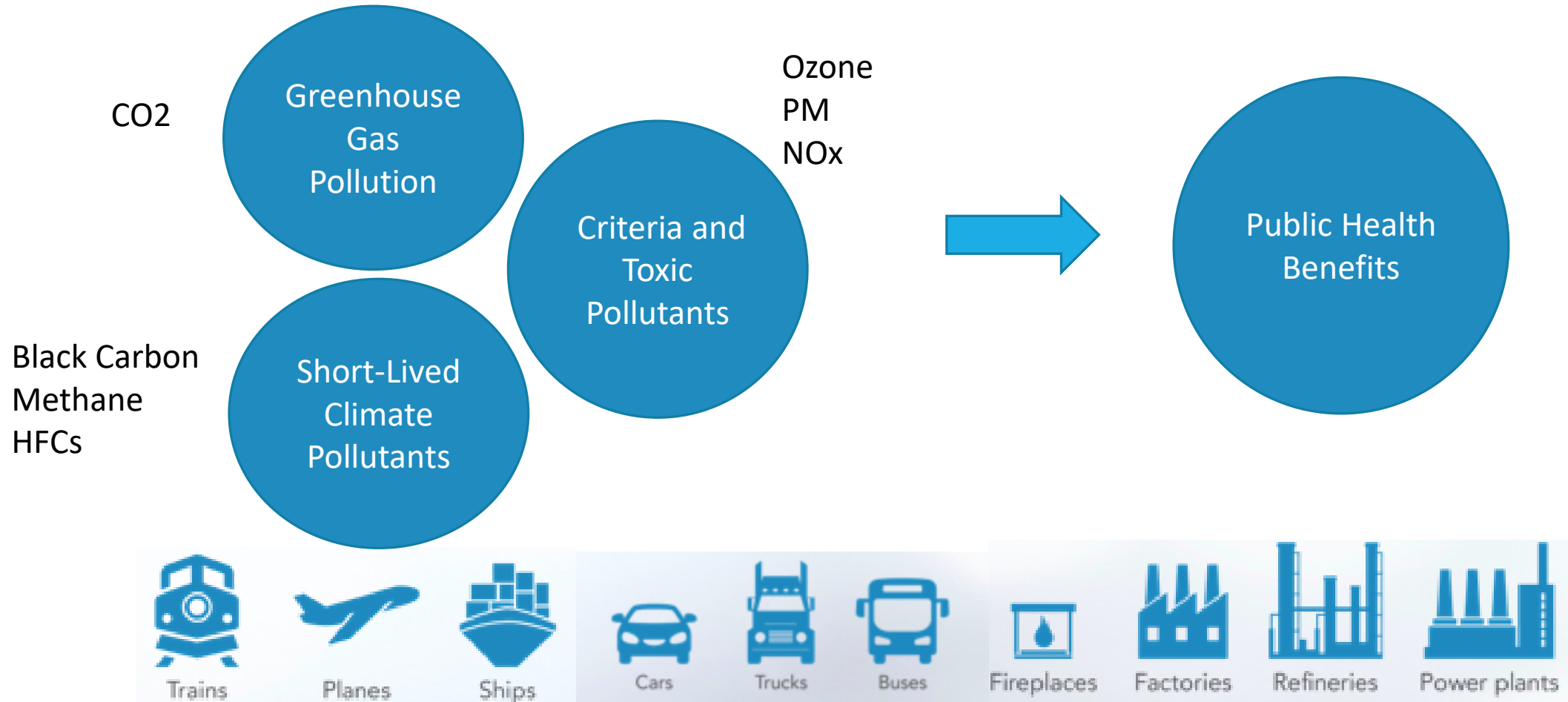


Scoping Plan Public Health Workshop

FEBRUARY 15, 2022



Fossil Fuel Combustion Phase Down Can Reduce Both GHGs and Other Air Pollution



California's Integrated Air Quality and Climate Programs



Health Effects of Climate Change



Extreme weather, heat waves, drought, wildfires



Vector borne disease, increased allergens



Poor living conditions, social inequities, reduced food supply



Air and water pollution, degraded environment

At-Risk Groups Suffer More Health Consequences

- Low-income; marginalized groups
- Race and Ethnicity
- Pre-existing diseases (cardiovascular disease and respiratory disease),
- Immigrant, refugee and tribal communities
- People with disabilities
- Older adults; Children
- Pregnant women



(U.S. EPA, 2019, p. 12-1; U.S. EPA, 2021; Governor's Office of Planning and Research, 2018, p. 25)

Defining Key Terms

Health Endpoints:

- ✓ Health outcomes used in health impact assessment (quantitative or qualitative)
- ✓ Outcomes that can be measured and improved - Asthma attacks, Hospitalizations

Climate Resilience:

- ✓ Capacity of people and communities to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience.

