



2017 Climate Change Scoping Plan Update

February 9, 2017



Outline

- ▣ Background
- ▣ Overview of Proposed Plan
- ▣ Additional Detail on Alternatives
- ▣ Refinements to the Economic Analysis
- ▣ Estimating Health Impacts
- ▣ Schedule
- ▣ Discussion

Background

- Most aggressive climate target in North America: 40% reduction in GHGs by 2030 compared to 1990 levels
 - Builds on California's success reducing GHGs
 - Aligns California with the rest of the world in climate change fight
- Proposed Plan draws on the successes and the lessons learned from the previous plans
- Proposes continuing major successful programs that have served as a model for other states and jurisdictions around the world
- Proposed Plan achieves GHG reduction target and continues to make our communities and economy more resilient and equitable at the same time

New Directives and Legislation

- ▣ Executive Order B-30-15
 - ▣ Reduce GHG emissions 40% below 1990 levels by 2030
 - ▣ Update Scoping Plan to incorporate 2030 GHG target
- ▣ Senate Bill 32 (SB 32) codifies 2030 GHG target
- ▣ AB 197
 - ▣ Consider the social costs of GHG reductions
 - ▣ Prioritize measures resulting in direct emission reductions
 - ▣ Follow existing AB 32 requirements—including considering cost-effectiveness and minimizing leakage

Objectives for Scoping Plan

- ▣ Achieve 2030 target
- ▣ Provide direct GHG emissions reductions
- ▣ Provide air quality co-benefits
- ▣ Minimize emissions leakage
- ▣ Support climate investment in disadvantaged communities
- ▣ Protect public health
- ▣ Facilitate sub-national and national collaboration
- ▣ Support cost-effective and flexible compliance
- ▣ Support Clean Power Plan and other federal action

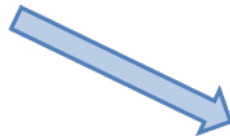
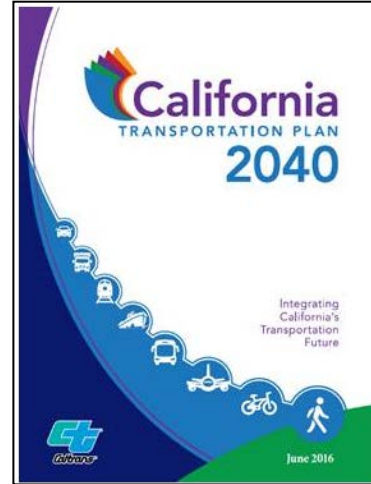
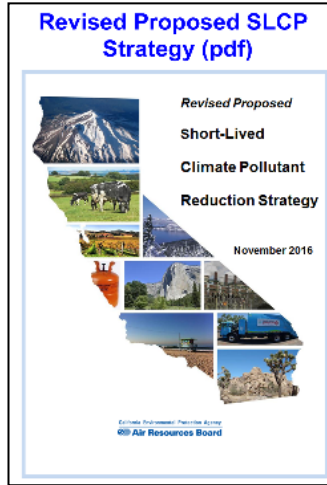
Building on an Existing Foundation

- Existing programs are delivering the emissions reductions needed to achieve the 2020 target
 - Program infrastructure exists to support continuation of existing programs
 - High compliance rates demonstrate regulated entities are able to successfully comply with existing programs
- Gross domestic product (GDP) has continued to grow
 - California is ranked as world's fifth largest economy
 - Per capita and per dollar of GDP GHG emissions have declined

