

Stanford University – Energy Modeling Forum

CARB's Research on Health, Equity, and Transportation

June 2, 2021

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The California Air Resources Board (CARB)



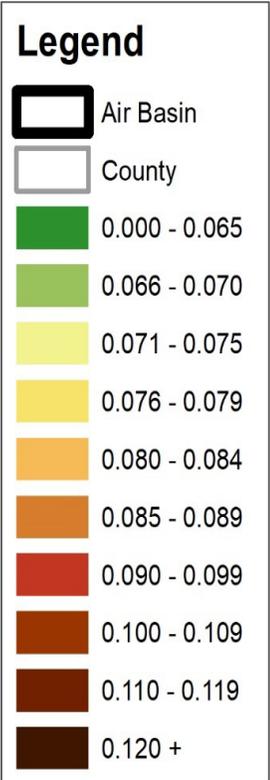
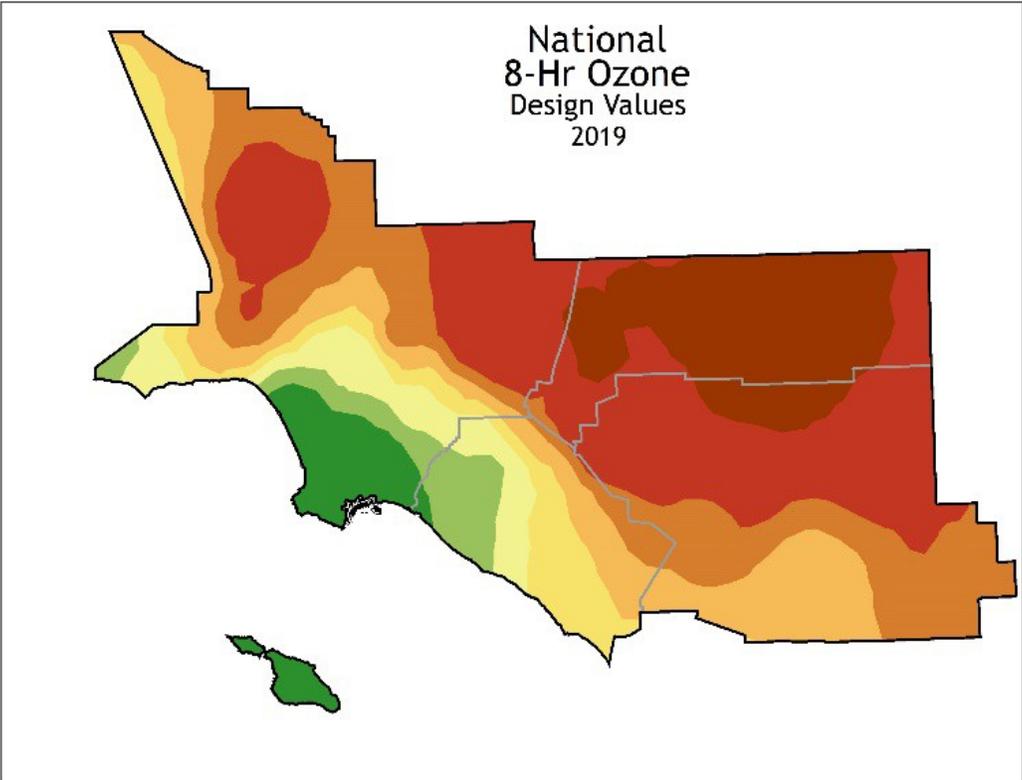
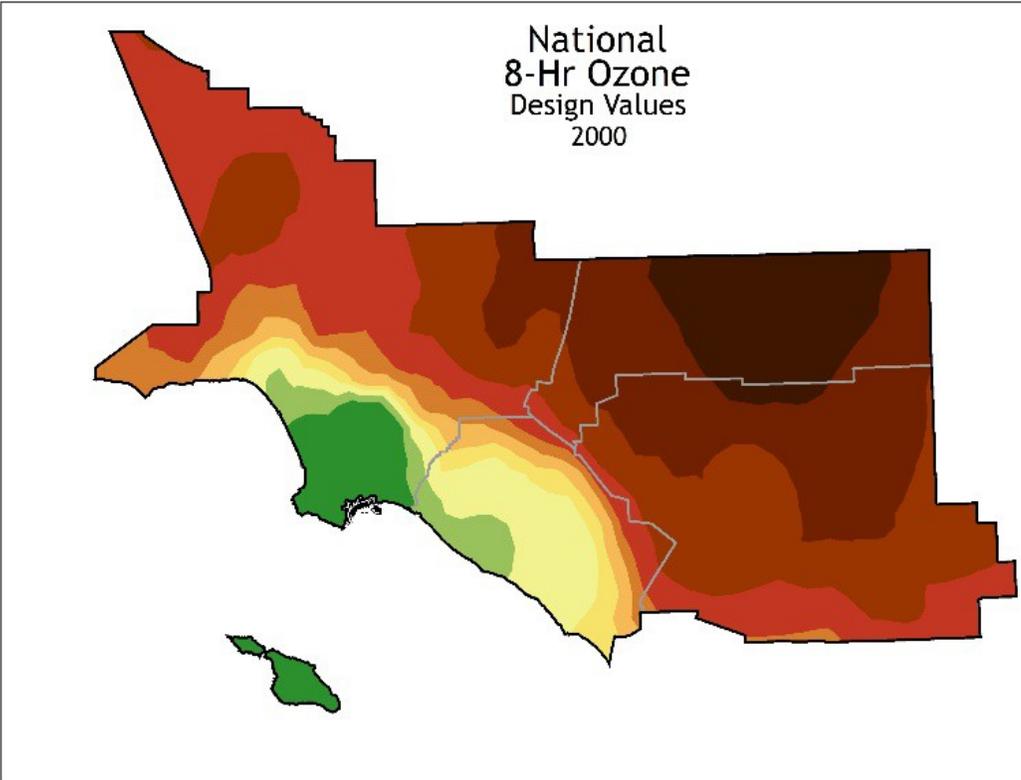
Vision