Background on CARB's Health Analysis

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

Current approach quantifies small subset of full suite of benefits (PM2.5 only):

- ✓ Cardiopulmonary mortality
- ✓ Hospitalizations for heart and lung causes
- ✓ Emergency room visits for asthma

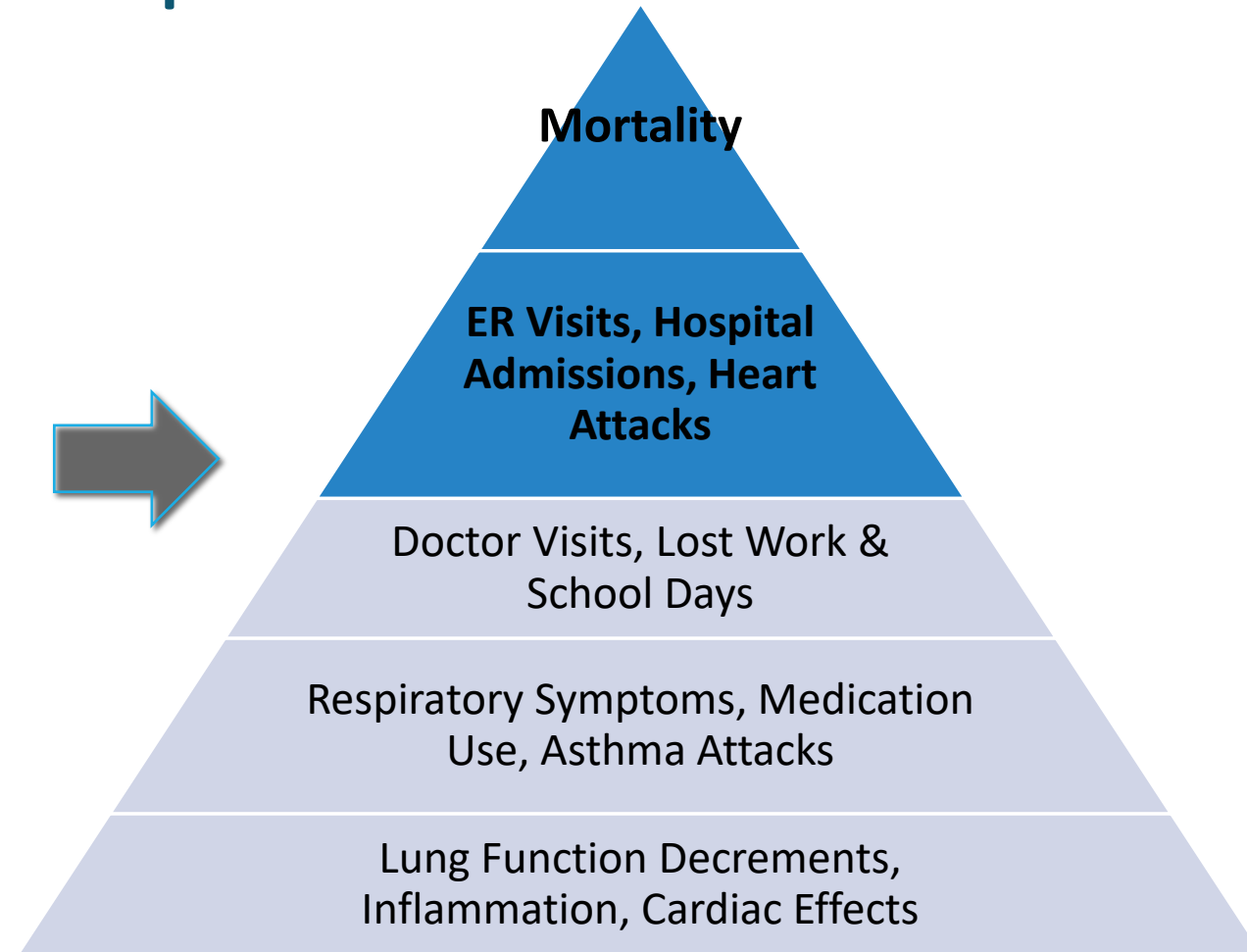
Air Pollution and Health Impacts

Ozone

Particulate Matter

Toxic Air
Contaminants

Secondary
Particulate Matter



(Graphic adapted from **EPA BenMAP website**
<https://www.epa.gov/benmap/how-benmap-ce-estimates-health-and-economic-effects-air-pollution>)