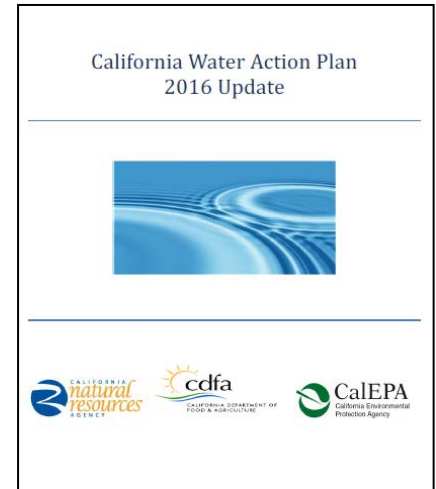
Foundational Plans for 2030



SB 375 Sustainable Communities Strategies



2030 Target Scoping Plan

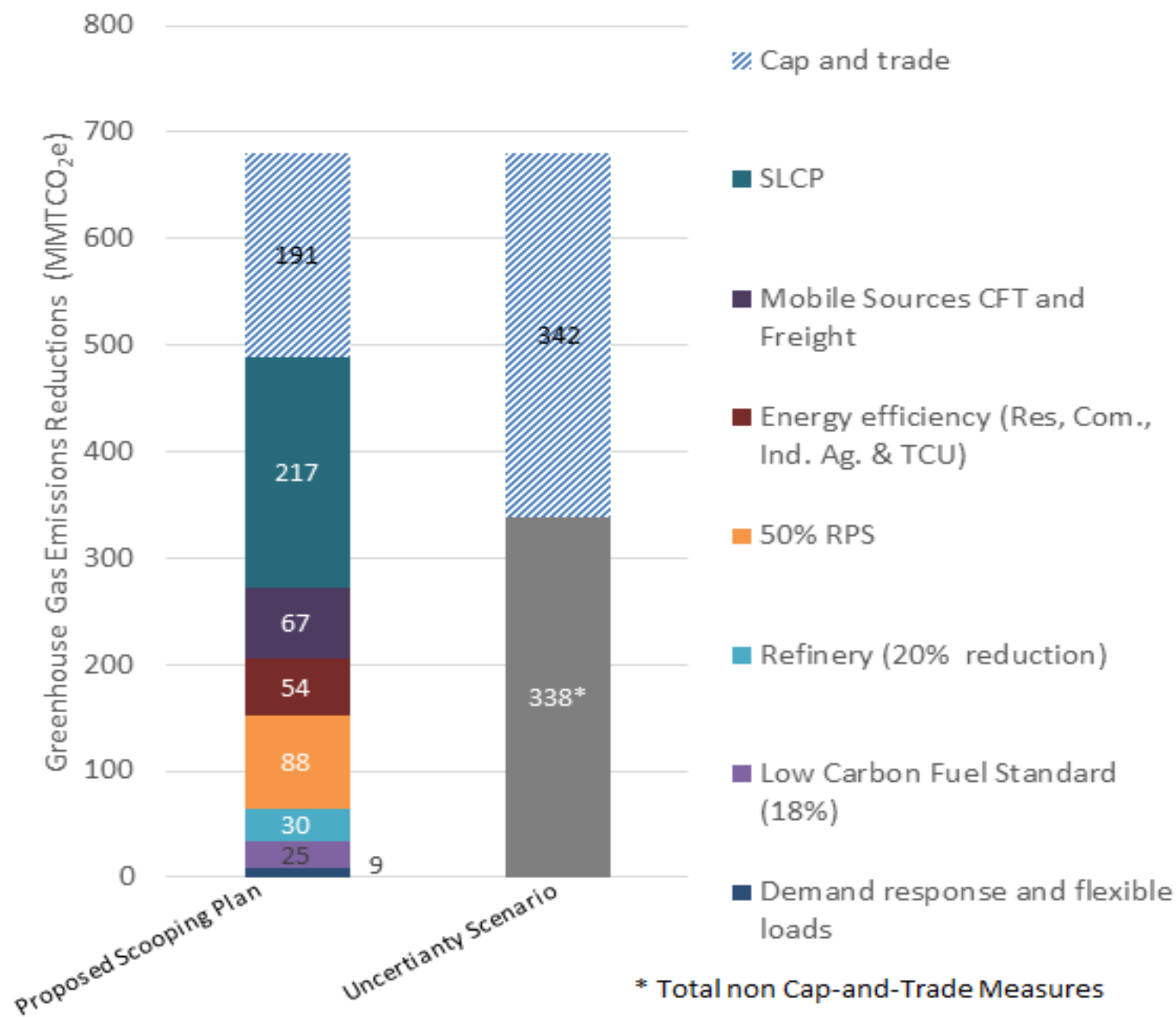


Proposed Scoping Plan Scenario

- ▣ *SB 350 – increase renewable energy and energy efficiency
- ▣ *SB 1383 – Short-Lived Climate Pollutant Reduction Plan
- ▣ *SB 375 – support sustainable community development
- ▣ *Mobile Source Strategy – help State achieve its federal and state air quality standards
- ▣ *Low Carbon Fuel Standard
- ▣ *Sustainable Freight Action Plan
- ▣ New Refinery Efficiency Measure – 20 percent by 2030
 - ▣ Fewer GHG emissions per barrel of a refined product
- ▣ Post-2020 Cap-and-Trade Program
 - ▣ Trading and offset usage limit of 8 percent

*Existing commitments included in any Scoping Plan Update

Figure II-2. Proposed Scoping Plan Scenario – Estimated Cumulative GHG Reductions by Measure (2021–2030)



Natural and Working Lands

- Goal: Manage California's Natural and Working Lands, including green space in urban areas, to be a resilient net sink of carbon in 2030, 2050 and beyond
- Continued efforts to model a reference case and management practices to inform performance targets
- By 2018, develop an Integrated and Working Lands Action Plan to detail how this sector becomes a net carbon sink
- SB 1383 goal to reduce methane emissions from livestock manure and dairy manure management operations

Proposed Plan Meets All Objectives (1 of 2)

- ▣ High probability of meeting 2030 target with hard cap
- ▣ Provides direct GHG emissions reductions from all sectors
- ▣ Provides air quality co-benefits through both command and control regulations and the Cap-and-Trade Program
- ▣ Protects public health through climate leadership, co-benefits, and investment in disadvantaged communities
- ▣ Minimizes emissions leakage through free allocation

Proposed Plan Meets All Objectives (2 of 2)

- Supports climate investment in disadvantaged communities by continuing to provide proceeds for GGRF
- Facilitates sub-national and national collaboration through linkage of Cap-and-Trade programs
- Supports cost-effective and flexible compliance by allowing trading
- Supports Clean Power Plan and other federal action because the Cap- and-Trade program can be used to comply with CPP

Alternatives Evaluated

- ▣ **No Cap-and-Trade** – rely on direct measures for all reductions
- ▣ **Carbon Tax** – replace Cap-and-Trade with a carbon tax
- ▣ ***All Cap-and-Trade** – no refinery measure and no enhancement to Low Carbon Fuel Standard (keep at 10% reduction in CI)
- ▣ ***Cap-and-Tax** – require each facility/entity to reduce emissions annually with no trading, emissions would be taxed

*Focus of discussion for today

All Cap-and-Trade Alternative

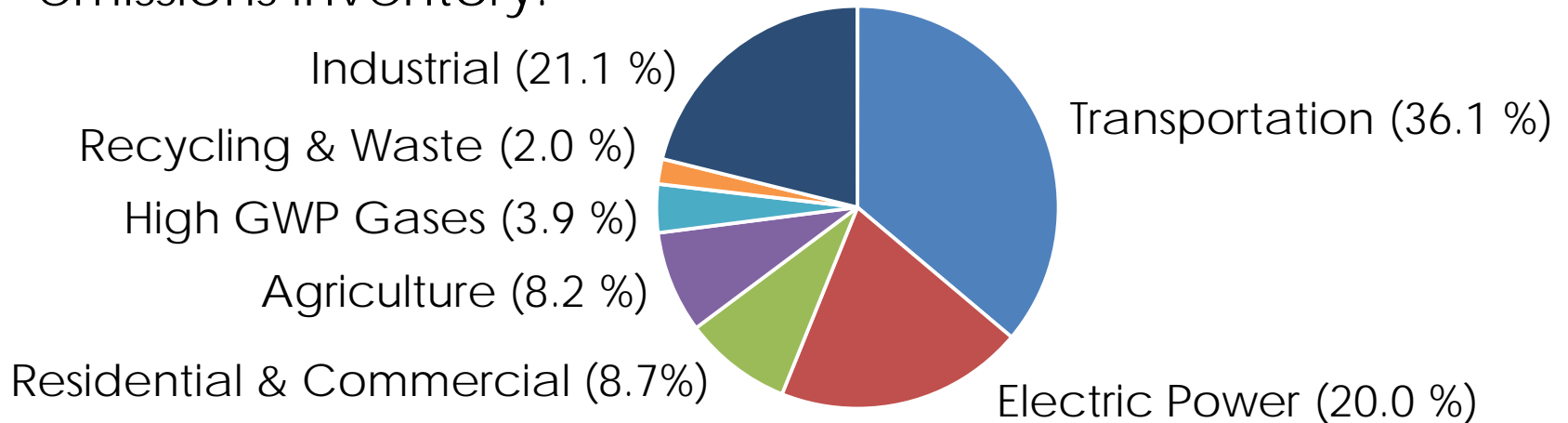
- ▣ Relies on Cap-and-Trade
- ▣ No refinery measure
- ▣ No enhancement to Low Carbon Fuel Standard (keep at 10% reduction in CI)
- ▣ Less certainty about amount of greenhouse gas reductions at refineries