Clean Air for All Californians

GOALS

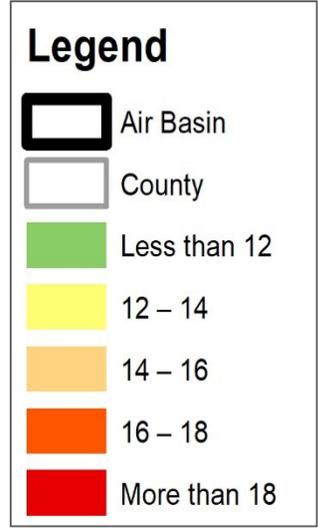
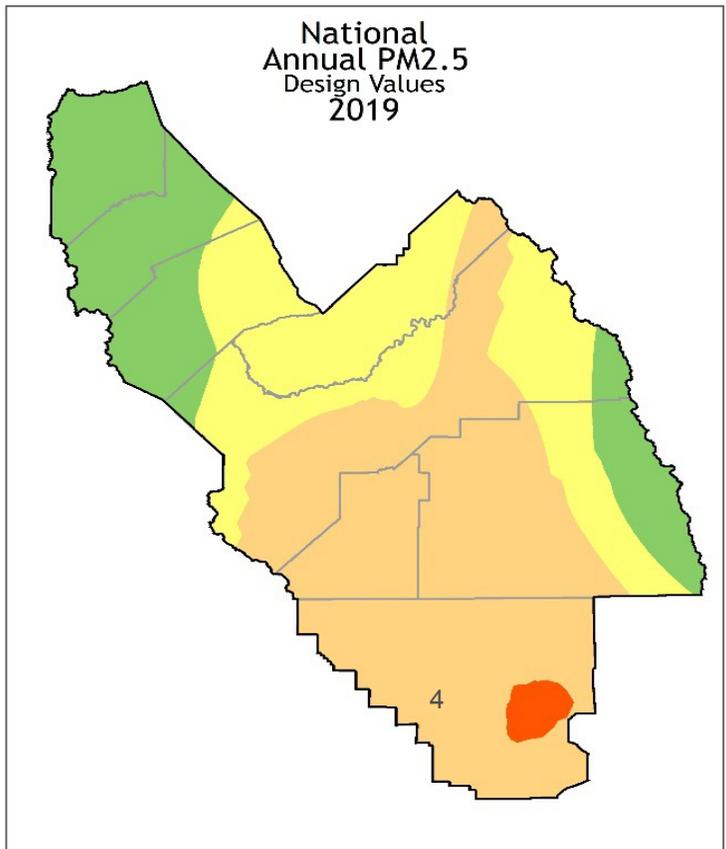
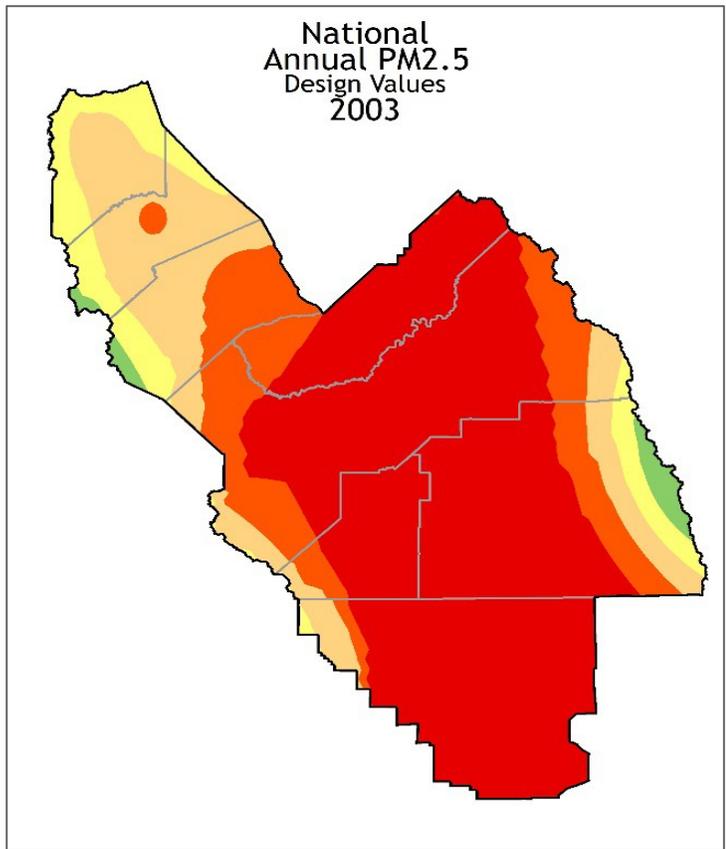
- Provide Healthful Air to all Californians
- Achieve Carbon Neutrality and Net Negative Thereafter
- Reduce Emissions in Heavily Burdened Communities
- Create a Positive and Inclusive Work Environment
- Maintain a Sustainable Organization