Example: Advanced Clean Trucks

CARB health analysis of Advanced Clean Trucks estimates potential statewide health benefits of PM2.5 reductions between 2020 - 2040:

- ✓ 943 fewer premature deaths
- ✓ 453 fewer emergency room visits (respiratory)
- ✓ 325 fewer hospital admissions (respiratory and cardiovascular admissions)

Strong Evidence for Broader Health Impacts

Asthma Onset/
Exacerbation*

Work
Loss Days*

School Loss
Days

Brain Health*

Birth
Outcomes*

Metabolic*
Outcomes

*CARB research underway

Expanding Health Endpoints for Ongoing Analysis of Rules, Plans

Updated Endpoints	New Endpoints
Hospital Admissions, Cardiovascular Outcomes*	Emergency Department Visits, Cardiovascular
Hospital Admissions, Respiratory Outcomes*	Acute Myocardial Infarction, Nonfatal
Emergency Department Visits, Respiratory	Asthma Onset
	Asthma Symptoms / Exacerbation
	Work Loss Days
	Lung Cancer Incidence
	Alzheimer's Disease
	Parkinson's Disease

*CARB will update the underlying study
 CARB is currently calculating ED visits for specifically asthma

Health Analysis: Qualitative and Quantitative Outcomes

Quantitative

- ✓ Reduced cases of mortality and morbidity

Qualitative

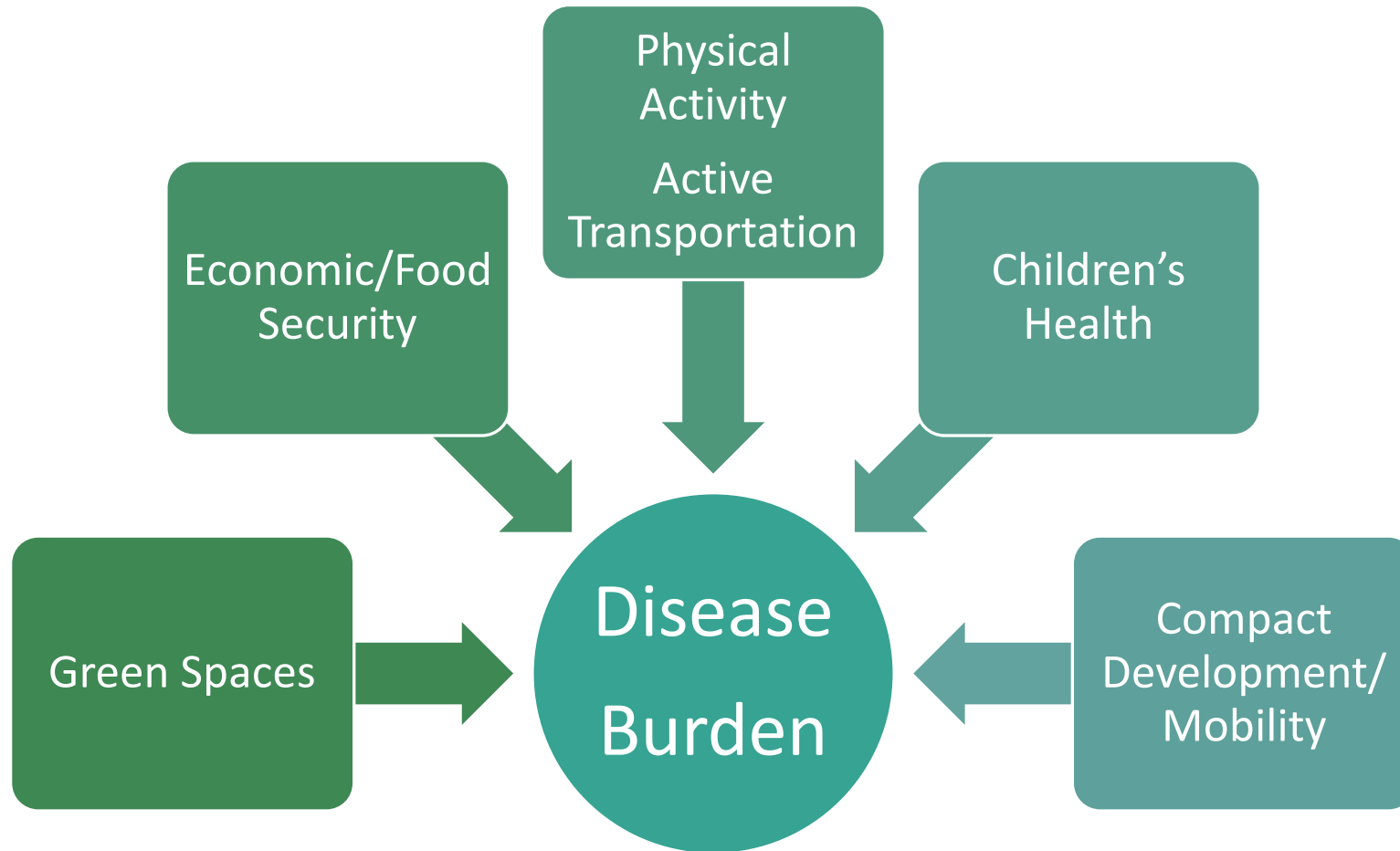
- ✓ Directional and scale of effects
- ✓ Broader set of health outcomes
- ✓ Health disparities



