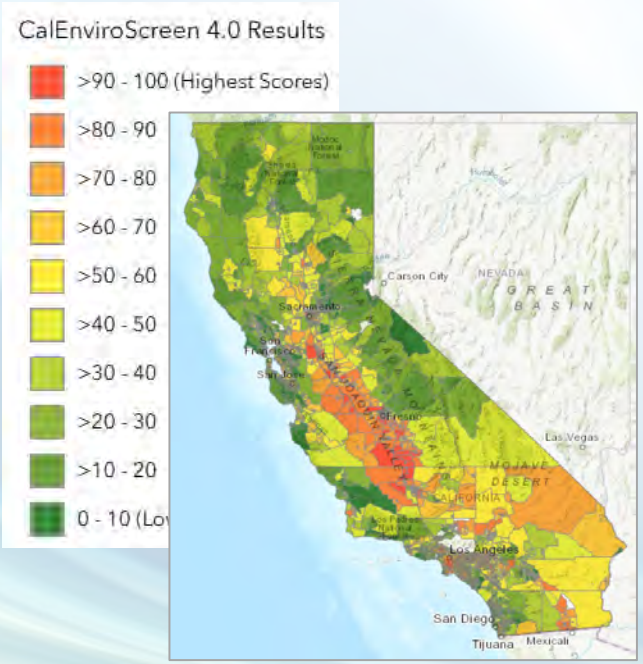
1. Evaluate local health impacts from multiple sources.
2. Identify climate change-related impacts that worsen burdens.
3. Identify communities & Tribal populations bearing greatest burdens.
4. Explore new assessment methods
5. Research to support equitable decision-making

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

Some Existing Tools Capturing Cumulative Impacts

Mapping tools

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

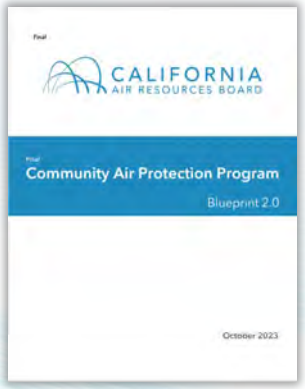


Frameworks

- 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



Cumulative Impacts Roadmap: From Research Priority to Solicitation

Cumulative Impacts Identified as a Research Priority

Five-Year Strategic Research Plan

1-on-1 Outreach

Gather internal and external input from CARB staff, CBOs, researchers, agencies, air districts