Clean Air Progress: Lower Ozone in South Coast



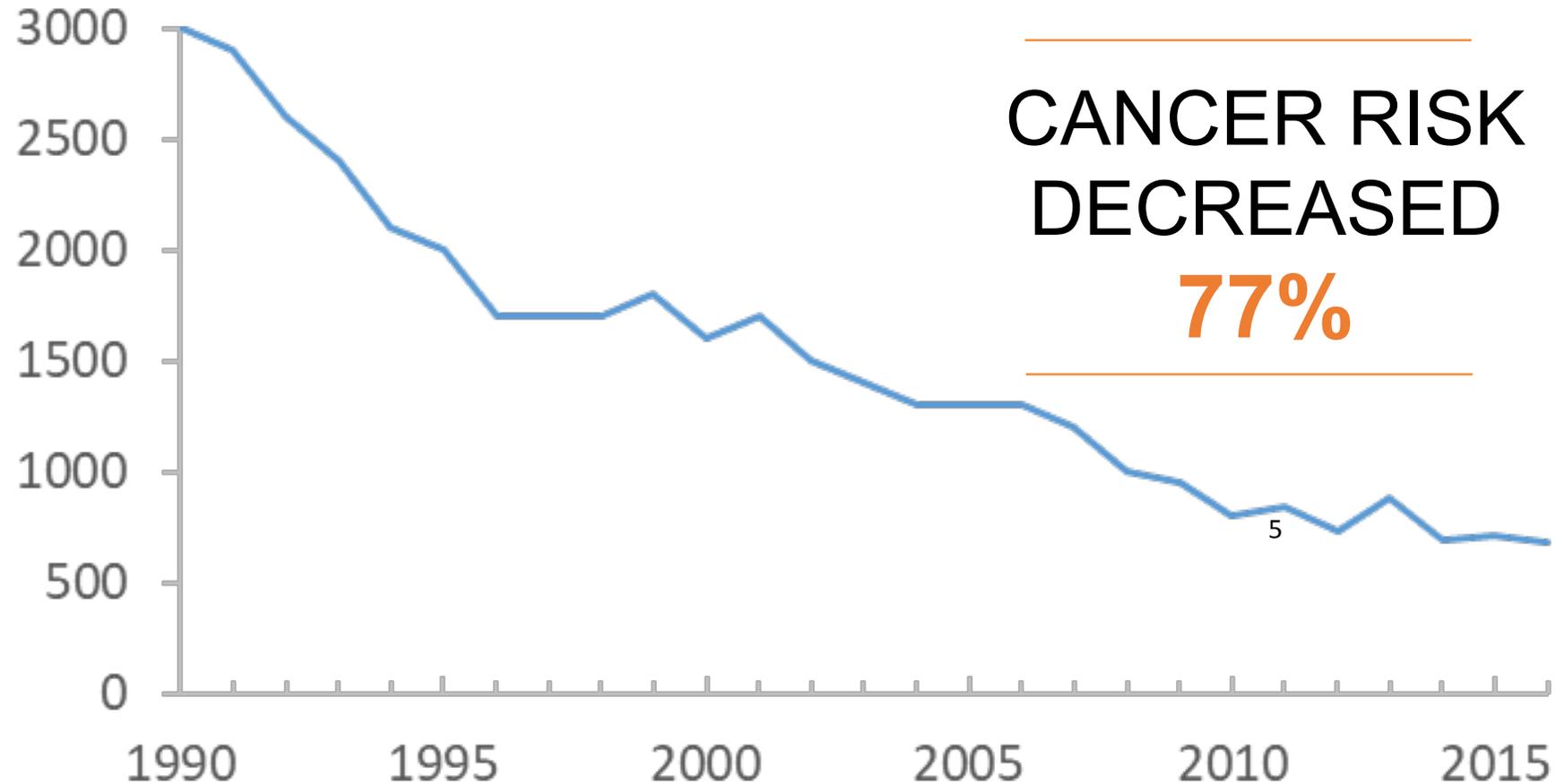
20 years of progress

Clean Air Progress: Less Particulate in the San Joaquin Valley

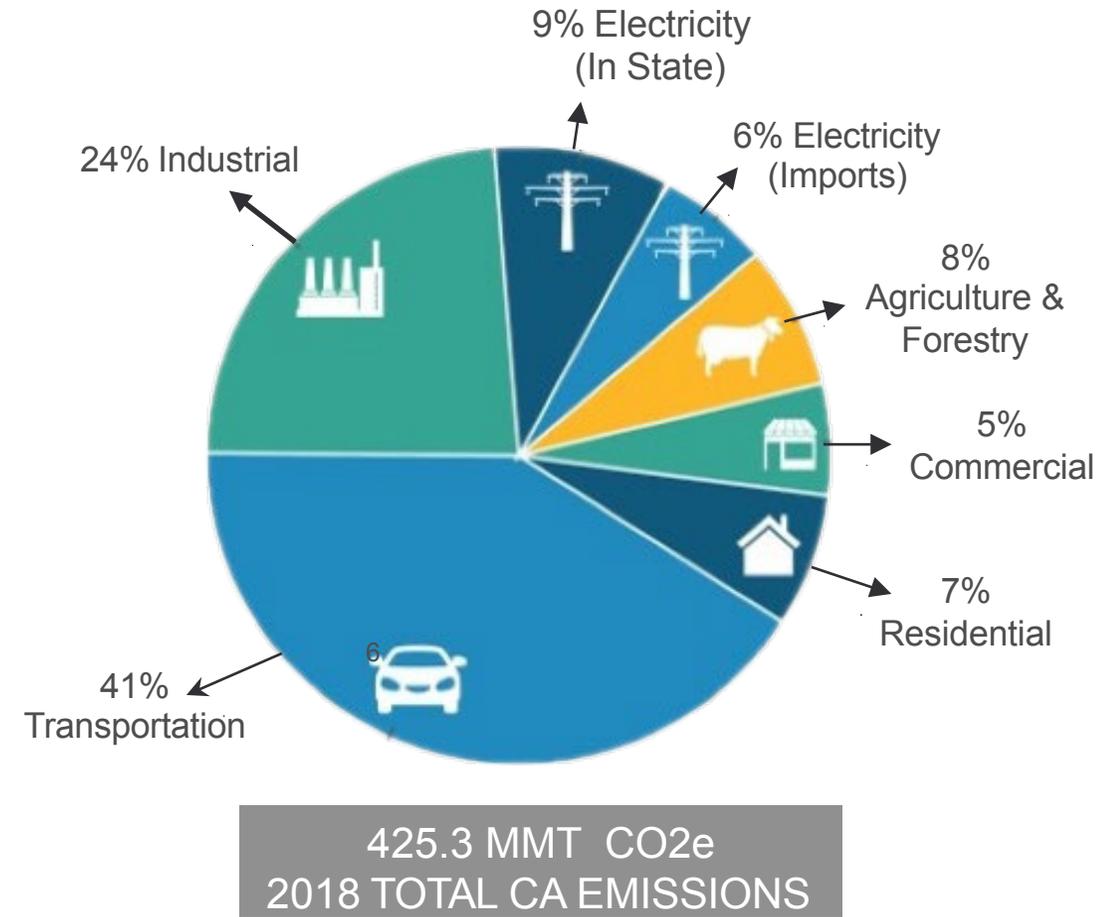
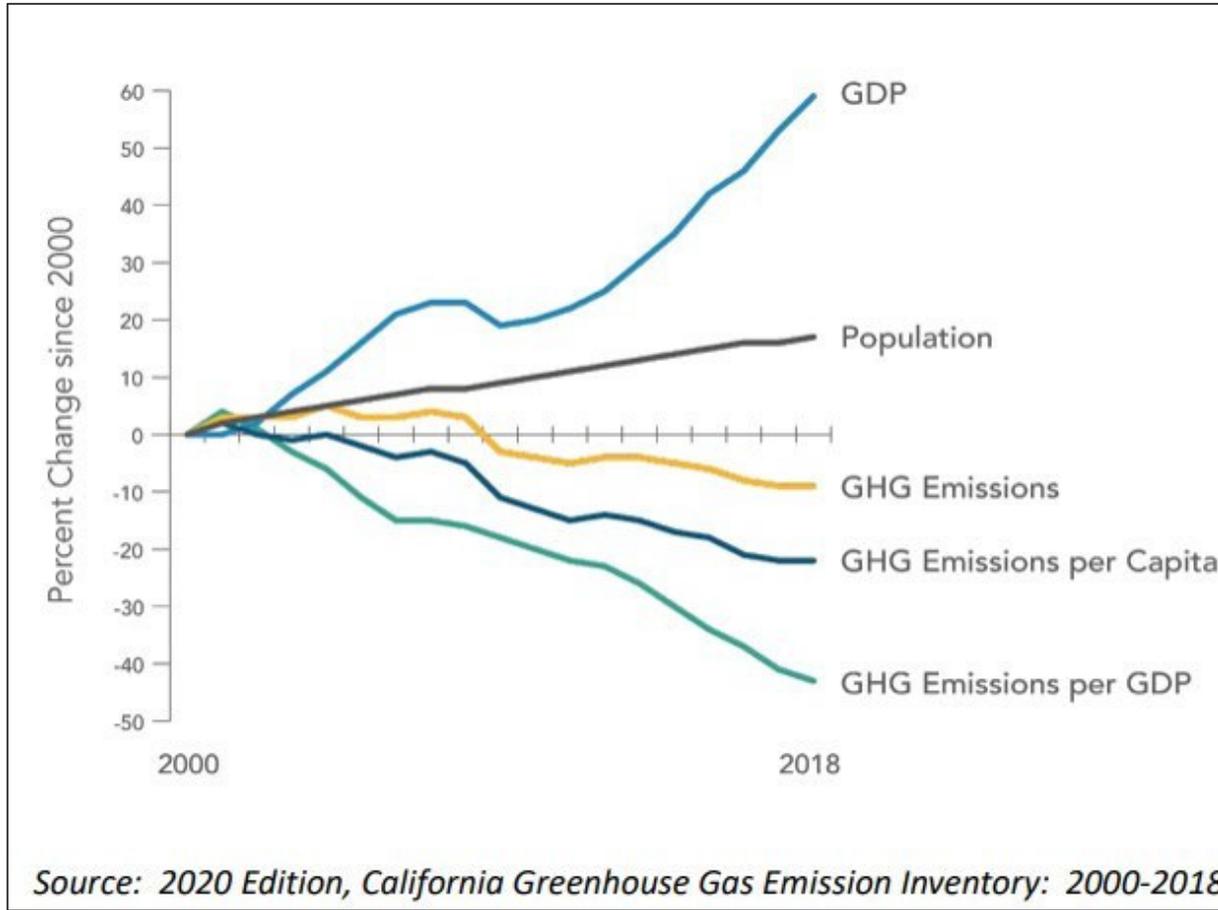