Cap & Tax: Overview

- The Cap-and-Trade Program would mostly be replaced by a Cap & Tax Regulation post-2020
- Emissions from each covered entity would be subject to a declining annual cap
- Each metric ton of GHG emissions from covered entities would be subject to a tax at the social cost of carbon
- Penalties would be assessed for any annual emissions above an individual entity cap
- No trading of emissions allowances and no use of offset credits

Cap & Tax: Sectors Covered

- Percentage of total emissions by sector from 2014 GHG emissions inventory:



Cap & Tax Option	Sectors Covered by Cap & Tax
Option A	All sectors
Option B	Transportation, industry, electric power, and residential and commercial [#]

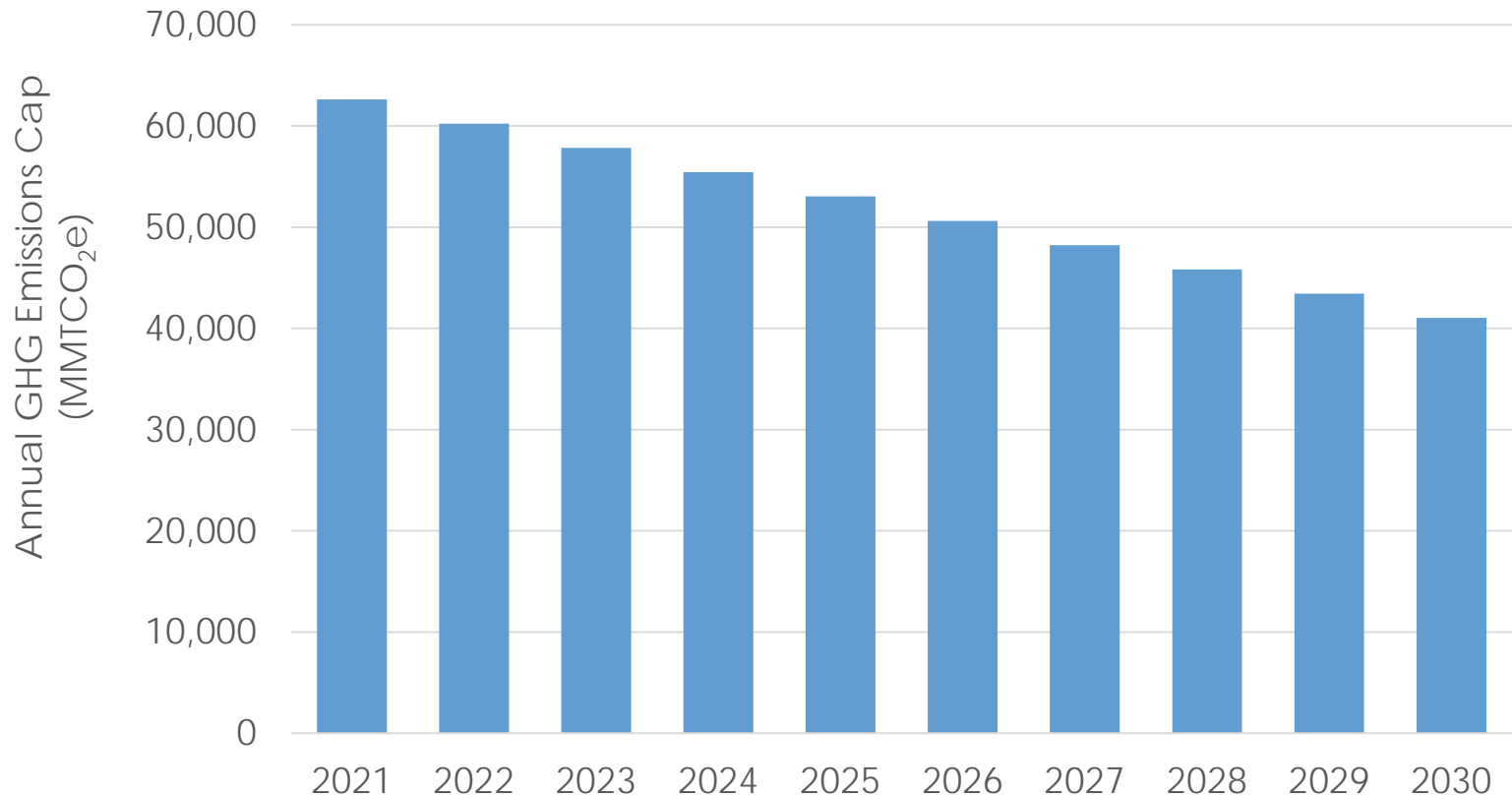
[#] These are sectors currently covered by the Cap-and-Trade Program.