Identify Key Research Concepts

Synthesize input to identify key research gaps and draft concepts

Public Workshop

Collect feedback and refine research concepts

Develop Solicitation

Two research pillars informed by community and technical feedback

CARB Outreach Process for Cumulative Impacts Research Priority

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

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

CARB

Recurring themes

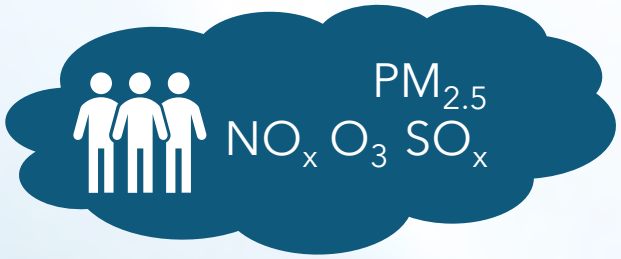
Key Research Gaps

- 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

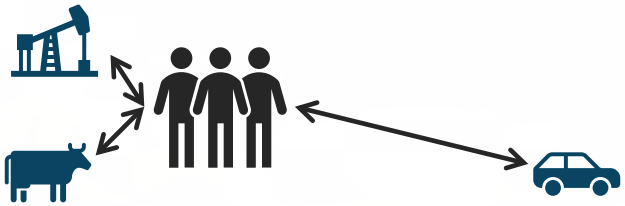
1. Multi-Pollutant Exposure

Health impacts from multiple or clustered pollutants



2. Exposure by Proximity

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



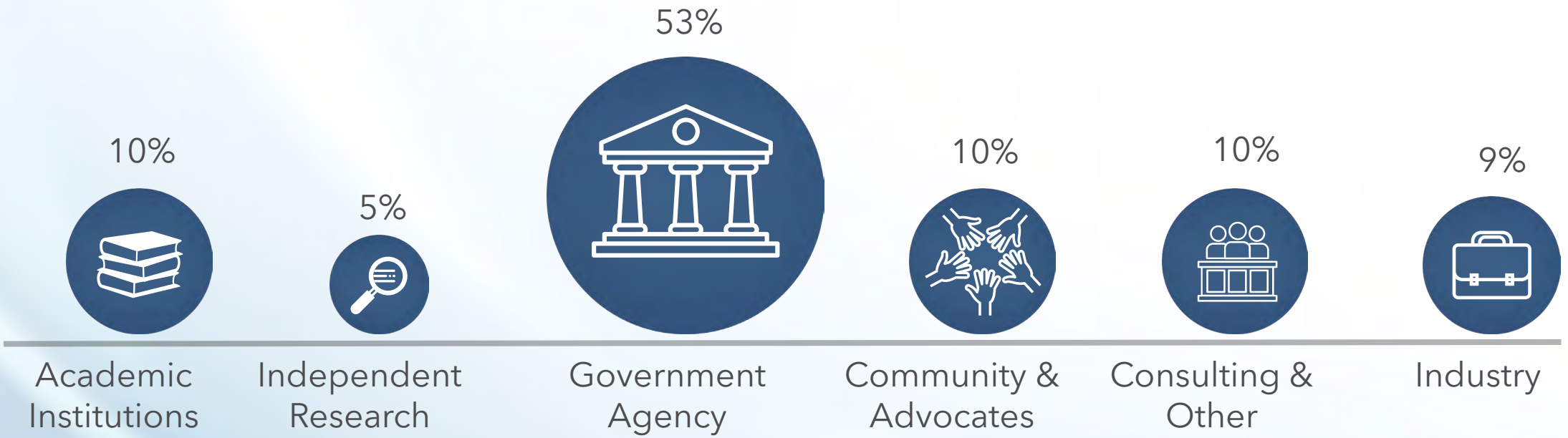
3. Effect modification

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

Public Workshop



Cumulative Health Impacts from Air Pollution in California

In developing this solicitation, CARB aimed to:

- Build on recommendations from recent cumulative impacts reports
- Advance the science on cumulative health assessments
- Inform CARB's health impact assessments
- Investigate community health concerns

Two complementary research pillars

Pillar I:

Statewide Multipollutant Health Assessment

Develop statewide multipollutant health impact functions to inform CARB's health impact analysis

Pillar II:

Community-Scale Health Assessments

Conduct mixed methods assessments of air toxics and health outcomes in overburdened communities

36 months
Project Duration

$1.2 million
Total Budget

January – April 2027
Kickoff executed contract

CARB

Pillar I: Cumulative Health Impacts from Air Pollution in California

Objective:

Develop statewide multipollutant health impact functions for mortality, cardiovascular and respiratory emergency department visits and hospitalizations, and other endpoints.

Desired Outcomes:

1. Literature review to identify robust methods and tools for health analysis from exposure to multiple criteria pollutants.
2. Obtain health and population data, effect modifiers, and covariates, representative of CA population.
3. Develop health impact functions using existing multipollutant exposure data (Daily 1-km $PM_{2.5}$ [total and speciated], NO_2, O_3).

Deliverables and Use:

Statewide health impact functions from criteria air pollutant exposure ($PM_{2.5}$, NO_2, O_3 + others) and health outcomes stratified by population characteristics (e.g., race/ethnicity, income) and region to inform CARB's health impact assessment methodology.

Pillar II: Cumulative Health Impacts from Air Pollution in California

Objective:

Conduct 2-3 community-scale mixed methods health assessments from exposure to toxic air contaminants.

Desired Outcomes:

1. Form community-specific Community Advisory Groups to inform key decisions and community engagement efforts.
2. Select 2-3 communities with elevated burden from exposure to air toxics (e.g., AB 617 consistently nominated communities) with existing or ongoing air quality monitoring in consultation with CARB staff.
3. With CAG guidance, develop work plan for community-specific assessments covering target air pollutants, exposure data sources, health endpoints, health and population data sources, etc.
4. Conduct health assessments using suitable mixed methods approaches.
5. Disseminate research findings to community stakeholders.

Deliverables and Use:

Quantitative and/or qualitative assessments of community-scale toxic air pollutant exposures and health outcomes, as guided by the CAG(s), to inform CARB's health impact assessment methodology, monitoring efforts, incentive programs, and regulatory actions.