15 years of progress

Cancer Risk per Million Residents



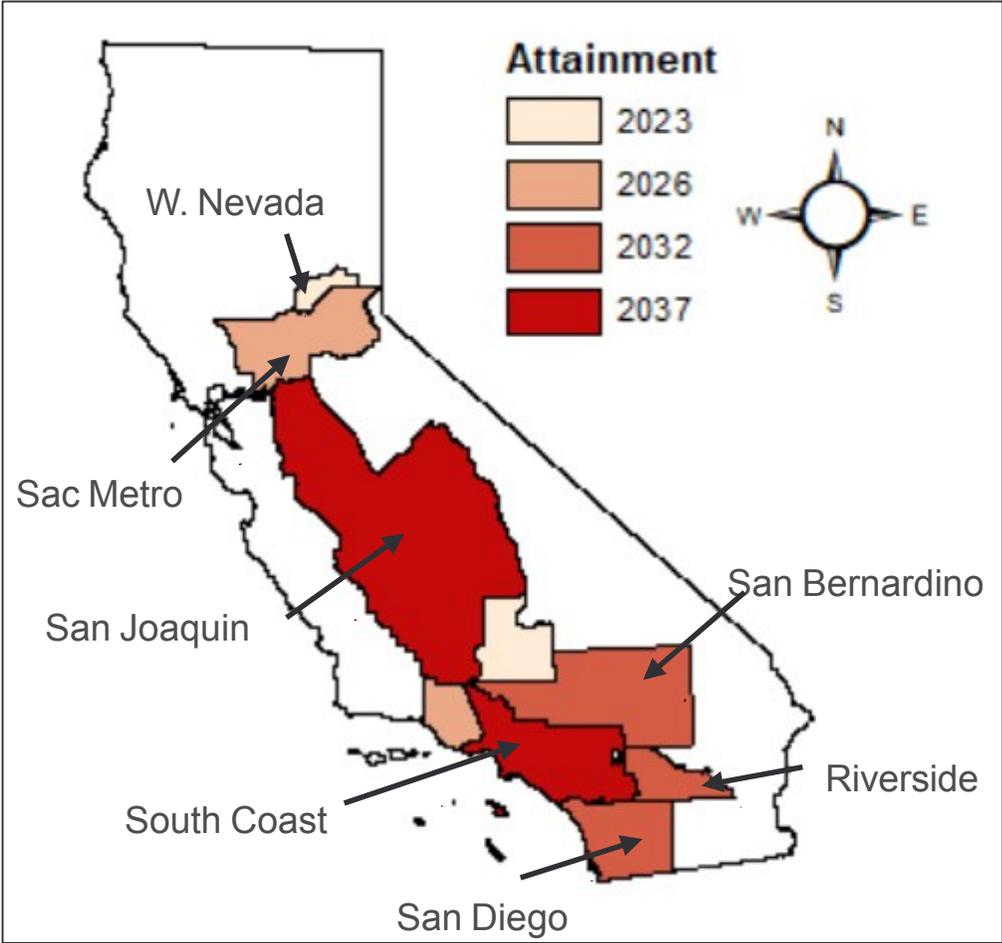
Clean Air Progress: Ongoing Greenhouse Gas Reductions