Why Do a Qualitative Analysis?

Elements	Quantitative	Qualitative
Economic valuation	X	
Disease burden from epidemiological studies	X	X
Community impacts		X
Statewide and regional analysis	X	X
Strength of evidence	X	X
Vulnerability and disparities		X

Key Areas of Focus Qualitative Analysis



Health Benefits Support Community Resilience



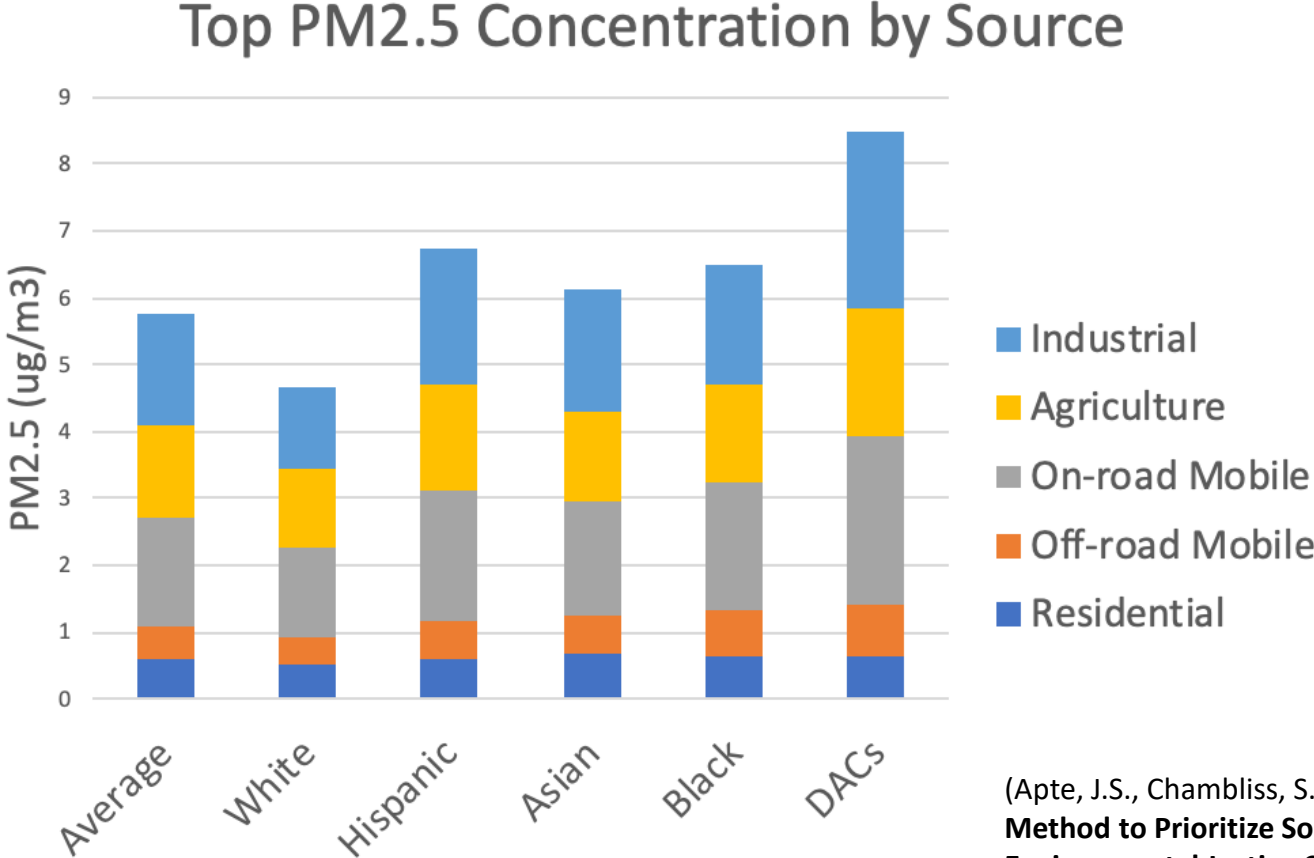
(Watts N, Cambell-Lendrum D, Maiero M, et al., 2015. **Strengthening health resilience to climate change: Technical briefing for the World Health Organization Conference on Health and Climate**)