Pillar II: Community Selection Criteria

1. Communities must have existing air quality datasets that provide reliable exposures representative of the region in addition to those from district or other regulatory monitors. Existing datasets must be of high quality and validated using regulatory monitoring data or other best practices. The strength of the existing datasets will be a key factor in pre-proposal scoring.
2. Communities that have demonstrated concern about health impacts of multiple sources of air toxic air pollutants or that have expressed interest to engage in cumulative health impacts research.
3. Communities that are overburdened and face multiple health burdens based on CalEnviroScreen, CalHealthMap, Healthy Places Index, emission inventories, consistently nominated AB 617 communities list, or other screening tools. CARB intends for this solicitation to facilitate new and expanded analyses in communities where health effects of toxic air contaminants are understudied.

Next Steps

- CARB selection and finalization of full proposal
- Research Screening Committee proposal review
- Execute Research Contract
- Ongoing communication with relevant air districts

Date	Milestone
August 14	Pre-proposals due
Early 2027	RSC meeting
1st or 2nd Quarter 2027	Execute contract

AGENDA: 6

State Cumulative Impacts Permitting Policies: Recent Developments 2025-2026

Presentation to the Bay Area Air District Advisory Council
San Francisco, October 5, 2026

Yukyan Lam, Research Director and Senior Scientist

THE NEW SCHOOL

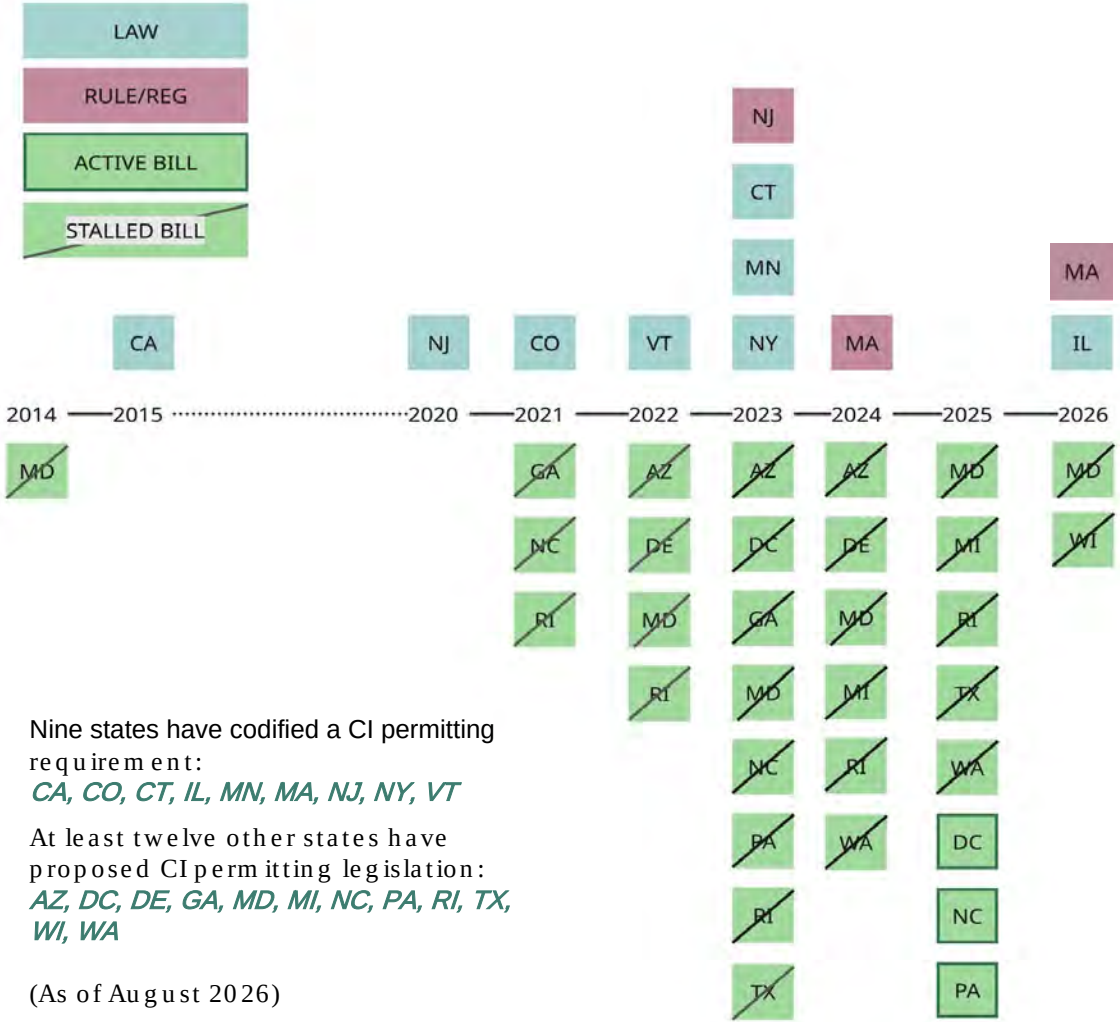
Tishman Environment and Design Center

Tishman Research Team

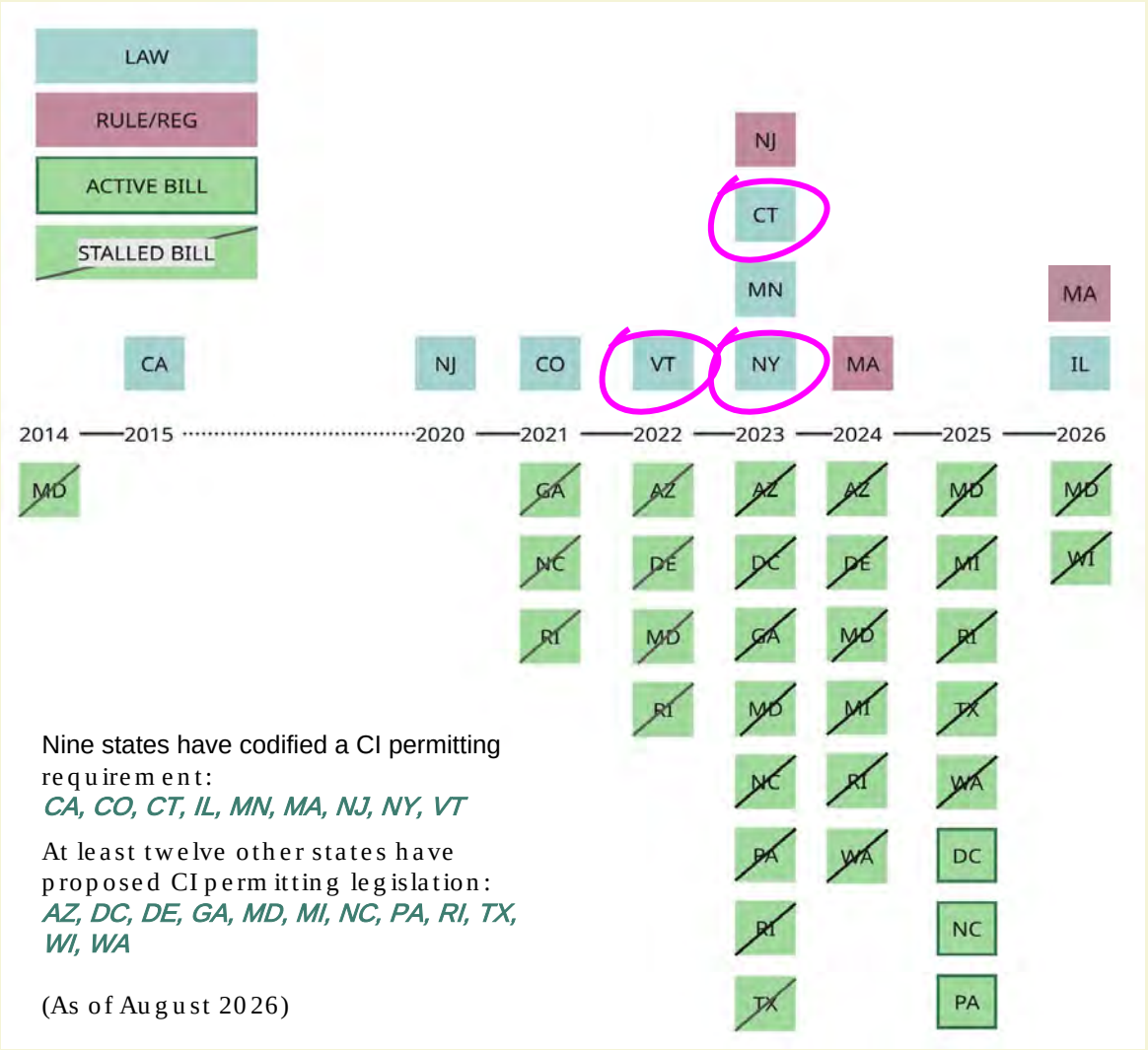
Yukyan Lam

Madeleine Killough

Anna Yulsman



Timeline of Proposed and Passed State Policies



Timeline of Proposed and Passed State Policies

CITY OF CHICAGO · OFFICE OF THE MAYOR

FOR IMMEDIATE RELEASE
April 16, 2025

CONTACT:
Mayor's Press Office
312.744.3334
press@cityofchicago.org

Department of Environment
kathleen.o'shea@cityofchicago.org

MAYOR BRANDON JOHNSON INTRODUCES THE HAZEL JOHNSON CUMULATIVE IMPACTS ORDINANCE

The ordinance aims to address the disproportionate pollution burden experienced by some Chicago communities.

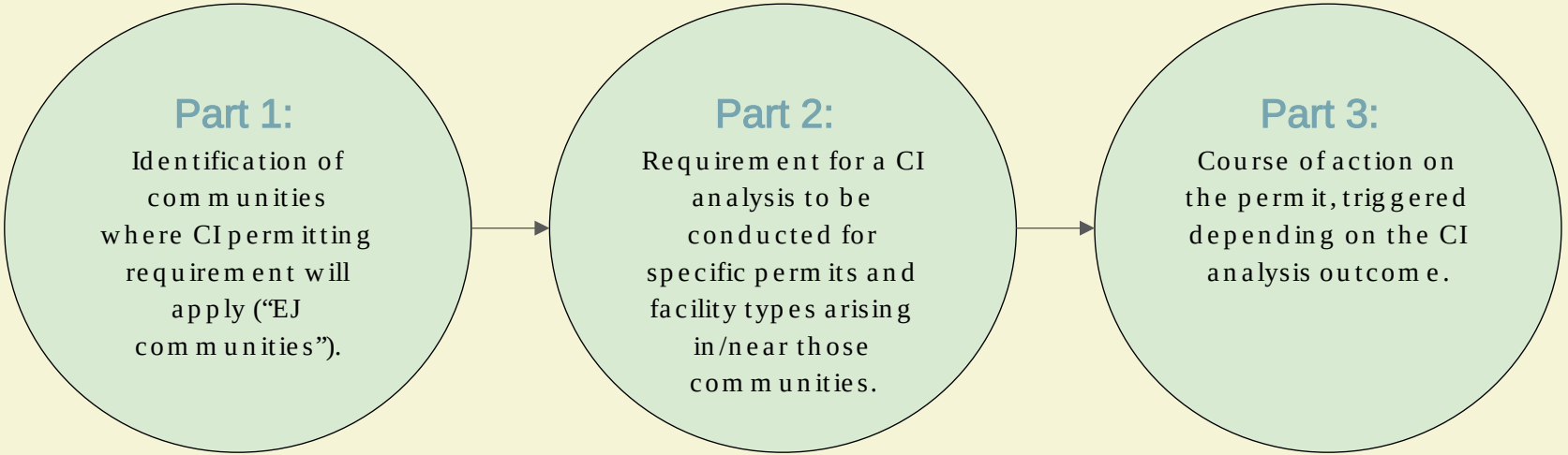
CHICAGO – Today, Mayor Brandon Johnson, alongside Alders Ramirez, La Spata, Sigcho-Lopez, Rodriguez-Sanchez, and Hadden, introduced the Hazel Johnson Cumulative Impacts Ordinance, a bold step towards protecting vulnerable communities from disproportionate pollution burdens. By applying a more thorough zoning review process for heavy and intensive land uses that have the greatest potential for pollution exposure, the ordinance aims to prevent additional stressors from compounding in already-burdened communities.

"Chicago is the birthplace of the environmental justice movement, so it is only right that we take the lead nationally on protecting our most vulnerable communities from the harm of pollution," said **Mayor Brandon Johnson**. "Chicago has a long history as an industrial hub, but that industry has at times come at a cost to working-class Chicagoans. Economic development cannot be a tradeoff where we sacrifice the health of Black and brown communities. We need to build thoughtfully and that means ensuring that our zoning policies help protect all Chicagoans from excessive pollution."

Named in honor of the late Hazel Johnson, who is widely regarded as the "Mother of Environmental Justice" for her work as an organizer against environmental racism, the ordinance would help protect communities of color, which are statistically more likely to be exposed to pollution, especially from manufacturing.