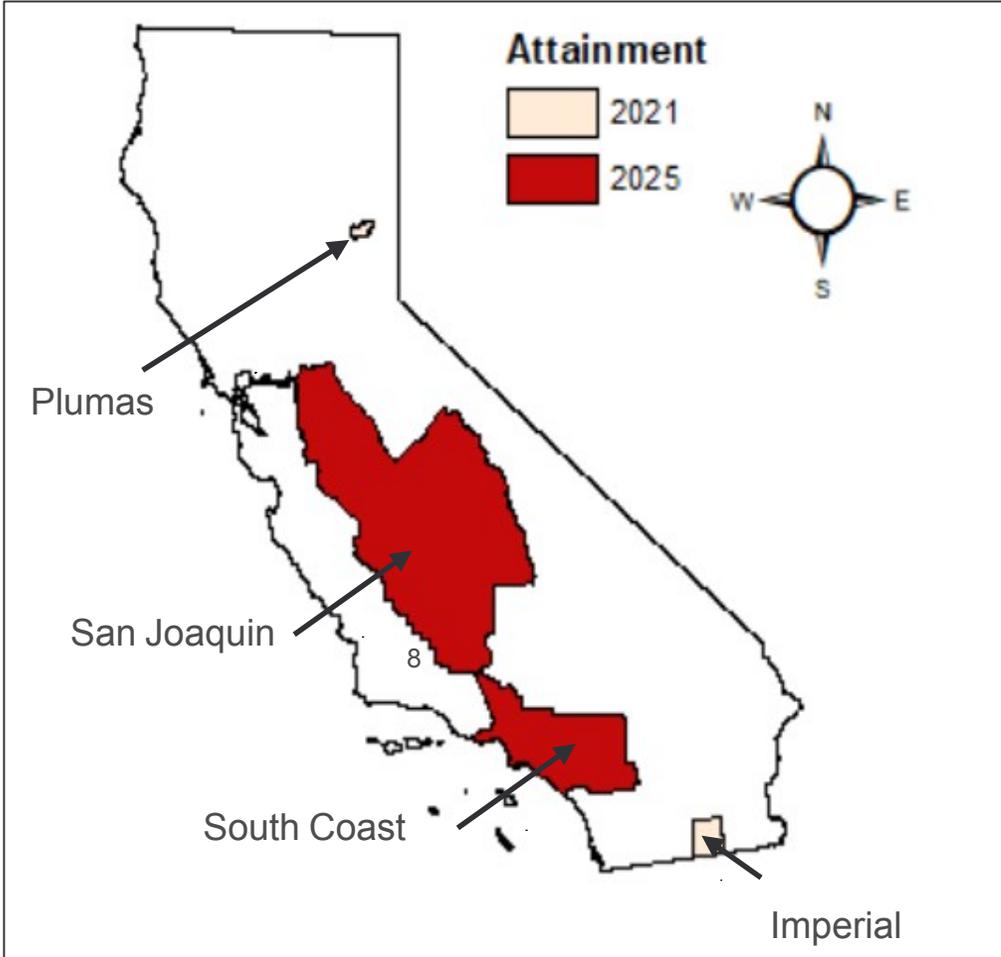


- Include equity in all programs
- Transition out of combustion in all sectors

70 ppb 8-hr Ozone



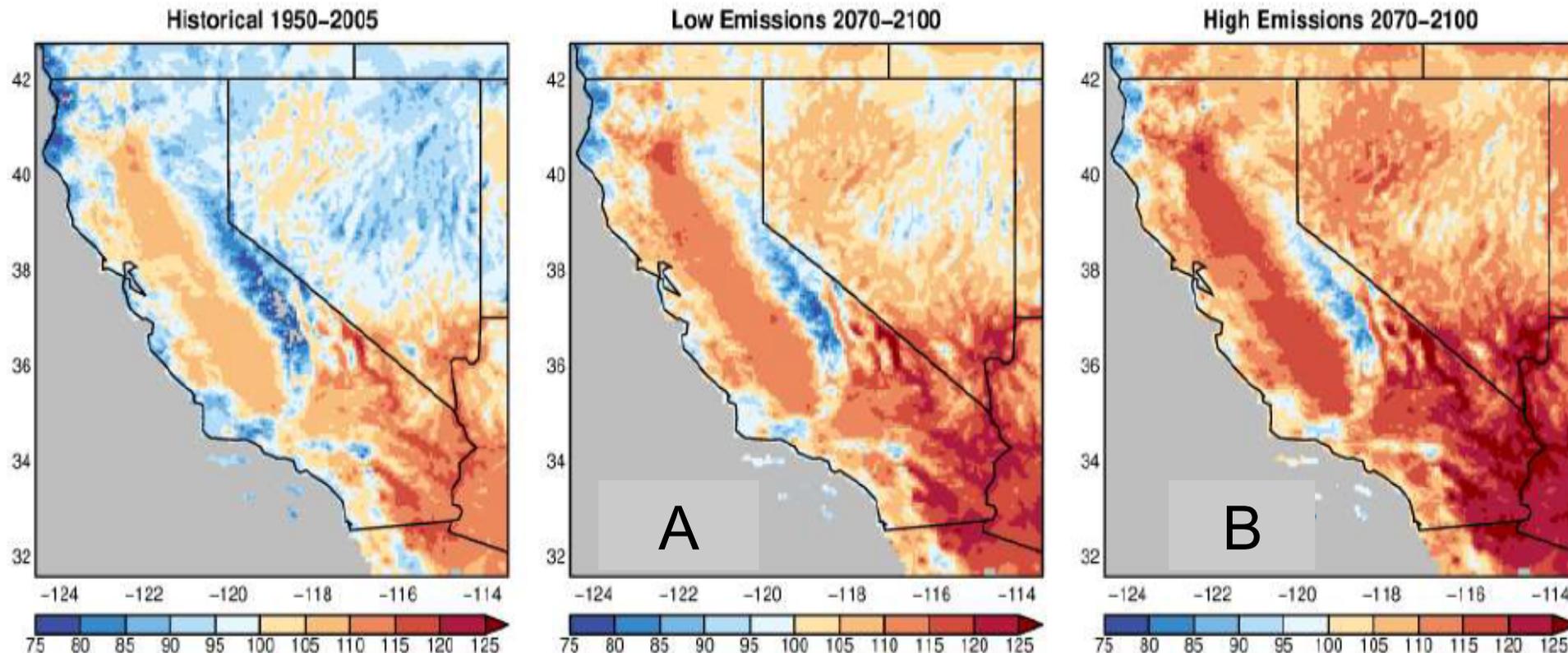
12 µg/m³ annual PM_{2.5}



Influence of Climate Change on Air Quality

Two future (2006-2100) scenarios:

- **A:** Moderate reduction in future emissions of greenhouse gases
- **B:** No reduction in future emissions of greenhouse gases



California is Highly Vulnerable to Climate Change

San Francisco



Increased Wildfire Risk

Burned area will increase 60-170% by 2100, depending on location



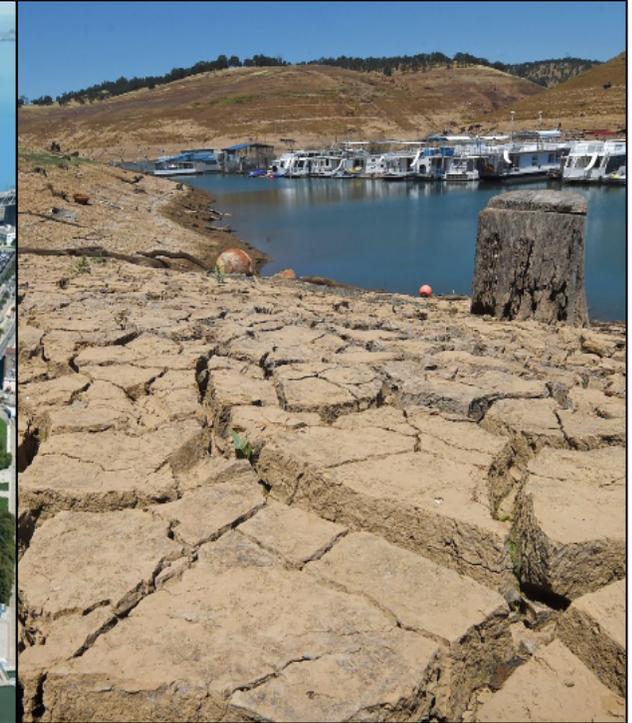
Loss of Snowpack

~25 inches of April snow water lost by 2100



Sea-level Rise

14-94 inches by 2100, depending on emissions scenario

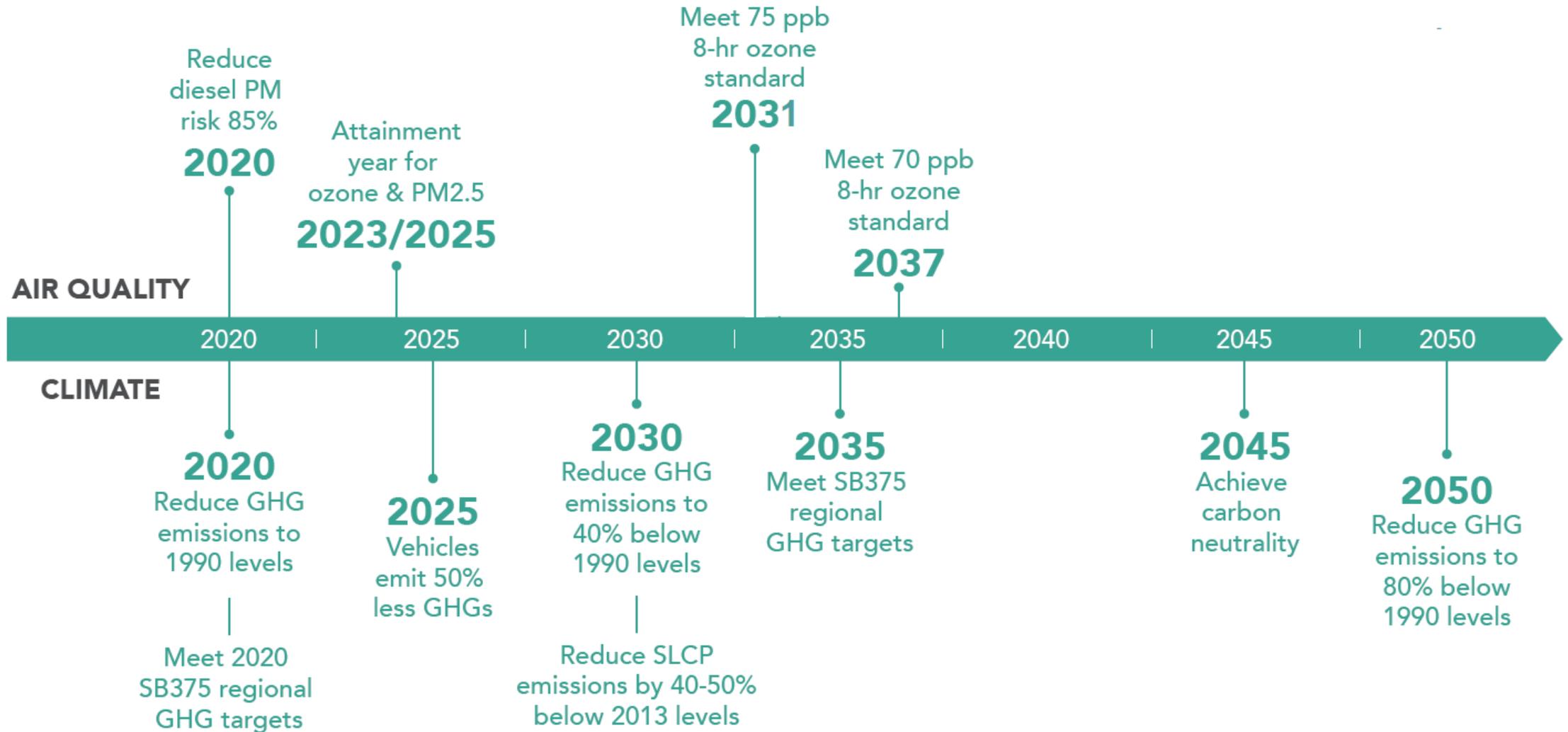


Extreme drought

Long-term declines in groundwater reserves

And much more....