Quantitative and Directional Health Benefits

Decreased Air Pollution	Increased Green Space	Decreased Noise Pollution	Increased Physical Activity
<ul style="list-style-type: none"> ↓ Asthma incidence, ED visits ↓ Asthma exacerbation ↓ All-cause mortality ↓ Preterm birth/low birth weight ↓ Diabetes incidence ↓ Respiratory mortality ↓ Lung cancer ↓ Cardiovascular mortality ↓ COPD 	<ul style="list-style-type: none"> ↓ Cardiovascular mortality ↓ Diastolic blood pressure ↓ Preterm births ↓ Stress ↓ Diabetes incidence ↓ All-cause mortality 	<ul style="list-style-type: none"> ↓ Hypertension ↓ Coronary heart disease ↓ Stroke 	<ul style="list-style-type: none"> ↓ Breast cancer ↓ Cardiovascular disease ↓ Dementia ↓ Colon cancer ↓ All-cause mortality ↓ Diabetes incidence

(Note. Adapted from “**Quantifying the Health Benefits of Urban Climate Mitigation Actions: Current State of the Epidemiological Evidence and Application in Health Impact Assessments**” by Castillo et al., 2021, *Frontiers in Sustainable Cities*, V3, Table 1 (<https://www.frontiersin.org/article/10.3389/frsc.2021.768227>))

Understanding Health and Exposure Disparities



(Apte, J.S., Chambliss, S.E., Tessum, C.W., Marshall, J.D. (2019). **A Method to Prioritize Sources for Reducing High PM2.5 Exposures in Environmental Justice Communities in California, Contract 17RD006**)

Developing New Health Assessment Tools

- Assess benefits of Natural and Working Lands management to reduce wildfire health risks
 - All-cause mortality, respiratory mortality
 - Hospitalizations for asthma and all-cause respiratory conditions
 - Emergency room visits for asthma
- Assess benefits of greenness on health
 - Mortality
 - Birth outcomes
 - Mental health improvements



Assessing Children's Health Benefits Using Existing Literature

Health Endpoint	Effect Size
Lung development	Living within 500 m of a freeway: showed a decrease in lung function growth
Asthma symptoms and medication use	An increase of 72-119% for risk of wheezing and use of asthma medication was associated with increased exposure to NO ₂
New-onset asthma	34% increase for risk of developing new-onset asthma was found with increased exposure to traffic pollution



(Gauderman et al. 2007; Gauderman et al. 2005; McConnell 2010)

Overview: Key Health Analysis Elements

Analysis Type	2017 SP	2022 SP
Quantitative Analysis	# cases and value statewide PM	# cases and value state and local PM and Ozone
Health Overview	Literature review	Literature review
Qualitative Analysis	Not included	Included
Health Endpoints	3	Proposing 11
Physical Activity – Chronic Illness and Mortality	# cases; 2030 estimate	# of cases; Date of estimate TBD
Wildfire Analysis	Not included	# cases and value for selected years
Heat Mortality Analysis	Not included	Under review

Health Challenges and Mitigation Opportunities

- Fueling transition: Assessing impacts of transition from petroleum to renewable fuels and electrification
- Mobility transition: Assessing safety issues linked to vehicle traffic during transition to walkable, bike and transit friendly communities

Longer Term Research and Analysis

- More detailed health analysis of specific regulations and policies implemented after SP adoption
- Identifying/tracking health indicators in impacted communities
- Ongoing look at new approaches to health analysis
- Evaluate ways to better understand, account for cumulative impacts in communities



Review and Conclusion

- Overview/update of air pollution and climate change health effects
- Health benefits of decarbonization no later than 2045 vs. Status Quo
- Quantitative and qualitative approaches
- Use expanded health outcomes and tools
- Include information on climate and health disparities

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