Cap & Tax: Achieving the 2030 Target

Sector	2021-2030 Annual Emissions Reductions (%)	
	PREFERRED: Cap & Tax Option A –Uniform Across All Sectors	Cap & Tax Option B – Only Cap-and-Trade Sectors*
*Transportation	4.5	4.7
*Industry	4.5	4.7
*Electric Power	4.5	4.7
*Residential & Commercial	4.5	4.7
Agriculture	4.5	3.5
High GWP Gases	4.5	5.4
Recycling & Waste	4.5	1.4

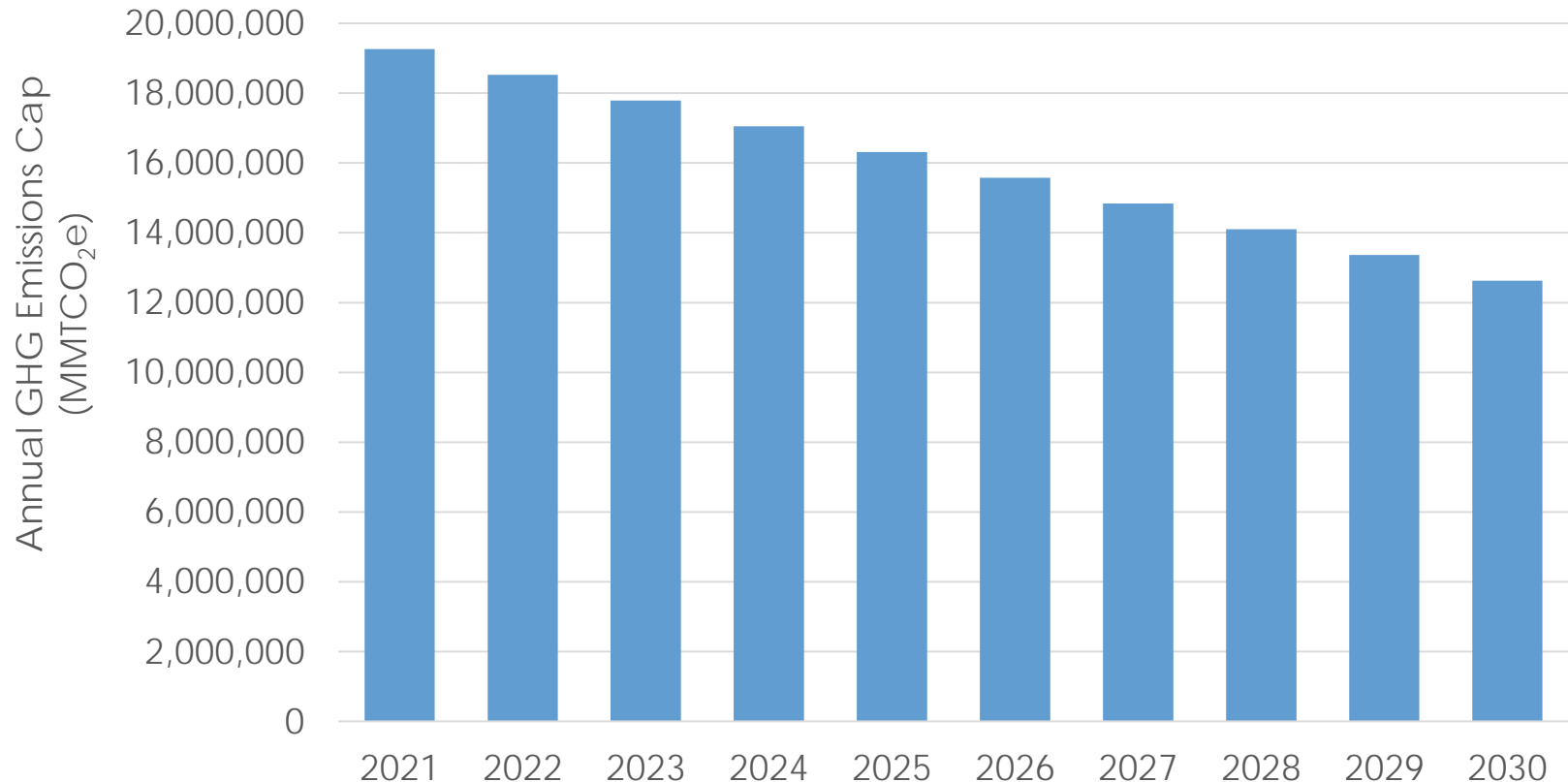
Cap & Tax: Example Caps for a Hypothetical Food Processor

Annual GHG emissions caps under Cap & Tax Option A for a hypothetical food processing facility with emissions equal to 65,000 MTCO₂e in 2020.



Cap & Tax: Example Caps for a Hypothetical Natural Gas Supplier

Annual GHG emissions caps under Cap & Tax Option A for a hypothetical natural gas supplier with emissions equal to 20,000,000 MTCO₂e in 2020.



Cap & Tax: Additional Details

- Set the tax at the social cost of carbon same as the carbon tax alternative
- Cap decline, not tax, would be main driver of emissions reductions
- Additional work would be needed to address new industry moving to the State
- Would need regulation to set individual caps for all entities, including establishing a base year
- Staff does not believe each sector can reduce at this level year over year
- Expected to be more cost than proposed plan and may result in loss of industry, jobs, and GDP

Refinements to the Economic Analysis

Planned Refinements to the Economic Analysis

- ▣ Regional impacts
- ▣ Macroeconomic analysis of all scenarios
- ▣ Health impacts