California's Integrated Climate and Air Quality Goals



Getting to Zero in Transportation



 **100% ZEV sales** by 2035

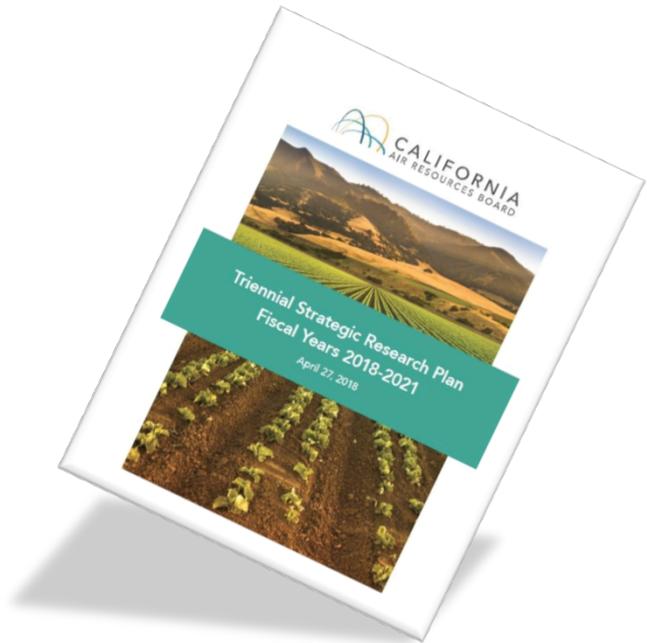
Full transition to **ZEV short-haul/drayage trucks**  by 2035

Full transition to **ZEV buses & heavy-duty long-haul trucks**  by 2045*

¹² Full transition to **ZE off-road equipment**  by 2035*

*where feasible

CARB Research Program: 2021-2024 Triennial Plan



Includes new initiatives including Expanding Health Analysis and Carbon Neutrality

New section: A Starting Point on Operationalizing Equity in CARB Research

The main research question I presented at EMF 2019:

How do we more fully quantify all the benefits of our AQ, climate change, and transportation system regulations and policies?

Quantitative

- Reduced cases of illness and premature death
- Reduced economic costs of health care, climate pollution
- Include new information and outcomes

Qualitative

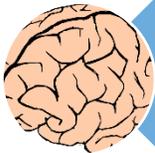
- Community resilience
- Greater mobility and physical activity
- Improved quality of life
- Increased health equity