Photo credit: Max Herman/Borderless Magazine

Common Three -Part Structure of CI Permitting Policies



Baptista, A., Lam , Y., Yulsman, A., Killough, M., Bez, C., "A Resource Database of Cumulative Impacts Permitting Policies: Emerging Opportunities to Protect Environmental Justice Communities from Additional Burden," *Environmental Justice* (2025)

Policy Elements: Decision on Permit - A Retrospective

Strength of mandate on permit decision

"Shall" deny:
DC, GA, IL, MN, NJ, NY, and WA

"May" deny:
AZ, CO, CT, DE, MA, MD, PA, RI, and WI

New facilities vs. expansions & renewals

NJ: New facilities mandatorily denied. Expansions & renewals apply conditions.

Trigger for decision: How much is too much?

NJ: Any additional contribution to adverse cumulative stressors is too much.

MN: *Substantial* adverse impact

NY: *Significant increase* for modifications and renewals; *de minimis* for new

Loopholes?: CBAs & public interest exceptions

Public interest exception:
NJ, MI, GA, WA

CBA clauses:
MN, CT

Policy Elements: Decision on Permit - A Current Look

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Loopholes?: CBAs & public interest exceptions

Public interest exception:
NJ, MI, GA, WA

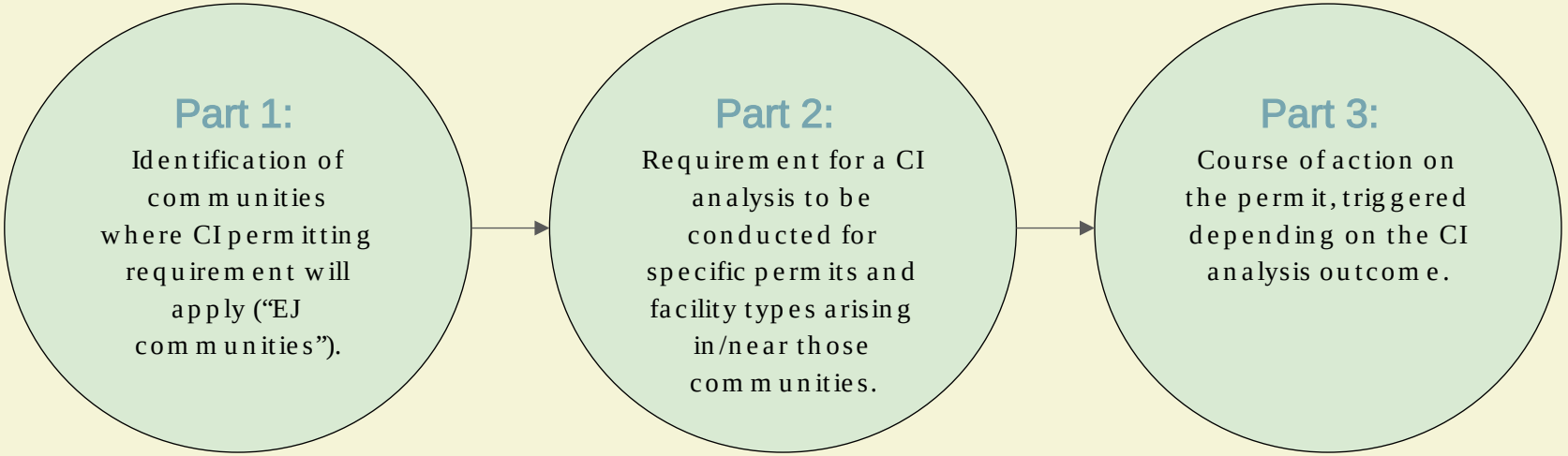
CBA clauses:
MN, CT

Illinois - new law "permit enhancements"

New Jersey - implementation progress

MN - proposed rule definition of "substantial adverse impact" and CBA treatment

Common Three -Part Structure of CI Permitting Policies



MN law - geographic constraint

MA rule - custom radii

MN law - discretionary CIA requested by public: *"a petition requesting that a cumulative analysis be conducted is **signed by at least 100 individuals** who reside or own property in the environmental justice area impacted by the facility and is supported by **material evidence** that demonstrates a potential adverse cumulative impact…"*