Regional Impacts Assessment

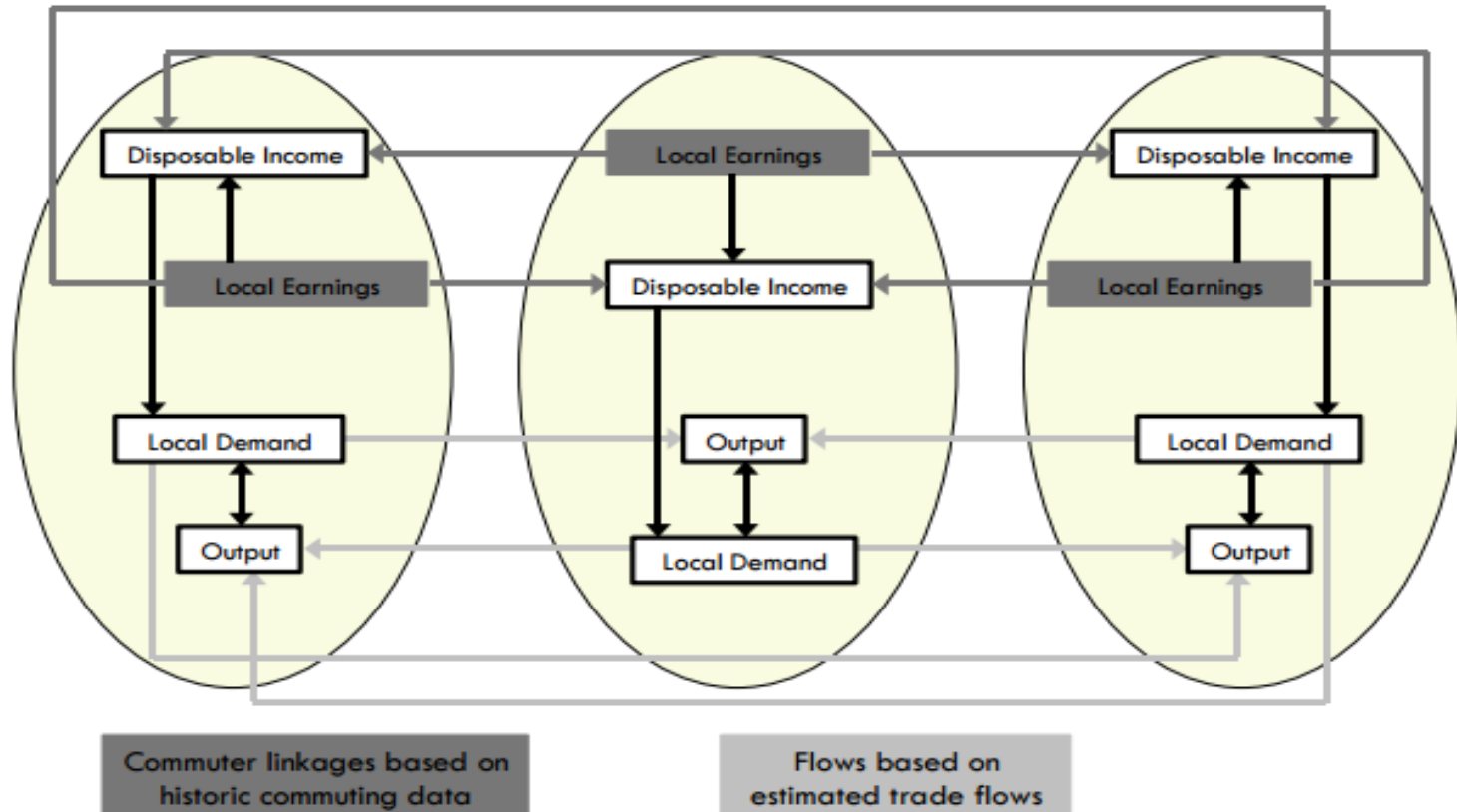
- Estimate the regional impacts of all Scoping Plan scenarios
- Analyze how the Scoping Plan scenarios will affect regional economic growth, industry output, wages, and employment
- Estimate the impact of the Scoping Plan scenarios on Disadvantaged Communities

REMI California County Model

- Representative of 58 regions and 160 sectors of the CA economy
- Accounts for regional differences in economic and demographic characteristics
 - Local consumption is estimated using data from the US Bureau of Economic Analysis (BEA) and the Census Bureau
 - Each county has distinct characteristics including industry output, personal income, and price indexes for housing and energy
- Allows for flow of population and employment between counties

California County Interactions in REMI California County Model

Trade and Commuter Flow Linkages



Translation of Inputs in REMI California County Model

REMI Policy Variable	County Conversion
Capital cost by Industry	Proportional to industry output at county level
Fuel cost for all industrial sectors	Proportional to industry consumption in each fuel category at the county level
Changes in final demand by industry	Proportional to industry output y county
Consumer spending for reduced fuel purchases	Proportional to personal consumption expenditure in each spending category at the county level
Production cost by industry	Proportional to industry output at the county level
Transfer payments	Proportional to population by county
Consumer price	Proportional to county personal expenditure in each category