Many Additional Health & Economic Benefits



Lung health benefits



Brain health benefits



Healthy birth outcomes

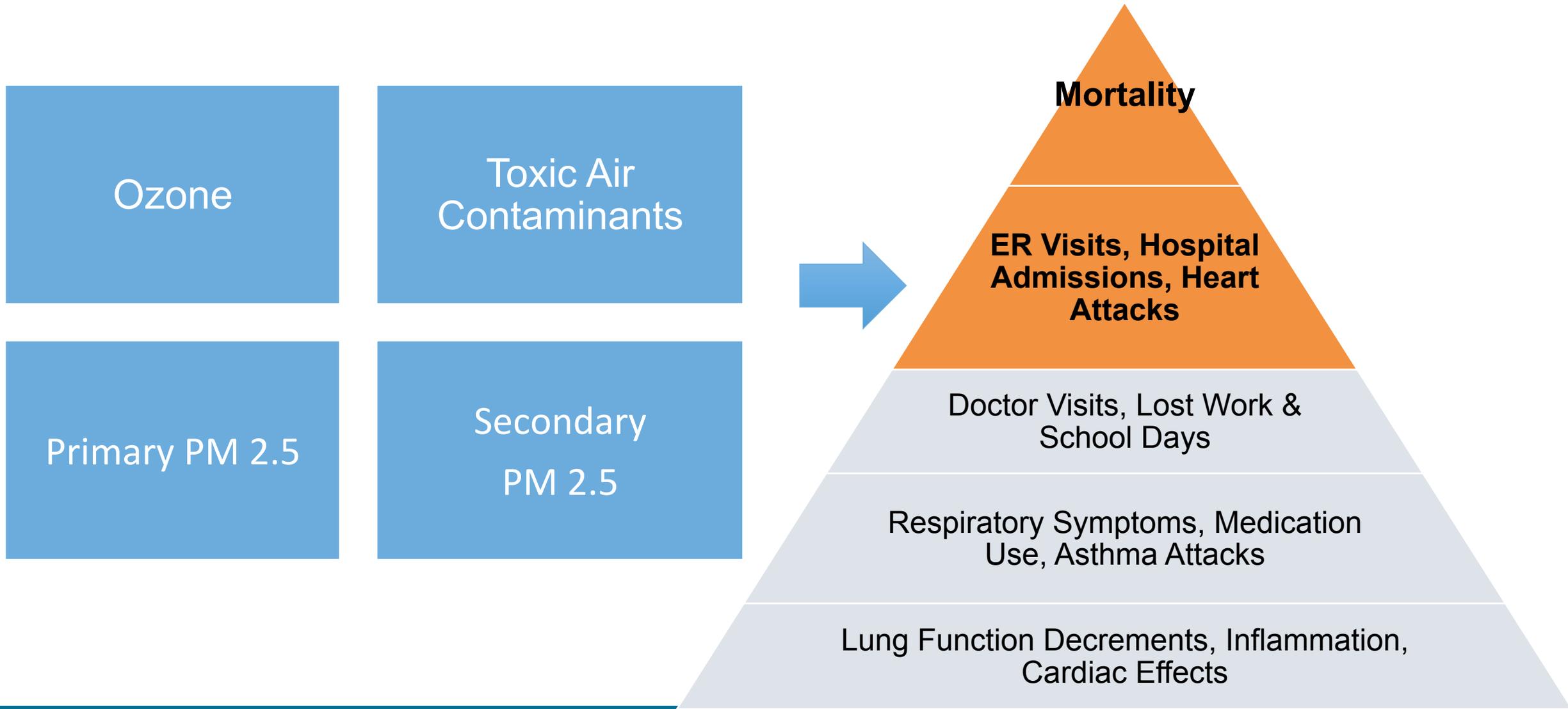


Improved life expectancy



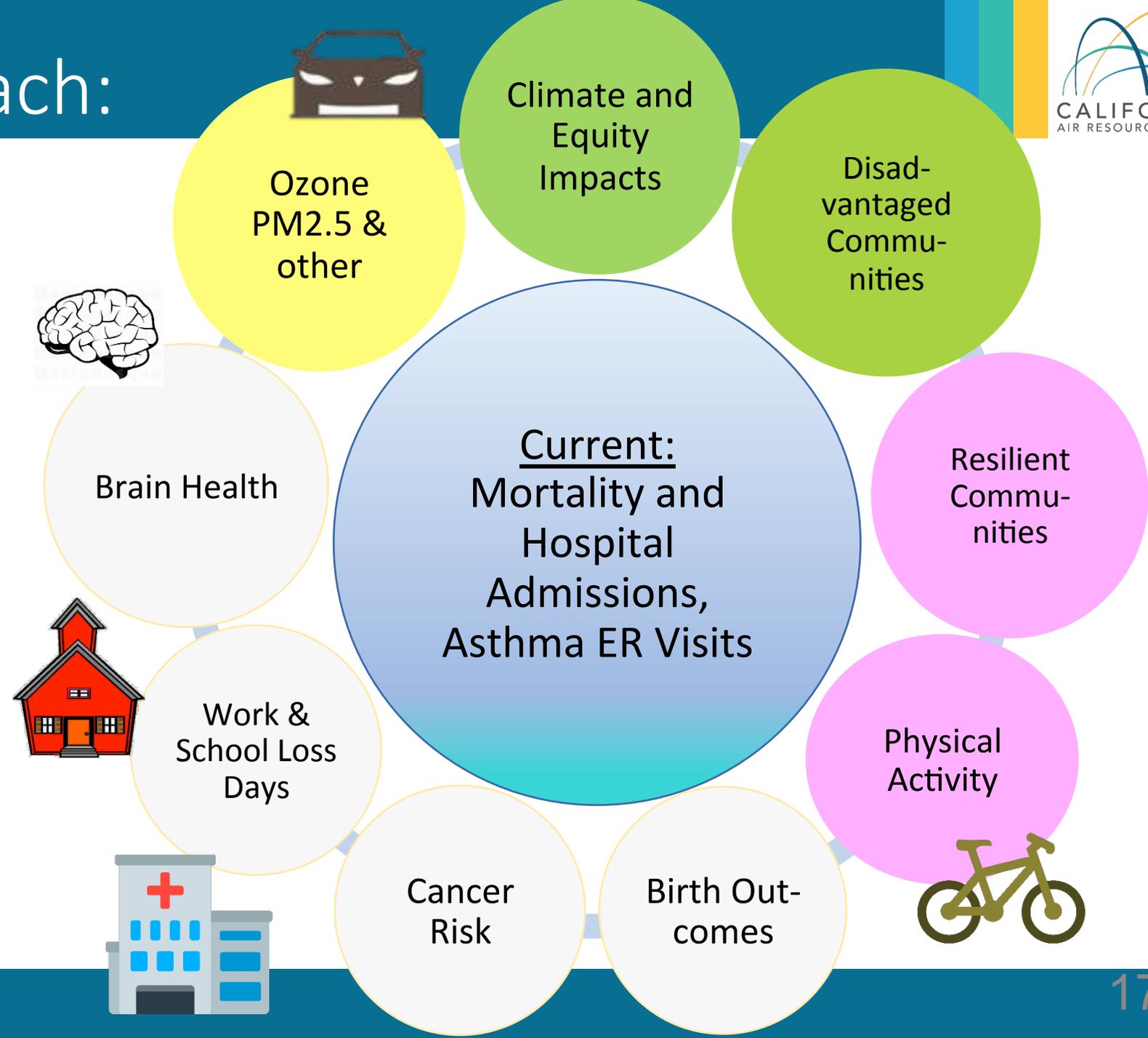
Less stress on healthcare systems

Expanding Pollutants and Outcomes



Expanded Approach:

Use health analysis methods that more completely capture full benefits



Resolution 20-13 (April 23, 2020): Health Evaluation of Air Quality and Climate Regulations and Programs

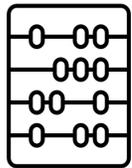
NOW, THEREFORE, BE IT RESOLVED that the Board directs staff to pursue the following actions, with input from the public and stakeholders as appropriate:

1. Develop new quantitative and qualitative approaches to evaluate the health benefits of CARB's air quality and climate regulatory actions and programs;
2. Explore and develop new methods for evaluating health impacts in disadvantaged communities that account for increased vulnerability and exposure to sources of pollution that impact communities;
3. Update and expand the methodologies to analyze the health benefits from reducing emissions of ozone and secondary particle pollution and develop methodologies for additional pollutants;
4. Evaluate and propose new approaches to evaluate and communicate the public health benefits of reducing greenhouse gases and improving community sustainability, resiliency, and quality of life;
5. Investigate approaches to expanding health analysis to include a range of additional health outcomes linked to pollution exposure.

Improving CARB's Health Analysis Methodology



Analysis Tools



Existing health analysis tools

IPT, BenMAP, InMAP, ITHIM

New health analysis spreadsheet tools - (Research contracts)

Health Endpoints



Expand IPT using BenMAP data

Expanded, updated endpoints for respiratory, brain, cancer, low birth weight, DACs

(Research contracts)

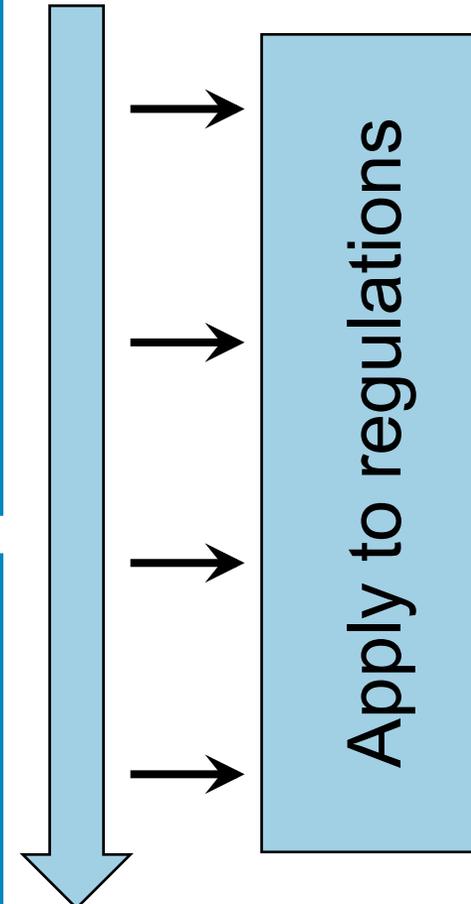
External Outreach



Advisory Committee and external outreach

Expanded health analysis symposium and public workshops

Winter 2021



Spring 2023

Apply to regulations

Assess Climate Change Impacts on Health & Equity

Air pollution &
increasing
allergens

Extreme heat

Severe weather

Degraded
environment

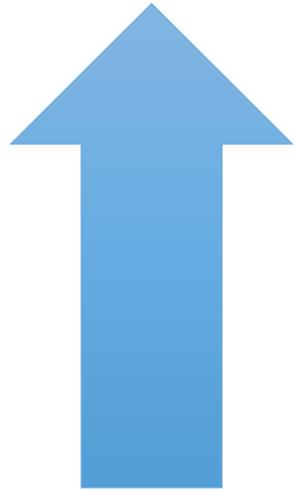
Poor living
conditions &
social inequities

Vector-borne
illnesses

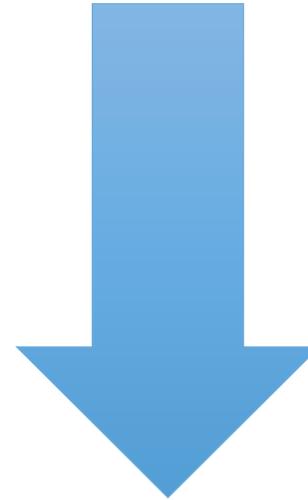
Water & food
supply impacts

Water quality
impact

Allows Us to Better Capture Linked Climate & Air Pollution Benefits



Sustainability
Physical Activity
Green Space
Resiliency
Equity
Quality of Life



Pollution
Sprawl
Vehicle Trips
Freight Impacts
Petroleum
Dependence

- Update current air quality health analysis tools
- Workshops this Fall on next steps in expanding health analysis
- Scoping Plan effort kicking off with workshops this month
- Health Analysis Symposium (January 2022)
- Develop new health analysis tools through research contracts
- Studying additional pollution-related health outcomes:
 - Asthma exacerbations, other respiratory and heart conditions, brain health, birth outcomes, cancer and non-cancer toxic impacts, lost work days
 - California-specific data where possible
- Projects include community outreach and engagement components.