MA rule - 'clean' energy + 'dirty' energy

IL law - compliance focus

MA rule - all indicators "elevated" by default for fossil fuel infrastructure

Thank you!

lamy@newschool.edu

SCAN ME

tishmancenter.org/
cumulativeimpacts

AGENDA: 7

2nd DRAFT Recommendations to Address Cumulative Impacts

Bay Area Air District Advisory Council

October 5, 2026
Advisory Council Meeting
Phil Martien, PhD, Chair

Overview

- Revisions in the 2nd Draft
- Recommendations, as Revised
- Questions and Discussion

Revisions in the 2nd Draft

1. Updated the document date from June 2026 to October 2026.
2. Removed Appendix B, based on Council discussion; renumbered Appendices C and D as Appendices B and D.
3. Added background information to the beginning of the Recommendations section: “Building on Existing Measures.”
4. Reorganized the recommendations to reflect their purpose, based on Community Advisory Council (CAC) Co-Chair suggestions for presenting to the CAC.

Revisions in the 2nd Draft (2)

5. Moved old Recommendation 7 to the top-level recommendations. It now appears as **Shift Agency Focus Toward Harm Reduction (**Recommendation 1b). This recommendation was reworded to reflect ideas in staff's June 15, 2026, presentation to the Council: *Regulatory Design Theory*.

6. Added a top-level recommendation, based on Council discussion: **Commit to Continuous Improvement** (Recommendation 1d).

7. Revised the discussion of place-based approaches and identifying overburdened communities (now Recommendations 2a-2c), based on public comments and Council discussion of supplements to CalEnviroScreen, including the statewide Healthy Places Index tool and locally generated city or county maps.

Revisions in the 2nd Draft (3)

8. Included a recommendation to develop a tiered metric for classifying compliance history, based on Council discussion: **Develop a Compliance History Metric** (Recommendation 4a).

9. Added more detail on how to consider a company's compliance history in issuing permits: **Consider Compliance History** (Recommendation 7a).

10. Revised the wording of the recommendation related to tracking community benefit agreements, based on staff recommendations and Council discussion: **Track Methods for Redirecting Resources to Mitigate Impacts** (Recommendation 8a).

Revisions in the 2nd Draft (4)

11. Added a recommendation discussed in the work plan but not included in the recommendations: **Track Next-Generation Risk Assessment (NGRA) and New Approach Methods (NAMs)** (Recommendation 8b).

12. Still needed: Summary section.

13. Added a Change Log to the end of the document. Changes made between drafts are added to the change log.

1. Top-Level Recommendations

a. Adopt Precautionary Approaches

b. Shift Agency Focus Toward Harm Reduction

c. Increase Engagement with Community Members

d. Commit to Continuous Improvement

2. Change What Counts – Improve How Overburdened Communities Are Identified

a. Continue Using Place-Based Approaches

b. Continue Using CalEnviroScreen but Explore Supplementing Maps Using the Healthy Places Index

c. Consider Supplementing with Local Maps of Overburden

3. Change What Counts – Expand Impact Assessments

a. Account for Population Burden

b. Account for Background Levels of Pollution

c. Calculate Hazard Indices Using Multiple Target Organ Systems

d. Account for Non-Chemical Stressors

e. Account for Impacts from Local Sources of $PM_{2.5}$

4. Change What Counts – Conduct Supporting Studies

a. Develop a Compliance History Metric

b. Use Monitoring and Modeling to Estimate Toxic Air Contaminant Emissions and Concentrations in the Bay Area

5. Change What Happens – Tighten Limits in Overburdened Communities

a. Tighten Limits for Cancer Risk

b. Tighten Limits for Acute and Chronic Non-Cancer Health Hazard

c. Adopt Tighter Limits for $PM_{2.5}$.

6. Change What Happens – Tighten Thresholds in Overburdened Communities

a. Adopt Lower Emissions Thresholds for Best Available Control Technology (BACT)

b. Use Emissions Limits as Triggers for Requiring Best Available Control Technology for Toxics (TBACT)