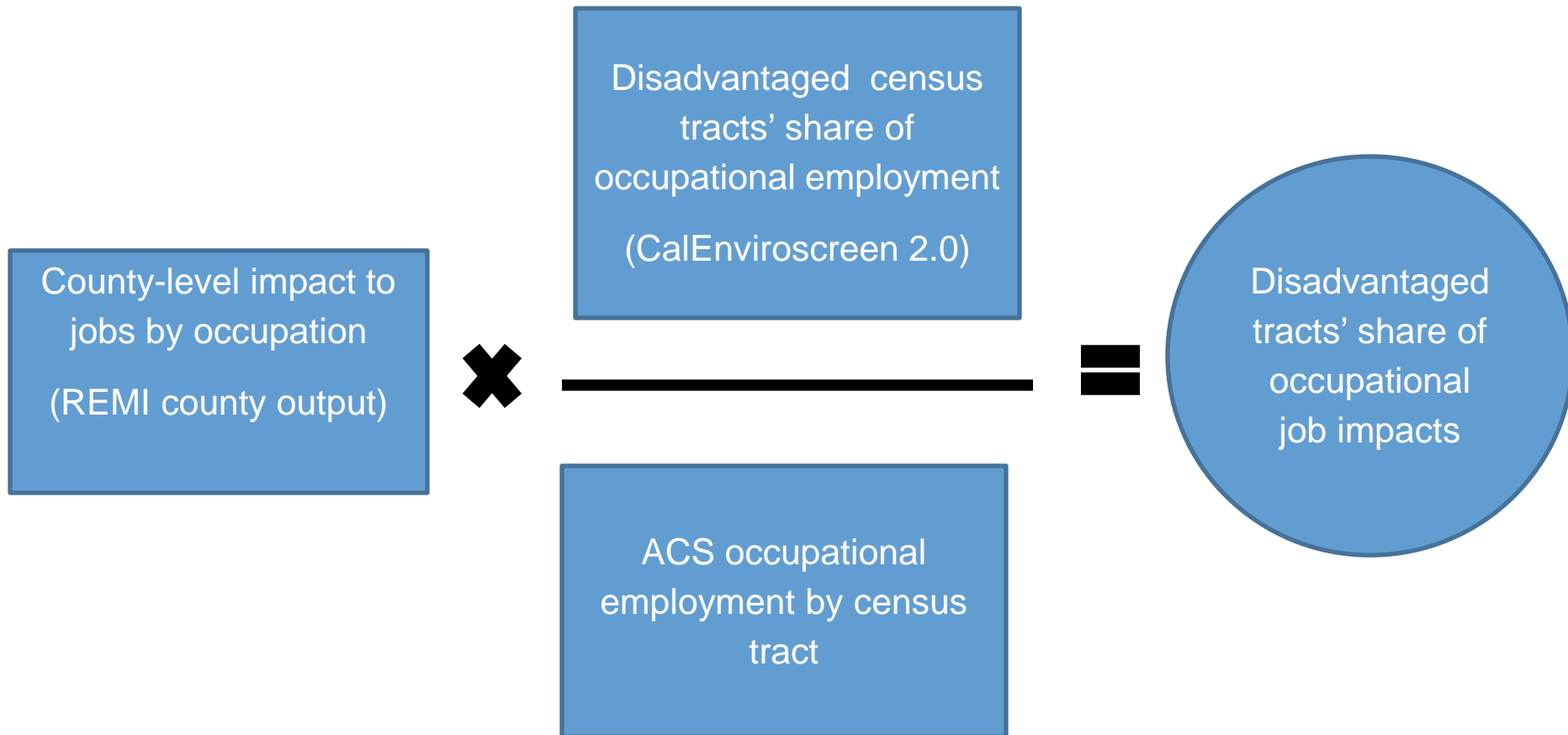
REMI California County Model Outputs

- ▣ County economic growth
- ▣ County employment
- ▣ County wages
- ▣ County-level industry output
- ▣ Can be used to estimate economic impacts of disadvantaged communities

Estimating the Economic Impact to Disadvantaged Communities

- Disadvantaged census tracts are identified using CalEnviroscreen 2.0
- Methodology
 - County employment information from American Community Survey (ACS) provides census-tract level estimates of jobs by occupation
 - Compare to the county-level estimates of jobs by occupation as output by the REMI California County Model
 - Estimate the employment impact on disadvantaged census tracts

DAC Impact Methodology



Results

- ▣ Estimate economic impacts relative to the baseline
- ▣ Estimate results by:
 - ▣ County
 - ▣ Regional area
 - ▣ Disadvantaged communities
- ▣ Metrics of interest
 - ▣ County economic growth
 - ▣ Employment
 - ▣ Wages
 - ▣ Sector value add

Economic Modeling of Scenarios

All Cap-and-Trade Economic Modeling

- Include PATHWAYS results that exclude the refinery measure and any enhancement to Low Carbon Fuel Standard in REMI
- Apply range of allowance prices in a similar manner as the Proposed Plan including free allowance allocation and return of auction proceeds through the GGRF and a per capita dividend

Allowance price range

(\$2015)	2020	2025	2030
C+T Floor Price	\$15.40	\$19.70	\$25.20
C+T Reserve Price	\$72.10	\$73.00	\$78.40

Cap & Tax Economic Modeling

- Based on uniform reductions from estimated 2020 GHG levels as modeled in PATHWAYS
- Reductions are modeled by sector and not individual facilities
 - Provides flexibility among facilities in a sector that does not exist when regulating individual facilities
 - The estimated cost of complying with Cap & Tax as modeled in PATHWAYS will likely be much lower than actual cost of compliance
- Include tax on all GHG emissions at social cost of carbon
 - No tax modifications to ensure competitiveness of CA businesses
 - All tax revenue is returned to CA consumers as a dividend