Estimating the Health Benefits of Reducing Emissions of Criteria Pollutants and Toxic Air Contaminants in California

(UC Davis)

- Evaluate and monetize health impacts from criteria pollutants and air toxics
- Estimate health effects at the census tract level
- Develop a user-friendly Benefits Spreadsheet Model tool

Measuring Effects of Exposures to NO_x, PM_{2.5}, Toxics Near Ports and Railyards in Southern California

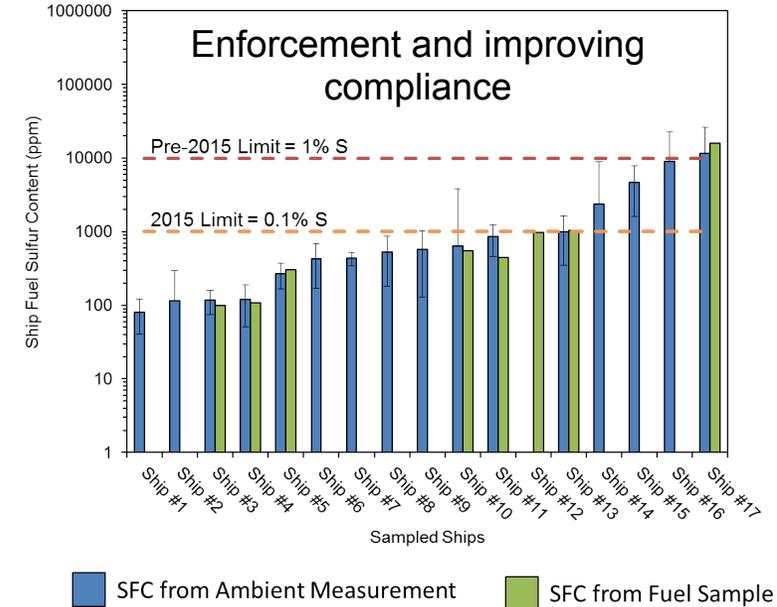
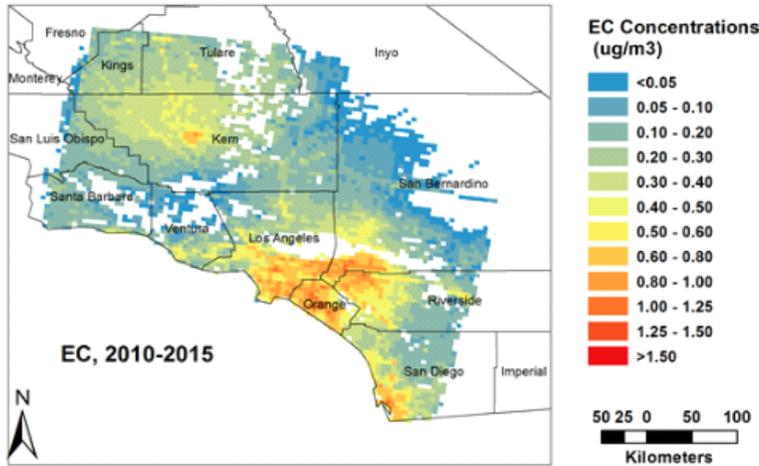
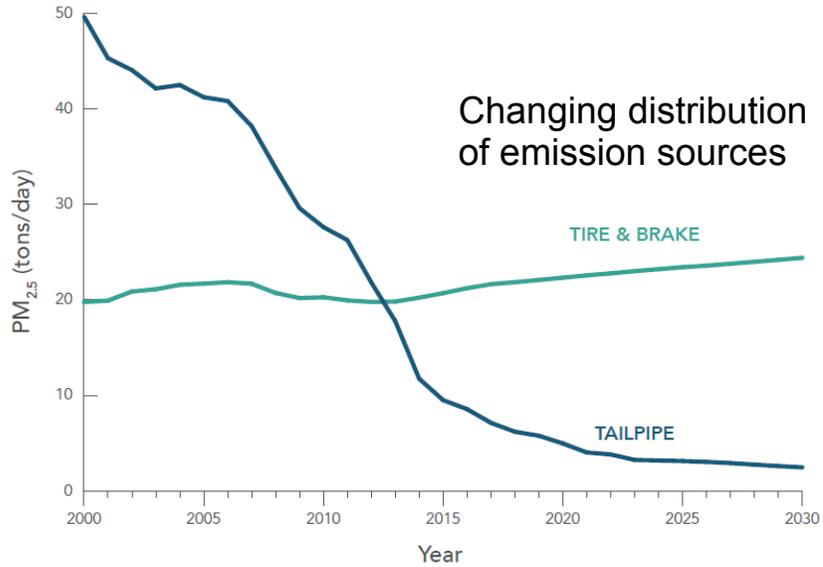
(UC Berkeley)

- Effects of pollution and air toxics on daily rescue medication use and annual ED visits in communities
 - Data from daily use rescue smart inhalers (1,200 participants from 2014-2019)
 - Asthma-related Emergency Department visits (2016-2019)
- Los Angeles, Ventura, San Bernardino, Orange, Riverside, San Diego, and Imperial counties

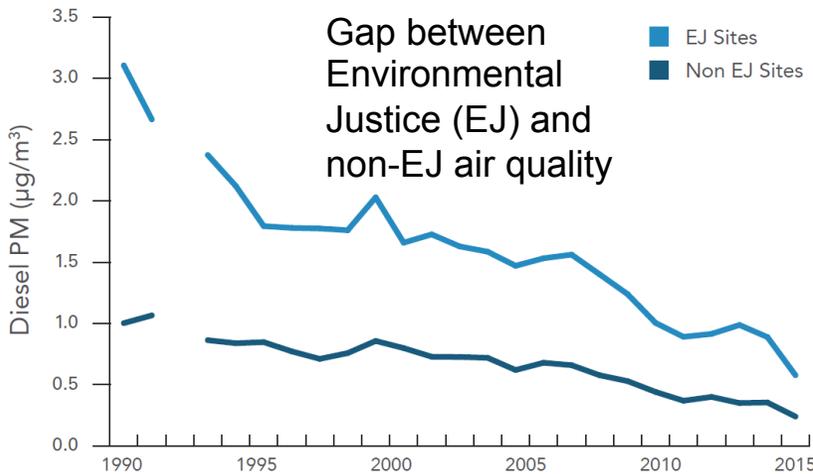
- Land use, housing, equity, and transportation
 - Contract: Strategies to Improve the Alignment of Planned Transportation Investments with Climate and Equity Goals
 - Contract: Opportunities to Address Past Inequity to Build Healthier, More Sustainable Communities
 - Contract: Screening Method and Map for Evaluating Transportation Access Disparities and other Built Environment-related Social Determinants of Health
- Incentives and advancing consumers, fleets, and businesses changes to advanced technology and lower polluting choices?
 - Contract: Low-Carbon Transportation Incentive Strategies Using Performance Evaluation Tools for Heavy-Duty Trucks and Off-Road Equipment
 - Contract: Strategies for Incentivizing High-Occupancy, Zero-Emission, New Mobility Options
 - Contract: Determinants of Medium and Heavy Duty Fleet Turnover
 - Contract: Decision Drivers to Facilitate Lower-Polluting Products Choices by Consumers

- Optimization of freight systems
 - White Paper: Pathways to Increasing California Freight System Efficiency
- Autonomous vehicles
 - Contract: Emission Impacts of Connected and Automated Vehicle Deployment in California

California's Air Quality and Climate Changes Challenges



Spatial variability of air quality, benefits/dis-benefits of regulations/policies



- Increased Wildfire Risk**
Burned area will increase 60-170% by 2100, depending on location
- Loss of Snowpack**
~25 inches of April snow water lost by 2100
- Sea-level Rise**
14-94 inches by 2100, depending on emissions scenario
- Extreme drought**
Long-term declines in groundwater reserves

Climate Change and feedback

THANK YOU FOR LISTENING

Questions?

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For more information, please visit:
<https://www.arb.ca.gov/homepage.htm>