c. Tighten Screening Criteria for Environmental Review

d. Set Lower Trigger Levels for Public Notification

7. Change What Happens – Adopt Precautionary Approaches

a. Consider Compliance History

b. Set Emissions Caps

c. Prohibit Select Permit Types

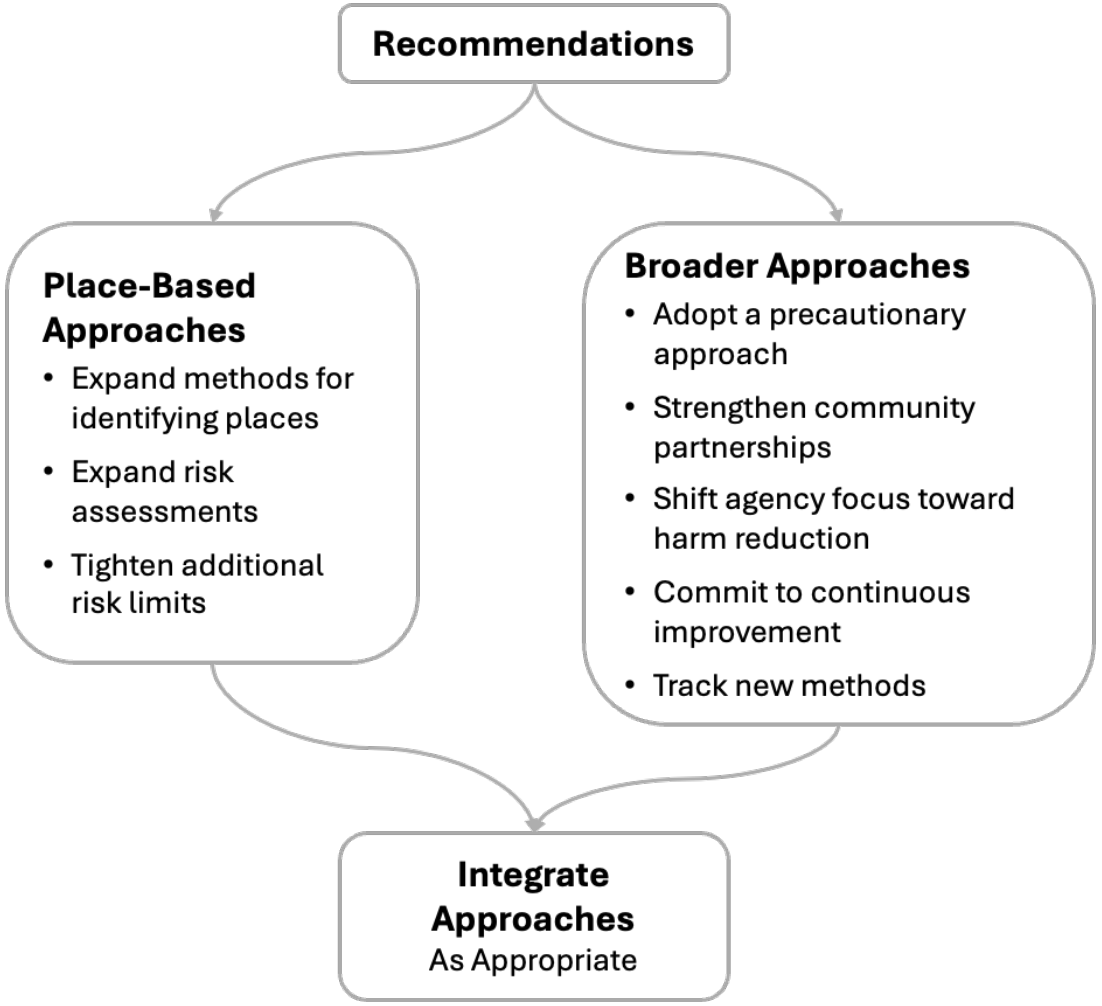
8. Track New and Emerging Approaches

a. Track Methods for Redirecting Resources to Mitigate Impacts

b. Track Next-Generation Risk Assessment and New Approach Methods

Questions, Discussion

- Could a figure help frame our recommendations?



Questions, Discussion (2)

- Are the revised ordering and rewording helpful changes?
- Additional recommendations?
  - More focus on precautionary approaches?
  - Additional hazard-based triggers for action?
  - More examples of precautionary approaches?
- Productive presentations for future Council meetings?

Draft Next Steps

- Discuss 2nd draft recommendations (today)
- External review, ad hoc meetings with others
- Discuss 3rd draft recommendations (via ad hoc and Advisory Council meeting, Nov 9, 2026)
- Complete 4th draft recommendations for Board of Directors (Jan 2027)
- Complete 5th draft (via ad hoc and Advisory Council meeting, early 2027)
- Complete final recommendations document (mid 2027)