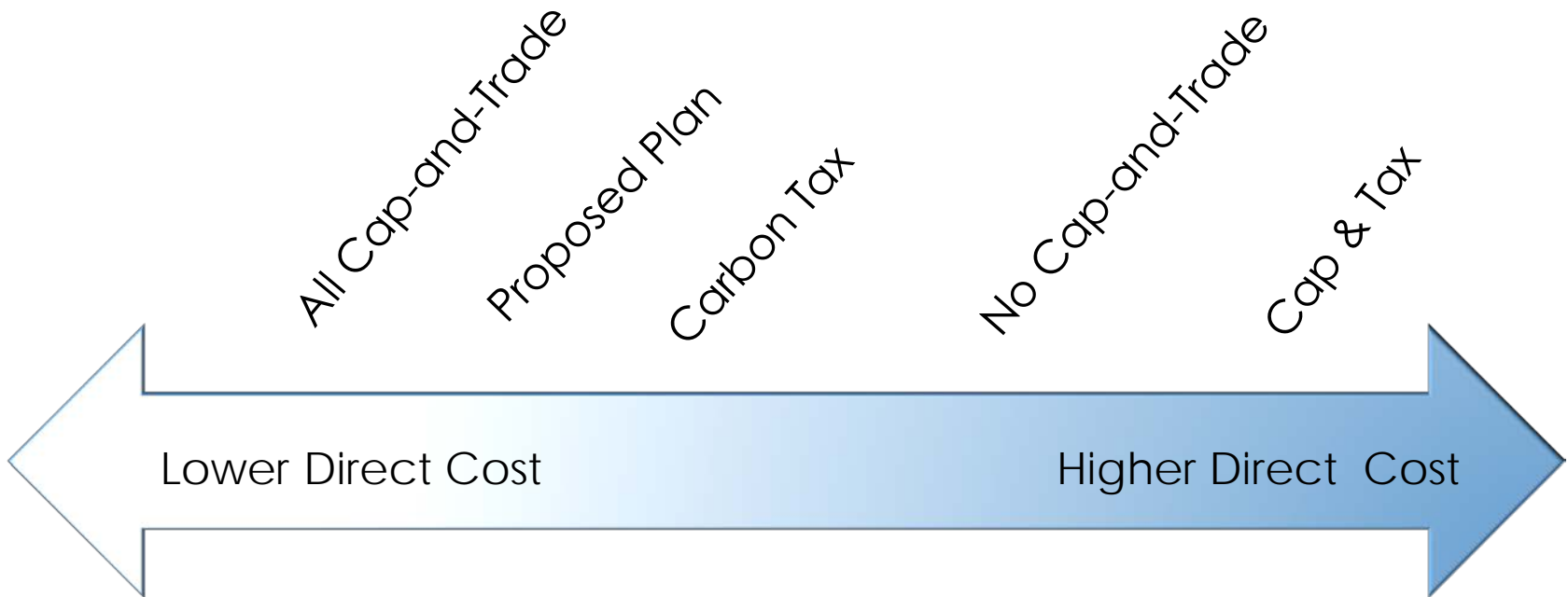
Cap & Tax Considerations

- ▣ Additional reductions are introduced to each sector on top of reductions achieved under the 'No Cap-and-Trade' scenario
- ▣ Limited information on mitigation potential in the industrial sector
- ▣ May require modeling reductions in output or production to achieve the 2030 target
 - ▣ The economic impact of reductions in output or production are introduced outside of PATHWAYS

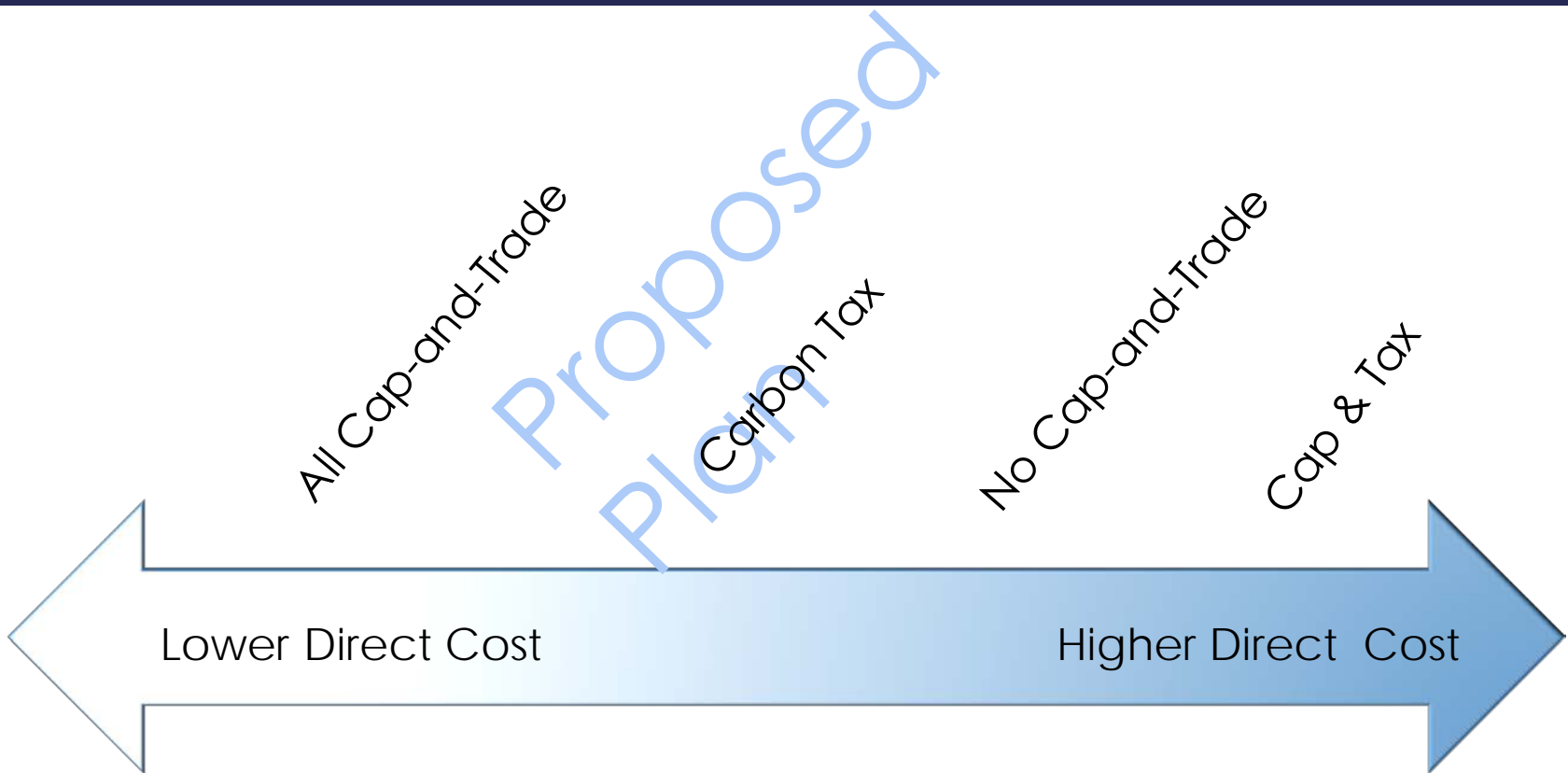
Potential Methods to Model Cap & Tax by Sector

Sector	Proposed Cap & Tax Measures (Build off modeling for no cap-and-trade scenario)
Agriculture	Additional reductions from dairy manure methane
Res. & Comm.	Additional electrification of buildings
Electric Power	Potential small increase in RPS
High GWP	No change
Industrial	10-15% electrification of manufacturing 10-15% additional reductions from refining, oil & gas, and industrial manufacturing - potentially from reduced output/production
Recycling/Waste	Additional reductions from waste
Transportation	Remove the early retirement of LDVs from No Cap-and-Trade Scenario

Preliminary Direct Cost Ranking of Scenarios



Preliminary Direct Cost Ranking of Scenarios



Health Economic Analysis

- Quantify and monetize the estimated avoided health impacts resulting from implementation of the Scoping Plan scenarios
- Monetized impacts may include:
 - Avoided premature mortality
 - Avoided hospitalizations
 - Avoided emergency room visits
 - Health benefits due to increase mobility

Health Impacts in REMI

- ▣ Identifying ways to potentially introduce monetized health impacts in macroeconomic modeling
- ▣ Changes in consumer spending on health related costs
 - ▣ Physician visits and hospitalization
- ▣ Changes in productivity due to avoided sick days
- ▣ Potentially incorporating avoided premature mortality

Estimating Health Impacts

Estimating Health Impacts from 2030 Target Scoping Plan

- ▣ Some actions that reduce GHG emissions can lead to reductions in ozone and PM2.5 precursors, and TACs
 - ▣ Reduced adverse health impacts
 - ▣ Reduced cancer risk
- ▣ SCSs can lead to more walkable communities
 - ▣ Increase in physical activity and improved overall health
 - ▣ Active Transport can lead to VMT reductions

Mortality Reductions Due to Decreases in Air Pollution

- US EPA has determined that PM2.5 exposure is a causal factor in premature mortality
- Estimate prevented
 - Premature mortality
 - Hospitalizations
 - Emergency Room visits
- Estimate mortality reductions from Proposed Scenario and 4 Alternatives

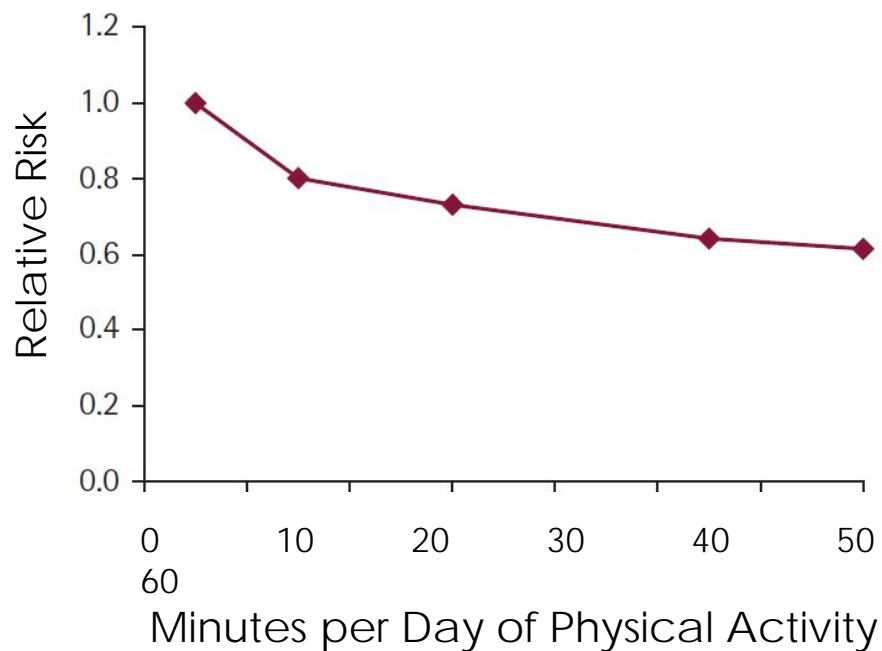
Methodology for Quantifying Mortality Reductions

- Same methodology as used for other ARB regulations
- Emission reductions from Scoping Plan lead to lower PM2.5 concentrations (Table III-1)
- Relate lower PM2.5 to improved health
- Adjust for population growth between 2010 and 2030

Active Transportation: Health Benefits of Physical Activity

- Regular physical activity reduces the risk of many adverse health outcomes.
- Individuals who are active for approximately 12 minutes/day have a 20% lower risk of dying early than those who are active just 5 min/day. Those who are active an hour a day have a 40% lower risk.
- Walking or bicycling for transportation contributes to your physical activity total.

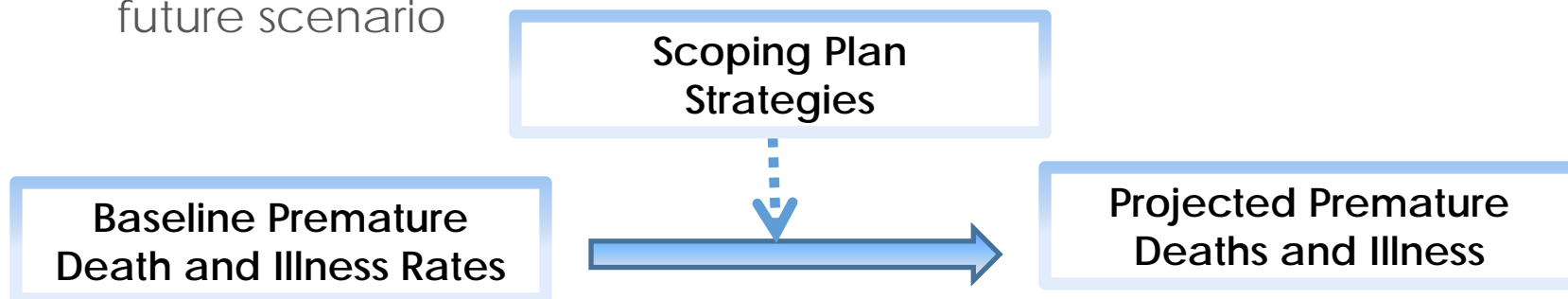
The Risk of Dying Prematurely Declines as People Become Physically Active



Active Transportation: Health Benefits of Physical Activity

■ Comparative Risk Assessment Methodology

1. Determine premature deaths attributable to baseline levels of physical activity
2. Estimate the increase in physical activity due to adoption of active transportation
3. Estimate the reduction in premature deaths from the baseline to the future scenario



- Projected health benefit of active transportation adoption is the difference between the baseline and scenario.
- Endpoints may include obesity, hypertension, heart disease, diabetes, and death
- *Seeking comments on this methodology*

Schedule

- ▣ CEQA comment period: January 20 – March 6
- ▣ Workshops today and in early March
- ▣ EJAC and Community Meetings
- ▣ February Board Hearing
- ▣ April 2017: Release Final Proposed Scoping Plan
- ▣ April 2017: Final Board consideration

Discussion

- The full text of “The 2017 Scoping Plan Update: The Proposed Plan for Achieving California’s 2030 Greenhouse Gas Target” is available at:

www.arb.ca.gov/cc/scopingplan/scopingplan.htm

- Stakeholders and the public are encouraged to submit comments by 5:00 PM PST on March 6, 2017

www.arb.ca.gov/lispub/comm/bclist.php